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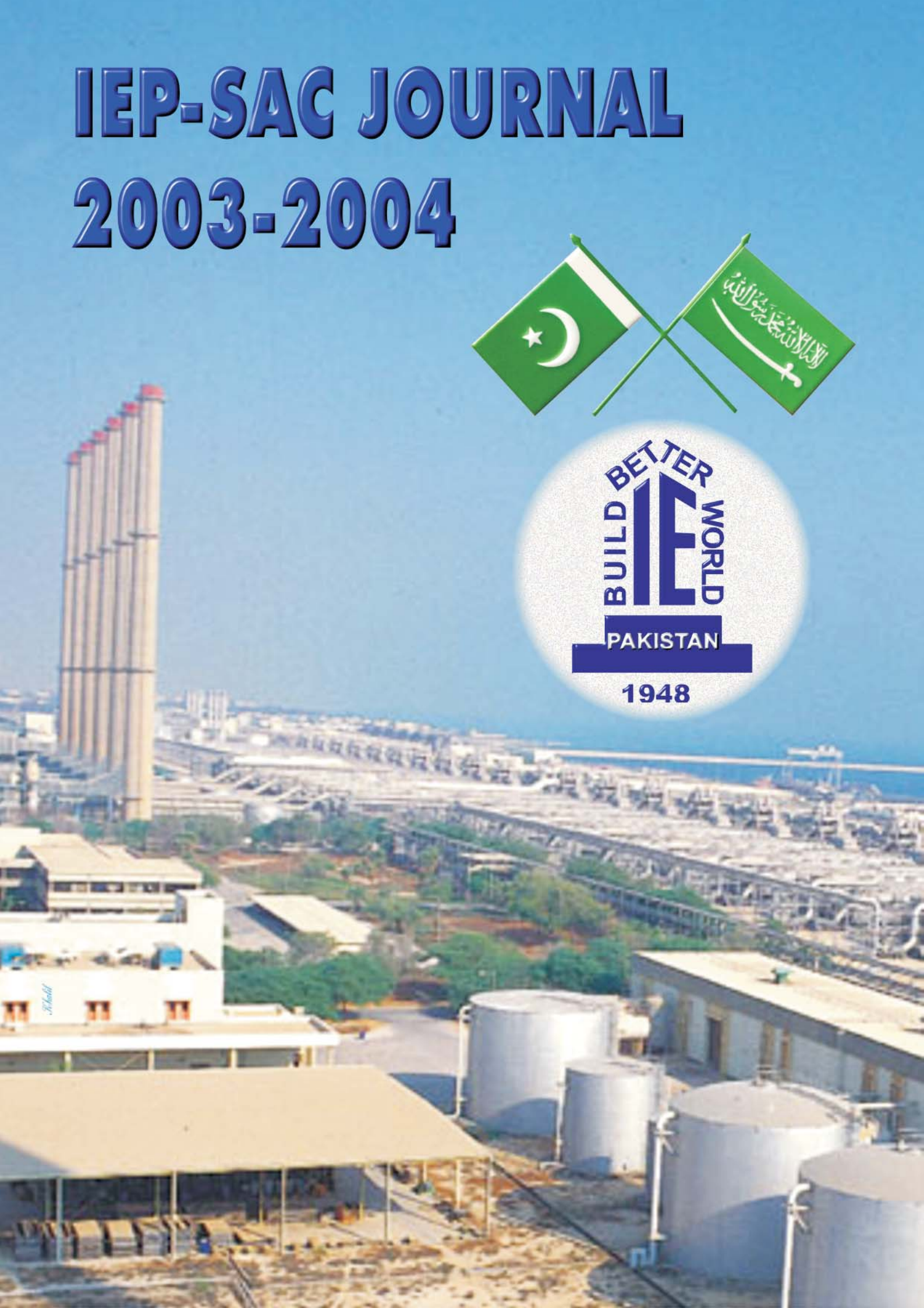

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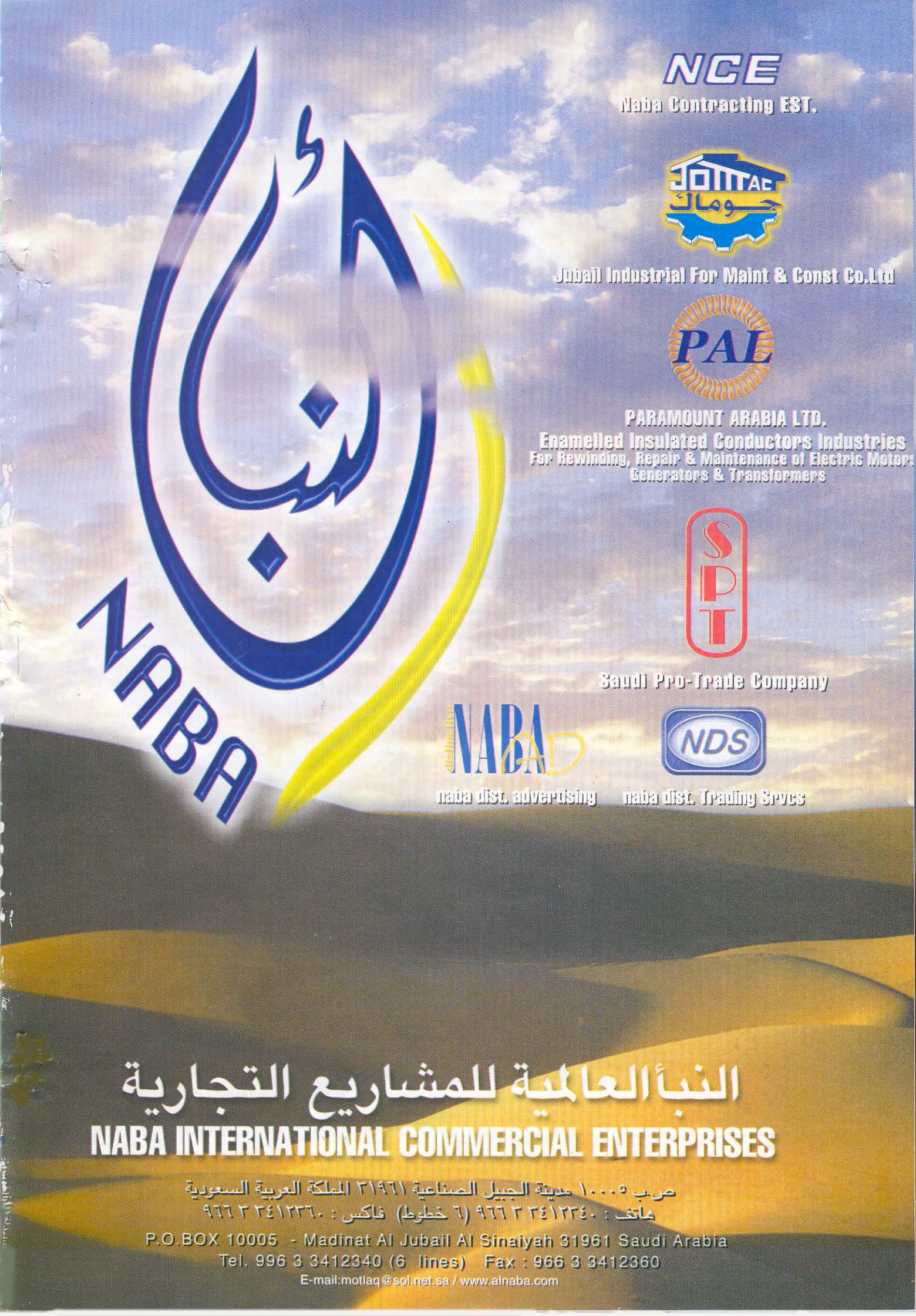
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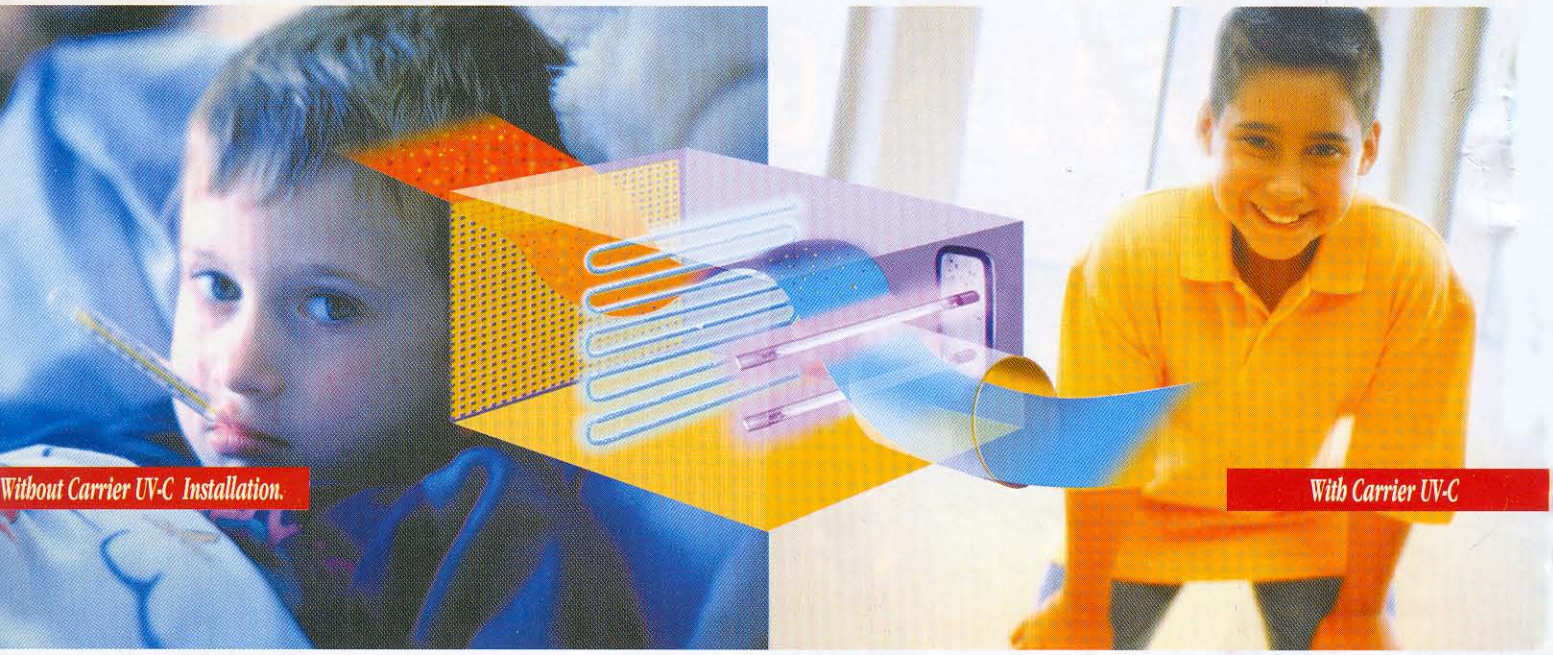

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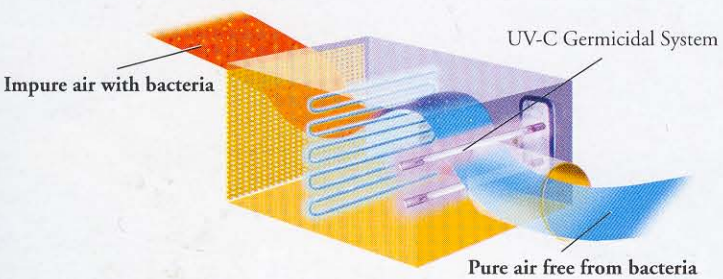

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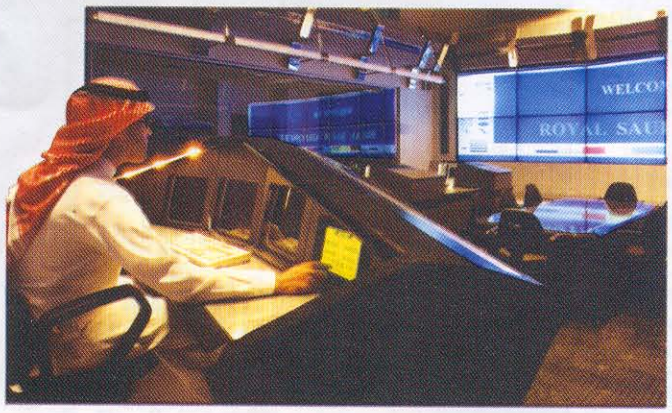

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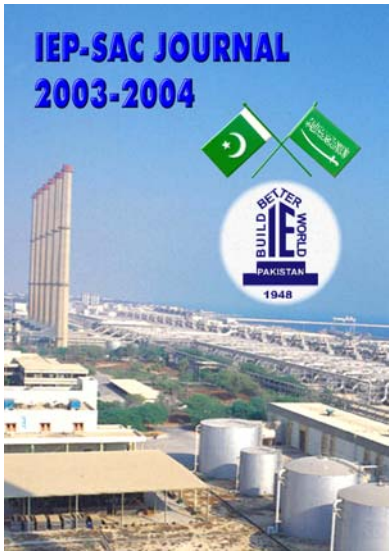

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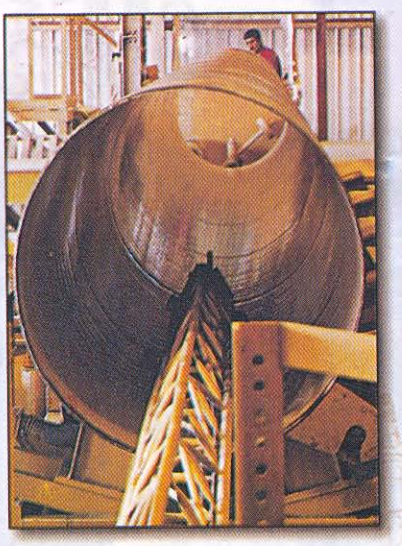

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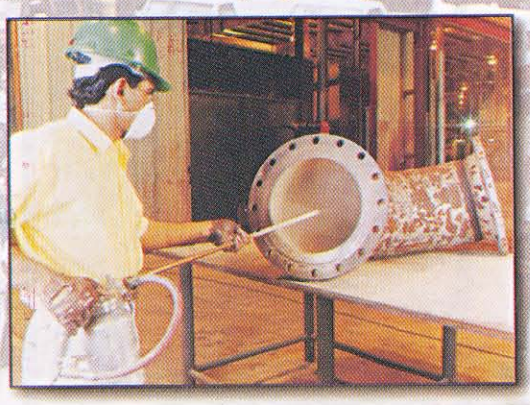

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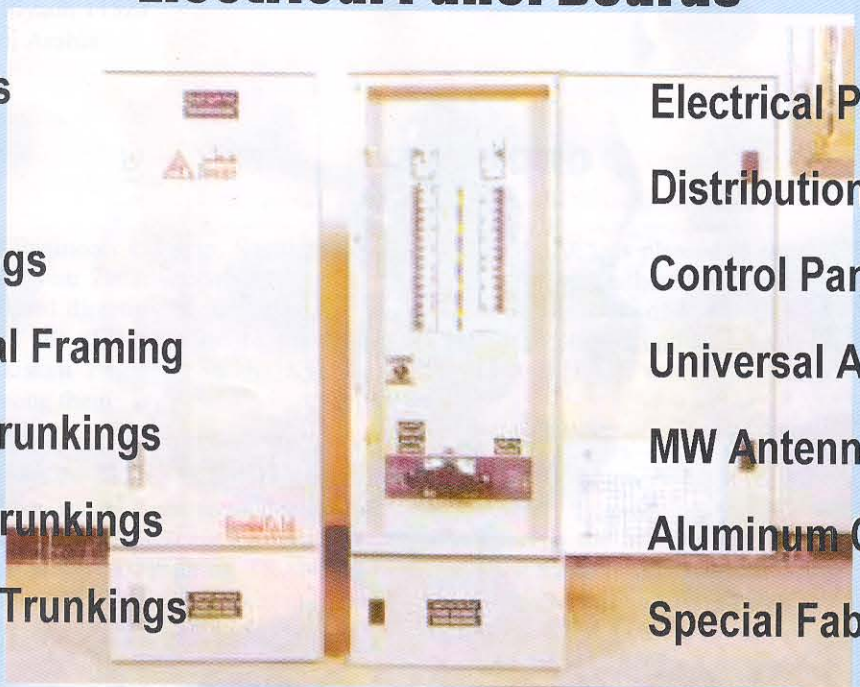

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FOREWORD

The Institution of Engineers Pakistan, Saudi Arabian Center (IEP-SAC), is pleased to present the IEP- Journal for the year 2003. It contains a number of technical papers authored by our members as well as an up-dated directory of the Pakistani Engineers in the Kingdom of Saudi Arabia. The main objectives of the IEP-SAC are to provide avenues and means of updating professional knowledge of Pakistani Engineers in the Kingdom of Saudi Arabia and to facilitate effective communication among them.

All professional bodies like the IEP-SAC are recognized by their members' accomplishments and contributions in their respective technical areas. We as Pakistani Engineers have an excellent opportunity to further enhance our technical and managerial imagine by excelling in our assigned jobs / projects by means of presentations and/or technical papers in the international magazines and/or conferences as well as ensuring TRANSFER OF TECHNOLOGY TO OUR SAUDI COLLEAGUES. Given the international changing environment, Pakistan is placed in an unique position to play a very important leadership role especially in the Middle East & Asian regions. In order to materialize and capitalize this opportunity, Pakistan engineers have one of the most crucial roles to play. I am sure, we have talents and capabilities to meet the expectations of the people.

We wish to express our deep appreciation for the voluntary but extremely valuable efforts of the members of the Local Council of IEP-SAC, and other friends of IEP-SAC in collecting the information and processing it against a very tight deadline. We are pleased to thank the IEP-HQ Pakistan for their continuos support. We wish to thank the Sponsors and Advertisers also who extended their support to make the publication of the Journal possible. Furthermore, We are thankful to all the engineers, town planners, architects and allied professionals who have submitted their particulars for the up dating of the directory. In addition, We are also thankful to our speakers and authors who have taken a considerable amount of time from their very busy schedule to prepare the presentations and technical papers.

We are grateful to H.E. the Ambassador of the Islamic Republic of Pakistan and his embassy staff for their usual cooperation and support.

We also take this opportunity to thank the Government of the Kingdom of Saudi Arabia for their hospitality and cooperation to the Pakistani Community in the Kingdom in general and Pakistani Engineers in particular.

Engr. Syed Mohammad Jaleel Hasan
Chairman
Institution of Engineers Pakistan
Saudi Arabian Centre

23rd October 2003
27th Shaaban 1424H

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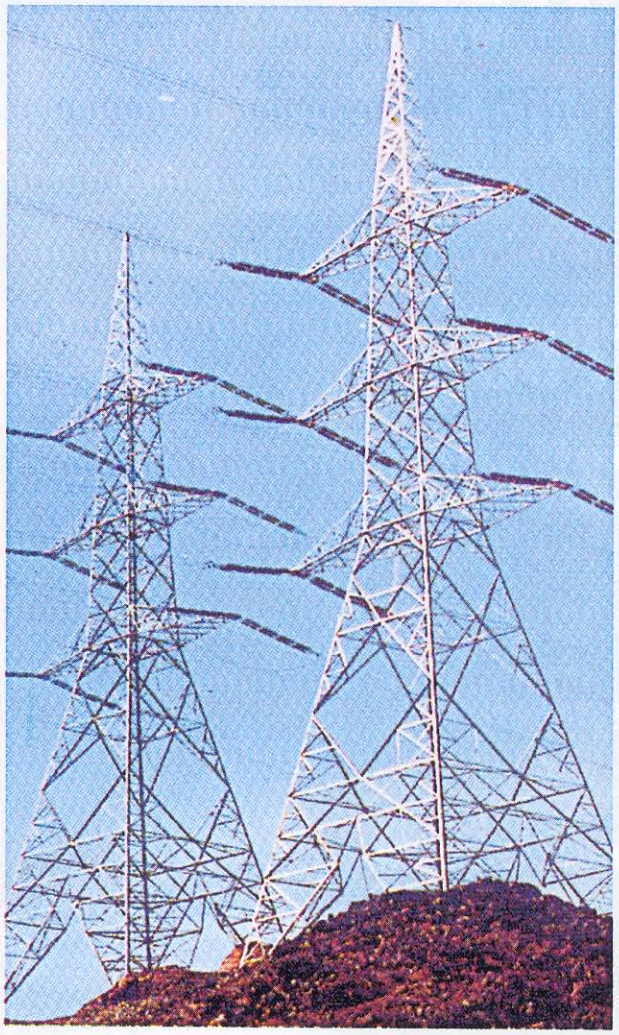

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Message of Admiral Abdul Aziz Mirza(Retd), Ambassador of Islamic Republic of Pakistan to the Kingdom of Saudi Arabia

I congratulate the Institution of Engineers Pakistan – Saudi Arabian Center (IEP-SAC) for organizing a Seminar on "Desalination, Past and Future" ". This Technology is advancing at a rapid pace and the dissemination of such information is indeed timely.

The Desalination Technology is very important and essential for all water stored areas of the region. It is heartening to know that Pakistani engineers and experts have had a sizable contribution in the advancement of this technology.

As Ambassador to the Kingdom of Saudi Arabia, I am pleased to learn that IEP-SAC has distinguished itself as a vibrant forum for Pakistani Engineers, Architects and Town Planners, who have earned good name for their motherland by their sheer hard work, dedication and professional skills in the development of brotherly Kingdom of Saudi Arabia. By holding seminars on various issues / topics from time to time, IEP-SAC provides its members opportunities to share experience and knowledge with each other on variety of subjects.

I call upon all the distinguished engineering professionals in the Kingdom to keep up their good work with full devotion and commitment. I wish to assure them of the Embassy of Pakistan's continued support in the pursuit of their professional activities and noble endeavours.

Finally, may I also take this opportunity to congratulate the Institute of Engineers Pakistan – Saudi Arabian Center for publishing an update of the directory of Pakistani Engineers in Saudi Arabia along with a number of technical articles. I hope that the Directory will not only be a useful source of information for the members of IEP-SAC but will also prove equally useful and beneficial to other interested organisations and to serve as an ambassador of the country.

Admiral Abdul Aziz Mirza(Retd)
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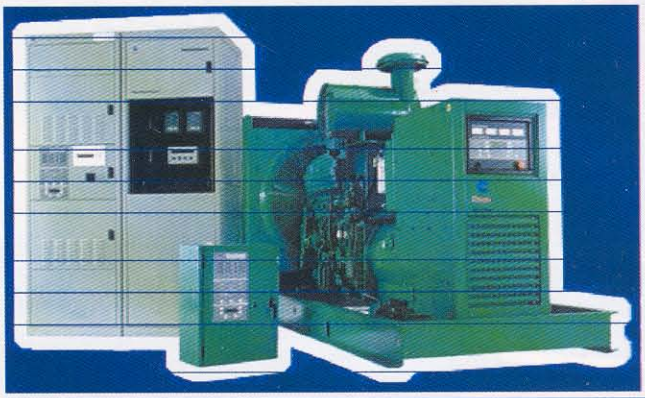

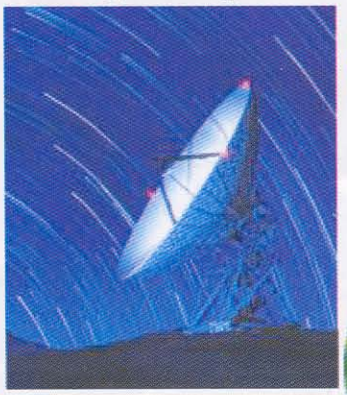

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Engr. M. P. Gangwani
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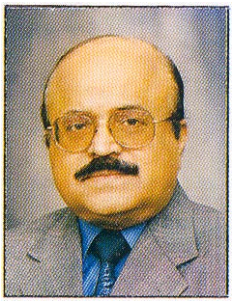

MESSAGE FROM
ENGR. M. P. GANGWANI
PRESIDENT

It is a matter of great pleasure that IEP Saudi Arabian Centre is holding its Annual Seminar and Dinner in October 2003. As per tradition the Seminar, this time also, will be presided over by His Excellency the Ambassador of Pakistan and it will be held in a befitting manner as more than 250 Engineers and Scientists, besides a number of Saudi Arabian dignitaries, are expected to participate in it.

The Saudi Arabian Centre will also publish a Journal containing all important technical papers which will be presented and read in the seminar by various authors on the topic of "*Desalination: Past, Present and Future*". This is an important topic as the "*Water Shortage*" has taken a serious turn in recent years. The efforts being made by Saudi Arabian Centre deserve Commendation.

I wish them all Success in their efforts.

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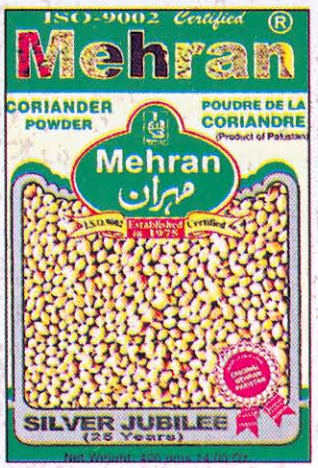

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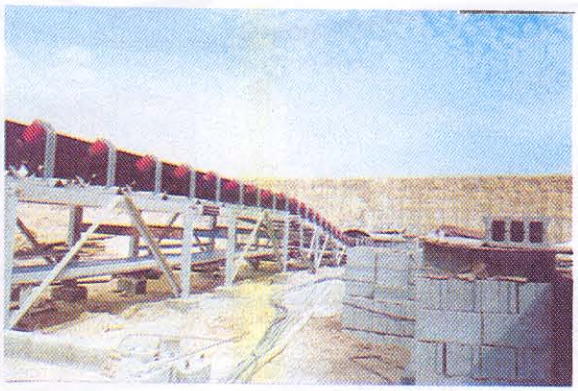

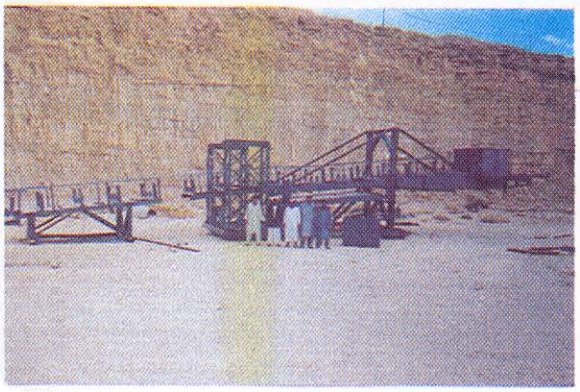

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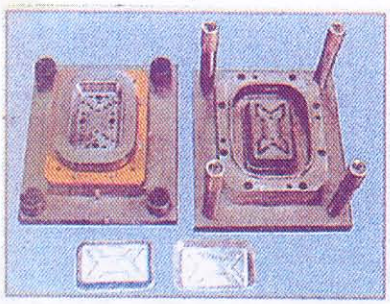

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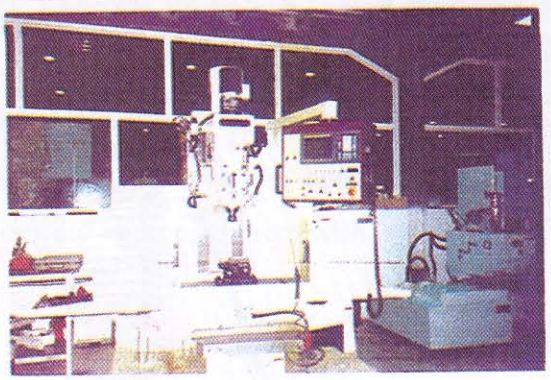

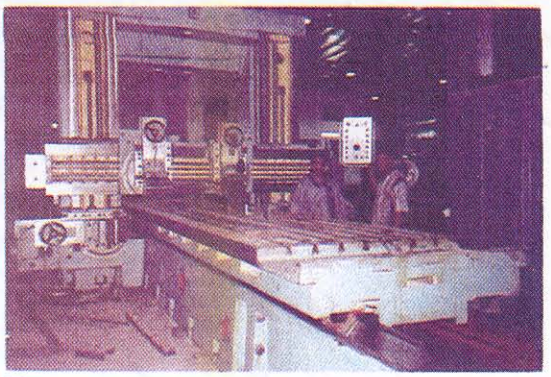

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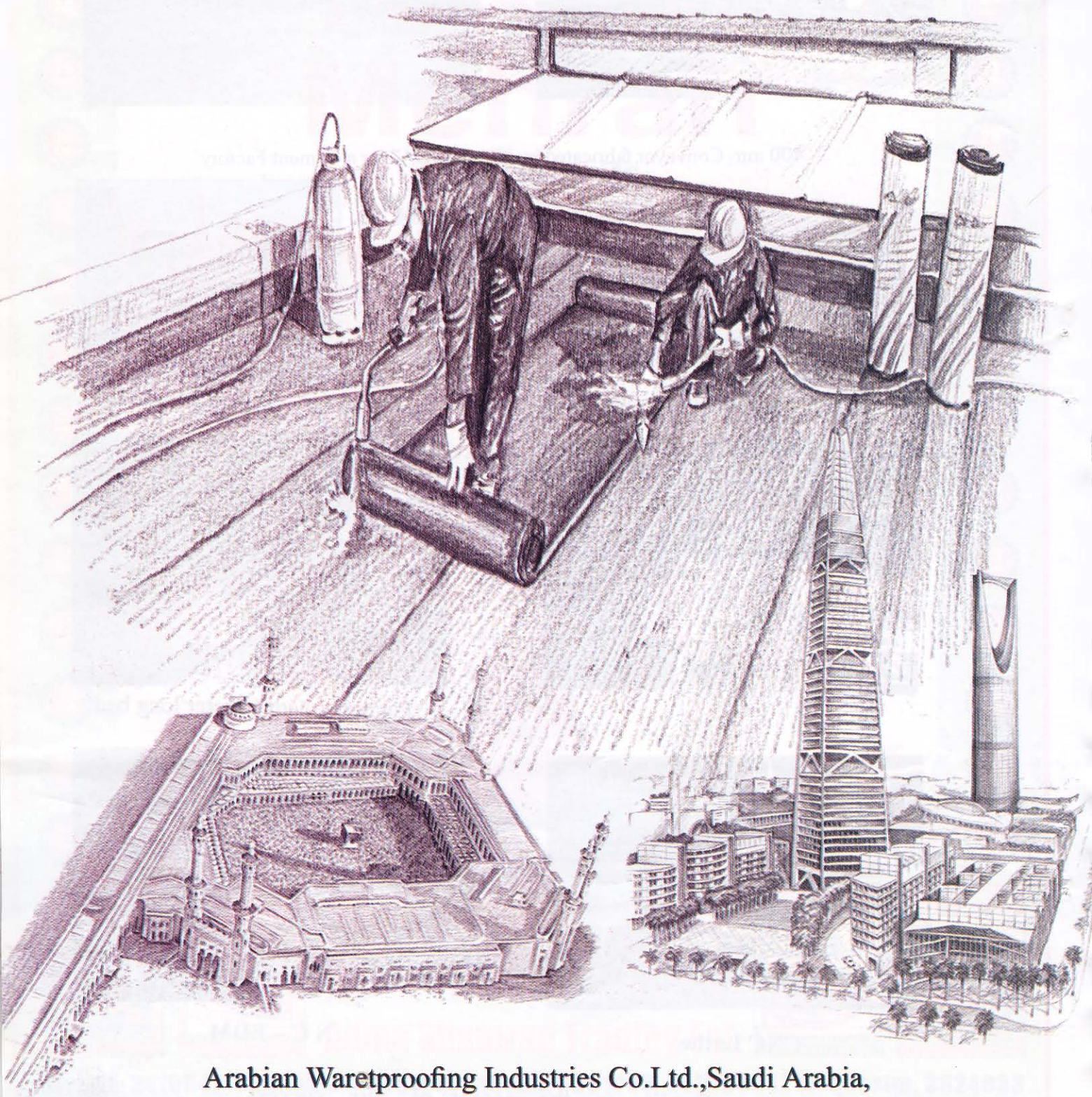

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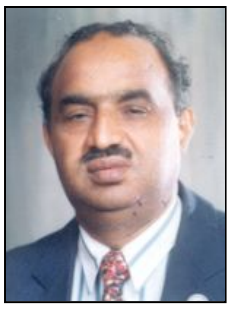

MESSAGE FROM
ENGR. CH. MUHAMMAD RASHID KHAN
SECRETARY GENERAL

It is a matter of immense delight to know that the IEP Saudi Arabian Centre is holding Annual Seminar on "*Desalination: Past, Present and Future*" in October 2003 followed by a dinner. On this occasion the Centre will also publish an updated directory of Pakistani Engineers working in Saudi Arabia to facilitate contact by them with one and other.

It is also a matter of great pride for the Institution that this Local Centre established by it in Saudi Arabia, has been working with dedication so as to promote harmony between the engineers of the two countries i.e. Saudi Arabia & Pakistan besides equipping them with latest techniques, research & developments.

The subject of the Seminar "*Desalination: Past, Present and Future*" is of great importance. The institution is indebted to the Ambassador of the Islamic Republic of Pakistan in Saudi Arabia who has very kind consented to preside over it. It is hoped that the proceedings of the Seminar when published in the Journal will create awareness among the people.

I wish the Organizers of the Seminar and the Chairman & General Secretary of the IEP Saudi Arabian Centre all the success.

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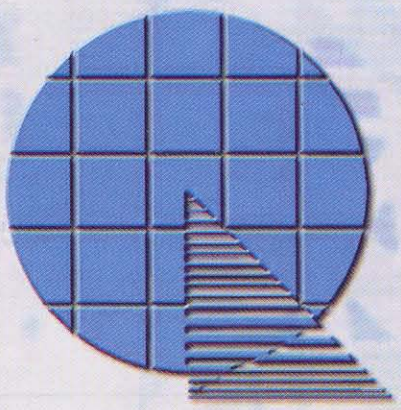

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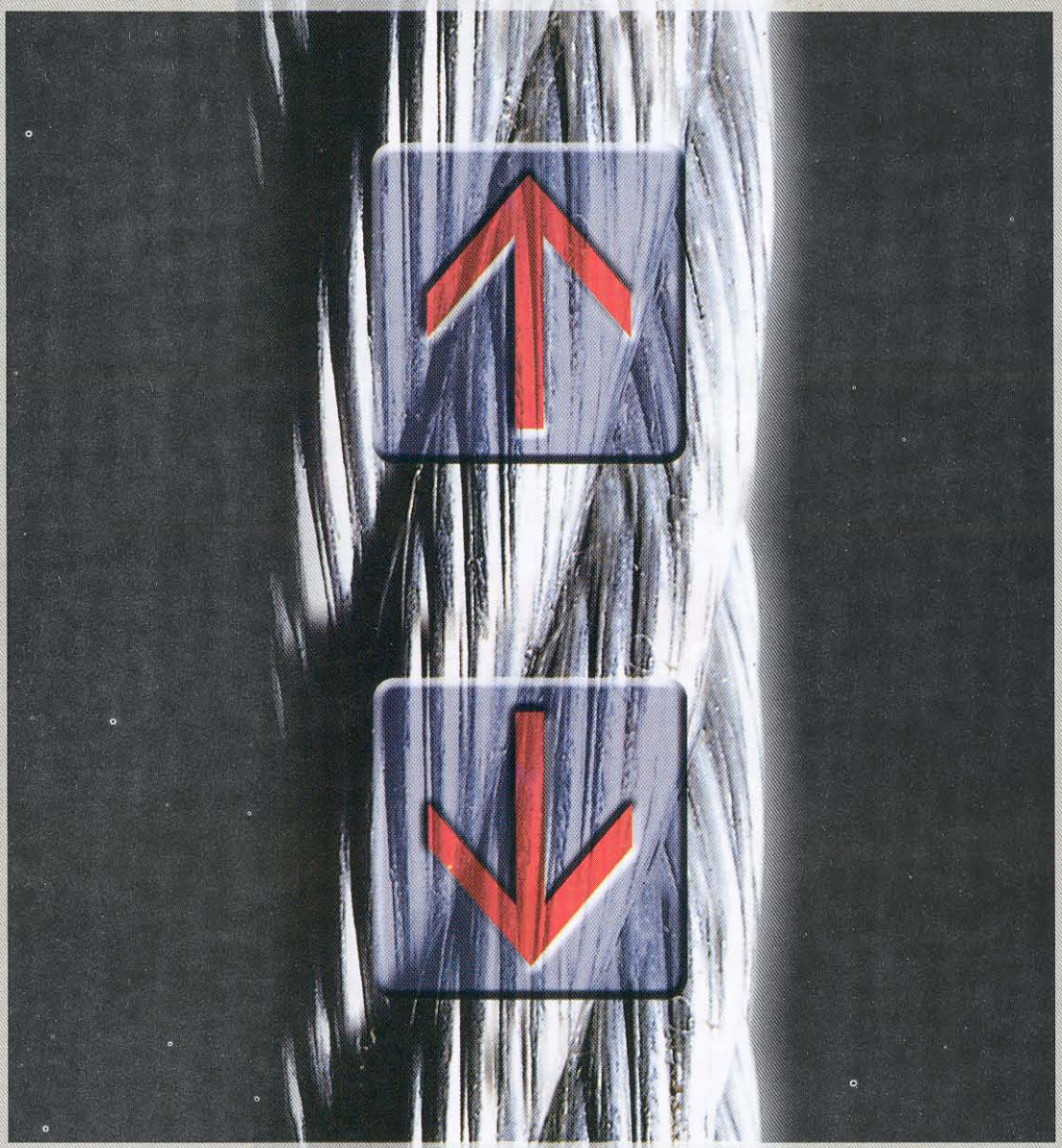

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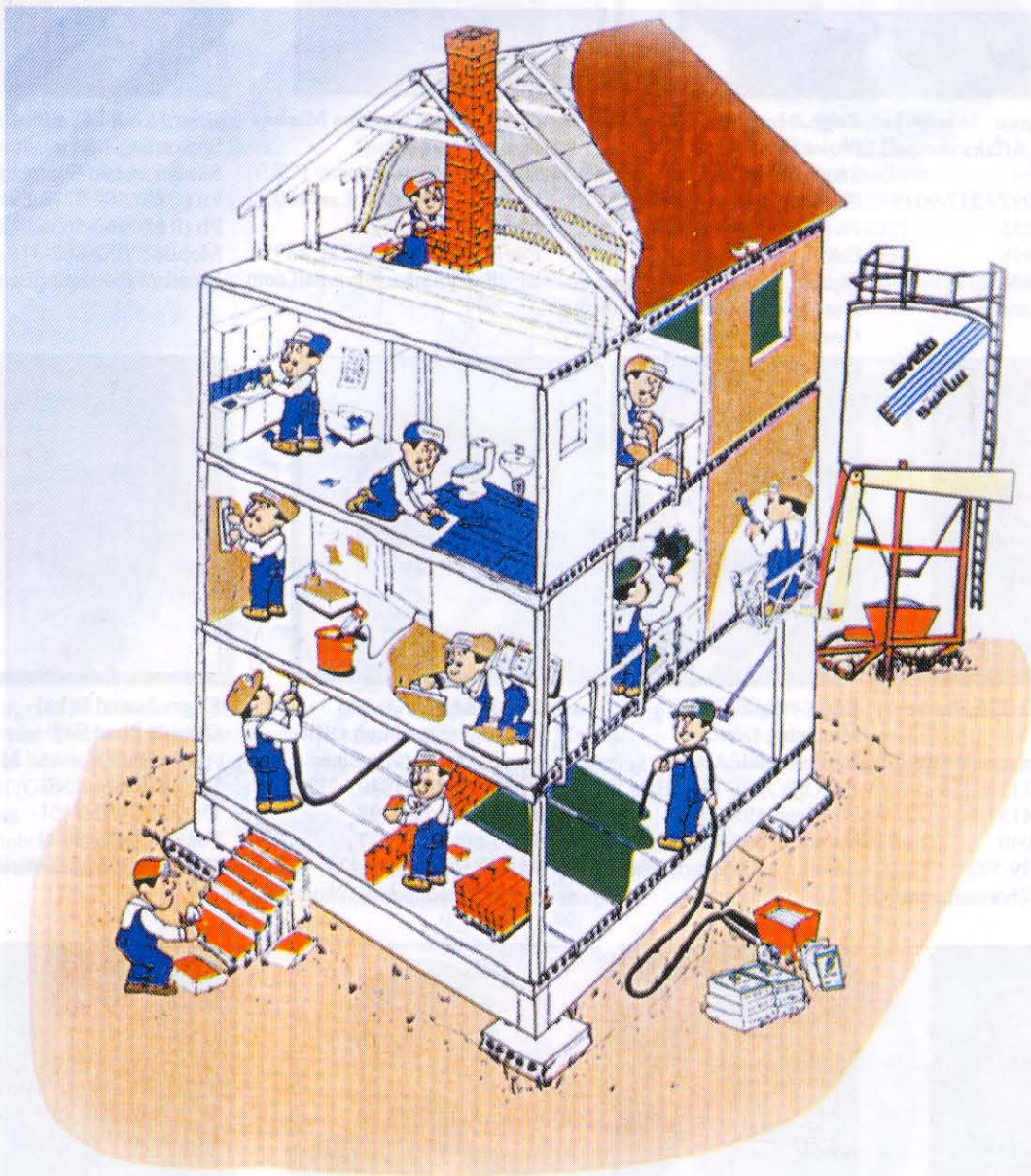

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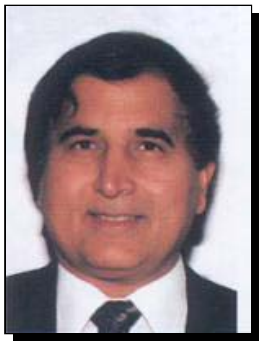

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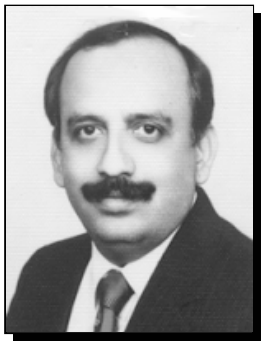

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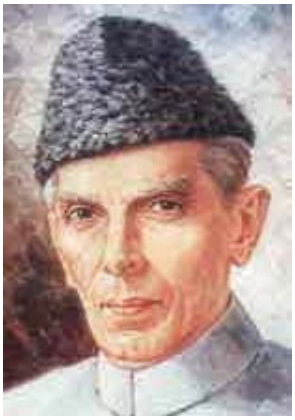

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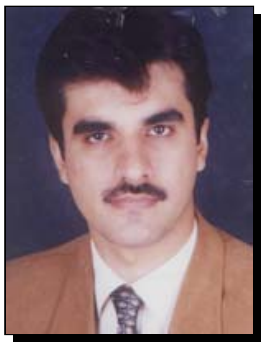

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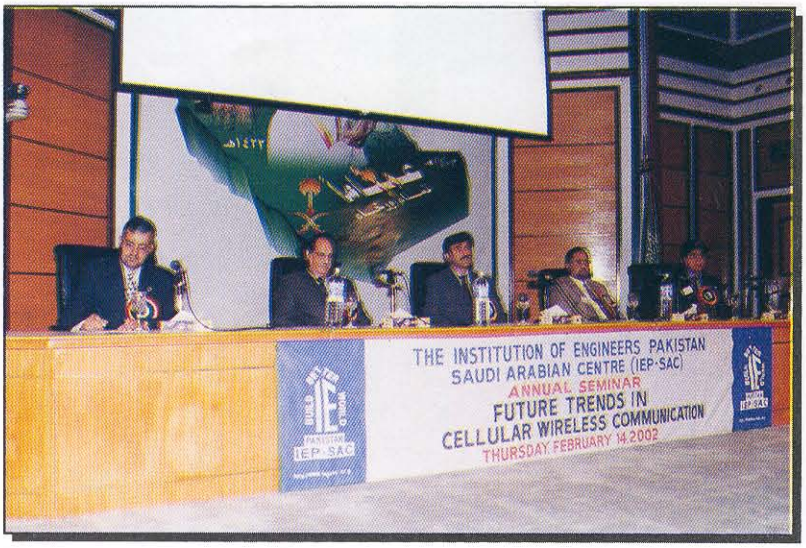


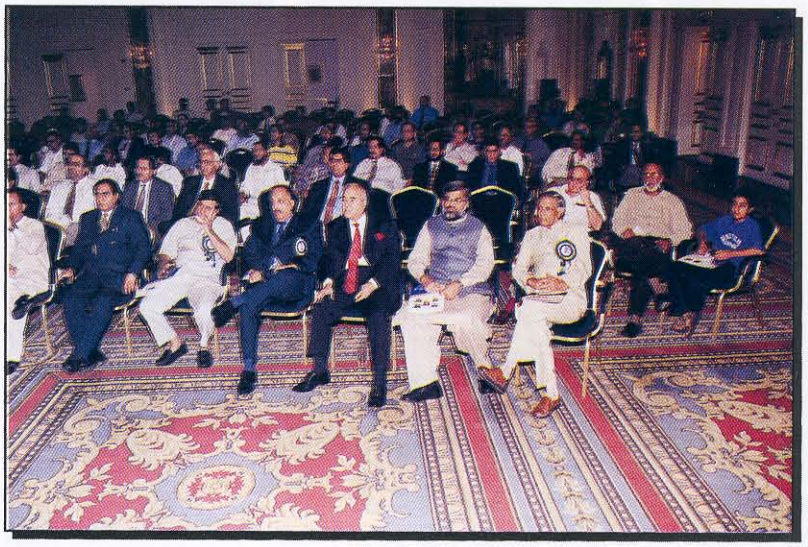
A view of the stage at the occasion of Annual Seminar and Dinner on "*Future Trends in Cellular Wireless Communications*" held on 14th February 2002. Sitting from left to right are Dr. Nazar Hussain Malik, Convenor Technical Seminar Committee; Dr. Israr-ul Haq Shaikh, the Keynote Speaker; Mr. Atzaz Ahmed, Head of Chancellery at Pakistan Embassy Riyadh; Engr. Jaleel Hasan, Chairman IEP-SAC and Engr. Masood Khan, Secretary General IEP-SAC.

An impressive view of a section of audience at Prince Salman Social Center, Riyadh. Prominent in the picture are Mr. Atzaz Ahmed, Head of Chancellery at Pakistan Embassy Riyadh, Engr. Jaleel Hassan, Chairman IEP-SAC and Engr. Masood Khan, Secretary General IEP-SAC.

A group photo of the engineers with some of the honourable gusts. Prominent in the picture are Engr. Jaleel Hassan, Chairman IEP-SAC, Engr. Masood Khan, Secretary General IEP-SAC, Engr. Shaikh Asrar Ahmed, Engr. Nazar Hussain Malik and Engr. Mubashir Kirmani.

GLIMPSES OF IEP-SAC ACTIVITIES

A view of the stage at the occasion of a Technical Seminar on "*Advancements in Indoor Air Quality Control*" held on 1st November 2002. Sitting from left to right are Mr. Pervez Malik, the Keynote Speaker; Engr. Jaleel Hasan, Chairman IEP-SAC; Head of Chancellery at Pakistan Embassy Riyadh and Dr. Nazar Hussain Malik, Convenor Technical Seminar Committee.



An impressive view of a section of audience at Hotel Hyatt Regency, Riyadh. Prominent in the picture are Engr. Abdul Quddus Minhas, Engr. Aftab Khan, Engr. Siraj-ul-Huda Siddiqui and Engr. Mubashir Kirmani.

Mr. Atzaz Ahmed, Head of Chancellery at Pakistan Embassy Riyadh, is presenting a memento to Dr. Israr-ul Haq Shaikh, the Keynote Speaker, in the presence of Engr. Jaleel Hasan, Chairman IEP-SAC.

GLIMPSES OF IEP-SAC ACTIVITIES

A group photo of the IEP-SAC Eastern Province members along with the Chief Guest Shaikh Hammad Al-Zamil and the Speaker Engr. Tariq Bin Zafar on the occasion of a Technical Seminar on "*Sigma Six*" held in Dhahran. Other prominent figures in the picture are Mr. Mutlaq M. Naba Al-Qahtani, Dr. Israr-ul Haq Shaikh, Engr. Ali Haroon, Engr. Ch. Riaz Ahmed Bajwa and Engr. Rizwan Ahmed

Chief Guest Shaikh Hammad Al-Zamil, Chairman of Zamil Group, is presenting a memento to Mr. Mutlaq M. Naba Al-Qahtani, President of Al-Naba Group, in the presence of Engr. Rizwan Ahmed.

Chief Guest Shaikh Hammad Al-Zamil, Chairman of Zamil Group, is presenting a memento to the Speaker Engr. Tariq Bin Zafar.

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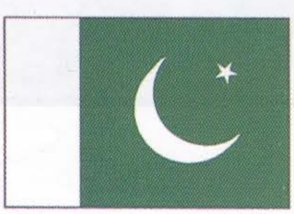

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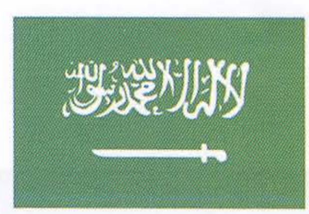

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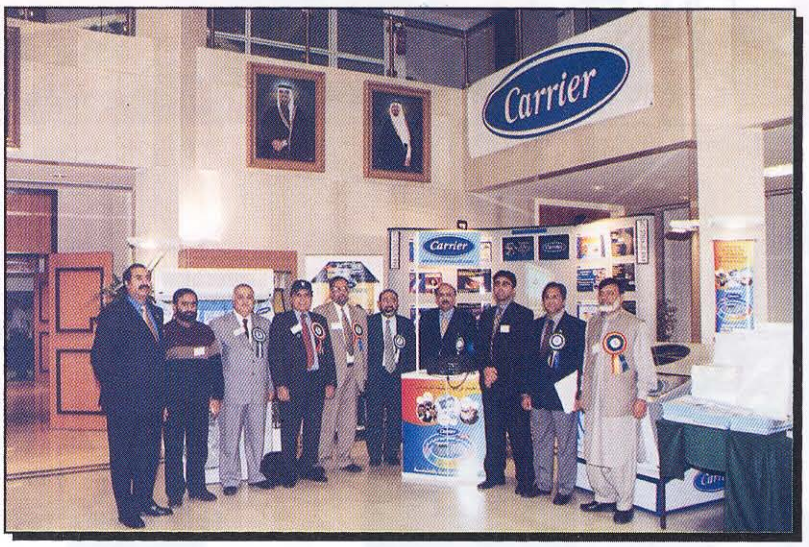
IEP-SAC JOURNAL

2003-2004

GLIMPSES OF IEP-SAC ACTIVITIES

A group photo of the IEP-SAC Eastern Province Local Council Members along with Shaikh Hammad Al-Zamil, Chairman Zamil Group, Mr. Mutlaq M. Naba Al-Qahtani, President Al-Naba Group, and other honourable guests at the occasion of a Technical Seminar.

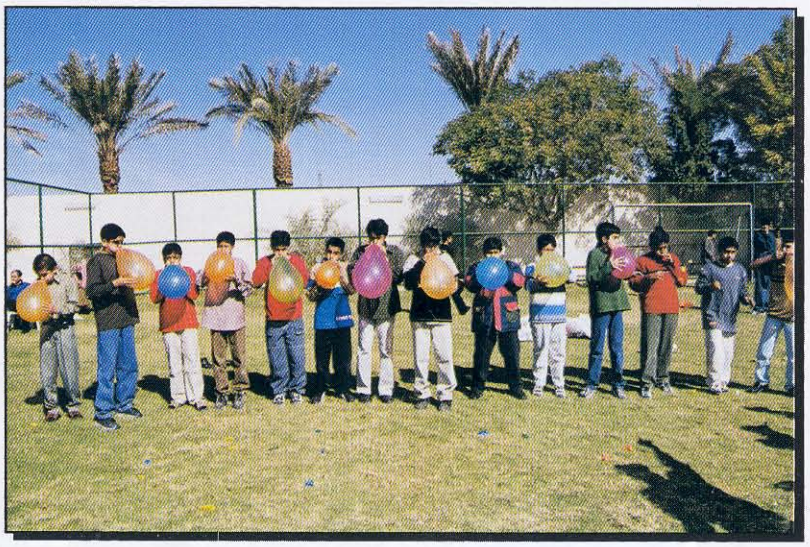


A group photo of IEP-SAC Local Council Members along with one of the exhibitors at the occasion of Annual Seminar and Dinner. Prominent in the picture are Engr. Noor Junejo, Engr. Syed Azhar Maqsood, Engr. Masood Khan, Engr. Jaleel Hasan, Engr. Abdul Majeed Shah, Engr. Aftab Khan and Engr. Abdul Quddus Minhas.

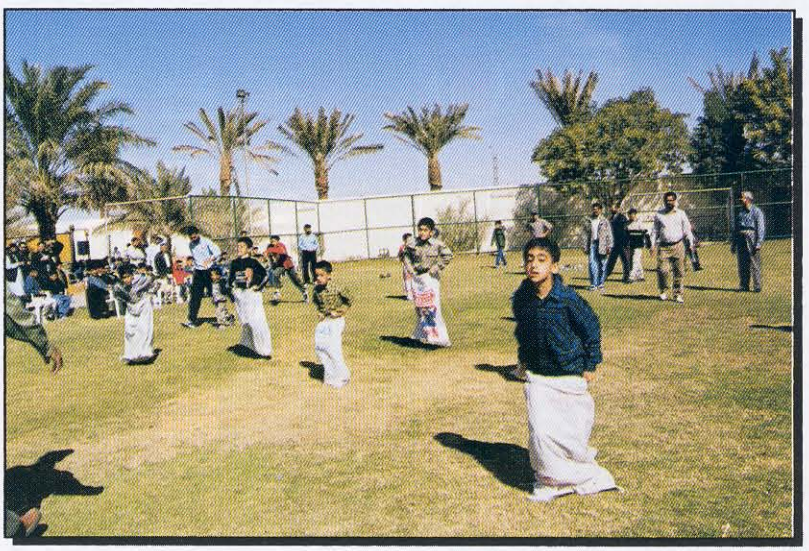
Engr. Masood Khan, Secretry General IEP-SAC is giving prizes to the winners of "Bait Bazi" competition. Other prominent figures in the picture are Engr. Saifullah Saleem, Engr. Mubashir Kirmani and Engr. Abdur Rashid.

GLIMPSES OF IEP-SAC ACTIVITIES

The participants are playing "*Odd men Out*", an interesting game that ask to break with the old friends and make new ones, at the occasion of "Family Get-together and Picnic"



The kids are testing their lungs by participating in "*Balloon Popping*" competition.



The kids are in action during a "*Sack Race*" competition.

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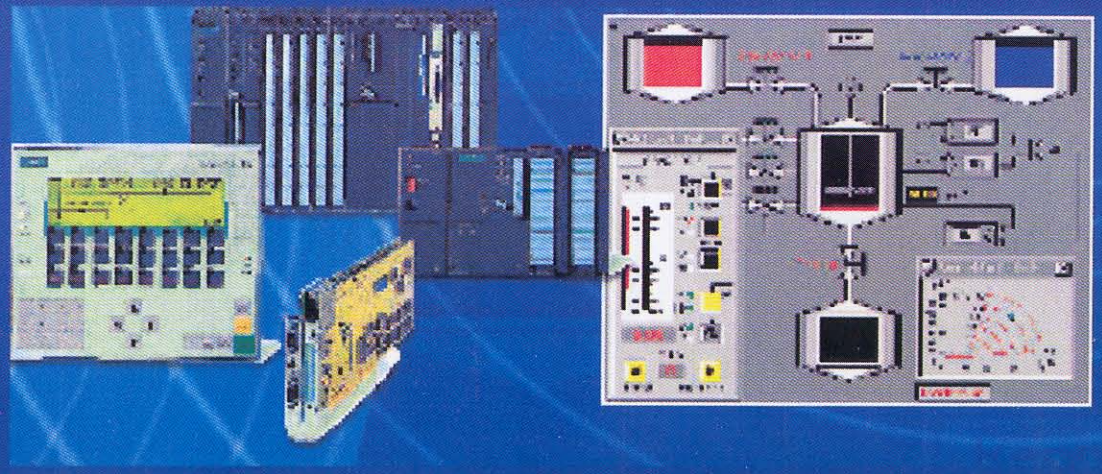

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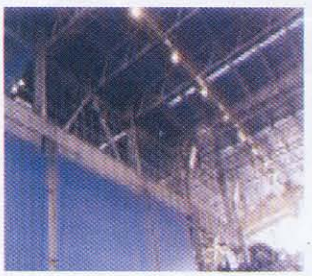

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GENERAL SECRETARY'S ANNUAL REPORT

I have the pleasure to present the annual report of IEP-SAC on the activities and events that took place during the year 2002-2003.

IEP-SAC has been actively pursuing its objective of creating a community spirit and fellowship among Pakistani Engineers working in Saudi Arabia. In addition, IEP-SAC strives for disseminating and sharing of latest technical knowledge among engineers. IEP-SAC also runs an ambitions scholarships program for deserving Pakistani engineering students.

Although some major global events and the subsequent political situations in the region and their effect on the Pakistani community in general was not very conducive of social and technical activities. IEP-SAC however, continued to pursue its above stated objectives in such adverse conditions. A brief of the activities since January, 2002 is given below:

IEP-SAC organized its Annual Seminar and Dinner on 14th February 2002. Topic of the Seminar was "*Future Trends in Cellular Wireless Communications*". Dr. Israr Ul Haq from King Fahad University of Petroleum was the Keynote Speaker. The function was presided over by H.E. the Ambassador of Islamic Republic of Pakistan.

The great annual social event of IEP-SAC is the family picnic. Two such major events were organized; first in April 2002 and second in January, 2003. Family picnics were very successful events attended by over 200 families each time in a rest house at the outskirts of Riyadh. Family picnics provide opportunities for cementing ties among engineering community in a relaxing and entertaining environment.

A Technical Seminar was organized and conducted on 1st November, 2002. This year's Technical Seminar topic was "*Advancements in Indoor Air Quality Control*". The presentation was given by Engr. Pervez Malik of Carrier. The Seminar proved to be very interesting and was well received by engineering community in Riyadh.

IEP-SAC has increased its Scholarships awards to 60 this year to provide financial assistance to the needy and deserving Engineering students in Pakistan. The recipients are selected from 11 Engineering Universities / Colleges spread all over Pakistan and Azad Kashmir.

IEP-SAC is now organizing its annual Seminar and Dinner on 23rd October 2003. Engr. Fayyaz Mudassir Mubin (Desalination Expert) from Saline Water Conversion Corporation (SWCC) Jubail – Saudi Arabia will be the keynote speaker. The topic of the Seminar will be "*Desalination Past, Present & Future*". The function will be presided by H.E. Ambassador of Pakistan. On this occasion IEP-SAC is publishing its annual Journal including the directory of Pakistani engineers residing in the Kingdom of Saudi Arabia. I am confident this journal will be very useful to our brother engineers as well as to the various engineering organizations in Saudi Arabia.

I appreciate the dedication of our Council members in making all of the above events a great success. I also appreciate the support and guidance of IEP head quarter and the full support we enjoy from the Pakistan Embassy in Riyadh. I am grateful for the support of all Pakistani engineers living in the kingdom and finally my personal appreciation of our Chairman IEP-SAC Engr. Jaleel Hasan for his wholehearted support and guidance in running the affairs of IEP-SAC. Finally I wish to convey my deep appreciation to all brother engineers, sponsors, advertisers and well wishers for their co-operation and support of IEP-SAC activities.

MASOOD A. KHAN
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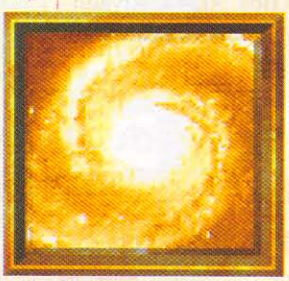

Have not those who disbelieve known that the heavens and the earth were of one piece, then We parted them, and We made every living thing of water? Will they not then believe?

(Chapter 21, Verse30)

قال رسول الله صلى الله عليه وسلم:

و فضل العالم على العابد كفضل القمر على سائر الكواكب.

(رواه الترمذى و ابو داؤد)

The Prophet (peace be on him) said:

A scholar among the virtuous is like a moon among the stars.

(Narrated by Tirmidhy and Abu Dawood)

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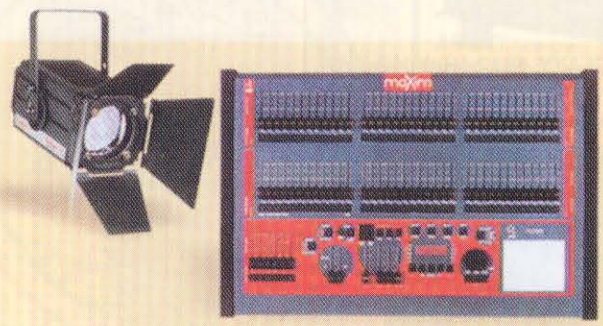

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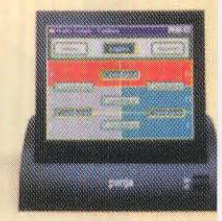

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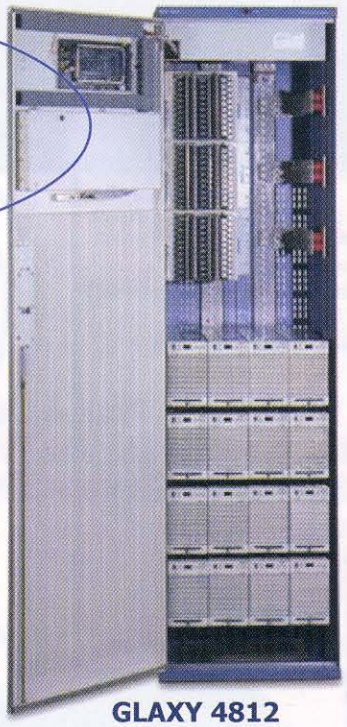

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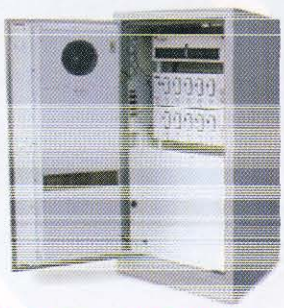

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AWARDS AND SCHOLARSHIP COMMITTEE
CONVENOR'S REPORT

AL-QURAN

*To spend your substance, out of love for Him, for your kin, for orphans, for the **needy**, for the wayfarer, for those who ask and for the ransom of slaves; (2:177)*

*If ye disclose (acts of) charity, even so it is well, but if ye conceal them, and make them reach, those (really) in **needs**, that is best for you. It will remove from you some of your (stains of) evil. And God is well acquainted with what ye do. (2:271)*

By the grace of Allah the Almighty, the scholarship Program for needy and academically sound students in Pakistani Engineering Universities and Colleges was launched in the year 1996. Initially eight Universities and Colleges were included in the Program. Later, three more institutions were added to the Program. This program serves all the four provinces of The Islamic Republic of Pakistan and The State of Azad Jammu and Kashmir.

On 6th October 1996, IEP-SAC Local Council approved the Rules and Regulations as prepared by the Awards and Scholarship Committee. The Rules, Forms and the list of Universities and Colleges can be seen and printed out from IEP-SAC website (http://www.iepsac.org). The scholarship is awarded to a student of first or second year. The student continues to take the scholarship for the entire duration of the course (maximum 4 years). The relevant institutions by the selection committees select the students. The funds are transferred by legal means to the universities and colleges for onward payments to the selected students.

Every year IEP-SAC initiates eleven (11) scholarships. So far six (6) batches of the students had taken benefit from this Program. Inshallah, the process of awarding scholarship will continue for the coming years. Batch number seven will get the scholarship in the year 2003. At present an amount of Pak Rs. 12,000 per year is being given to each selected student.

By the help and blessing of Allah the Almighty 31 students had graduated by benefiting from this Program. A total of 60 students are presently getting the scholarship. The number of students will increase to 71 during the year 2003. To date we had transferred Pak Rs. 1,852,100 to Pakistan under this Program.

We had started the scholarship program on a small scale and we had maintained its continuity. I take this opportunity to appeal to engineers in particular and Pakistani community in general to please join hands in this noble and just cause. It is a service to Pakistan. Let us make more effort to continue it. For more information please contact any of the member of the Awards and Scholarship Committee or any Local Council Member.

ABDUR RASHID SHAD
Convenor Awards and Scholarship Committee
Institution of Engineers Pakistan
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Federal Board of Inter/Sec Education	http://www.fbise.edu.pk
Federal Bureau of Statistics	http://www.fbs.gov.pk
Geological Survey of Pakistan	http://www.gsp.gov.pk
Government Forms	http://www.forms.gov.pk
Government of Pakistan Info	http://www.pak.gov.pk
Government of Pakistan Portal	http://www.pakistan.gov.pk
Government of Punjab	http://www.punjab.gov.pk
Government of Sindh	http://www.sindh.gov.pk
Higher Education Commission	http://www.hec.gov.pk
Karachi City Government	http://www.karachicity.gov.pk
Lahore City Government	http://www.lahore.gov.pk
Ministry of Finance	http://www.finance.gov.pk
Ministry of Foreign Affairs	http://www.forisb.org
Ministry of Interior	http://www.interior.gov.pk
Ministry of Labor/Overseas Pakistanis	http://www.labour.gov.pk
Ministry of Privatization	http://www.privatisation.gov.pk
Ministry of Religious Affairs	http://www.mra.gov.pk
Ministry of Science and Technology	http://most.gov.pk
National Accountability Bureau	http://www.nab.gov.pk
National Assembly of Pakistan	http://www.na.gov.pk
National Database & Reg. Authority	http://www.nadra.gov.pk
National Library of Pakistan	http://www.nlp.gov.pk

DEPARTMENT	WEBSITE
National Reconstruction Bureau	http://www.nrb.gov.pk
National Savings Organization	http://www.savings.gov.pk
National Tariff Commission	http://www.ntc.gov.pk
Overseas Employment Corporation	http://www.oec.gov.pk
Overseas Pakistan Foundation	http://www.opf.gov.pk
Pakistan Housing Authority	http://www.pha.gov.pk
Pakistan International Airline	http://www.piac.com.pk
Pakistan Medical Research Council	http://www.pmrc.gov.pk
Pakistan Meteorological Department	http://www.met.gov.pk
Pakistan Post	http://www.pakpost.gov.pk
Pakistan Railways	http://www.pakrail.com
Pakistan Science Foundation	http://www.psf.gov.pk
Pakistan Software Export Board	http://www.pseb.gov.pk
Pakistan Sports Board	http://www.sports.gov.pk
Pakistan Telecom Authority	http://www.pta.gov.pk
Pakistan Telecom Company Limited	http://www.ptcl.com.pk
Pakistan Television	http://www.ptv.gov.pk
Pakistan Tourism Develop. Corp.	http://www.tourism.gov.pk
Private Power & Infrastructure Board	http://www.ppib.gov.pk
Privatization Commission	http://www.privatisation.gov.pk
Radio Pakistan	http://www.radio.gov.pk
Securities & Exchange Commission	http://www.secp.gov.pk
Small/Medium Enterprise D Authority	http://www.smeda.org.pk
State Bank of Pakistan	http://www.sbp.org.pk
State Engineering Corporation	http://www.sec.gov.pk
Water & Power Develop. Authority	http://www.pakwapda.com

DESALINATION: PAST AND PRESENT

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ABSTRACT

This paper describes water, its nature, sources, impurities in water, desalination and water treatment and development of desalination industry. It also discusses types of desalination processes namely Thermal Desalination, Membrane Desalination, Electrical Desalination, Reverse Osmosis (RO), Brackish Water Reverse Osmosis (BWRO) and Sea Water Reverse Osmosis (SWRO). It also explains type of RO Membranes, Spiral Wound (SW) RO Membranes and Hollow Fine Fiber (HFF) RO Membranes. The paper further reviews the present status of commercial desalination technology in global context. Finally the Desalination Technology in Saudi Arabia and Pakistan has been detailed extensively.

DESALINATION

Any water, e.g. well water, river water, surface water or sea water, contains at least the following:

1. Suspended solids (material that can not be dissolved): like red chili powder in water
2. Dissolved solids (material that is totally dissolved in water and can not be seen by human eye,
3. Bacteria

The first type of impurities can be removed by filtration and clarification and this process is generally known as municipal treatment. The second type of impurities cannot be removed except through desalination process. The bacteria are removed by disinfection like chlorination and ozonation. In strict sense, desalination is defined as the removal of dissolved solids but in broad sense it may cover all the three water treatment technologies listed above.

Why do we require desalination? The World Health Organization (WHO) has established that for human drinking the total dissolved solids should not be more than 500 milligram per liter. That is the reason why all drinking water system should have desalination or the water source must be less than 500 mg/liter of dissolved salts [1].

DESALINATION PROCESSES

There are three major process of desalination namely:

1. Thermal Process where change of phase occurs during the process (e.g. first boiling of water and then condensing it)
2. Reverse Osmosis where the seawater passes through the RO membranes and then finally good quality of water (or WHO Drinking Quality water) is obtained
3. Electrodialysis where electric energy is used to desalinate water.

THERMAL DESALTING

The most common ways to desalt the sea water involve some form of boiling or evaporation. In a simple still, seawater can be boiled releasing steam which, when condensed, forms pure water. Many stills can be connected together making the process more efficient. To achieve this however each still, or effect, must be at different pressures. At sea level pure water boils at 100 degrees Celsius (212 deg F). In a vacuum it can boil at much lower temperatures. Multiple Effect Distillation (MED) makes use of this phenomenon.

What happens if water is heated to 100 degrees Celsius but held under pressure until it is released into a vacuum chamber? The answer is the water flashes into steam. The difference between flashing and boiling is;

Boiling is accompanied by a constant input of heat, just as when we cook on a stove.

Flashing involves heating the water while holding it under pressure and then introducing a vacuum to allow flashing to occur.

The principle behind the Multi-Stage Flash (MSF) desalination is use of multiple flashing stages at successively lower pressures in a sequence.

Other thermal processes include a variation of the simple still known as Vapour Compression (VC). This can be achieved using Mechanical Vapour Compression (MVC) or Thermal Vapour Compression (TVC). MVC uses centrifugal fans or blowers to compress and thereby heat steam making it suitable for driving a desalination process. TVC uses moderately pressured steam to drive a steam jet thermo-compressor.

MEMBRANE SEPARATION

Semi permeable and ion specific membranes can also be used to desalt seawater. Membrane processes are based on separation rather than distillation (although membrane distillation has been performed).

Reverse Osmosis membranes basically let water pass through them but reject the passage of salt ions. In reality a small percentage, say 1%, of sea salts pass through the membranes, or leaks around the seals. For potable water this leakage is acceptable but for industrial purposes it may require further treatment.

The operational pressure of reverse osmosis system is a function of the salinity of the feedwater. The salinity results in a colligative property known as Osmotic Pressure. The osmotic pressure of brackish waters is very much lower than that of seawaters or brines. Typical 500 ppm (parts per million) potable water has an osmotic pressure of 0.34 bar while the osmotic pressure for normal seawater is closer to 25 bar.

Since this directly relates to working pressure and energy consumption reverse osmosis has an advantage over thermal processes where the latent heat of evaporation is nearly constant irrespective of the quantity of total dissolved salts (TDS) in the water.

ELECTRODIALYSIS

Electrodialysis and Electrodialysis Reversal (EDR) make use of ion specific membranes, which are arrayed between anodes and cathodes to drive salt ions in controlled migrations to the electrodes. While not as widespread as RO these are still in common use. However, RO is by far the most widely used separation process since it has tremendous energy advantages when 1% salt passage can be tolerated, when steam is not available, and when good quality seawater is available.

DESALINATION IN SAUDI ARABIA

Saudi Arabia is the world's largest producer of desalinated water. At present the desalination provides about 70 percent of the Kingdom's drinking water needs. There are 30 desalination plants in the Kingdom, which supply water to more than 50 cities and distribution centers. These plants also meet about 20 percent of the Kingdom's electricity needs. Several new desalination plants are under construction in view of the growing demand.

Saudi Arabia's water desalination output crossed the one billion-cubic-meter mark last year. The latest plant, Shuaiba Phase Two Project, was inaugurated on 12th March 2003. Shuaiba is a coastal town on the Red Sea about 90 km southeast of Jeddah. The Shuaiba plant and the storage facility at Briman in Jeddah are linked by a 120-km long pipeline. The Shuaiba Plant is the second largest desalination plant in the Kingdom, which supplies 154 million gallons (582,689 cubic meters) of water and 500 megawatt of electricity. The Shuaiba plant was established at a cost of SR4.5 billion. The second phase will double the quantity of water supplied by the plant to Makkah and Taif and will raise the supply to Jeddah by 60 percent.

The organization responsible for desalination and supply of desalinated water through pipe lines is Saline Water Conversion Corporation (SWCC). The SWCC made a new record during the last fiscal year as the total output of its 30 plants rose to over one billion cubic meters, which is equal to 150 liters of water daily for each individual in the Kingdom.

There are four new desalination projects, including expansion of the Wajh and Rabigh plants and establishment of two plants in Qunfuda and Laith.

DESALINATION IN PAKISTAN

Pakistan being a tropical country receives abundant rains. However, this is not evenly distributed and many parts of the country have severe water shortage. It is anticipated that roughly three quarter of the rain is lost as run-off. The coastal areas of Balochistan and Sindh provinces are witnessing rapid urban and industrial

growth which need good quality water. It is possible to augment water sources by adopting desalination and water reuse technology. Installation of large size seawater desalination plants based on MSF and RO should be under active consideration. It appears that desalination and water reuse could contribute to about 25 percent of the water requirement in these areas. Today, there are a number of desalination plants of medium capacity operating in Pakistan for production of industrial quality water and treatment of industrial and domestic effluents for water reuse.

Desalination of water is one of the most important engineering task facing the coastal regions of Pakistan in general and the city of Karachi in particular. Lacking unlimited supplies of potable water, Pakistan has to depend on the desalination processes of brackish water and seawater to satisfy the ever-increasing demands. These demands are expected to reach the 756 MGD (millions gallons per day) only for Karachi city in the year 2005. Apart from Karachi, for the coastal areas of Balochistan and Sindh, the only answer appears to be seawater desalination. A concerted effort is required to produce potable water from the Arabian Sea as well as from high salinity wells in Southern regions. The coastal regions of Sindh and Balochistan are also witnessing rapid urban and industrial growth, which require good quality water. Installation of large-size seawater desalination plants based on Multi-Stage Flash Distillation (MSF) and Reverse Osmosis (RO) should be considered seriously. It appears that desalination and water reuse may contribute almost twenty-five (25) percent of the water requirement in these areas.

HISTORY OF DESALINATION IN PAKISTAN

The work on study, research and development and proper implementation of desalination technology in Pakistan started in 1962 at the Pakistan Atomic Energy Commission (PAEC). The commission was primarily involved in the research work for installation of Nuclear Desalination Plants with the possibility of using available energy from nuclear power plants. It was proposed to set up seawater desalination plants based on thermal process using steam from nuclear power plants. In addition to that the PAEC also started work on solar desalination and constructed world's largest seawater solar still at Gawadar, a seaport in Balochistan province.

At a later stage, work on desalination was also initiated at Pakistan Council of Scientific and Industrial Research (PCSIR) in the fields of Reverse Osmosis and ion-exchange process. Basic theoretical studies on membrane technology were also carried out at a number of academic institutes. Finally, a number of private companies dealing in the field of water treatment adopted RO technology as a supplement to softening and demineralization equipment for production of good quality water from raw water containing moderate salinity of 1,000-1,500 ppm.

In late eighties, scarcity of water started in the areas where natural sources of water were not available and only sub-soil water could be utilized. The first large size capacity desalination plant was installed in 1987 at Saindak Copper Mines, located in a small town, near Iranian border. It was a Brackish Water Reverse Osmosis (BWRO) plant supplied by an American water treatment company, Water Link. The production capacity was 200,000 US gallons per day (757 cubic meter per day). The source of water was well water with a salinity of approximately 4,500 milligram per liter from a 250 feet deep well. The product water was used for drinking and industrial application.

In 1990, the trend of installing desalination plant got an upward boost, especially in remote locations where no water source was available like Faisalabad and Dera Ismail Khan. In these areas, no canal or river water was available. For industrial application, two RO units of 250,000 gallons per day (946 cubic meter/day or 40 cubic meter per hour were installed at Lucky Power/Lucky Cement Plant, Pezo, Dera Ismail Khan. The supplier was a famous American Company, US Filter. The purpose of product water was industrial and drinking. Around the same time, two Brackish Water Reverse Osmosis (BWRO) units were also installed in Faisalabad. One with a capacity of 100,000 gallons per day (380 cubic meter per day) at Sitara Textile Mills and another one at Crescent Textile Mills, which had a capacity of 200,000 gallons per day.

However, major desalination activity was carried out in the city of Karachi and its suburbs. First RO plant in Karachi was installed at Abu Dhabi Royal palace located in Clifton area, very close to the sea. The source of water was a beach well of almost brackish water salinity. The capacity of this plant was 50,000 gallons per day (GPD) and it was procured directly from the USA.

Later on, the giant beverage companies, Pepsi Cola and Pakola stepped into the market. In 1996, one RO plant was installed at Pepsi Factory, which had a capacity of 150,000 GPD and another one of 100,000 GPD at Pakola Factory. The American company, Water Link, supplied both plants. But the major contribution in the share of desalination capacity came from textile industries.

EXISTING DESALINATION CAPACITY

Even though the desalination technology is nascent in Pakistan, however, there are approximately sixty medium sized plants in Pakistan and the total desalination capacity for Reverse Osmosis Plants is approximately 10 million gallons per day (MGD). Being the biggest Industrial City, Karachi has the biggest share. Almost seventy percent (70 %) plants are or in the neighbourhood of Karachi.

Table 2: List of Desalination Plants, installed in Textile Industry of Pakistan

No	Location	No. of Units	Capacity (GPD)	Year of Installation	Supplier
1	Siddique Sons	Two	150,000	1997	Culligan
2	Gatron	One	150,000	1998	Water Link
3	Meko Tex	Two	100,000	2000	Water Link
4	S.G. Fiber	Two	100,000	1996	Culligan
5	Nakshbandi	Two	100, 000	1997	Aqua Clear
6	Younus Textile	Two	150,000	2000	Aqua Clear
7	ARTISTIC	One	75,000	2001	Water Link
8	Afroz Textile	One	100,000	2001	METITO
9	Bismillah Fabrics	One	150,000	2001	Water Link

THERMAL DESALINATION IN PAKISTAN

It is interesting to note that the Thermal Desalination Process has also been applied in Pakistan since 1992. The history of thermal desalination started when one 100,000 GPD plant was installed in Lahore in 1992. The plant was based on Vapour Compression Process and was procured for Royal Palace of Abu Dhabi. The source of water for Lahore plant was a tube-well with a salinity of approximately 1,500 mg/l and the purpose of product was to supply domestic water other than drinking purposes.

A similar Vapour Compression (VC) plant of 100,000 GPD capacity was commissioned in Rahim Yar Khan in 1993. This was also procured for Royal Palace of Abu Dhabi. The source of water is a canal, which has a salinity of approximately 2,000 mg/l. The fresh water is being used as plumbing water. Table 1 shows the summary of desalination plants in Pakistan.

REVERSE OSMOSIS DESALINATION PLANTS

The most popular process of desalination in Pakistan is Reverse Osmosis. Table 2 shows a list of Karachi-based textile mills, where desalination plants of significant capacity are operating.

Other major industrial sector, which utilizes desalination technology, is pharmaceutical industry. The pharmaceutical companies that have the desalination plants are listed in Table 3.

Table 3: List of Desalination Plants, installed in Pharm. Industry of Pakistan

No	Location	No. of Units	Capacity (GPD)	Year of Installation	Supplier
1	Bristal Myers	One	50,000	2001	Culligan
2	Brooks	One	6,000		Local
3	Roche-Pakistan	One	Not available	Not available	Local

RO MEMBRANE BEING USED IN PAKISTAN

All commercial Reverse Osmosis membranes have been and are being used in Pakistan. However approximately seventy percent of all membranes are from FilmTec Company. Around twenty percent are from Fluid Systems and Koch. Very few membranes were utilized from the giant membrane-company, Dupont. Considering the raw water quality, almost all of them are brackish water or highly brackish water membranes.

SOLAR DESALINATION IN PAKISTAN

A non-governmental organization (NGO), NICE LINK has developed Solar Still for desalination of brackish water for desert and mountainous areas. A small solar still to produce potable water of 200 liter per day capacity costs only Rs. 45,000 [1].

Table 1: Inventory of Desalination Plants installed in Pakistan

No	Type of Plant	Total Number	Total Capacity
1	Brackish Water Reverse Osmosis (BWRO)	60	10 MGD
2	Multi-Effect Distillation (MED)	3	1.0 MGD
3	Vapour Compression (VC)	2	200,00 GPD

Note: *This table shows only those desalination plants, which have capacity more than 50,000 GPD. Smaller plants are not covered.*

INTERNATIONAL DESALINATION COMPANIES IN PAKISTAN

There are a number of foreign companies which are actively involved in supply, installation and commissioning of desalination plants. All companies are providing Reverse Osmosis Plants. There is no company, which is supplying thermal (MSF, MED, VC) or electrodialysis (ED, EDR) plants.

1. Culligan. International

Culligan International is an American Company and was most successful in Pakistan during early years of desalination history. This company has installed eight RO plants in Pakistan so far. However, because of international merger, Culligan is no more active.

2. Aqua Clear

Aqua Clear is an Australian Company, which has installed seven RO plants in Pakistan.

3. Water link

Water Link is an American company, which has installed fourteen plants and has been the most successful company.

4. Aqua Tech.

Aqua Tech is an international company based in Singapore. This company has installed two RO Plants of each 50,000 GPD capacity in Asia Petroleum which supplying fuel to Hubco Power Plant.

PAKISTANI DESALINATION COMPANIES WITH FOREIGN COLLABORATION

For medium sized RO Plants, many Pakistani desalination companies are working with foreign collaboration. The most prominent among these are:

1. Fluid Technology International.

This company is the most prominent among all desalination companies. It has installed nineteen RO desalination plants with a total capacity of 2.0 MGD It can be ranked the most active desalination enterprise. Initially, it had collaboration with Culligan International. Later, it has started to operate as a sole agent of famous American company, WATER LINK.

2. Environmental Pollution Control Company (EPCO)

This is a new company in desalination market. It represents METITO International in Pakistan. Metito is a Lebanese company, with its headquarter in Sharja, U.A.E and has been very active in Saudi Arabia and other Gulf countries.

PAKISTANI COMPANIES INVOLVED IN THE ASSEMBLING OF DESALINATION PLANTS

There are many Pakistani companies, which are making (assembling) Reverse Osmosis Desalination Plants. The most prominent are:

1. Waterman, Karachi
2. High Aqua, Karachi
3. Aqua-Dem, Karachi
4. Gresham. Karachi
5. Clean Water Group (CWG), Lahore
6. Bin-Qutub, Lahore, Karachi

KARACHI SCENARIO

The existing water supply depends on three sources. The oldest source, Dumlottee Wells was supplying 5 MGD but it is largely exhausted. The Hub System supplies 100 MGD from a multi-purpose dam on the Hub River via a conduit to Manghopir where it enters the primary distribution system. Hub Source is unreliable and due to continuous drought, hub supply has reduced to zero. The balance of 435 MGD of existing supply is provided by the Greater Karachi Bulk Water Supply System (GKBWSS). The Dumlottee Well field was developed in 1884 and expanded in 1923. During the World War-II in 1942 it was supplying 15 MGD to the city. The current public supply to the metropolis is from two sources, Indus and Hub Dam totaling to 605 MGD. The unaccounted or loss of water in the supply system, however, is of enormous magnitude 40% i.e. 242 MGD. The Karachi Water and Sewerage Board (KW &SB) estimates the current demand at 820 MGD taking into account the losses. Therefore,

there is a shortfall of 215 MGD, which constitutes 35.5% of the supplied quantity [2].

The population of Karachi in accordance with 1998 census was 9.8 million projected to 11 million in 2000 at 5% growth rate. The water demand at 54 gallons per capita per day (average domestic, industrial and commercial) comes as 594 MGD. The water demand for the city will keep on increasing with passage of time as shown in Table 4.

Table 4: Present and Future Water Demand in Karachi

No	Year	Estimated Population (millions)	Demand (MGD)
1	2000	11	594
2	2005	14	756
3	2010	18	972

FUTURE OF DESALINATION

THE METROPOLITAN AREA OF KARACHI

The existing surface and groundwater sources in Karachi are not reliable. Moreover, the groundwater is contaminated and saline. The rainfall in Karachi and the surrounding area is low and extremely variable. The average is around 200 mm/year. The increased bulk water supply from Indus River will need large development investment, because of the distance of 170 km from the source. Therefore, in all probability substantial short fall in the water supply is going to persist in future. In any case the water supply is intermittent i.e., for 3 to 4 hours on alternate days.

Desalinated water certainly is not designed to compete with bulk water supply from a source like Indus River in terms of cost or in terms of a sizeable share. However, it has a special strategic position, when one compares quality and reliability of water from the municipal piped system. The desalination plants become very attractive, as they dispense with the piping system because of their location at the point of use. The distribution system is vulnerable and undependable in times of emergencies. As a matter of contingency, the health support systems will always need continued potable water supply, which can only be assured by desalination plants distributed throughout the city. There are undoubtedly good prospects for installing dispensing stations just like petrol pumps, offering potable water at a reasonable cost to the citizens of Karachi. The RO technology also offers the added advantage of introducing mobile units to produce water on as and where required basis. The technology is ideally suited to provide water for survival in a scenario, when there is an overall breakdown of public services.

THE COASTAL REGIONS OF PAKISTAN

The total straight length of seashore of Pakistan is 990 kilometer and if actual contour is measured then it comes out to be 1046 kilometer. The share of Balochistan is 670 kilometer and of Sindh is 320 kilometer. The major towns on the seashore of Balochistan are: Gawadar, Pasni, Turbat and Giwani.

The coastal regions of Sindh and Balochistan are full of promise for introducing desalination technology. There was a time when water for settlements on the coast used to be transported in launches plying from Karachi. One of the serious inhibiting factors in developing economic activities in the coastal region has been the lack of fresh water. The desalination systems both thermal and reverse osmosis lend themselves eminently to the use of renewable sources of energy. There is plenty of sun available and mature technology for conversion of solar energy to electrical power via photovoltaic systems is also available. The RO Desalination plants could be installed at point of use in the shortest possible time. Thermal desalination units based on the latest Evacuated Tube and Heat Pipe Collector technology could also be installed at places, where reasonable maintenance facilities are available. Efforts for poverty alleviation can become more meaningful, if dependable systems for at least drinking water for the people are provided at subsidized rates [5].

APPROPRIATE DESALINATION PROCESSES FOR PAKISTAN

Numerous processes for desalination of water have attained economic and commercial status. Thermal Distillation, Reverse Osmosis (RO) and Electrodialysis (ED) are already applied to a variety of practical installation in many parts of the world. Solvent Extraction, Ion Exchange Demineralization, Freeze

Separation, and Hydrate Separation are limited to special cases only. Thermal Distillation processes currently in use include Multi-Stage Flash Distillation (MSF), Vertical-Tube Evaporation, Vapour Compression and Solar Distillation. The world's largest desalination plants in commercial operation use the Multi-Stage Flash Evaporation or Vertical-Tube Evaporation. Vapour Compression is used primarily in small portable plants. Solar Distillation is used only in relatively small plants in remote locations.

For Pakistan, the methods that are of current importance, Distillation and Reverse Osmosis are best adapted to the desalination of seawaters while Reverse Osmosis is also applicable to brackish water. In short, the desalination methods most frequently used would be Reverse Osmosis (Seawater RO as well as Brackish water RO), Multi-Stage Flash Distillation (MSF) and Vapour Compression System (VC).

Large size thermal desalination plants and RO desalination plants require large capital cost. Private sector can not afford. In this background small size RO units between 100,000 GPD to 500,000 GPD seem to be most economic and viable.

The prospective organizations for medium-size desalination Plants are.

1. Textile Industries
2. Pharmaceutical Companies
3. Residential Complexes
4. Big Establishments

Generally, RO process is the best choice for these establishments.

Whereas the prospective organizations for large size (probably MSF or MED) desalination plants are:

1. Karachi port Trust (KPT)
2. Pakistan Navy
3. Port Qasim Authority (PQA)
4. Pakistan Steel
5. Sindh Industrial and Trading Estate (S.I.T.E)
6. Korangi Industrial and Trading Estate (K.I.T.E)

The requirement for good quality water for major textile mills varies from 0.25 MGD to 1.0 MGD.

A feasibility study should be conducted for each application of desalination process, which must define the following parameters:

1. Most recent capital cost of plant and auxiliary equipment
2. Most recent land cost for installation of plant
3. Viable size of the plant
4. Integration into the network
5. Most suitable approach for financing the construction of desalination plant such as Build-Operate and Transfer (BOOT), turnkey basis etc.

WATER RE-USE – ULTIMATE GOAL

A total of 200 MGD of domestic and toxic sewage is produced in the city of Karachi. With plans underway to increase the bulk quantity of water under new project-plans, the sewage generation would further rise. The capacity of three existing sewage treatment plants is 151 MGD. At present the treated effluent is disposed in the sea.

The reuse of sewage effluent can be made through various types of treatment processes to achieve desired water quality. If conventional potable supplies were reserved for drinking, then treated sewage effluent could be available on demand for development of parks and roadside plantation. This would represent a reduction in the demand on conventional sources. Since the sewage contains pathogenic organisms like typhoid, cholera, parasitic, worms and viruses and as the municipal parks are used for resting there would be a high level of human contact with reclaimed effluent. Hence, any treatment facility must ensure that health risks are avoided and toxic components are removed before use as process water.

The treated sewage effluent from SITE Plant (known as TP-1) can be utilized for industrial use in SITE area itself. To achieve the objective, TP-1 effluent has to be further refined so that water of desired quality can be used in SITE. A proposal on these lines was prepared earlier by a firm for SITE suggesting new technology to make the treated effluent usable. It is proposed to pursue the proposal further.

CONCLUSIONS AND RECOMMENDATIONS

- Reverse Osmosis Desalination Process is most feasible for treatment of brackish water.
- Federal and Provincial Governments should adopt a promotional approach to the desalination programs and projects. These Governments should force bulk consumers to install their own desalination plants.
- To obtain good quality water for drinking is the basic right of every citizen. Even for coastal regions of Balochistan, the provincial government must provide this life-support facility to the people even if the cost of producing water has to be subsidized.

- Custom tariff on imported equipment should be rationalized and anomalies in respect of the import of desalination related equipment must be removed.
- The indigenization of desalination technology and manufacture of equipment with adequate maintenance backup should be realized with a tripartite collaborative approach – the government, end-users and prospective manufacturers.
- The bulk consumers should be forced to have their own water purification system and the bulk consumers draining huge amount of water should be forced to recycle some of such water.

*** *Date: 21st June 2003*

REFERENCES

[1] WHO Standards for Drinking Water, 1983. Published by WHO Headquarter, Geneva, Switzerland.

[2] Karachi Water Board Report No. 2, March 1997.

ADVANCES AND TRENDS IN ELECTRIC POWER INDUSTRY PART II

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ABSTRACT

This paper provides a brief review of the major developments in Electric Power Industry since its inception, highlighting the major technical events. It discusses different forms of power generation and briefly outlines the main advantages of each type.

*The paper is an abridged form of a presentation made by **Mr. Edward Wollyung** of General Electric on the occasion of IEP-SAC Seminar held in Riyadh on 25th May 2001. The abridged form of the seminar presentation was divided in 2 parts. The first of the two parts appeared in the last year's issue the Journal. The second part is being presented here.*

MAJOR FACTORS INFLUENCING THE ADVANCES AND TRENDS

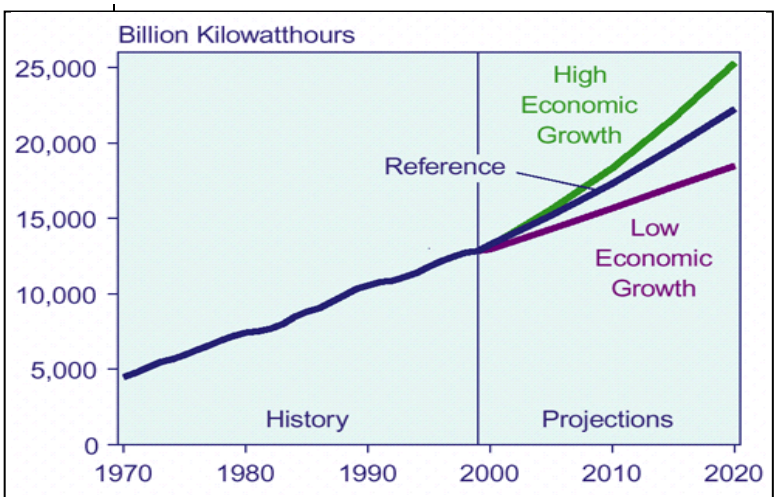
Major factors that have influenced the advances and trends in electric power industry can be summarized as:

6. Economic Factors
7. Political Pressures
8. Social Pressures
9. Resource Limitations
10. Technological Events

Some of these factors are illustrated here briefly.

ECONOMIC FACTORS

The net use of electrical energy has increased generally over the years. Fig-1 shows the world's net, actual and projected electricity consumption from the year 1970 upto 2020. The projections from 1999 to 2020 depend upon the economic growth rates and, thus the forecasts



Sources:
History: *Energy Information Administration (EIA), Office of Energy Markets and End Use, International Statistics Database and International Energy Annual 1999, DOE/EIA-0219(99) (Washington, DC, January 2001).*
Projections: *EIA, World Energy Projection System (2001).*

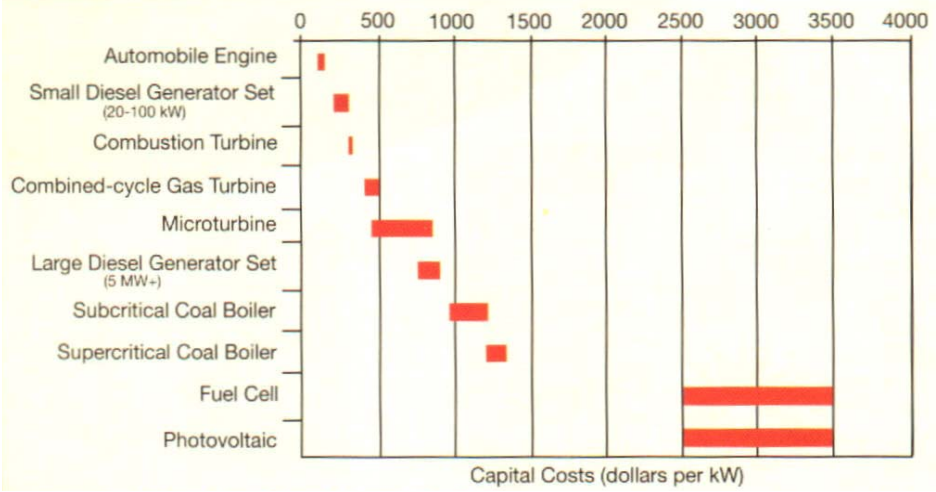
Figure 1: World Net Electricity Consumption in 3 Cases

are given for low, medium and high economic growth rates. It is clear from this figure that the net electrical energy requirements are greatly influenced by the average economic growth rate of the world economy.

The total electrical energy is converted from other forms using a variety of technologies. The cost varies with the technology used and the size of equipment capacity. Table-1 gives a comparison of the capitals cost per kW of electrical installed capacity and size limit for a broad spectrum of power generation technologies.

In addition to the existing technologies, several modern technologies are emerging for electrical power production. Table-2 provides a comparison of several of such technologies namely; microturbines, small reciprocating engines and high temperature fuel cells. It also shows the expected results of advancements in some of these electrical power generation technologies over the first decade of the 21st century.

Table 1: Economics and Size Limits for different technologies



Source: CERA (Cambridge Research Association)/Bear Stearns

Table 2: Estimated Technology Performance Characteristics

Technology	Year	Installed cost ($/kW) High	Installed cost ($/kW) Low	Non-fuel O&M ¢ High	Non-fuel O&M ¢ Low	Electrical efficiency (%) Low	Electrical efficiency (%) High	Unit size (kW)
Recuperated Microturbines	2000	900	750	1.0	0.5	30	30	25-75
	2005	700	500	0.5	0.3	33	3625-500	
	2010	600	400	0.2	0.1	38	42	25-1000
Small Reciprocating Engines	2000	750	500	2.0	1.5	24	33	50-300
	2005	700	450	1.7	1.3	26	3550-300	
	2010	650	400	1.3	1.0	26	37	50-300
High-Temperature Fuel Cells	2000	-	-	-	N/A	-	-	-
	2005	2000	1500	2.0	1.0	45	55	250-1000
	2010	1500	1200	1.5	0.5	50	60	250-1000

Source: Bear Stearns

ENVIRONMENTAL FACTORS

Environmental factors greatly influence the usage of different electrical power generation technologies. In thermal power plants, use of coal, heating furnaces oil (HFO) and natural gas (NG) cause pollution products that may have direct / indirect influence on humans through a variety of mechanisms. So there are economic costs associated with the environmental issues. Similarly, there are safety concerns for nuclear power plants. Table-3 provides a comparison of the environmental costs for a number of power generation technologies. It is important to note that in Table-3, conspicuously missing is the cost and impact of waste disposal for nuclear power plants. Due to these reasons different technologies have to compete as per existing priorities of a given country at a given time.

Table 3: Environmental Factors Expressed as Cost Impact

Category	Coal	HFO	NG	Nuclear
Human Health Accidents	0.70 - 4.00	0.70-4.80	0.10 - 0.20	0.03
Crops Forestry	0.17 - 1.50	1.60-1.70	0.08 - 0.09	small
Buildings	0.15 - 5.00	0.20 -5.00	0.05 - 0.18	small
Disaster	-	-	-	0.11 - 2.5
Global Warming	0.50 - 24.00	0.50 - 1.30	0.30-0.70	0.02
Indicative Totals	**2.05 - 34.50**	**3.00 - 12.80**	**0.53 - 1.17**	**0.16 - 2.55**

OTHER FACTORS

Several other factors also influence the usage of a particular power generation method. Some important points in this regard are summarized here:

- Large plants need large funding which is usually not easy. As a consequence, normally only tested and traditional approaches are approved for large power plants.
- Reliability concerns of the electrical system influence its growth and selection of a given power generation technology.
- Availability concerns dominate the choice of plant and equipment hardware.
- Social pressures dictate the acceptance of certain technologies.
- Political influences dictate the method selected as well as the

location and usage of the power generation technique employed.
- Technological break-throughs result in replacement of older technologies with newer methods and techniques.

Thus, it is clear from the above discussion that many factors interact to determine the ultimate selection of the power generation plant location, size and technology employed.

ADVANCES IN POWER GENERATION TECHNOLOGIES

Under the influences of different factors mentioned in the last section, various power generation technologies have advanced to their present level. A brief review of most significant of these technological advancements is presented next.

ADVANCEMENTS IN STEAM TURBINE PLANTS

Following are some of the key developments that have taken place in steam turbine power plants.

- Supercritical boilers employing plants operating on the high pressure side at about 2500 psi and aimed at improving the overall plant efficiency, in addition to bottom cycle re-heating method to minimize net plant heat rate have emerged.
- Low NOx boilers both fluidized bed boilers and low NOx combustors aimed at lowering the NOx emissions have been developed and these have reduced the damage to the environment.
- Advanced STG designs to increase efficiency – LSB designs have approved for this purpose.
- PRB Coal, or imulsion and COM fueled plants using special low sulfur source coal are aimed at lowering SOx emissions and are becoming more common. This again reduces the acid rain and other environmental concerns.
- SOA air pollution control equipment focused on overcoming the environmental concerns have been developed. Fig-2 shows a schematic of a fluidized bed boiler for power generation.

COMBUSTION TURBINE ADVANCEMENTS

Following are brief highlights of the advancements in combustion turbine technologies.

- Higher firing temperatures to gain a higher overall efficiency and lower heat rates have been developed.

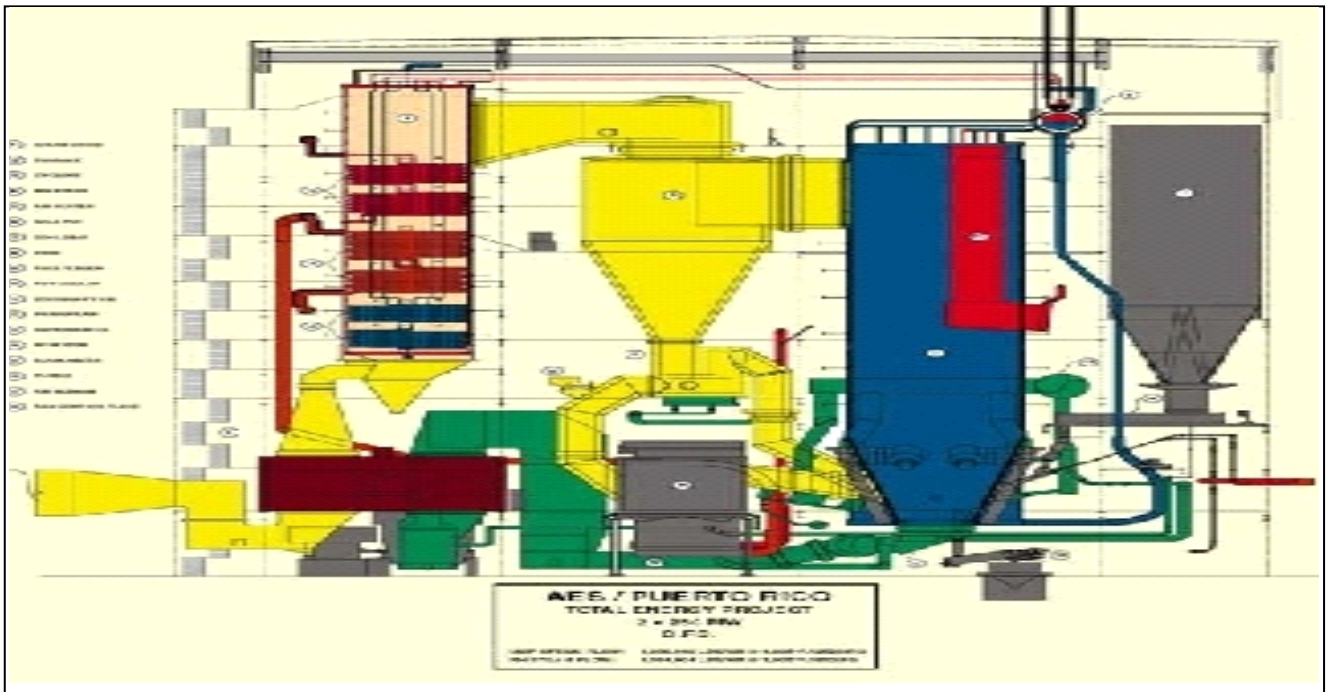


Figure 2: The CFB boilers are based on the design of those installed at Alstom's Tonghae power project in South Korea. Each unit will produce 165 bar steam, with 538oC superheat and reheat steam temperatures.

- Low NOx combustion systems to decrease the pollutants in turbines are available.
- Increases in availability/ reliability and use of aero-derivatives are more common.
- Portability of equipment has increased and rental of turbines is possible.
- Micro turbines for small-scale power generation applications are developed.
- Inlet cooling techniques are being used in order to increase the power output of combustion turbines.
- New hybrid GTG with fuel cells providing much improved overall efficiency of the power generation system are being developed.

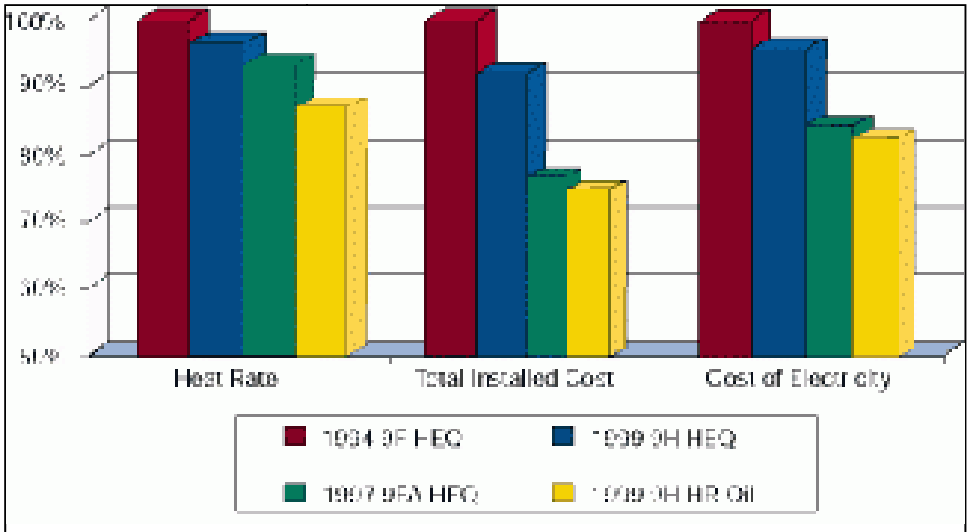


Figure 3: Economic Impact of Candidate Design Improvements.

COMBINE CYCLE AND CO-GENERATION PLANT ADVANCEMENTS

In addition to advancements in steam and gas turbines technologies, significant progress have been achieved in combined cycle and co-generation technologies, In such applications, the overall plant efficiency is significantly improved, thereby offering savings in term of fuel cost as well as associated environmental costs. A brief listing of the major achievements in these areas is provided here.

1. IGCC plant technology addresses both fuel flexibility and environmental issues, therefore integrated combined cycle plants are gaining acceptance at a rapid rate.
2. H Class GTG/STG integrated system results in a higher efficiency, lower heat rate and conformity with environmental issues and are becoming popular.
3. Kelvin Cycle is employed through modified water/steam cycles in order to improve over all plant efficiency.
4. Co-generation applications in industrial plants are becoming more common.

Figure-3 shows a comparison of heat rate, total installed cost and cost of electricity using four different technologies.

Due to such benefits, currently there are 24 different IGCC plants in operation or in construction throughout the

Figure 4: Delaware City Refining IGCC (9PPM Nox) temperatures.

world. Moreover, major advances have been made in combustion and environmental validation of such plants. Consequently improved ratings and performance records have been achieved with the combined cycle plants. Such plants offer high RAM values and standard production GT can also be used with some modifications to enhance economics.

Figure-4 shows a combined cycle facility in USA. This facility will provide the refinery with reliable steam and power supply.

NEW TRENDS AND ADVANCEMENTS IN RENEWABLE ENERGY SOURCE

In addition to the above-mentioned advancement, significant advancements have been occurring in renewable power and clean power technologies. A brief list of these technologies is given next.

- Wind Farms are emerging around the world for clean and renewable power.
- Hydro plant and small-scale hydro plants are finding more applications.
- Fuel cell technology is finding more and more commercial applications.
- Photo-voltaic cells based power supplies are increasingly being used.
- Energy Warehouse is being established to store energy in the following modes:
  - Electro/chemical storage

Figure 5: Wind Turbines

Figure 6: Hydro Turbines

  - Hydro storage
  - Air system storage
- Transformer /generator hybrids are being developed and put into operation resulting in improved efficiency. HTS-high temperature super-conducting material is being investigated for their use in the developments of cables and electrical machines, thereby, improving energy conversion and transportation efficiency.

CONCLUSION

This paper shows that significant advancements have occurred in conversional power generation technologies. Moreover, new power generation technologies are emerging and are changing the electrical power production sector.

NOTE: The paper is divided in 2 parts and the second part is being presented here. The first part has already been presented in the previous issue of this Journal.

*** *Date: 25th May 200*1

REFERENCES

[1] DOE/EIA-0219 (99), Washington, DC, January 2001. Projections: EIA, World Energy Projection System (2001)

[2] 1995 and 1999: Energy information administration (EIA). International energy annual 1999. DOE/EIA-0219(99), Washington, D.C. January, 2001. 2010 and 2020: EIA, world energy projection system (2001)

[3] Frost and Sullivan

MOBILE INTERNET TECHNOLOGIES AND INFRASTRUCTURE

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ABSTRACT

The development and propagation of cellular voice systems over past several years has exposed the capabilities and the usefulness of wireless communications and, thus, has paved the way for wide-area wireless data applications and mobile Internet. The demand for mobile Internet is experiencing a significant increase and is turning into a communications revolution that can change the lifestyle pattern in the near future. This paper examines the technologies and the infrastructure that provides the base for this revolution and reveals its potential.

INTRODUCTION

Two of the most influential technological developments in the past ten years have been the spread of the Internet and the mobile telephony. In last few years, the telecommunications industry in most countries has witnessed a new phenomenon – the fusion of mobile technology and the Internet, creating a new paradigm, "Mobile Internet". The "Mobile Internet" and "Wireless Data Communication" has become one of the hottest topics in recent years. It represents a communications revolution that has already started and is gaining momentum, and is enhancing and enriching the way people communicate and do business.

Although, the demand for mobile Internet is growing, the progress is slow, the process is complicated, and there is confusion, hype and unrealistic expectations. Most of the users and service providers have built up expectations that mobile Internet will provide a user experience similar to fixed Internet. Given high expectations for a mobile Internet offer that would replicate the fixed Internet experience, the mobile Internet as it exists today is an alien product for most of the users – the screen is small, access is slow, and the charges are high.

Even though the reality of mobile Internet is more prosaic, there are some good technologies available right now, and more are on the way. The spectacular success of Japanese operator NTT DoCoMo's i-mode mobile Internet service indicates that there is sizeable demand for such services. The next-generation cellular systems, public wireless LANs and new phones and PDAs offer significantly increased value.

KEY MARKET DRIVERS

To understand the future of mobile Internet and to find out how it will evolve, let's look at some of the key drivers of this market:

Growth in Internet Usage:

The number of Internet users, worldwide, is predicted to reach 500 million by 2003, growing at an average rate of

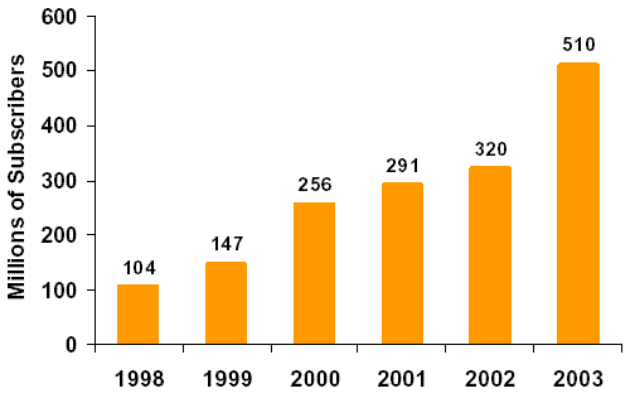

Figure 1: Worldwide Growth in Internet Users
(Source: CSFB)

29% since 1998. This desire to access information on the Internet will spill over to those users wanting it at all times and places via mobile devices.

Explosion of Mobile Communications:

According to Nokia, about 700 million users worldwide had mobile phone at the end of 2000. The company estimates that there will be 1 billion mobile phone users by the first half of 2002 – or one out of every six people on the planet. It also estimates that there were 60 million web-enabled handsets worldwide at the end of 2000 which will increase to more than 200 million by that time. Again, the growing number of mobile users and web-enabled handsets would result in increase in demand for Internet access.

According to Strategis Group, in United States alone, mobile data services will be used by 60 percent of the population in 2007 and subscribers will rise from five million in 2000 to 172 million during that seven-year span.

The Yankee Group Europe also predicts that by 2003, 25% of total wireless revenue will be accounted for by wireless data, up from just 5% at the end of 1998. This is an increase from $4.3 billion to almost $39 billion.

High Speed Standardized Platforms:

Over the next few years, mobile voice and data services will continue to be delivered over a number of network platforms. Gradually, the market will shift from current second generation technologies to second-plus, and then third-generation technologies. The introduction of WAP and other combined efforts to standardize key technologies will also result in huge demand for mobile Internet access. The Universal Mobile Telecommunications System (UMTS) Forum predicts that by 2010 data services will represent $300 billion or 66% of all worldwide 3G revenues.

Low Cost Devices:

The development and adoption of smaller mobile computing devices such as Palm Pilot, PocketPC, handheld PCs, smart phones and two-way pagers will make wireless data solutions more affordable and practical for a broader range of users.

MOBILE TECHNOLOGY LANDSCAPE

Today's wireless networks are a combination of incompatible technologies and standards. Subscribers cannot use their mobile devices outside their coverage area, and developers are potentially forced to create multiple versions of the same applications. In contrast, the wired Internet is a more homogeneous environment with globally implemented standards. Figure 2 provides a high-level view of just how different the wireless Internet landscape is from the wired Internet, and indeed how much more complex it is.

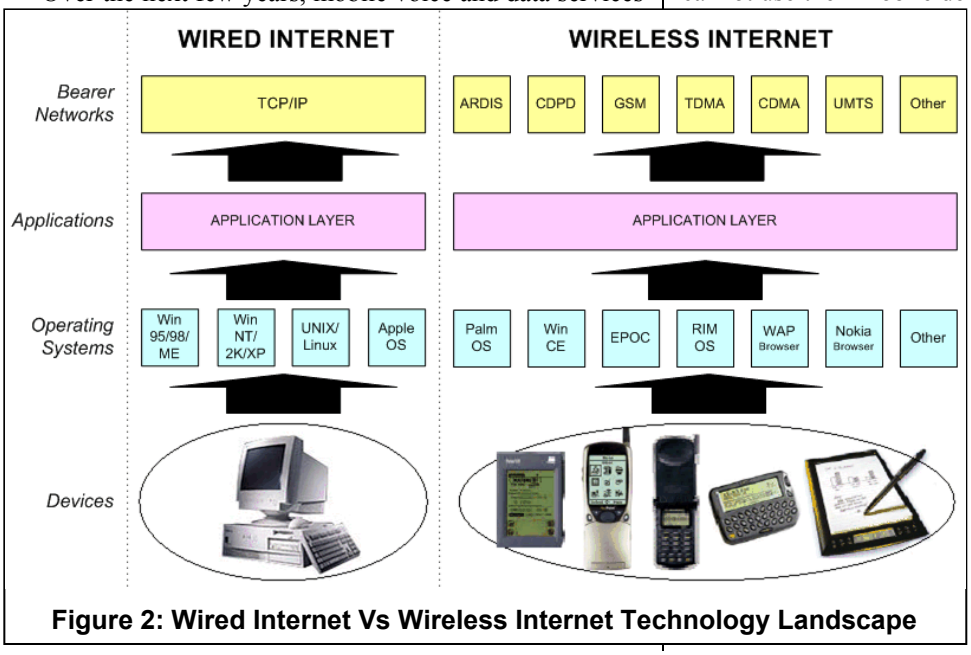

Figure 2: Wired Internet Vs Wireless Internet Technology Landscape

In the following sections we will review the three major components of a wireless landscape (bearer networks, devices and operating systems) and find out how the technology will evolve in next few years.

WIRELESS DATA NETWORKS

Just as wired telephone systems are advancing to deliver the promise of the information super-highway, so wireless systems are evolving to provide the similar capabilities, without the restriction of a fixed connection. Mobile Internet aims to move the Internet world onto a mobile environment. It is primarily affected by two components; portability and connectivity. The portability is the ability to carry computer during travel and use it at any place, and the connectivity is the ability to connect to external resources and have access to external data

Wireless data networks play a significant part because it can offer ubiquitous connectivity, that is, connectivity at any place, any time. For this reason, wireless data networks can be of real value to the business world since computer users become more productive when they exploit the benefits of connectivity.

Usually, portability and connectivity are at odds: the more portability increases, the more difficult it becomes to connect to external resources. However, wireless data technology provides the means to effectively combine both capabilities and, therefore, it is an essential technology for mobile Internet.

The wireless data networks are broadly divided into two categories according to their mobility characteristics – Wireless Wide Area Networks (WWAN) and Location-based wireless networks.

They are further divided into different categories based on different characteristics as shown in Figure 3. The most important of these characteristics is the data transport mode, also known as data connection type which is either circuit switched or packet switched.

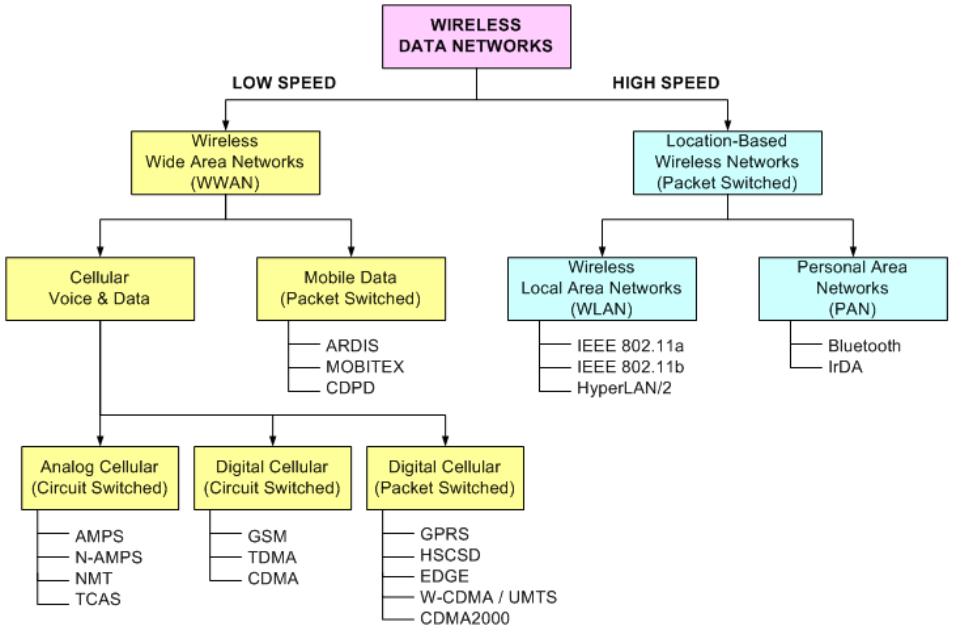

Figure 3: Categories of Wireless Data Networks

Circuit Switched Connection:

A device using a circuit switched network only connects to it when data is to be sent. They are similar to telephone calls, where a temporary circuit is dedicated exclusively to the sending and receiving nodes for the duration of the data transfer. The connection is only present when you need it and you only pay for the duration of the connection. While connected on a switched circuit network you have exclusive use of the established connection and data can be sent continuously. This type of data transaction is typically routed through the Public Switched Telephone Network (PSTN).

Packet Switched Connection:

A packet switched connection is one where you are connected all the time and only pay for the amount of data transferred. In this case, the data is divided into small packets and each packet contains a source and a destination address. Packets of data are sent from source to destination using the quickest route available. The network bandwidth is shared and multiple simultaneous users are allowed to access multiple locations across a network. Packet networks are more efficient for short data such as e-mail and database queries, and allow for instant communications without the need to establish a connection to the network. Packet switched data is typically routed over a high-speed Public Data Network (PDN). Nearly all data-only wireless networks are packet networks. In contrast, nearly all voice-only networks are switched circuit networks.

Circuit-switching and packet-switching can make a great difference in terms of transmission cost, throughput, and service quality. There are some applications that are best suited to the circuit-switched model, while others are best suited to the packet-switched model. In general, packet switched connection is more efficient and consequently less costly for applications that transmit small quantities of data at every transmission. On the other hand, circuit switched connection is more efficient for large file transmissions.

WIRELESS WIDE AREA NETWORKS (WWAN)

For wireless wide-area networks there are mainly two available technologies: data transmission over cellular networks, whether analog or digital, and data transmission over mobile data networks (Figure 2). The main difference between these technologies is the data transport mode. Cellular networks, being primarily voice oriented, generally utilize circuit switching technology; whereas mobile data networks employ packet switching technology. The new cellular network technologies support packet switching and many major wireless voice carriers have plans to move to this technology over next one to three years. Currently, due to physical layer constraints, wide-area networks typically feature low-speed wireless data transmission, on the order of 9.6 Kbps. However, with the emerging new protocols, much higher data transmission speed is supported.

CELLULAR VOICE AND DATA NETWORKS

Cellular standards fall into three categories; first generation analog cellular systems, and second and third

generation digital cellular systems. An interim technology, usually known as second generation-plus supports high speed data communication over today's digital cellular systems. Table 1 shows main feature of these technologies. A brief discussion and of these technologies and a comparison of data services follows:

Table 1: Main Features of Cellular Technologies

1st Generation	2nd Generation	2nd + Generation	3rd Generation
Analog trans.	Digital trans	Digital trans	Digital trans
Mainly speech	Mainly speech	Mainly speech	Speech and video
Voice band data	Digital data	Increasing digital data	Mainly digital data
Circuit switched	Circuit switched	Increasingly packet switched	Mainly packet switched
Local systems	Global roaming	Global roaming	Global roaming

First Generation Technologies

First-generation mobile communications systems, sometimes referred as 1G, were basic analog radio systems that established the first cellular radio infrastructure. The biggest problem with this system for cellular providers is the lack of capacity to handle the sheer number of users that demand voice service. The analog cellular networks use circuit switched connections for data transport; however, the radio link performance for data is considered marginal due to the limitations imposed by the analog nature of the technology. Radio channel dynamics such as dropouts, signal fades, and multi-paths, which can be tolerated during a voice connection, can be disastrous to a mobile data subscriber. Subscriber data rates of 2400 bits/s or less can be sustained using standard modems with some adaptation for connection to the cellular network.

In general, the analog cellular infrastructure systems are not an efficient means of sending data due to limited available capacities, limitations of data recovery, low security, and the high cost of use for many applications. Some of the widely used standards include the following:

Advanced Mobile Phone System (AMPS):

The AMPS was the first standardized cellular service in the world and was released for commercial use in 1983 in USA. The system uses 800 MHz to 900 MHz frequency band and the 30 KHz channel bandwidth. This is the most widely used analog cellular standard.

Narrow-band Advanced Mobile System (N-AMPS):

This system operates in 800 MHz range and provides three times greater capacity than AMPS by using 10 KHz channel bandwidths instead of the standard 30 KHz channel bandwidths used in the AMPS system.

Nordic Mobile Telephone (NMT):

This system was in use throughout the Nordic countries. The system has two variants based on the frequency of allocation. NMT450 operates on 450 MHz, while NMT900 operates on 900 MHz.

Total Access Communications Systems (TACS):

This system was based in the U.K and has several variants. The most popular are J-TACS (similar to AMPS) and E-TACS (Expanded TACS).

Second Generation Technologies

Second-generation mobile communications systems, sometimes referred as 2G, are currently predominant in the wireless communication industry. These use digital technology to provide many advantages for both the voice- and data-based mobile professional. These include increased system capacity, increased security against casual eavesdropping, superior cell hand-off, and better recovery of radio signal under different conditions. In addition to speech, these support services such as fax, short messaging, and roaming of mobile end-stations.

The second-generation technologies use circuit switched connections for data transport and provide data transmission rate of 9.6 to 14.4 Kbps. These implement a high level of flow control and error correction and provide reliable data transfer. With second-generation systems, multiple users can share a single cellular channel, thus reducing congestion and providing access for more users. These use the multiple access methods and provide extensive coverage with a proven and reliable communications infrastructure. The existing standards in use worldwide include the following:

GSM (Global System for Mobile Communications):

This was the first European digital open standard and is in commercial use in 1992. It was developed to establish cellular compatibility throughout Europe. Its success has spread to all parts of the world and by the year 2000, there were over 250 million subscribers worldwide. It is based on a combination of TDMA (Time Division Multiple Access) and FDMA (Frequency Division Multiple Access) techniques and operates at 900 MHz and 1800 MHz frequency bands in many parts of the Europe and Asia, and uses 1900 MHz in North America. Today, it provides an error-free Internet access at 9600 bps to the subscribers. Some analysts suggest that due to a single dominant network standard, GSM, Europe is 18 months ahead of the US wireless market.

TDMA (Time Division Multiple Access):

TDMA refers to products developed using the IS-136 specification for advanced digital wireless services. It was the first U.S. digital standard and was started in 1993. It is a natural evolution of analog AMPS networks and, therefore, was previously known as D-AMPS (Digital AMPS). It is the most widely used wireless technology in the USA, and as of year-end 2000, there were about 61 million TDMA

subscribers worldwide, with an estimated 31 million subscribers in the North America.

TDMA technology provides a 3 to 1 gain in capacity over analog technology by dividing a single radio frequency channel into a series of timeslots. Each user is assigned a set of timeslots during which they are allowed to broadcast. This technique is better at handling heavy traffic than others, since there is a hard upper limit on the amount of bandwidth that a particular user will utilize, but this is its weakness as well. Cells that do not have a large number of users will have underutilized bandwidth. Similarly, there is a much harder limit on the total number of users that can be supported within a cell.

Table 2: Technical Summary of Second Generation Technologies

	---- EUROPE -----	---------- UNITED STATES ----------	
	GSM	**TDMA**	**CDMA**
Frequency band	890-960 MHz	824-894 MHz	824-894 MHz
Allocated bandwidth	50	50	50
Access scheme	TDMA	TDMA	CDMA
Duplex method	FDD	FDD	TDD
Channel bandwidth	200 KHz	30 KHz	1250 KHz
No. of voice/freq. channels	8 / 16	3 / 6	
Total traffic channels	1000 / 2000	2496 / 4992	
Channel bit rate	270.833 Kbps	48.6 Kbps	Vendor dependent
Voice coding	22.8 Kbps	8 / 4.5 Kbps	8
Data rate	9.6 Kbps	9.6 Kbps	14.4 Kbps

CDMA (Code Division Multiple Access):

This system, known as IS-95, was adopted by the Telecommunications Industry Association (TIA) in 1993. It uses the same frequency bands as AMPS and supports AMPS operation, employing spread-spectrum technology and a special coding scheme. In this technique the call is spread over a series of frequencies based on a sequence of jumps that are semi random in nature. The spread spectrum approach minimizes signal loss within any particular frequency band, as well as providing security for the communications. The handset and the base station agree on the sequence ahead of time, which gives the base station the capability to minimize collisions within a cell. It is characterized by high capacity and small cell radius.

CDMA provides outstanding voice and call quality, fewer dropped calls, improved security and privacy, greater capacity, reduced background noise and interference, and possibility of simultaneous voice and data calls. Designed with about 4.4 trillion codes, CDMA virtually eliminates cloning and other types of fraud. Globally, commercial CDMA networks serve tens of millions of subscribers. Table 2 provides a comparison of the main features of the second generation cellular technologies:

Second-Plus Generation Technologies

The second-generation technologies provide data transfer rates only up to 14.4 Kbps. The high data speeds that are needed for video and graphic image transmission are not available on most of the today's mobile phone systems. Such capabilities require a highly complex and robust technology platform that will not be available in most of the countries until few years from now. An interim step to the next generation technologies is second-plus generation or 2.5G technologies as shown in Figure 4. These technologies support data transfer rates of 57.6 Kbps and higher and offer subscribers access to the Internet at speeds that are comparable to a wire-line ISDN connection or even faster. These include HSCSD, GPRS and EDGE. An overview of these technologies is given next:

HSCSD (High Speed Circuit Switched Data):

HSCSD is a circuit-switched mobile data standard that gives a single user simultaneous access to multiple channels, up to four, at the same time. In comparison, GSM supports only one user per channel per time slot. Assuming a standard data transmission rate of 14.4 Kbps, using four timeslots with HSCSD allows theoretical speeds of up to 57.6 Kbps. This is broadly equivalent to providing the same transmission rate as that available over one ISDN B-Channel.

HSCSD does not disrupt voice service availability. In fact, HSCSD can be preempted by voice calls- such that HSCSD calls can be reduced to one channel if voice calls are seeking to occupy these channels. In networks where HSCSD is deployed, GPRS (discussed in next section) may only be assigned third priority, after voice as number one priority and HSCSD as number two. HSCSD is therefore more likely to be deployed in start up networks or those with plenty of spare capacity – since it is relatively inexpensive to deploy and can turn some spare channels into revenue streams. It is however easier to implement in mobile networks than GPRS because some GSM vendor solutions require only a software upgrade of base stations and no new hardware.

HSCSD is expensive for end users as they have to pay for multiple simultaneous calls. However, being a circuit-switched standard, HSCSD could be the best way of communicating with other circuit switched communications media such as the PSTN and ISDN.

GPRS (General Packet Radio Service):

GPRS is a new packet-based bearer that is being introduced on many GSM and TDMA mobile networks from the year 2001 onwards. It is a non-voice value added service that allows a subscriber to send and receive data in an end-to-end packet transfer mode, without using any network resources in circuit-switched mode. It also permits

the user to receive voice calls simultaneously when sending or receiving data calls.

GPRS facilitates instant connections (no dial-up) whereby information can be sent or received immediately as the need arises. This is why GPRS users are sometimes referred to be as being "always connected". A GPRS mobile device displays a mobile portal service all the time, but it is only activated, and the user is only charged, when information is being transmitted. The main feature of GPRS is that it reserves radio resources only when there is data to send and that these radio resources are shared by all Mobile Stations (MSs) in a cell. It handles data transfer rates from 14.4 Kbps, using just one TDMA slot, up to 115.2 Kbps, using all eight TDMA slots. This will allow it to handle all types of transmission from slow-speed short messages, to the higher speeds needed for browsing complex web pages with high graphics content.

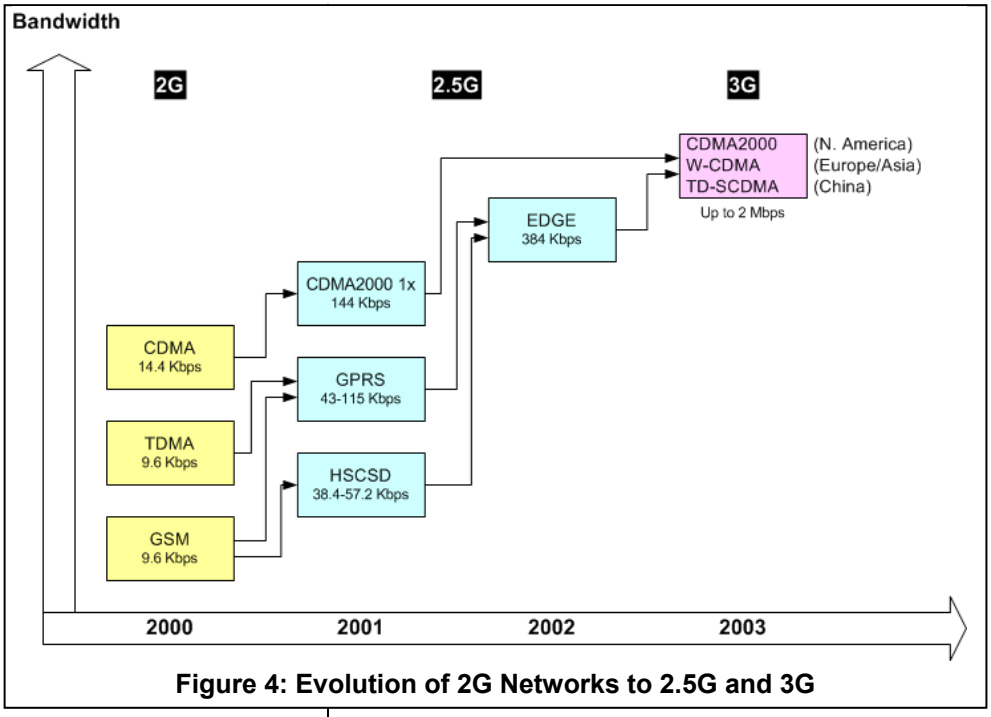

Figure 4: Evolution of 2G Networks to 2.5G and 3G

GPRS fully enables a true "Mobile Internet" scenario by allowing integration between the existing Internet and the GPRS network, via interfaces to TCP/IP. Its network can be viewed as a sub-network of the Internet with GPRS capable mobile phones being viewed as mobile hosts. This means that each GPRS terminal can potentially have its own IP address and will be addressable as such. Any service that is used over the fixed Internet today – web browsing, file transfer, chat, email, telnet – will also be available over mobile network via GPRS. In addition, higher data rates will allow users to take part in video conferencing and interact with multimedia websites and similar applications as well.

Enhanced Data rates for Global Evolution (EDGE):

EDGE is a radio based high-speed mobile data standard that was first proposed to the European Telecommunications Standards Institute (ETSI) in 1997 as an evolution of GSM. In fact, it was formerly called GSM384. It is the result of a joint effort between TDMA industry association and the GSM Alliance to develop a common set of third generation wireless standards which supports high-speed modulation. EDGE allows mobile operators to offer 3G services without having to purchase a 3G license. It allows data transmission speeds from 48 Kbps, using just one timeslot, up to 384 Kbps, using all eight timeslots. It supports 800/900/ 1800/1900 MHz frequency bands. Although it reuses the GSM carrier bandwidth and timeslot structure, it is by no means restricted to use within GSM cellular systems. In fact, by enhancing the capability of existing GSM or TDMA systems, it facilitates an evolution of existing cellular systems towards third-generation capabilities.

Implementation of EDGE by network operators has been designed to be simple. Only one EDGE transceiver unit will need to be added to each cell. The new EDGE capable transceiver can also handle standard GSM traffic and will automatically switch to EDGE mode when needed. EDGE capable terminals will also be needed since the existing mobile phone or terminals do not support the new modulation techniques and will need to be upgraded to use EDGE network functionality. EDGE provides the most cost-effective means to provide IP-based multimedia services and applications within existing spectrum. The advantages of EDGE include rapid availability, the reuse of existing GSM and TDMA infrastructure, and support for gradual introduction. In addition, it allows the full advantages of GPRS to be explored, with fast connection set-up, higher bandwidth, and data rates as high as 384 Kbps.

Third Generation Technologies

Two shortcomings of the second generation bearer networks are low bandwidth and limited network capacity which negatively impact the user experience and the reliability of the service. Third generation or 3G technology is a new technological evolution that will offer far more bandwidth and greater data and voice call capacity than today's digital mobile networks allow. It is a next giant step in mobile technology development with its goal being full interoperability and inter-working of mobile systems. The idea behind 3G is to unify the disparate standards that today's second generation wireless networks use.

With 3G technology, portable bandwidth will rise to the level of wired broadband connections and the data transfer

rates of up to 2 Mbps will be possible (128 Kbps in a car, 384 Kbps when a device is stationery or moving at pedestrian speed and 2 Mbps in fixed applications). When this speed is achieved, wireless technology will find a new audience that is interested in Internet browsing, wireless gaming, and listening to music. Current mobile networks are only designed for voice and text messaging, whereas 3G networks will allow faster and more complex data transmission such as streaming video and audio, video conferencing, satellite navigation and interactive application sharing. These networks will provide packet switched data access to the Internet with an end-to-end IP connection. This means that when the mobile phone is activated it is automatically connected to the Internet via a normal browser. Subscribers will then enjoy capabilities similar to today's fixed-line Internet services with significant add-ons such as location-based and highly personalized services.

Third generation technology allows handsets to be left permanently connected to the network and use capacity only when they receive or transmit packages. Subscribers can thus pay for the volume of data transmitted, not how long they talk.

Although the technology behind 3G may seem complicated, the ways in which 3G will affect all of our lives are easy to imagine. Just imagine having a combined camera, computer, stereo, and radio included in your mobile phone. Rich-media information and entertainment will be at your fingertips whenever and wherever you want. Being able to do so much, the end user device is no longer just a mobile phone, and will be referred to as a terminal

Standards:

Standardization of third generation mobile communications began in the mid-1990s under supervision of the International Telecommunications Union (ITU). The goal was full interoperability and inter-working of mobile systems capable of providing value-added services. In 1998, the ITU called for Radio Transmission Technology (RTT) proposals for IMT-2000 (International Mobile Telecommunications-2000), the formal name for the third generation standard. Under the brand IMT-2000, it approved three standards to achieve this: W-CDMA, CDMA2000 and TD-SCDMA. W-CDMA (Wideband Code Division Multiple Access) was backed by the European Telecommunications Standards Institute (ETSI) and the GSM operators in Europe and elsewhere; while the CDMA2000 was backed by the North American CDMA community, led by the CDMA Development Group (CDG). The third standard won the support in the other parts of the world. Earlier, in January 1998, the W-CDMA standard was also incorporated by ETSI in the specification of UMTS (Universal Mobile Telecommunications System) Terrestrial Radio Access; hence W-CDMA and UMTS are

Table 3: Market Snapshot and Status of Deployment of Mobile Internet Technologies

COUNTRY	MOBILE PENETRATION	HOME INTERNET PENETRATION	2G LICENSES	3G LICENSES	AMOUNT PAID FOR 3G LICENSES	2.5G LAUNCHED?	MMS AVAILABLE?	1ST 3G SERVICE LAUNCH
Australia	64.8% (Jun 2002)	50% (Dec 2001)	4	6	US$ 580 Million	Yes (Q2 2000)	Yes (Aug 2002)	Q1 2003
Canada	36.1% (Jun 2002)	49% (Dec 2001)	4	5	US$ 919 Million	Yes (Apr 2001)	Yes (Oct 2002)	Q1 2002
France	61.9% (Jun 2002)	23.9% (Oct 2002)	3	4	US$ 2.23 Billion	Yes (Q4 2000)	Yes (May 2002)	Q1 2004
Germany	67.9% (Jun 2002)	31% (Q3 2001)	4	6	US$ 46.11 Billion	Yes (Dec 2000)	Yes (Apr 2002)	Q4 2003
Hong Kong	86.8% (Jun 2002)	53% (Dec 2001)	6	4	US$ 524 Thousand	Yes (Q4 2000)	Yes (Jul 2002)	Q1 2003
Italy	91.5% (Jun 2002)	34% (Dec 2001)	4	5	US$ 10.04 B1illion	Yes (May 2001)	Yes (May 2002)	Q4 2002
Japan	55.6% (Jun 2002)	44% (Dec 2001)	5	3	N/A	Yes (Q1 1999)	Yes (Q4 2000)	Q4 2001
Malaysia	32.6% (Jun 2002)	5% (2001)	5	2	US$ 26.33 Million	Yes (Q2 2002)	No (Q2 2003)	2004
Singapore	67.5% (Jun 2002)	56% (Mar 2001)	3	3	US$ 173.4 Million	Yes (Q4 2000)	Yes (Sep 2002)	Q1 2004
South Korea	64.34% (Jun 2002)	58% (Dec 2001)	5	2	US$ 3.3 Billion	Yes	Yes	Oct 2000
Taiwan	100% (Jun 2002)	50% (Dec 2001)	6	5	US$ 14 Million	Yes (Q2 2001)	Yes (Oct 2002)	Q4 2003
U.K.	81.7% (Jun 2002)	38% (Dec 2001)	4	5	US$ 35.36 Billion	Yes (May 2001)	Yes (Jun 2002)	Q1 2003

Table 4: Comparison of Data Services for 2G, 2.5G and 3G Networks

SERVICES	2ND GENERATION	2ND + GENERATION	3RD GENERATION
Web browsing	Short text screens	100KB web page takes approx. 30 sec to download	100KB web page takes approx. 2 sec to download
File transfers	No	500 KB document takes approx. 2mn to download	500 KB document takes approx 10 sec to download
e-mail	Short Message Service (SMS)	Text-based with small attachments	Full attachments
Instant messaging	SMS	Text-based	With audio/video clips
VoIP (Voice over IP)	No	Limited	Yes
Streaming audio/video	No	Short clips	Yes
Access to corporate intranet	Very limited	Text-based	Yes
Access to corporate apps	Very limited	Text-based	Yes

often used synonymously.

IMT-2000 is to ensure that these technologies can work in different networks, primarily in IP networks, but for the sake of backwards compatibility, in the GSM and the American ANSI networks as well. Most major network operators in Europe and Asia are committed to the W-CDMA standard for 3G mobile communications. Nevertheless, other standards are being implemented in other parts of the world. In North America and Asia Pacific, the next generation wireless network is going to be mainly based on CDMA2000 and China, the world's largest market for mobile communication, will be using TD-SCDMA standard for 3G networks.

Availability:

Upgrading from 2G to 3G requires significant capital investment. In the UK, for example, five 3G mobile licenses were auctioned off at a total of $35 billion with the expectation that it will cost each license-holder between $4 billion and $9 billion to build out their 3G network. For this reason carriers have been reluctant to upgrade their networks before they see a real demand for high-speed wireless data and many view 2.5G as more than just an interim solution as it delivers significant bandwidth improvements at greatly reduced cost.

Today, however, as major wireless service providers assess the high costs of deploying 3G services and the accompanying technical difficulties such as 3G handset and network infrastructure readiness, a few are already working on deployment of W-CDMA in Europe and Japan. Table 3 shows market snapshot and status of deployment of mobile Internet technologies in some of these countries. NTT DoCoMo in Japan has already released a third generation phone service FOMA (Freedom Of Mobile multimedia Access) in major urban areas of the country. FOMA receives data at 384 Kbps and transmit at 64 Kbps, and delivers everything from movie trailers and sports highlights to music, video clips and news feeds.

The Strategies Group predicts that there will be 9.5 million 3G mobile high-speed data subscribers by 2005 and UMTS Forum predicts that by 2010 data services will represent $300 billion or 66% of all worldwide 3G revenues.

Fourth Generation Technologies

As the major network operators have just started providing 3G services, some groups and companies have already started working on fourth-generation mobile-phone system. The 4G technology will take mobile communication another step up to integrate radio and television transmissions, and to consolidate world's phone standards into one high-speed technology.

There are two key elements which are required to deliver a legitimate 4G network. First is the ability to roam across different wireless network standards with the one device; and the second, and most obvious, is a higher level of bandwidth. Figures of 100 Mbps have been tossed around, but a more reasonable figure to expect is about 20 Mbps.

At present, there are two competing 4G standards: a joint effort by Hewlett Packard and Japan's NTT DoCoMo to create Moto-Media, and the Wireless World Research Forum specifications with the backing of some of the Europe's largest phone makers.

The questions engaging most observers at the moment are just how big is the 4G market going to be, and when can the industry be reasonably expected to invest in a new network. Some of the analysts have estimated that the 4G mobile systems will have 50 million subscribers by the end of year 2007, and it would account for 14 percent of total mobile data revenues. But most of the analyst estimate the technology to be ready around 2008-2010. Nokia and Samsung have already teamed up to create 4G wireless equipment, a move which demonstrates the support for the 4G mobile systems.

Comparison of Data Services

The demand for mobile data services is growing. Increased mobility has fueled an expanding market for both consumers and the enterprises. A comparison of various data services for cellular networks is shown in Table 4. For consumers, second-plus and third generation networks will bring access to the Internet, with near wire-line speed and quality. 2.5G services will mostly be text-based with still images and short audio clips. Services will include web browsing, financial transactions, image downloads, e-mail

and instant messaging. As networks migrate to 3G, these same services will be enriched with multimedia content including full audio and video clips.

For enterprises, second-plus generation networks will allow access to corporate intranet and e-mail, business applications and databases, and increasing mobile sales and field employees' productivity. In the future, 3G capabilities will enable even greater benefits from wireless business applications through VoIP (Voice over IP), rapid file transfer and video-conferencing.

PACKET SWITCHED MOBILE DATA NETWORKS

A packet switched mobile data network is a type of specialized mobile radio system which functions as a wireless wide-area data-only network for the mobile professionals. Like first generation cellular telephone systems, these packet radio systems use analog radio technology. Unlike cellular systems, however, these networks offer connectionless support – subscribers do not maintain a dedicated, point-to-point connection to the destination station. Subscribers using the packet radio system are billed a monthly fee, plus a usage fee based on the amount of information (packets) transmitted through the system. The primary packet data services currently available in United States for mobile applications include ARDIS, MOBITEX, and a number of other services based on CDPD (Cellular Digital Packet Data) technology. A brief discussion of these services is given below:

ARDIS (Advanced Radio Data Information Services)

The ARDIS is a two-way radio service that is based on Motorola's RD-LAP technology. It was originally created and jointly owned by Motorola and IBM to serve IBM field technicians. However, later it was made available to the public. In 1998, it was acquired by the American Mobile Satellite Corporation. ARDIS support data transfer rate of 19.2 Kbps in urban areas, where it has 90% coverage of U.S business population (business population is considered the top 200-300 metro areas). Outside of those areas service can still be achieved, albeit at a lower 4.8 Kbps data rate. Due to overhead burdens associated with the radio channel protocol and error correction, subscriber data throughputs are actually much less than the raw data rate. Moreover, the network latency is fairly high. These limitations make the network unsuitable for most Internet and corporate intranet applications.

MOBITEX

MOBITEX protocol was originally developed by Swedish Telecom as a private mobile alarm system used by field personnel. However, later it evolved into a public mobile radio service. Commercial operation was introduced in Sweden in 1986 and, since then, a number of networks have been deployed in U.K, U.SA, Canada, Australia and Scandinavian countries. In United States, the MOBITEX was introduced by RAM Mobile Data which is now a wholly owned subsidiary of BellSouth Wireless Data.

MOBITEX covers about 93% of the U.S. business population, making it a serious contender for some applications. Originally, MOBITEX transmission rate was 4.8 Kbps but now it has been upgraded to 19.2 Kbps. However, similar to ARDIS, the subscriber data throughput is much less than the raw data rate due to data transmission overhead. Moreover, network latency is fairly high - often several seconds. For these reasons, it is suitable only for limited text messages, not graphics or file transfers.

CDPD (Cellular Digital Packet Data)

CDPD specification was developed by a consortium of eight U.S. cellular companies. It allows data transmission to be overlaid onto the existing analog cellular channels. It provides two significant enhancements to the AMPS cellular system – increased total system capacity and specifications for implementing data. CDPD networks are operated by various carriers in United States, including AT&T Wireless, Ameritech, Bell Atlantic Mobile and GTE.

CDPD offers standard RSA encryption over the air-link, making it the network of choice for public safety agencies and point of sale cash transactions. It offers users a raw data rate of 19.2 Kbps. However, overhead for coding and channel management to handle frequency hopping will reduce actual throughput. The reliability of CDPD data speeds is also questionable, particularly in mobile situations. Network-induced latency can be high, often more than one second. These limitations have made CDPD most useful for specific vertical-market applications.

LOCATION-BASED WIRELESS NETWORKS

The location-based wireless data networks provide wireless data service in a small geographical area – usually in offices, buildings and campus environments. They use packet switching rather than circuit switching to transport data. They do not experience the same rough physical layer constraints of their wide-area counterparts and, therefore, they are capable of supporting high-speed wireless data transmission, on the order of a few Mbps. The location-based wireless data networks are further divided into two alternatives: data transmission over Wireless Local Area Networks (WLANs) and data transmission over Personal Area Networks (PAN). These are discussed in the following sections:

WIRELESS LOCAL AREA NETWORKS (WLANs)

Wireless Local Area Networks use wireless transmissions (e.g. radio frequency) instead of phone lines or fiber optics to connect data devices. They cover limited areas and provide high-bandwidth wireless service. They will probably never replace the classical wired LAN; however, it can be a very effective means of extending the flexibility of a wired LAN. The dominant use for this technology is in hostile environments, such as factories, open-office settings and old buildings, where cabling is difficult or impractical; and on forklifts that rove through large warehouses. Several major airports are already providing this protocol as a service to computer-literate passengers, as are several major conventions.

WLAN uses 2.4 GHz, 5 GHz and 22-28 GHz ranges of radio frequency. This area was clouded earlier with the arrival of incompatible standards, but most of the new solutions are based on a standardized protocol known as 802.11 or Wireless Ethernet. This is briefly discussed in the following section:

802.11

802.11 is a family of specifications for wireless local area networks (WLANs) developed by a working group of the Institute of Electrical and Electronics Engineers (IEEE). It is perhaps the fastest-changing network protocol around. There are currently four specifications in the family: 802.11, 802.11a, 802.11b, and 802.11g. All four use the Ethernet protocol and CSMA/CA (Carrier Sense Multiple Access with Collision Avoidance) for path sharing.

802.11:

The 802.11 standard is the first in the family. It provides 1 or 2 Mbps transmission in the 2.4 GHz band using either Frequency Hopping Spread Spectrum (FHSS) or Direct Sequence Spread Spectrum (DSSS).

802.11a:

The 802.11a is an extension to 802.11. It provides transmission speeds up to 54 Mbps in the 5GHz band. It uses Orthogonal Frequency-Division Multiplexing (OFDM) that makes high data speeds possible. But most commonly, communications takes place at 6 Mbps, 12 Mbps, or 24 Mbps. Due to higher absorption rate of signals at 5 GHz spectrum, 802.11a devices have shorter operating range of about 60 meter. 802.11a is relatively new technology and is expensive.

802.11b:

The 802.11b standard, often called Wi-Fi, is backward compatible with 802.11 and provides 11 Mbps transmission (with a fallback to 5.5, 2 and 1 Mbps) in the 2.4 GHz band. 802.11b uses only Direct Sequence Spread Spectrum (DSSS) modulation scheme and the devices have operating range of about 100 meter. It is inexpensive, readily available and is the widely adapted standard at present.

802.11g:

This is a most recently approved standard which offers both higher throughput and backward compatibility with 802.11b access points. It offers wireless transmission over relatively short distances at up to 54 Mbps. Like 802.11b, it operates in the same 2.4 GHz range and is thus compatible with it. 802.11g technology is relatively inexpensive and the devices have good operating range of above 100 meter.

PERSONAL AREA NETWORKS (PANs)

The Personal Area Networks are generally very small networks, covering a personal workspace, an office, or a meeting room. The major advantages of PAN are freedom from cables, automatic data synchronization between computers, and easy sharing of data between workers in a small area. Two types of technologies are available for PAN – infrared and radio frequency. A popular infrared networking standard, IrDA (Infrared Data Association), provides universal connectivity at a high-speed within a single room. On the other hand, Bluetooth is a new, low cost, short range radio frequency standard that can transmit, to some degree, through walls, floors, ceilings and non-metal objects. Both of these technologies are briefly discussed in the following sections:

IrDA

IrDA is a protocol suite designed to provide wireless connectivity between two devices that would normally use cables for connectivity. It is a point-to-point, half-duplex (data is sent in one direction at a time), narrow angle infrared (30° cone) data transmission standard designed to operate over a distance of 0 to 1 meter and at speeds of 9.6 Kbps to 16 Mbps. The short-range and narrow angle of IrDA provides a simple form of security as it requires the two devices to be facing each other for them to transfer data. IrDA is an inexpensive technology and is widely available on personal computers, peripherals, embedded systems and devices of all types.

Bluetooth

Bluetooth is a radio frequency (RF) standard for short-range, point-to-multipoint voice and data transfer. It uses low-power/low-cost transceiver chips embedded in mobile computers, mobile phones, printers and other portable devices. The embedded Bluetooth chip eliminates the need to use cables that is currently necessary to interconnect personal devices. Bluetooth supports up to 8 devices in a piconet (two or more Bluetooth units sharing a channel). The devices may also be connected to existing networks to create a network of any number of Bluetooth devices in the vicinity of each other. This way they can communicate and exchange data, even on the move. Bluetooth doesn't require an access point, and so is well suited for mobile devices.

Bluetooth operate within a license-free frequency band of 2.4 GHz, which is available all over the world. The

speed of data transmission is 1 Mbps at distances of 10 cm up to 10 meters, which is expendable to 100 meters by increasing the transmit power. It provides three voice and data channels via a one-to-one connection with built-in encryption and verification. Driven by Ericsson, the Bluetooth Special Interest Group was founded by Nokia, Ericsson, IBM, Intel and Toshiba. It now has several thousand members. Many mobile phones on the market have started to come with Bluetooth enabled accessories, such as headsets and chat-boards, but we are still some way before the technology is accepted as a lifestyle standard.

MOBILE DEVICES AND OPERATING SYSTEMS

In the new information age, the mobile phone will deliver much more than just voice calls. It will become a multi-media mobile terminal, capable of accessing Internet, connecting to corporate networks, video conferencing, and sending and receiving email messages, graphic images and movies. The transformation from using phones for basic communication to using them as all-purpose data devices is already evident in the use of SMS (discussed later), which lets cellular phones send and receive messages. The key ingredients for the transformation are the mobile devices and the operating systems.

MOBILE DEVICES

There is a broad range of mobile devices that can be used for wireless communication. The new devices are becoming available every day. They provide improved capabilities at lower prices in smaller form factors. They can be divided in the following categories:

Cellular phones:

The cellular phones provide the basic capabilities of voice communication. Most of digital phones include text messaging, and store phone numbers and appointments. Some advanced phones also include applications, like WAP (discussed in next section), for web access. According to some sources, at present, there are more than 1 billion cellular phones worldwide.

Personal Digital Assistants (PDAs):

PDAs are handheld devices with much larger screens than cellular phones and pagers, and are usually equipped with pen or stylus for inputting data. They allow users to use small applications, specially designed for the PDA, and provide PIM functions to store addresses and appointments. The PDAs usually connect to Internet through wireless modems and rely on operating system's standard software for web browsing, e-mail, and instant messaging. The major operating systems in use are Palm OS, EPOC /Symbian and Microsoft PocketPC. The example of such devices includes Palm Pilot, Handspring Visor, Psion Revo, and HP, Compaq and Casio PocketPCs.

Smart Phones:

There are a large number of new devices coming out that really are neither a cellular phone nor a PDA. They offer both wireless voice and data services, and include functions like text messaging, web access, and personal information manager (PIM). These devices are generally known as Smart Phones. These require compromises. However, These pit size and weight against input ease, display clarity, storage, battery life, and data integration. In the near future, experts expect cellular phones to be equipped with foldout keyboards, eyepieces, and color displays, and also may incorporate features such as speech recognition. The example of such devices includes Nokia's Communicator and Ericsson's MC218.

Pagers:

The latest generation of pagers support two-way messaging and personal organization tools, and allow interacting with mobile devices, desktop computers and the Internet. The Internet services allow users to establish preferences for information on various topics including stocks, weather, lottery and horoscopes. The information is then sent to the pagers on demand from WAP-enable websites. The example of such devices includes RIM's Blackberry, and Cross' NetPen and Crosspad.

Modems:

Wireless modems for the voice-and-data networks are usually wireless voice handsets. They allow computing devices, like PDAs, handheld PCs and Laptop PCs, to be connected to a wireless network. However, the technology behind the wireless modem doesn't reliably predict performance. All CDMA handsets and many of the new GSM handsets require only a serial cable to connect the handset to a computing device.

OPERATING SYSTEMS

The wired computing environment is largely homogenous, comprising a relatively limited set of mature and interoperable operating systems. In contrast, there are a plethora of operating systems and micro-browsers used to run web-based applications on mobile devices. Most of the PDAs and Smart Phones use Palm, PocketPC and EPOC. Some advanced cellular phones use Phone.com UP Browser and Nokia Browser, and pagers use proprietary operating systems like RIM OS and Motorola OS. The three main contenders to set the standard for wireless operating systems are as follows:

PALM Operating System:

PALM is the most popular operating system in PDA arena. By mid 2000, seven million Palm devices had been sold, giving Palm about three quarters of the global

handheld computing market. Palm is proactively taking steps to incorporate wireless support into Palm products for both GSM mobile phone standard and non-GSM world. Major Palm partners include IBM and Symbol. Other Palm operating system licenses include Handspring, OmniSky and Nokia.

EPOC Operating System:

Designed specifically for use in mobile devices, EPOC mobile operating system supports multiple communication standards. It is being used in PDAs such as Psion Series 5. It is offered by Symbian, a consortium formed in 1998 by Nokia, Ericsson, Motorola and Psion Software. Later, Psion's software division was folded into Symbian, along with some of the personnel from the other founding partners. Industry leaders such as Sony, Sun, Philips and NTT DoCoMo have joined the Symbian alliance and licensed EPOC.

Pocket PC:

Microsoft's PocketPC (formerly Windows CE) incorporates a subset of Win32 Application Programming Interface (API). This means that there is no need to learn a new programming language to develop an application for PocketPC. It comes in several form factors for the mobile market. These include PDAs, Handheld PCs and Industrial terminals for vertical markets. About a dozen companies such as Casio, Compaq, Everex, HP and Philips have launched consumer-oriented mobile devices based on PocketPC operating system.

MOBILE INTERNET ENABLING TECHNOLOGIES AND SERVICES

Mobile phones have a huge user base and it is growing very rapidly. This created a great demand for Internet access and messaging through mobile devices. Several wireless phone manufacturers recognized this and created specifications, either individually or in groups, for web access and for sending and receiving messages through mobile devices. Many of these technologies use existing Internet standards to provide Internet content to wireless clients. By elegantly combining the mobility of cellular networks with the power of Internet applications, these technologies are rapidly gaining market share worldwide. The most important of these technologies are as follows:

SMS (SHORT MESSAGE SERVICE)

SMS is a bearer network that, since 1992, has enabled mobile phone users to send and receive text messages of up to 160 alphanumeric characters (70 characters when non-Latin alphabets such as Arabic and Chinese are used). SMS is designed as a pager replacement technology for mobile phones. It is ideal for pushing brief information one-to-one or one-to-few. After a slow start, it has become so popular that billions of messages per month are now transmitted over GSM networks. SMS messages do not require the mobile phone to be active and within range – it will be held for a number of days until the phone is activated. SMS messages are transmitted within the same cell or to anyone with roaming capability. The messages can also be sent to mobile phones directly from mobile operator's website or by using gateway address in Internet email programs, like Microsoft Outlook.

Popular SMS applications include voicemail notifications, person-to-person messages, information services, chat, and downloading ringing tones. Network operators are also able to update their mobile services using SMS messages to communicate with the smart cards (usually known as "SIM cards") within GSM mobile phones. SMS offers some very useful features such as the ability to store and forward messages, confirmation of short message delivery to recipient, and simultaneous delivery with GSM data, voice and fax services. The main drawback is obviously that it only supports "short messages", but a "long message" service is currently being developed.

MMS (MULTIMEDIA MESSAGING SERVICE)

MMS is a service environment that allows different kinds of services to be offered, including messaging service that exploit multimedia. The messaging service enables the mobile phone users to send and receive messages comprising a combination of text, images, sounds and video. It is a natural evolution from SMS messaging which already has a large user base. The size of the message is only limited to the restriction imposed by the network operator.

MMS is standardized by 3GPP (Third Generation Partnership Project). Its functionality is being delivered in two stages – firstly over a GPRS bearer (2.5G rather than 3G) – where it will contain a subset of the media such as still images (but not video) followed by 3G where it will contain 'full' multimedia such as video clips. MMS require not only new network infrastructure but new MMS compliant terminals – It will not be compatible with old terminals. However, the messages can be sent to/from email which may overcome the problem of initial limited device availability.

MMS, like SMS, is a non-real time service. The message first goes to MMSC (Multi Media Service Centre) which sends the receiver a notification that a new message

is waiting. The receiver can then download the message immediately or download it later. More content rich applications can be developed using MMS than are currently possible with just 160 text characters available with SMS. Possible examples of an MMS based applications are stock quotes that can be viewed as diagrams, weather report with images, and animated text messages.

WAP (WIRELESS APPLICATION PROTOCOL)

WAP is an application environment and a set of communication protocols that enables mobile devices to access the Internet and advanced telephony services. It is emerging as an open global standard that empowers users of cellular phones, smart phones, PDAs, and two-way pagers to easily access Internet/Intranet information – independent of their bearer network, operating system, and terminal. They can access the same wealth of information from a pocket-sized device as they can from the desktop. It was invented and is driven by the WAP Forum – a group originally formed by Nokia, Ericsson, Motorola and Phone.com in 1997. It now has 500 member companies.

WAP can be built on any operating system including PalmOS, EPOC, PocketPC, and JavaOS. Its specification supports most wireless network services and protocols, including GSM, TDMA, CDMA, CDPD, GPRS, and next-generation network standards, and is specifically devised for small-screen devices intended for one-hand navigation without a keyboard. WAP is based on WML (Wireless Markup Language) which is a derivative of XML (Extensible Markup Language) and is similar to HTML (HyperText Markup Language) but more restricted. WML's user interface is a micro-browser that works well with small displays such as those on cellular phones. With WAP and WML, content can be pulled from the Internet and formatted for use on small hand-held devices.

Currently, web sites have to be specifically designed for WAP – only about 1% of the web is available in WML. Moreover, browsing is limited to online shopping, trading stocks, location guides, weather reports, sending email, and similar activities, in text-only mode. Due to lack of content and a clumsy interface, public reaction to WAP is, therefore, hostile and the take-up is low. Although relatively unpopular at the moment, many companies and analysts predict a massive surge in WAP use once GPRS becomes a worldwide standard. Seen by many as the perfect partner for WAP, GPRS has distinct time slots serving to manage data packets in a way that prevents users from being penalized for holding standard circuit-switched connections. Moreover, the current WAP version 1.1 is going to be replaced with version 2, which uses something close to standard Internet Protocols.

I-MODE (INFORMATION MODE)

On February 22nd 1999, Japanese mobile service operator NTT DoCoMo launched i-mode, its own specially developed mobile Internet service. Ever since its introduction, the i-mode has been a huge success. It was taken up so quickly that in just three years (as of March 31, 2002), the number of i-mode users in Japan reached to 32 million – about 25 % of Japans total population. The i-mode explosion can actually be attributed to two factors – the cultural readiness of the Japanese people to accept the technology, and the foresight of DoCoMo to properly engineer the technology to benefit both the user and the developer.

The i-Mode standard is much more an adaptation of existing Internet standards than is WAP. It works on a packet-switched network, so the user is constantly connected to the service, and only pays for the information downloaded to the mobile phone. The data transmission rates are just about the same as for WAP (9.6 Kbps) but since the service is always-on, it saves all the dial-up time. For developers, the i-mode sites are written in cHTML (Compact HTML), which is actually a subset of HTML 4.0 and therefore extremely intuitive. The cHTML user interface is superior to that of WAP, boasting four directions in which the user can navigate instead of two, and uses HTTP as its transport protocol. It also supports color and allows display of GIF images among other things. It means that i-mode micro-browsers can read the majority of standard Internet pages. Again, the problem with WAP was that its language, WML, was a brand new specification. Today, i-mode offers a wide array of websites from internationally known companies such as CNN to very local information.

CONCLUSION

Cellular technology today is primarily intended for speech and not particularly good at delivering data. It currently provides low-speed wireless data transmission, typically in the order of 9.6 Kbps. Significant evolution and innovation is to be expected in the future with the introduction of 3G systems, such as W-CDMA (UMTS) and CDMA2000. These systems will handle data transmission rates up to 2 Mbps. They are being tested in parts of Europe and the Far East, but they are not expected to be deployed in most of the countries until few years from now. In the meantime there are few intermediate steps that are being considered.

As a first step, the GPRS, which is being deployed at present in many countries, will provide cost-effective wide-area packet data service with transmission rates up to 115 Kbps. Further evolution is expected with the implementation of EDGE which will allow network

operators to offer wireless multimedia services and applications at speeds up to 384 Kbps.
The introduction of GPRS and EDGE, and the evolution to 3G technologies, will provide the potential for a whole range of mobile multimedia services, such as videoconferencing, web surfing, online shopping, stock trading, sending email, access to corporate networks and intranets, and financial transactions from a mobile terminal. Regardless of the technologies that drive the market, based on the conjunction of circumstances that are required, most analysts agree that the mobile Internet market will be sizeable in next few years. The Internet provides a data source that makes it useful to be connected. The digital cellular infrastructure provides the basis for digital data communication. Finally, wireless technology advancements that have made such communication possible at reasonable speed and reliability provide the last requirement.
The world of Mobile Internet is not simply an advanced stage of Internet evolution, but rather an entirely new world shaped by mobility. The less developed Internet infrastructure in Asia and Europe will contributed to mobile Internet popularity, whereas high-speed landlines in the United States have set expectations unreasonably high for the handheld devices. Already, Asia and Europe are leading the world when it comes to mobile Internet. The remarkable success of Japan's DoCoMo service, i-mode, has provided a glimpse of what mobile Internet access is going to mean for a user in the future. The first wave of the Internet has connected millions of users, but the mobile Internet wave will connect billions in every country around the world.

*** *Date: 25th October 2002*

REFERENCES

[1] "Yes to 3G", Mobile Streams, February 2001, http://www.mobile3G.com
[2] "Yes to GPRS", Mobile Streams, February 2001, http://www.mobileGPRS.com
[3] "Success4SMS", Mobile Streams, February 2001, http://www.success4SMS.com
[4] "Success4WAP", Mobile Streams, February 2001, http://www.success4WAP.com
[5] "Next Messaging", Mobile Streams, February 2001, http://www.NextMessaging.com
[6] "GSM Phase 2+", IEEE Communications Surveys, 3Q 99, vol. 2 no. 3, http://www.comsoc.org/pubs/surveys
[7] "Cellular Communications", WebProForum Tutorial, International Engineering Consortium, http://www.iec.org
[8] "The Wireless Market", December 4, 2000, http://www.mediasmithinc.com/white/wp-wireless1.html
[9] "The Wireless Standards War is Over", Wireless Update, December 6, 2000, Dundee Securities Corp.
[10] "Nokia in Messaging", Nokia Mobile Phones, http://www.nokia.com
[11] Japan Mobile Net website, http://www.japan-mobile-net.com
[12] "Exploiting the full opportunity of 2.5G and 3G networks", IBM Corp, October 2001, http://ibm.com/solutions/wireless
[13] Wireless Super Guide, PC Magazine, May 21,2002, http://www.pcmag.com/article/0,2997,s=1590&a=25968,00.asp
[14] "Wireless Internet", July 2000, AT&T, http://irc.att.com
[15] "Unlocking the Internet for Mobile Access", Orsus Solutions, Ltd. 2000

EVALUATION AND CONTROL OF CHANGE ORDERS IN ENGINEERING, PROCUREMENT AND CONSTRUCTION (EPC) CONTRACTS

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ABSTRACT

One important feature of successful project management is the control of change orders, which are unavoidable in almost all projects especially those involving sizable capital investments. Control of change orders is vital in projects that need to be completed on schedule and within the projected budget. Such a realization is possible only if the contracts are prepared, organized and controlled on unassailable basis. This point of view has been expressed in Part-A of this paper. In the second half (Part-B) of this paper the author has described his personal experience in developing and implementing an effective change order control system for a 2000 TPD (tons Per Day) Air Separation Plant EPC Project.

INTRODUCTION

Often loosely controlled project costs result in unexpected economic failures. Likewise over cost-consciousness could result in a compromise on quality and consequently on reliability of the project. Since change orders are almost inevitable in sizable investment projects, a professionally managed control system for such changes can make the project feasible and built to the desired safety and reliability standards while a loosely controlled system can upset the project budget and cash-flows which can drag the project towards a situation resulting in economic failures.

Usually extra care is taken while concluding the contract to ensure completeness and sufficient detailing of contract documents like definition of scope of work, design data, specifications, relationship among all involved parties, responsibilities, liabilities and associated risks. However, experience dictates that change orders are inescapable in almost all contracts. This leads to the necessity of keeping the flexibility to accommodate changes in the contract no matter what type of contract is being made.

This paper deals with the evaluation and control of change orders in a systematic and cost effective way that can be used as a basis by the project management team to deal with change orders. For better understanding and clarity, the definitions of various terms have been included in the footnotes. The paper has been split into two parts:

Part A deals with the terminology often used in change order business and describes the change order control mechanism. A brief overview of how the change orders are handled in various types of construction projects contracts and the basis used to evaluate the price and validity of the change order have been covered in this part.

Part B describes the practical approach adopted by the project team of which author was a member, for the evaluation and control of the change orders in one of the capital investment expansion projects.

PART-A

CHANGE ORDERS AND TYPES OF CONTRACTS

CHANGE ORDER INCEPTION AND ITS CONTROL MECHANISM

Change Order is a mechanism by which the contract is amended to incorporate changes in the basic scope of the project. It can also be defined as a written document issued to the contractor by the Company, after the contract has been signed, confirming mutual agreement to a change in scope of work, related costs and the time extension required, if any, to complete the work. The cost of change is decided on lump sum, cost-plus or unit price basis.

Article 7 of the American Institute of Architects (AIA) general condition document states that a change order is a written instrument prepared by the architect and signed by the owner, contractor and architect stating their agreement to a change in the work, the cost of the work and the extension of time, if any, required to complete the work. The AIA documents term the change order work as the "*Construction Change Directive*".

Change Order Control is basically the mechanism of controlling the changes to the anticipated cost or schedule of the project.

The application of change orders in Capital Projects Contracts is of profound significance as it plays a pivotal role in controlling project costs and simultaneously creating a flexibility to accommodate changes both for owner and the contractor. As a matter of fact the material prices, technical changes and construction conditions are rarely fixed which leads to a high probability that changes and claims will occur. To control the impact of any changes on vital parameters of the project it is essential to have a professional and cost-effective system in place where in all related procedures are fully defined without any ambiguity.

The inception of change order takes place when any instruction from the owner is issued to the contractor, either verbally or formally in writing, which is reckoned as a change to the basic scope. Also whenever the contractor anticipates a deviation from the basic scope that must be brought about in order to meet the project objectives, a Notice of Potential Variation (NPV)[1] is issued and change order process is triggered. A change notice is usually not a well-liked situation for the owner but still it must be documented and delivered without any delay. Once the validity of NPV is confirmed, the scope and purpose of the change order is evaluated and discussed among the parties and the parameters of the change order are fixed and finalized in order to clearly identify the quantity and types of materials required for the change order. While finalizing the change order, following points should be given due consideration:

1. The cost of required change and its effect on completion date of the project.
2. Effect on other parameters resulting from this change like plant utilities, performance guaranteed figures etc.
3. Requirement of additional financial bonding i.e. advance payment Letter of Guarantee (if down payment is to be made) and modification in the original performance bond[2] value, if the value of change order is likely to increase the overall contract value by 10% (or as defined in the contract).

The key point to be ensured about change order is that the assessment of cost must be in line with the compensation basis outlined in the contract agreement.

CHANGE ORDERS AND TYPE OF CONSTRUCTION CONTRACTS

There are various methods and procedures by which construction contracts and related change orders are evaluated. Three main types of contract are as follows:

1. Lump-sum or Fixed Price Contracts
2. Cost Plus (Reimbursable) Contracts
3. Unit Price (Measured) Contracts

The relationship between change orders and the type of contracts can be visualized from the explanation that follows.

[1] ***Notice of Potential Variation (NPV)*** *is an early indication mechanism that provides the company's project management team with an estimate of the cost of potential change in scope and associated impact on schedule and other contractual terms so that appropriate consideration is awarded to evaluate its validity. This document informs the management that something is going to go differently than planned.*

[2] ***Performance Bond*** *is an unconditional and irrevocable letter of guarantee issued by a first class bank in favor of the company on account of contractor. The guarantee is issued for a sum normally equal to 10% of the contract value or as specified in the contract in order to safeguard the company in case of contractor's failure to perform and fulfill his obligation under the contract.*

1. The Lump-sum or Fixed Price Contract

This type of contract is entered into when the quantity and quality parameters of the project are well defined. It is more suited where design, specifications, environmental and business conditions are well known and the owner does not intend to change the capacity, quality or other aspects of the contract. Moreover, to pass on some of the risks to the contractor, the owners prefer to enter into lump-sum contracts where contractor carries total responsibility for proper performance of the work. The price quoted for this type of contract is lump sum for the defined scope regardless of the contractor's actual cost.

In large construction jobs like installation of process plants, it might become a complicated matter as many activities of civil, structural, mechanical, electrical and instrumentation will be affected by bringing about a change in the capacities of the equipment or by addition or subtraction of the equipment. It is, therefore, expedient in such lump-sum type contracts to break down the costs into categories of work like Civil, Structural, Mechanical, Electrical and Instrumentation and Processing to facilitate prompt consensus and reduce chances of conflicts between contractor and the owner.

2. Cost plus (Reimbursable) Contract

In this type of contract, the quality and quantity of the project are not well defined and there are uncertainties regarding the quality, quantity and cost of the project. The contract is flexible and changes can be accommodated at any time during the execution. This type of contract is not suitable for plant constructions where it is desirable to achieve the plant completion in a specific time with specified types of products and set of equipment.

3. Unit Price (Measured) Contract

This is a special form of lump-sum contract commonly used on projects where scope of work is well known but the exact quantities of major work items cannot be defined by the plans and specifications. The price is based on each unit of each activity and therefore the increase or decrease of these units is flexible to a certain limit, say 10 to 15%. Some times even of large variations may also result that will effect profit and loss situation of the project. Changes in contract design and construction to the items that are not part of the original contract, for example changing of capacities of equipment, extension in plant, not included in the bid document will have an effect on the contract and change order will be necessary.

ESTIMATION BASIS FOR EVALUATING A CHANGE ORDER

The gross estimate of a change order can be carried out by one of the following methods:

1. Square meter of floor area (e.g. for buildings, control room sub-stations)
2. Cubic meter of volume (e.g. for steel tanks)
3. Ratio or Factor Estimating (e.g. for expansion of plants)
4. Function Estimating
5. Parameter Estimating
6. Detailed Estimating (it's a fair cost detailed estimate based on actual quantities e.g. estimates for change orders)

The pricing is usually taken from the bid document where these unit prices are a part of the contract. The prices for the process equipment, compressors, exchangers, motors, boilers or any other instruments and machines are derived from the original quotations of the suppliers and manufacturers. It is advisable to maintain a log of all the change orders under certain distinctive categories. A study should be done on their schedule, status, criticality and concurrence. The effect of change orders on the overall schedule should specially be studied and appropriate measures adopted in order to lessen their effect on the master schedule. The contract signed between the contractor and the owner should explicitly define liabilities and risks. For control of changes, the contract conditions should include the following:

1. Notice Requirement for Change Orders

When a genuine need for a change in the scope of original contract is felt, the contractor after satisfying himself with the scope of the required change prepares and submits a "Notice of Potential Variation" to the owner or client for verification and approval.

2. Equipment Rental Rates

Change orders on almost all projects are best addressed by including equipment rental requirements in the original bid document. The inclusion of these requirements does not affect the cost of the contract but facilitates in arriving at cost estimates of positive or negative change orders without excessive negotiation between the parties.

3. Direct Manpower and Supervision Rates

The man-hour rates for various work categories should be included in the bid document and reasonable rates per hour allowed in the contract. The list should include craft

from each category like mechanics, electricians, equipment and structural foremen, engineers and supervisor of all categories of civil, structural, mechanical, electrical, instrumentation and process discipline. In particular specialist technicians and engineers coming from equipment vendor abroad for testing and commissioning should be included in their terms of contract elaborated and evaluated.

4. Overhead Allowed for / Acceptable Profits

Certain percentage applicable to each category of work or resources like material, manpower and equipment should be specified in the contract to compensate for the overheads involved. This is allowed to cover the expense for contractor's administration, management and other indirect activities and usually amounts from 5 to 15% of the individual activity cost or overall change order cost. A reasonable percentage of cost, if not already covered under overheads, is usually allowed depending on the type of work involved.

5. Material Costs

It is difficult to incorporate prices of equipment and instrumentation in the bid document, as specific details of the changes are not known. Most of the changes in a process plant construction contract are based on a sudden realization of qualitative or quantitative requirements. These prices are, therefore, based on the actual quotations from the suppliers.

Rates for other materials like structural and building construction materials normally available locally should be included in the bid as well as contract documents. As this list of construction materials is very long with a variety of makes, therefore including the rates of basic materials like concrete, re-bars, structural steel, steel plates, asphalt, pipes, block-work, plastering and painting etc. will facilitate the change proposal. The rates should be on per unit basis.

PART-B

CHANGE ORDER CONTROL PROCEDURE ADOPTED ON AN EPC PROJECT

BACKGROUND

National Industrial Gases Co. (GAS) is one of the affiliates of Saudi Arabian Basic Industries Corporation (SABIC) located in Jubail Industrial City, Saudi Arabia. The present capital investment of SABIC is over US $ 3 billion with a mission to construct, operate and market the basic petrochemical products both nationally and internationally by optimum utilization of scarce resources of hydrocarbon and minerals in the country. GAS operates a tonnage facility to supply industrial gases to other SABIC affiliates and outside customers through a pipeline network and tanker system. Three air separation units were under operation in Jubail till year 2000 while a major expansion is recently integrated to enhance the oxygen production capacity by another 2000 Tons Per Day (TPD).

Air Products PLC of United Kingdom was awarded the contract on Lump-Sum Turn Key (LSTK) basis to construct this Air Separation Unit of 2000 TPD capacity. The Contract was split into two portions i.e. offshore and onshore. Design and Engineering, Procurement of Equipment and Bulk Materials were covered under the offshore contract while Construction, Field Engineering and Local Purchase fell under the onshore contract.

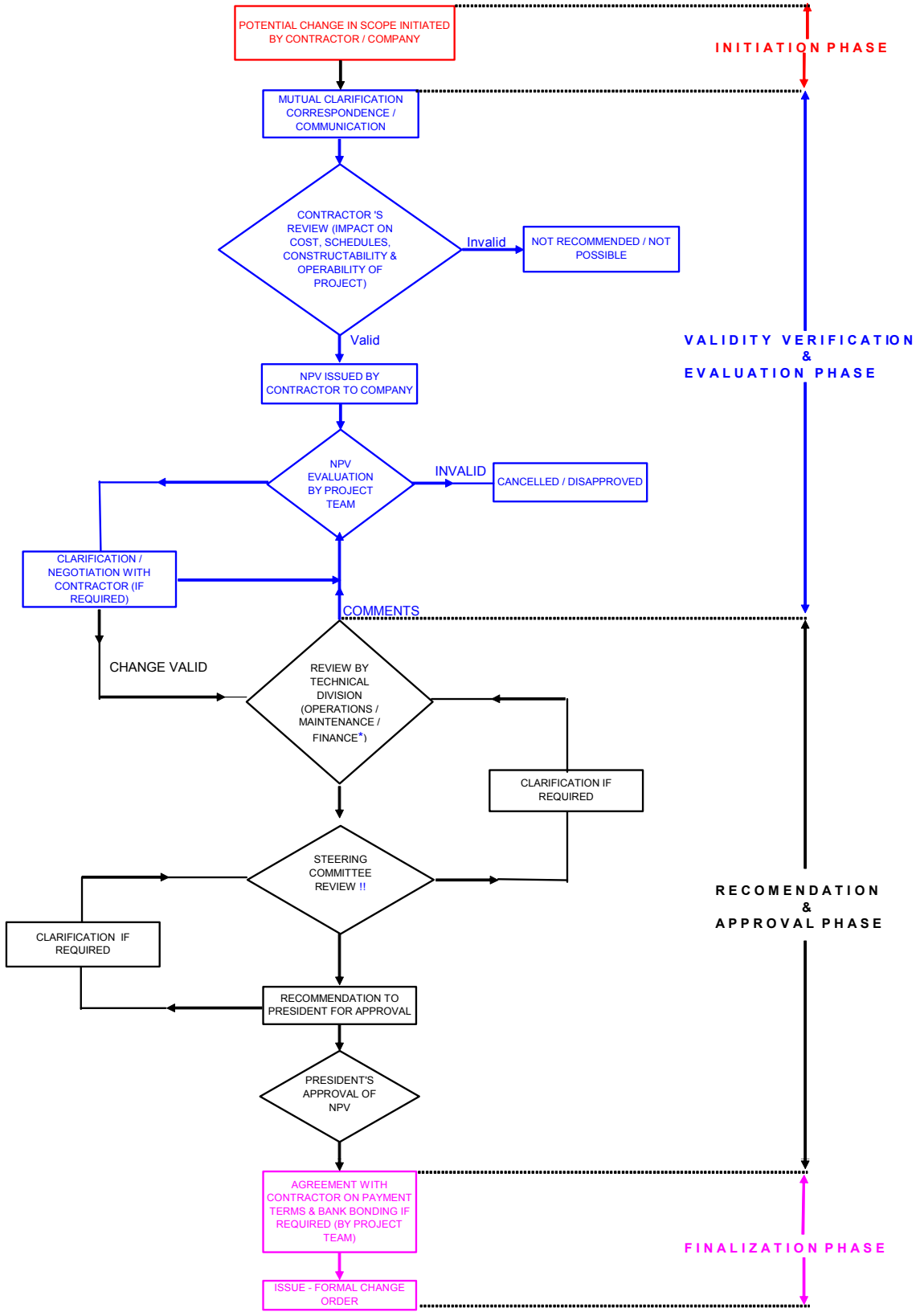
During the previous expansion projects the company had faced some acute problems in controlling the impact of change orders on project costs and schedules and therefore strongly felt the need to develop an effective system for the future expansions. The procedure adopted by GAS for the evaluation and control of typical changes in the scope is being discussed in the following section of this paper. Hereinafter, the word company would mean "GAS" and the word contractor would mean "Air Products PLC"

CONTRACTUAL DEFINITION OF A CHANGE

The term "change" was defined in the contract as any alteration in the basic scope whether by way of amendment, deletion or addition required to comply with the requirements of the project. Generally incorporation of certain work as a result of development of design or specification to enhance the reliability and safety of the plant is not considered as a "change" provided it does not require use of improved material or more costly equipment resulting in a substantial increase in cost.

NOTIFICATION AND VALIDITY OF A CHANGE

If any instruction from the company is considered as a change in basic scope or the contractor considers an item or



* **For budget allocation, contingency use, additional budget approval etc.**

!! **Applicable only for "Variations" and "Optional Items"**

Figure 1: Evaluation & Control Procedure Flowchart – Variations & Optional Items

an activity necessary to fulfill requirements of the project that was not covered in the original scope of work, the contractor is required to notify the company of its effects promptly and issue a Notice of Potential Variation (NPV)

giving detail of associated costs, expected change in project schedule and other parameters like change in utilities requirement and guaranteed production data. The project team evaluates the contents of NPV to confirm its validity. If a change is merely a result of development in design or specifications, the NPV is disregarded and this job has to be carried out at no additional cost to the company. At times, clarification of various parameters of the NPV is required to be obtained from the contractor and negotiations on various terms are conducted in order to justify the validity of the NPV. A recommendation is then made to the concerned authorities for review and approvals as outlined in the flow chart shown in Figure 1 to ensure that the changes will be accommodated within the contingency[3] approved budget. The organization chart for the control of change orders business is shown in Figure 2.

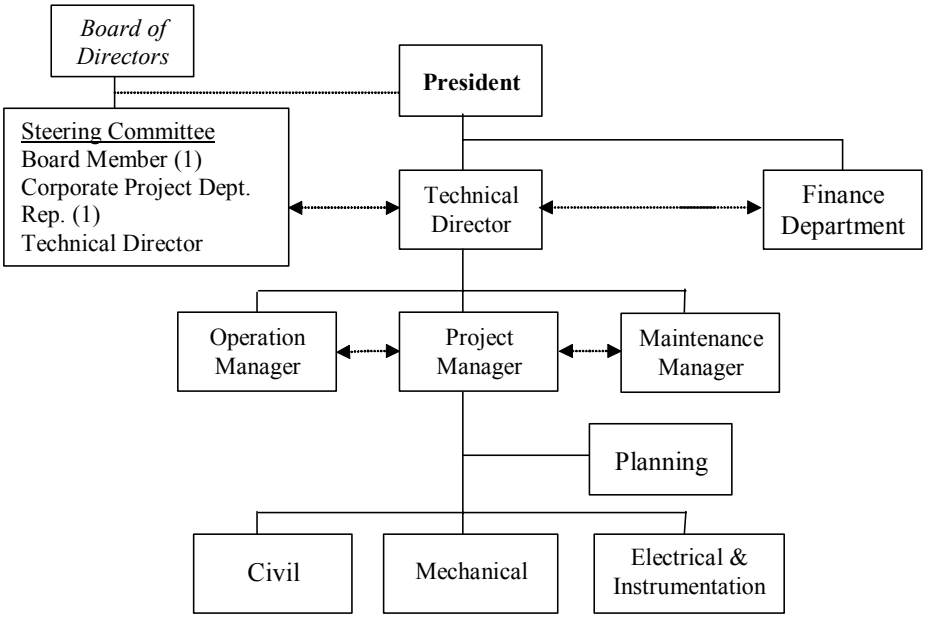
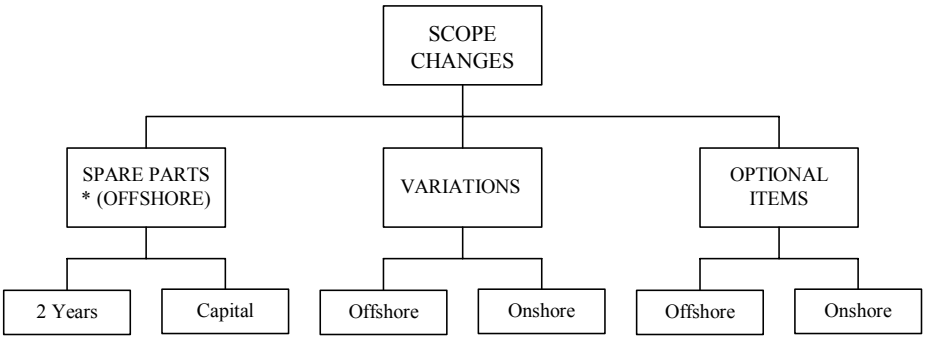


Figure 2: Organogram for Change Order Control



** Supply of spare parts covered under offshore contract*

Figure 3: Change Orders – Breakdown Structure

The control procedure depends on:

- Category of change orders.
- Price difference from the approved contingency budget or TCS[4] estimates.

The entire process of change order control is divided into the following 4 Phases as shown in the respective flow charts:

- Initiation Phase
- Validity Verification and Evaluation Phase
- Recommendation and Approval Phase
- Finalization Phase

[3] *AACE Cost Engineer's Notebook defines contingency as a cost element of an estimate to cover a statistical probability of the occurrence of unforeseeable elements of cost within the defined project scope due to a combination of uncertainties, intangibles, unforeseen and highly unlikely occurrences of future events based on management decision to assume certain risks.*

[4] ***Technical Contract Specifications (TCS)*** *The technical scope of work and related specifications that are regarded as technical basis for the execution of the contract.*

CATEGORIES OF CHANGE ORDERS

In this project, the scope changes were classified into 3 main categories:

1. Spare Parts (Insurance Spares and 2-year Spares)
2. Optional items
3. Variation Order

The breakdown structure used for change orders is shown in Figure 3 and discussed below:

1. Spare Parts

Based on Company's experience in this business, since the company is already operating a big facility of Air Separation Units, a list of spare parts after mutual agreement between the company and the contractor was included in the TCS. This list was used as the basis by the

contractor to develop spare parts prices to be included in the contract, in addition to lump sum price. However, the orders in actual, both 2-years spares and insurance spares were evaluated based on the recommendation from equipment suppliers and company's historical consumption data for similar equipment. The pricing of these spares is based on the actual quotations from the manufacturers, which is received along with the NPV.

After the project team gets fully satisfied with the price, schedule and other terms in NPV, a recommendation is prepared by the Project Manger which is forwarded to Technical Division Director's Office where Operations and Maintenance (O&M) as well as Finance Department shall review and provide their comments. The Finance Department is responsible to review budget allocation and inform utilization of contingencies or obtain additional approval in case the budget is already exhausted. This is necessary as use of funds out of contingency account is beyond the authority limit of the Project Manager. The O&M Department is responsible to review the NPV from operation and maintenance viewpoint. After incorporating the suggestions received from all concerned, the Technical Division Director prepares a final recommendation to the President and approval is secured.

Table 1: Change Order

NATIONAL INDUSTRIAL GASES COMPANY
ASU PROJECT, PHASE IV JUBAIL

CHANGE ORDER FOR ☒ SPARE PARTS
☐ VARIATION
☐ OPTIONAL ITEMS

CONTRACT NO :
OWNER : NATIONAL INDUSTRIAL GASES CO.
CONTRACTOR : AIR PRODUCTS
CONTRACT EFFECTIVE DATE :
CONTRACT COMPLETION DATE :
ORDER NO : **S-2Y-006**

OFFSHORE ☒ ONSHORE ☐

DESCRIPTION OF SCOPE:

This order is issued to Contractor for the supply of ***2-YEARS SPARES*** for various items as given below. Owner has agreed and directed the contractor to supply the following :
Supply 2-years operating spares, CIF DELIVERED TO SITE as per the following details

SR. NO	NPV REF	DESCRIPTION	Currency	AMOUNT	REMARKS
1	B033	DIESEL GENERATOR PACKAGE	£		For 1000 hours service
2	B034	MANUAL VALVES	£		Category - 1 spares
3	B037	NEUTRAL EARTHING RESISTER	£		Item 4
4	B039	LEVEL TRANSMITTERS	£		Category - 1 spares
5	B041	LEVEL SWITCHES	£		Category - 1 & 2 spares
6	B043	LEVEL GAUGES	£		Category - 1 spares
7	B049	DCS	£		Item 8, 34 to 51, 54 to 60
8	B050	CONDENSATE TRAP	£		Category - 1 & 2 spares
9	B052	BURSTING DISCS	£		Category - 1 spares
10	B053	PRESSURE GAUGES	£		One set of recommended spares
11	B054	TEMPERATURE ELEMENTS	£		One set of category - 1 spares
12	B055	ANALYZERS	£		One set of category - 1 spares
		TOTAL (£)		-	
16	B038	LOX/LIN VAPORIZER	FF		One gasket per vaporizer
		TOTAL (FF)		-	

*Note : Packing & freight (charged at cost) to be covered under a separate change order

PRICE

The agreed price of this order is **£** ---------- and **FF** ---------- only.

confidential

REVISED COMPLETION DATE 31st March' (No Change)

PAYMENT TERMS 100% On delivery to site with documentation

DELIVERY TERMS * Packed & Delivered to Site, Al-Jubail

Except as herein expressly modified, said Contract as heretofore amended, and all terms and conditions thereof, shall remain unchanged and in full force and effect and shall apply to all work to be performed.

AGREED BY CONTRACTOR

BY : _____
TITLE : _____
DATE : _____

ACCEPTED AND AUTHORIZED (GAS)

BY : _____
TITLE : _____
DATE : _____

Note: Two originals to be signed by CONTRACTOR and returned to COMPANY for acceptance signature, after which one original will be sent to CONTRACTOR and one retained by COMPANY.

The Project Manager passes on the intimation of approval to the Contractor and discussions are held to finalize the payment terms and other commercial requirements like bank bonding, duty exemption etc. Upon settlement of all issues a formal change order is issued in two originals, one for Contractor and one for the Company. The sequence of evaluation and approval procedure is outlined in the flow chart Figure 1.

The price of spare parts (landed at site) as per the contract terms is to be reimbursed on actual cost based on the quotations received from the spare parts suppliers. Compensation for the overheads i.e. services extended to expedite procurement of the parts is already covered in the lump-sum price of the main contract. The cost of packing and freight were agreed to be paid on actual basis over and above the suppliers quoted prices (see notes in Table 1, Change Order).

Optional Items

These are basically those items that were quoted by the Contractor at the time of bidding but were kept in the contract as optional items. The decision to include any of these items in the project after the award of contract depends upon the business circumstances, more specifically

product demands. For this reason, firm prices were obtained from the bidders valid for one year from the effective date of the contract and included in the contract but not as a part of lump-sum price. Examples of this category items are the addition of Krypton/Xenon Extraction System, Argon Recovery System and addition of Nitrogen Compressor in the Project. This addition was dependent upon the company policy to go for products diversification, market demand survey report of the new products Krypton/Xenon and additional demand of nitrogen and argon from the customers presently undergoing expansions in their respective plants in Jubail City. For this project, the company approved Krypton/Xenon extraction system option as shown in Table 2.

Table 2: Change Order – Log Sheet

Sr	Category	Order No.	Description	Reference	Amount			Status	Date	REMARKS
					DM	US$	SR			
A	SPARE PARTS	CAPITAL SPARES								
		S-I-001	Capital spares for MAC	F092				A		
		S-I-002	Spare Motors for BAC	F113				A		
		S-I-003	Capital spares for DFE	AP quote				A		
		2 - YEARS SPARES								
		S-2Y-001	Spares for MAC Motor	F112				A		
		S-2Y-002	2 Years Spares for DFE	F115				A		
		S-2Y-003	2 Years Spares for MAC	F116				A		
B	VARIATION	V-OFF-001	Upgrade Motor CB to 3KA	F193				A		
		V-OFF-002	On-load Tap Changer	NPV-C006				A		
		V-OFF-003	Exciter unit to MAC motor					W		
		V-OFF-004	Protection of SW System	NPV-C014				A		
C	OPTIONAL	OFF-SHORE								
		OPT-C(2)-001	Kr / Xe Recovery Unit	1st QRM				A		
TOTAL VALUE								Eqv. SR		

Legend: U= Under Processing; A=Accepted & Approved; C=Cancelled; W=Approval Awaited

Based on exchange rate of 1 DM=2.2 SR; 1 US$=3.75 SR

The procedure for optional items either onshore or offshore portion is more or less the same as that of the spare parts except that it is routed through the Steering Committee before obtaining approval from the President (refer to Figure 1). The addition of optional items price in the contract gave flexibility to the Company to make a business decision at a pre-agreed prices during the first year of Project Phase.

3. Variation Order

The variation orders are applicable for all other required changes, either addition or deletion in scope, not covered in (i) spares and (ii) optional. The NPV issued by the contractor carries the detailed cost estimates in a pre-agreed format, which are checked and verified by the Project Team, as no lump-sum prices are available in the contract for variations. Nevertheless, basis of calculations already established in the contract are applied to verify justification of calculated price. For any concerns raised by the Company, clarifications are sought till the contents of the NPV are deemed satisfactory. This is applicable both in case of either addition or deletion in the scope. The take out price given by the Contractor for negative variations is reviewed to ensure that the credit offered is in line with the basis that were used for calculating the lump-sum price. Upon confirmation of validity, the same procedure as that used for optional items category is adopted to get approval of the President.

The basis for variation order prices was defined in the contract as follows:

Price for design related activities
= Actual Cost + 15% mark-up
Price for construction and other activities
= Actual Cost + 10 % mark-up
Price for sub-contract services
= Sub-contractor's cost + 5% mark-up

ROLE OF STEERING COMMITTEE

A Steering Committee was appointed by the shareholders consisting of one Board Member, one representative from corporate Project Office and the Technical Division Director of the company. The committee ensures that the project budget and schedule are well maintained and contractually things are moving in the right direction. With regard to change orders other than spare parts, the proposal after evaluation by Project Team and review by the Technical Director and Finance Department is forwarded to the Steering Committee. If found acceptable, it is recommended by the Steering Committee to the Company President for approval. The role of all concerned is more explicitly outlined in the flow chart Figure 1.

CONTROL OF CONTINGENCY AND ITS IMPACT

The cost of variations and any unexpected requirements are covered under the contingency account. Upon approval of each variation an equivalent amount is drawn out of the project contingencies and overall project cost is updated to reflect its impact. This allocation of budget and utilization of contingency account is controlled by the Finance Department. By this way the contingency amount reduces gradually and unforeseen changes are accommodated. The effect of variations is regularly analyzed to see its impact on the total project cost to ensure that it does not over-run

the approved budget. Further with approval of each new change order the effect on cash out flow is reviewed critically to ensure timely reservation of funds especially when the payments are to be effected in foreign currency. As a normal practice the payment schedule reservations for foreign currency are made in advance with commercial banks / treasury department to avail the benefit of reduced currency conversion rate rather than buying the foreign currency at spot rate which is comparatively high.

CONCLUSION

To effectively manage costs and to ensure reliability of EPC projects, the company must make provision for the change order works in the bid documents irrespective of the type of contract whether it is a turnkey job, cost plus, fixed price or unit price.

To avoid contingency being used as slop funds, the control of contingency should be beyond the authority limit of the Project Manager i.e. under the direct control of senior management.

Clauses pertaining to change order works and the basis of change orders evaluation should be well defined as a part of the contract documents. Moreover, to arrive at an amicable settlement without much negotiation, the change order evaluation and control procedures should be in place right from the outset of the Project

Change orders should be handled expeditiously. Procedures and format fair to both the Owner and the Contractor should be included in contract to avoid costly and time-consuming arbitration claims and mediation. This will help in cost savings and timely operations of the plant.

A log of all change orders under certain distinctive categories (see Table 2) should be maintained. A study should be done criticality on their schedule, status and concurrence. The effect of change orders on the overall schedule should specially be studied and appropriate measures adopted in order to lessen their effect on the master schedule.

*** *Date: 12th October 2002*

REFERENCES

[1] American Institute of Architects (AIA) General Condition Documents

[2] Author's experience as a member of Project Management Team - for Supply and Installation of a 2000 TPD Air Separation Plant, LSTK Project.

ACKNOWLEDGEMENT

Author wishes to thank the management of following companies for providing the opportunity to gain experience and ability to prepare this paper.

[1] National Industrial Gases Co. (GAS), Saudi Arabia.

[2] Saudi Basic Industries Corp. (SABIC), Saudi Arabia.

[3] Air Products PLC, UK. American Institute of Architects (AIA) general condition documents

WATER TREATMENT AND DESALINATION SYSTEMS

SEWAGE TREATMENT PLANT

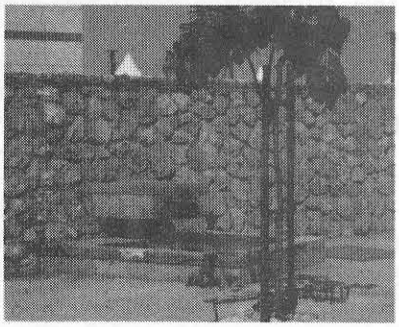
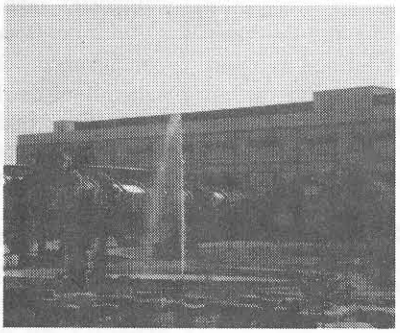
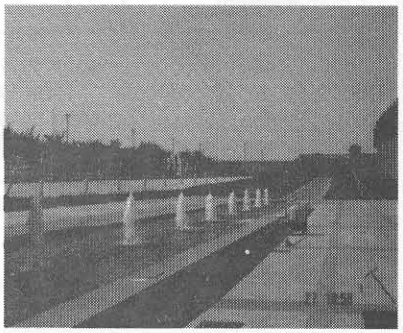
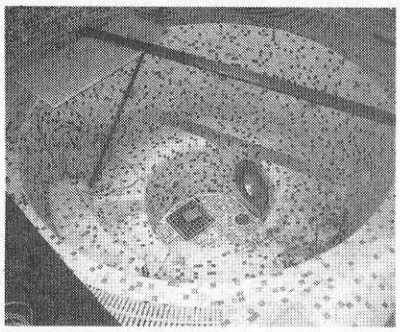
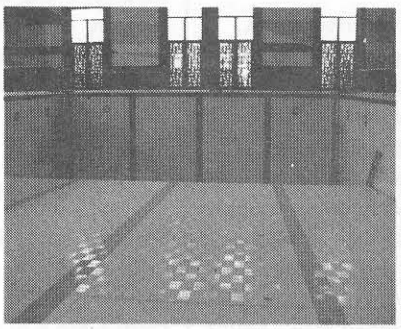
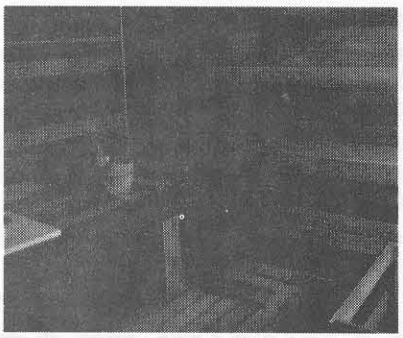
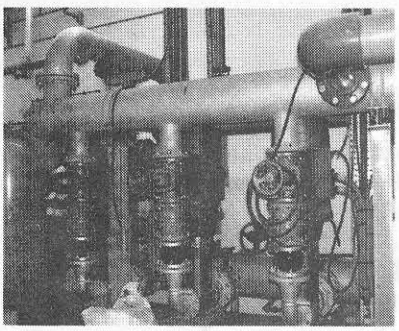
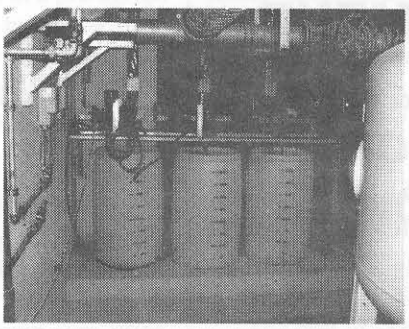
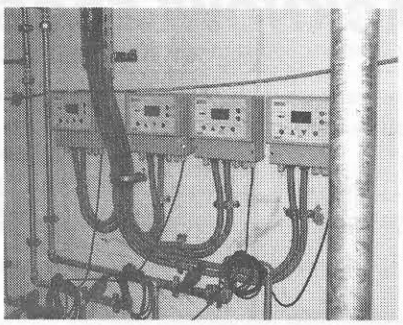
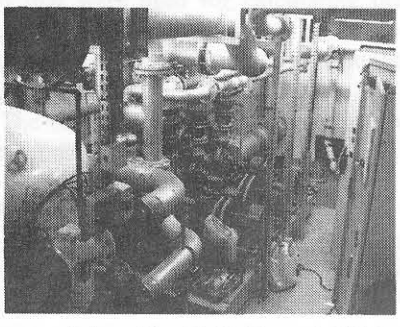
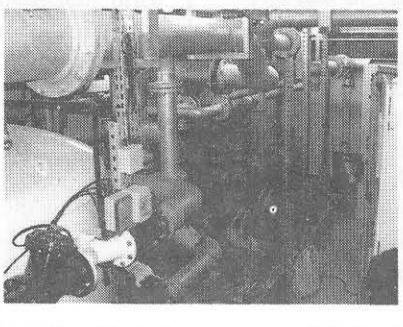
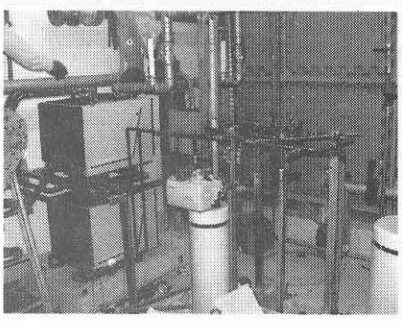
SWIMMING POOLS

FOUNTAINS

SAUNNA & STEAM ROOMS

JACUZZI / SPAs

aquarius

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ECHO CANCELLATION IN TELEPHONY

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ABSTRACT

Both wireless and long distance landline networks must contend with a variety of different factors that can adversely degrade the quality of voice communications. Network delays can cause echo and other distortions. In the wireless network, acoustic echo, background noise, and other additional disruptions must be dealt with in order to assure voice quality. Voice quality has traditionally been influenced by impairments resulting from the analog nature of older equipment installed in terrestrial networks and the relatively low grade sound quality resulting from speech compression techniques used in digital wireless networks. Although these impairments are gradually being eliminated by the introduction of new technologies, electrical and acoustic echo still remain possible sources to degrade voice signal quality.

This paper discusses the properties of acoustic echo and electrical echo (hybrid echo) in order to explain why different techniques are needed to control and eliminate each type of signal degradation. In addition, for some non-voice applications, superior echo canceller technology is considered to improve overall network quality.

ACOUSTIC AND ELECTRIC ECHO

Mainly two kinds of echoes namely the electric echo and the acoustic echoes exist in communication systems. The electric echo is also called hybrid echo or line echo. This echo can be found in the public-switched telephone network (PSTN), mobile, and IP phone systems. The electric echo is created at the hybrid connections which are created at the two-wire / four-wire PSTN conversion points as shown in Figure-1.

The electric echo can be generated from both the near end and the far end electric devices. The near end echo, hybrid echo, has been around almost since the advent of the telephone itself. Due to the economic reason, we use two-wire system to perform full duplex functions that actually require the performance of a four-wire system. The principle is to use different kinds of "hybrid" to balance and separate the sending and receiving signals. The real hybrid circuits can not be 100% ideal because of the leakage, and the parasitic or parametric deviations. Therefore, part of the signal takes the wrong path from both the near end hybrid and the far end hybrid and thus becomes echo. In the old telephone system, the echo is 28ms or less. In the modern telephone system, the electric echo will be longer. The electric echo in GSM could be up to 80ms. The electric echo in IP telephone could be up to 120ms or even longer.

Acoustic echo is generated from either hands-free telephone or a telephone with poor voice coupling between the earphone and the microphone. In a hands-free telephone, we have to let remote voice go through the

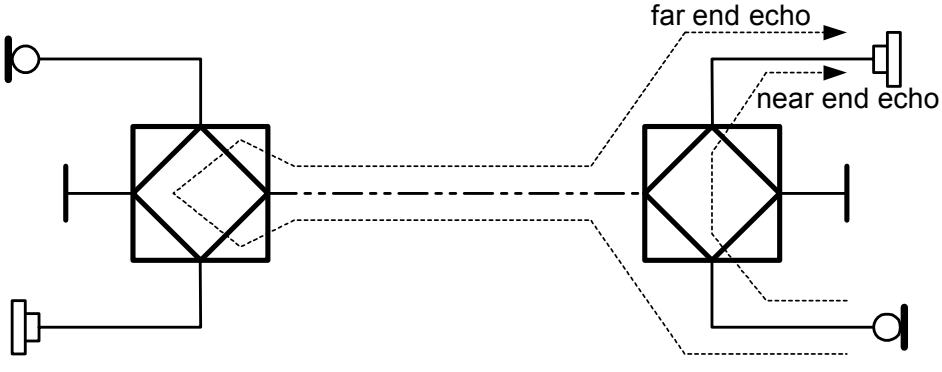

Figure 1: Hybrid Connections and the Resulting Electric Echo

loudspeaker and become part of the microphone signal. When subscriber B is calling subscriber A, and A uses a hands-free telephone, the voice from subscriber B is sent to the loudspeaker. The microphone of subscriber A picks up both the voice from the subscriber A and the loudspeaker voice from subscriber B. Thus, the subscriber B receives an acoustic echo. There are two different components making up this acoustic echo. The first is the direct coupling between the loudspeaker and the microphone, and the second is the undesired remote speech reflected from roof, windows, and walls, etc. The echo from the second component could be as long as 200ms.

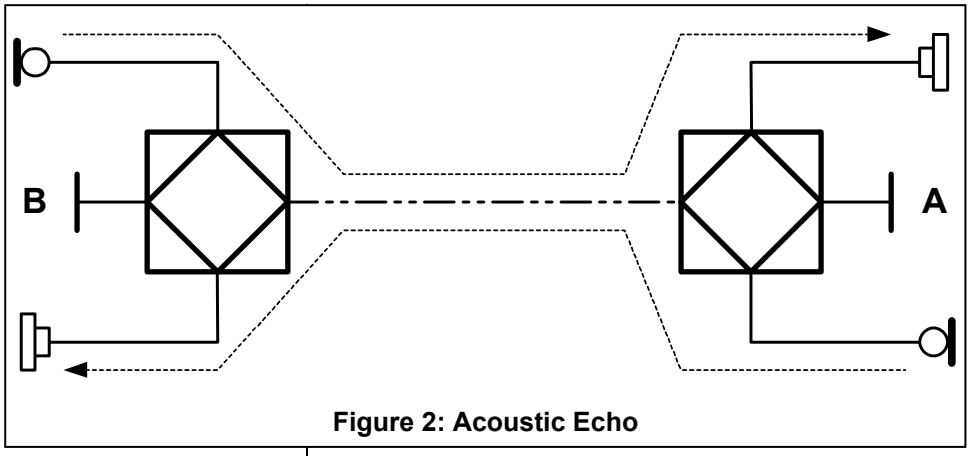

Figure 2: Acoustic Echo

Acoustic echo can be present in both wireline and wireless applications. Most wireline configurations that are exposed to echo conditions are equipped with echo cancellers; therefore wireline acoustic echo is controlled via standard echo cancellation algorithms and associated Non Linear Processing (NLP) techniques.

ECHO CANCELLATION IN TELEPHONES

A concept commonly called "echo cancellation" for echo control was invented at Bell Laboratories in 1964. An echo canceller is a device that analyzes the received speech signal, generates an algorithmic model of the "estimated echo" signal, and subtracts the "estimated echo" from the signal(s) that is returned via the long distance circuit. Figure 3 illustrates a typical Echo Canceller configuration for a long distance wireline application.

As shown in Figure 3, Echo Canceller 1 (EC-1) forms a replica of the expected echo signal that will be returned to subscriber "A". This is done by sampling "A's" speech signal (R_{in}), and passing the sample through a filter that matches the transfer characteristics of the "tail-end circuit" (i.e. the filter emulates the impedance and signal delay characteristics of the network equipment and hybrid connected to subscriber "B"). Subscriber "A's" echo replica is inverted, and then summed with the actual signal that appears at the S_{in} port of EC-1. The S_{in} signal may contain a combination of "A's" echo and "B's" speech (e.g. during double-talking), but only "A's" echo signal will be "cancelled" (i.e. "B's" speech will pass through EC-1 unimpaired and appear on signal S_{out}). In this example a second Echo Canceller (EC-2) is installed at the other end of the long distance circuit (i.e. adjacent to subscriber "A"). It should be understood that EC-2 performs the equivalent function as EC-1. That is, EC-2 samples "B's" speech signal, generates a replica of "B's" echo, and sums the inverted replica of "B's echo" with the actual signal that appears at the S_{in} port of EC-2, thereby canceling "B's" echo while allowing "A's" speech signal to pass through EC-2 unimpaired to appear at the S_{out} port.

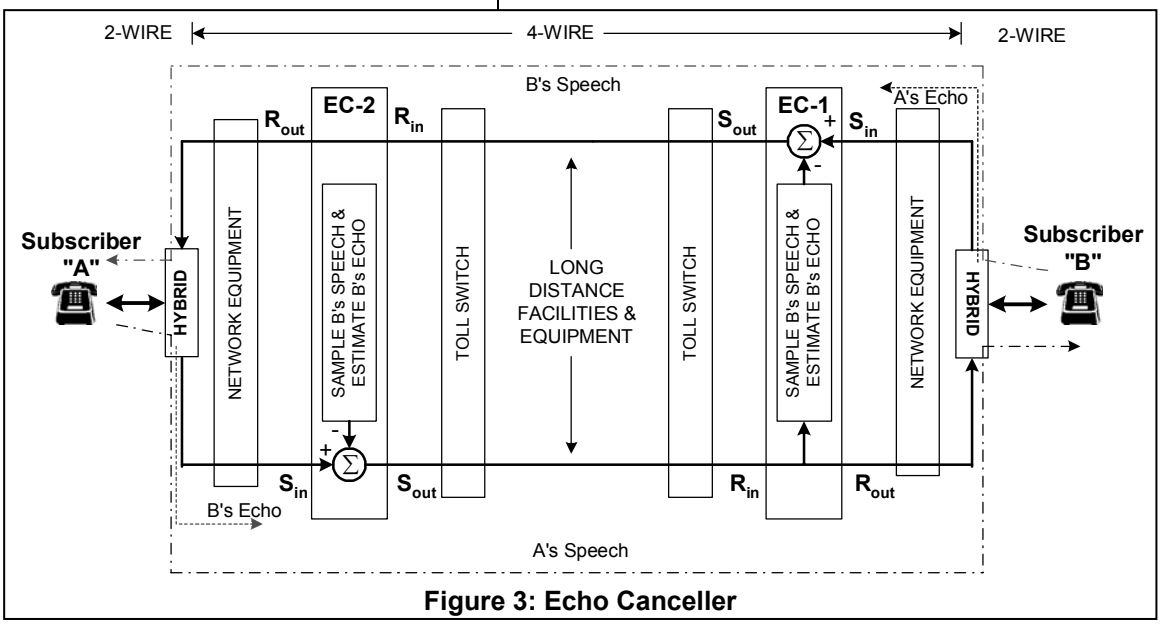

Figure 3: Echo Canceller

NON-LINEAR PROCESSOR (NLP)

The theory used to analyze echo cancellation is based on an assumption that the echo signal returned (S_{in}) can be represented as a linear expression of subscriber "A's" speech signal (R_{in}). In reality, subscriber "A's" speech signal may encounter Coder/Decoder (CODEC) equipment, a hybrid, loaded and non-loaded network sections, and several local switches before it reaches the S_{in} port of the Echo Canceller, as represented by the box labeled "network equipment" in Figure 4. As a result, the S_{in} signal is delayed, distorted, dispersed, decoded, re-coded, and may have had significant noise added to it. Fortunately, the non-linear and stochastic components in the S_{in} signal are relatively small, and a well-designed echo canceller can reduce the echo signal level by about 30 dB. However, when an echo signal is delayed more than several hundred milliseconds, it can be perceived at levels of -50dB or -60 dB, depending on subscriber "A's" ambient noise level. Therefore a Non-Linear Processor (NLP) is incorporated into most echo cancellers to handle the condition called "residual echo".

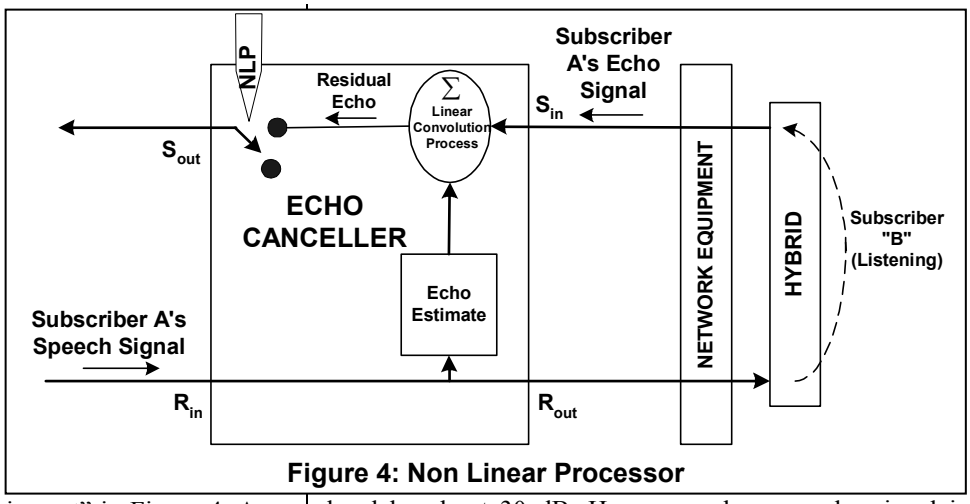

Figure 4: Non Linear Processor

ECHO CANCELLATION IN CELLULAR TELEPHONY

Typical cellular applications, such as Global System Mobile (GSM), Time Division Multiple Access (TDMA), and Code Division Multiple Access (CDMA) require echo control, even though subscribers may be physically located only a few hundred meters apart. This is because cellular networks utilize extensive processing to achieve signal compression, channel coding, and TDMA/CDMA frame interleaving. These functions are performed in the Base Station Controller (BSC), and typically introduce about 100 ms of processing time (delay) for each direction of transmission.

A typical mobile-to-PSTN (public switched telephone network) call configuration is illustrated in Figure 5. In this example, mobile subscriber "A" is speaking, and as shown "A's" echo (returned by the PSTN hybrid) is controlled by the Echo Canceller (EC) located on the PSTN side of the Mobile Switching Center (MSC). If not properly cancelled, "A's" echo would arrive at the mobile unit with a delay of approximately 200 ms, which would severely degrade voice quality.

It should be understood that in this example the PSTN subscriber "B" does not hear an echo because a hybrid does not exist in the mobile network equipment (i.e. there is no hybrid to reflect subscriber "B's" voice back from the mobile network connections). In wireless applications, the echo canceller equipment should ideally be located close to the PSTN hybrids (the origin of the echo), but because the number of Mobile-to-PSTN connections is lower than the number of hybrids in the PSTN, the Mobile Switching Center (MSC) location is a more economical solution. In addition, a call connected to a roaming wireless subscriber may be routed through multiple MSCs, and the propagation time between MSCs adds to the overall tail-end delay. Therefore, international telecommunications union (ITU) standards

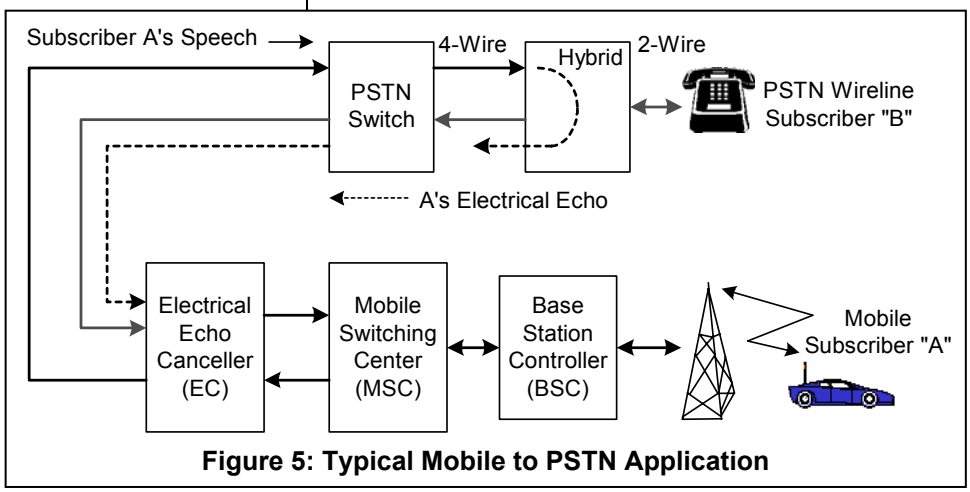

Figure 5: Typical Mobile to PSTN Application

recommend that echo cancellers used for wireless applications be capable of accommodating up to 64 ms tail-end delay.

In general, the voice quality of digital wireless applications is typically lower than PSTN applications. This is a result of wireless voice signal encoding techniques and the higher acoustic noise levels that often surround mobile subscribers. The popular use of hands-free mobile telephone sets in vehicles, coupled with high background noise levels (e.g. engine, wind, traffic sounds), increases the magnitude of this problem for many digital wireless network operators. Similarly, voice quality and performance issues frequently arise because of the wide range of environmental conditions associated with wireless phone usage (e.g. noisy public areas, outdoor conditions, inexpensive wireless phone sets). In attempting to improve speech quality and minimize performance differences between wireless and PSTN calls, echo canceller equipment is often confronted with the task of controlling acoustic echo in addition to traditional electrical echo. There are two fundamental reasons for why acoustic echo is more difficult to control than traditional electrical echo. First, acoustic echo tends to change its characteristics as the subscriber moves around within an acoustic space. For example, acoustic echo generated while using a hands-free speakerphone in a vehicle will change characteristics if the subscriber lifts his hands, tilts his head, or makes similar modest movements. An even a more dramatic change will occur if the subscriber opens a window, or the vehicle travels over a rough surface. This acoustic phenomenon is equivalent to a hybrid that has very significant dispersion characteristics, or when multiple hybrid replacements (e.g. adding or dropping conference call connections) occur within the duration of a single call. These conditions require continuous adaptation to changes that can be fast and/or drastically different. Second, the acoustic echo generated in a wireless environment passes through a non-linear path of speech vocoder equipment. Traditional echo cancellers use a form of the Normalized Least Squares algorithm (based on a variant of a Least Squares estimation) that performs reasonably well when the echo is a linear function of the original speech signal e.g. electrical echo. However, the performance of this type of algorithm deteriorates significantly when the echo is a non-linear function of the original signal e.g. acoustic echo. Therefore, non-linear methods must be used to control acoustic echo. However, additional steps should be taken when implementing non-linear functions to ensure potential side effects are minimized and the acoustic echo is properly distinguished from valid speech that should be allowed to pass through the echo canceller.

CONCLUSIONS

Echo control has gone through tremendous technological developments since its original inception. Continued trends in technology will support ever-increasing levels of integration and density. Echo cancellers are presently designed to process more than 600 channels (64 kbps DS0 or equivalent signals) on a single moderate size printed circuit board. Future echo cancellers will be equipped with specialized functions that further enhance voice quality and provide new network services.

Although higher levels of concentration are emerging, the majority of subscribers will still access telecommunications networks via two-wire local loop connections. Therefore, echo will be generated by the hybrids that terminate these local loops, and consequently echo canceller products will continue to be deployed into the foreseeable future.

*** *Date: 27th October 2002*

REFERENCES

[1] S. Haykin, Adaptive Filter Theory, 3rd ed., Prentice-Hall, 1996.

[2] X. Y. Gao, W. M. Snelgrove, "Adaptive Linearization of a Loudspeaker", ICASSP 1991, Vol. 3, pp. 3589-3592.

[3] M. E. Knappe, R. A. Goubran, "Steady State Performance Limitations of Full-Band Acoustic Echo Cancellers", ICASSP 1994, Adelaide, South Australia, Vol. 2, pp. 73-76.

[4] A. N. Birkett, R. A. Goubran, "Acoustic Echo Cancellation for Hands-free Telephony Using Neural Networks", Neural Network for Signal Processing 1994, IEEE. Workshop Proceedings, Sept. 194, pp. 249-258.

[5] H. F. Olsen, Acoustical Engineering, Toronto, D. Van Nostrand Company, Inc., 1964.

[6] A. N. Birkett, R. A. Goubran, "Limitations of Hands-free Acoustic Echo Cancellers due to Nonlinear Loudspeaker Distortion and Enclosure Vibration Effects", IEEE ASSP Workshop on Appi. Of Signal Processing to Aud. And Acoustics, New Paltz, New York, Oct. 1995.

MAINTENANCE OF ELECTRICAL EQUIPMENT

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ABSTRACT

This paper highlights the significance of maintenance of electrical equipment and machinery, which plays a vital role to improve their efficiency, extend their useable life and retain their functionality intact. It defines various types of maintenance and discusses the ways to perform these types regularly and meticulously. It emphasizes that all electrical installations should be regularly inspected, maintained and tested in order to keep them safe, secure and sturdy. Visual and precise inspections of all running equipment should be made and the external conditions should be recorded. If damage is identified or if the degree of protection is found impaired or if an abnormality is expected, then the situation should be carefully assessed and remedial actions should be taken, either immediately as forced maintenance or gradually during scheduled preventive maintenance. Simultaneously predictive maintenance should also be carried out to foresee an impending failure and to adopt a corrective action plan ahead of it. This is achieved through condition monitoring of important parameters of the equipment or plant during its on-going operation. The paper gives some practical maintenance and operation checklists and guidelines. An exhibit shows in the form of flow charts, what should be done at what time and at which locations to avoid undesired results of unwanted environmental or operational features. Cost benefit ratio of maintenance has also been discussed, explaining how maintenance offsets the loss of equipment and the resulting loss of revenue, in the long run.

PHILOSOPHY OF ELECTRICAL MAINTENANCE

Electricity has become the lifeline of today's industrialized world. Operation of all industrial, commercial, institutional and residential sectors, nowadays, entirely depends on electric power. Whole country comes to a standstill if power supply fails, as both homes and businesses have become so reliant on constantly available electricity sources. One cannot now imagine living without electricity. A variety of electrical equipment and installations are found everywhere, which make our life easy, convenient and comfortable. The proper upkeep and timely maintenance of these equipment and installations prolong their design life, ensure their safe working, guarantee their optimal availability, improve their efficiency, reduce their renewal costs and minimize the risks due to their extended use. A prudent and effective maintenance plan helps reduce possibilities of sudden downtime of equipment and production loss in industrial plants.

All electrical installations deteriorate because of a number of factors such as wear, tear, corrosion, excessive loading, ageing and environmental influences etc. If no proper attention is paid, this deterioration will continue and may reach to an alarming point. Ultimately the affected equipment, apparatus and installations will not only cease to function, but may explode, burst or burn, endangering the surroundings to a great extent. In that case, electricity becomes like a jinn out of bottle, who will tear apart whatever comes in its way. So every effort should be made to confine this jinni within the bottle and get maximum use of his relentless working powers.

GOOD MAINTENANCE: A KEY TO REHABILITATION

There cannot be a second opinion to the crucial importance of regular and periodic maintenance of electrical equipment, machinery, systems and installations. All of these must be regularly inspected, checked and maintained in order to keep their performance in tune to the highest degree of safety, reliability and functionality. A carefully employed maintenance program helps detect deterioration before it becomes danger and then disaster. Such program facilitates us to adopt appropriate remedial measures, well in time, to rehabilitate the system. This **rehabilitation** involves **repair, replacement** or **renovation** of the respective equipment or system, as defined below:

Repair: is the rectification of local damage due to failure of a part or parts.

Replacement: means installation of new parts without changing the fabric of existing system.

Renovation: means total or partial modification of original fabric of existing system by means of which its current performance is improved.

It thus goes without saying that an effective and well-planned maintenance plays a pivotal role to keep systems healthy and ready to work round the clock. This is the key to achieve the highest industrial productivity and profitability. Timely repairs, overhauls, fault-rectifications and retrofitting are the key factors to guarantee maximum plant efficiency at minimum costs.

Let us see what different types of maintenance are and how these are performed to secure oft-repeated electrical workability.

TYPES OF MAINTENANCE

Generally speaking, there are four types of maintenance:

- Outline Inspection
- Corrective (or Breakdown)
- Preventive
- Predictive

These types are briefly described hereunder:

OUTLINE INSPECTION

This consists of two parts: **visual inspection** of electrical facilities during their normal working and **precise (or detailed) inspection** during their off-working periods. In the visual inspection, the responsible person patrols the specified check points regularly, confirms the exactness of operating states by using his five senses and monitors / detects the presence of any abnormality. For example, hearing some abnormal sound, sensing extreme hotness by touching or observing something unusual. This is a routine data collecting activity, conducted during daily, weekly, monthly and quarterly cycles. The data collected so far, serves as a guideline to do the requisite restorative or regenerative actions during the next phase of inspection i.e., precise inspection.

The precise or detailed inspection is carried out, in two phases, after stopping the operation of facilities. Firstly as a small recovery measure, such as general cleaning, lubricating, oiling etc, without disassembly of equipment. In second phase, certain measurements and tests are conducted to verify the exactness of actual state-of-affairs of the facilities. Generally, this takes place over 1 to 3 years.

CORRECTIVE (FORCED OR BREAKDOWN) MAINTENANCE

Corrective or breakdown maintenance, also called as forced or 'fire-brigade' maintenance, takes place when a sudden failure or breakage occurs, making the equipment or system non-functional, either totally or partially. In other words, this is a crisis-management measure, which involves man and material resources, to make the defective systems re-workable, through the rehabilitation cycle, defined in Item-1 above. Here economical aspects are mostly sidelined, because the abnormality is corrected and normal functions are restored, irrespective of the cost impact. Everyday examples of this type of maintenance are replacement of a fused bulb of a lamp, repair of a ceased water pump, or re-winding of a burnt motor etc.

PREVENTIVE MAINTENANCE

As the name suggests, the theme of this type of maintenance is to prevent possibility of failure, malfunctioning or breakdown of any running equipment and machinery. This is performed on the basis of:

- Manufacturer's recommended instructions, service intervals or running hours.

- Initiation of a red alert signal or appearance of a sign of abnormality, noticed during *visual inspection.*
- Data collected during second phase of *precise inspection.*

Preventive maintenance is planned in a specified sequence and scheduled at pre-determined intervals. To carry out this maintenance, the equipment is taken out of operation and is put back into service only after its completion. During this maintenance, some critical parts are also changed, which are otherwise still in running condition, but are prone to any malfunctioning in near future. This is done to minimize risk of breakdown and achieve a greater degree of reliability of the plant. A common example is change of a motor-belt, which is working all right but is found uneven, jerky, loose or withering out. If this kind of belt is retained after completion of preventive maintenance, it will soon become non-operational, causing stoppage of motor and subsequent loss of relevant industrial or commercial process. So it will be wise to replace it during preventive maintenance and to save such a big loss.

PREDICTIVE MAINTENANCE

The objective of predictive maintenance is to predict or foresee an impending failure, which helps to adopt a corrective action plan, well in time. It consists of ways and means, employed in a plant, system, equipment or machine to tell us:

- What has happened inside it during its prolonged use?
- What is happening inside it and how it is behaving during its normal use?

The first method comprises diagnostic techniques, mostly used during preventive maintenance, such as insulation check-up of motors or cables, Capacitance and Dissipation Factor (C&DF) testing of current transformers, dielectric testing of insulating oils or timing test of breakers etc. The second one is based on continuous or on-line monitoring and evaluation of important parameters or conditions of the equipment such as temperature, pressure, sound level, speed or vibration. This is commonly known as *condition monitoring* or *condition based maintenance* and is frequently employed in plants nowadays. It is, therefore, in the fitness of things, some details are discussed below:

Condition Based Maintenance

Condition based maintenance or condition monitoring continuously extracts information from a running system or machinery and indicates its prevalent condition or healthiness in quantitative terms. Condition monitoring apparatus stores the current values of important operating parameters and compares them with the corresponding past recorded values. These condition monitors are programmed to decide, on the basis of this comparison, whether the equipment or plant is operating properly or whether it is likely to develop a malfunction in near future. In the later case, the monitor can advise which remedial action should be taken to avoid expected faults. So maintenance menu and schedule can be planned, reducing maintenance downtime and assuring greater availability.

The condition monitoring of electrical equipment involves not only their mechanical well being but also their electrical state. Sometimes ancillary parts of an electrical system are also monitored to detect an unusual happening. For example, chemical state of cooling water systems in thermal power plants serves a good tool to predict unperceived faults like scaling, tube foiling, pitting or erosion etc. These faults may not be too rapid or fatal, but their effects like corrosion or scale formation reduce optimum performance, ultimately causing decreased functionality in the long run.

EFFECTIVE MAINTENANCE MANAGEMENT PLAN

A successful and effective maintenance plan helps reduce downtime of equipment and production loss in industries. Nevertheless, it requires a careful and thorough planning and management. Make a comprehensive list of what to do, where to do and when to do. Start independent segments of planned work in parallel. For interconnected and tied works, do first things first and arrange what is following next. Check the step-wise sequence for the works, which are permissively interlocked. This means think of nut when you are fixing a bolt. A stitch in time will save nine. After finishing the job, analyze its technicalities in broad perspective, whether next maintenance is economical or retrofitting is better or new equipment should be bought altogether. It applies, especially, to old equipment, apparatus and machinery.

Following are some useful tidbits, which should be taken care of before start of any type of maintenance:

Maintenance Check Points

- While purchasing any electrical equipment, get sufficient copies of operation and maintenance manuals from the manufacturers. Follow these manuals in letter and spirit, during all phases of operation and maintenance of the concerned equipment. Keep one or two copies in a safe place,

to be used only if other copies are misplaced or not immediately available.

- Major equipment should have its own logbook, which should contain all of the relevant historical information including nameplate data, previous maintenance record, parts replacement etc. If the need arises, consult the manufacturer and provide him all available information of the equipment.
- Ensure that all necessary tools, spare parts, supporting equipment etc are available in your warehouse in abundant quantities. Replenish warehouse stock periodically. Never underestimate small things like nails, bolts, lugs, tapes, glues, cotton rags etc, as these may stop big jobs. Remember an ant could kill an elephant.
- Work that can be done by machines, should be done by machines. Manpower should be used on the task that only humans can do. This will bring down equipment on line without any extra delay.
- Apart from outline inspection, a permit to work, signed by an authorized person, must be issued, prior to start of any maintenance work. The concerned electrical equipment must be de-energized, isolated and switched-off from the power supply. This will involve isolating the relevant breakers,

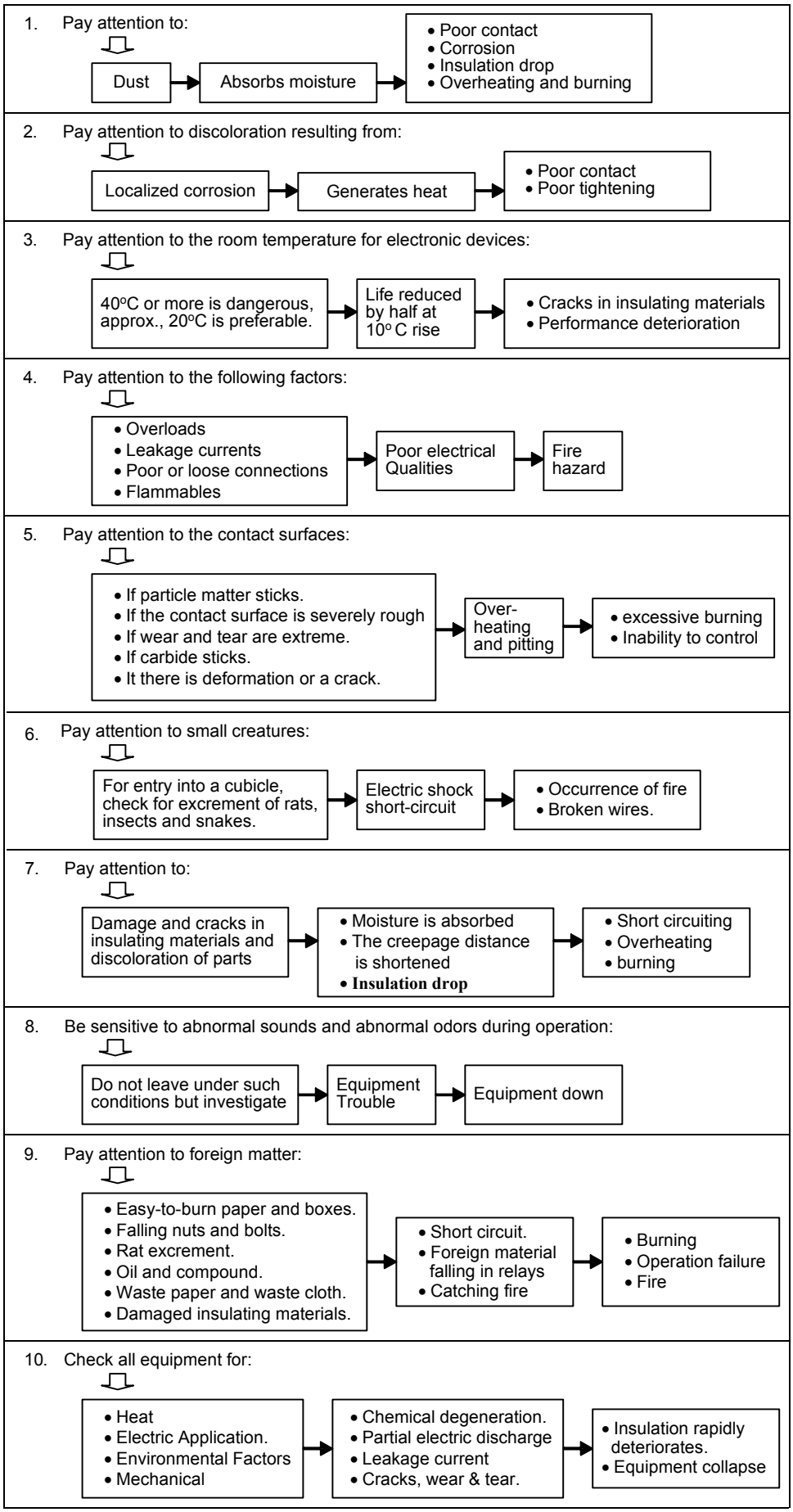

Exhibit 1: Maintenance Inspection Checklist

checking that the power is off by testing with the correct electrical detectors and ensuring that the switches / breakers are properly padlocked. Area of work shall be barricaded with protective barriers, safety signs or warning tapes etc.
- Always assume electrical circuits as LIVE until proved DEAD.
- Safeguard DEAD circuits from becoming electrically charged during work. Isolate from all points of supply, secure each point of isolation, and provide earthing where appropriate.
- Keep yourself abreast with modern trends and technologies. Get standard O&M handbooks or journals and develop a habit of reading them off and on. Try to implement the procedures and guidelines, given therein, wherever possible.
- Special attention should be paid to site and personnel safety as well as good housekeeping. After finishing the job, ensure the site is clean of debris, used pieces of wires, cables, tapes and all unwanted things.

Operational Check Points

Proper and meticulous operation minimizes chances of forced maintenance, costly repairs and downtime. Following guidelines should be observed while handling or operating any equipment.

- Never touch, catch or climb on any part of a transformer, motor, RMU, or likewise apparatus, while it is energized. Injury or death can occur from electrical discharges.
- Always pull the big equipment with pulling eyes supplied on it.
- When unloading heavy equipment or placing it in position, make sure the jack lugs or places designated for jacking are used.
- Do not open any valves or plugs of any oil-filled transformer, re-closer or breaker etc and any of their accessories, while being energized. This may cause the liquid to drop below the minimum level (the gas or oil sampling valves are the exception). An internal flashover may occur if the oil is lowered below the minimum oil level. Oil level gauges must be constantly checked.
- The control circuits, inside and outside the control cabinets, utilize voltages that can pose safety hazards. Be careful while operating any of the switches, breakers or control devices. If work on these circuits is necessary, the power source must be shut off before start of work.
- In case of energized transformers, proper cooling equipment (fans, pumps and selector switches) must be in operation under auto mode. Otherwise, dangerous pressures can occur inside the transformers. Check color of silica gel, it should be changed or regenerated, if its two-third quantity turns pink. Also level of sealing oil in oil cup should not fall below red line.
- The secondary circuit of any current transformer, not connected in auxiliary circuits, must be shortened and grounded.
- Operation of generators and power transformers under over excitation condition should be as minimum as possible. Always follow the limits prescribed by their excitation curves.

General Inspection Checklist

Exhibit-1 shows a general checklist or flow chart, which is applicable, to a variety of equipment. This flow chart identifies stress areas, accompanying symptoms and ultimate effects. It is a handy guide to

- perform recommended inspection of stress area.
- catch changes due to the imminent stresses.
- find symptoms of equipment malfunction at an early stage.
- provide early cure and treatment.
- investigate the cause of malfunction and help its elimination.

Each entry of this Exhibit has three blocks. First block indicates stress area. Second block shows what the ill effects of that particular stress area are. Third block shows the ultimate results of ill effects. There is a recommended action to be performed on the stress area block. The Exhibit explains what abnormality will happen and what will be the ultimate dangers in each, if the recommended action is not performed.

COST BENEFIT RATIO OF MAINTENANCE

The benefits of a well-in-time maintenance program are understandable, but the hard fact is that such programs put off the operation of machinery, resulting in a sudden loss of revenue, which, otherwise, could be gained had it been in operation. Moreover, maintenance accrues labor costs, overtimes and material costs. These factors adversely affect the cost benefit ratio of maintenance plans. In production plants, forced maintenance is a major source of expenditure, as it drastically increases running expenses with nil or very little production. Such possibilities could be minimized through an effective outline inspection and condition monitoring. Anyway, if forced maintenance has to be done, then every effort should be made to complete it as soon as possible and to bring the equipment back to normal operation. Maintenance crews should work round the clock, if the

need arises. In that way, equipment functionality will be restored and cost benefit ratio will improve.

Nevertheless, preventive maintenance should go as planned, because it offsets the risks of sudden breakdowns of equipment or accidental failures. Disallowing or delaying preventive maintenance schedules will have a negative effect on the cost benefit ratio, in the long run.

Let us consider a practical example. Suppose there is a serious electrical accident in a company, involving a heavy damage of machinery, major injury to workers and their consequent absence from work for some weeks. Likely costs to the company will be:

- Sick pay to injured workers and their treatment / hospitalization charges.
- Cost of replacing lost production e.g. overtime paid to other employees.
- Cost due to accident investigation and responding to the law enforcing authority.
- Cost incurred due to shut down of plant pending investigation.
- Cost associated with repair or replacement of damaged machinery / equipment.
- Cost arising from a possible civil action brought by the employees against the company for damage compensations.
- Future increased insurance premiums.
- Cost to redress lost company reputation.

All of these costs would be either eliminated or minimized to a great extent, had a regular visual / precise inspection, preventive maintenance and condition monitoring been undertaken. Costs associated to these maintenance plans would have been much lower compared to above-mentioned costs, which always appear at wrong times and leave no room for a second option. An easy question could be asked: whether a plant shutdown and resulting loss of revenue, is affordable for executing preventive maintenance plans? Contrary to this, a smart plant manager's question would be: whether a plant can afford non-execution of preventive maintenance for saving plant shutdown and resulting loss of revenue? This is because he knows that cost benefit ratio of executing preventive maintenance is ultimately higher than of its non-execution.

CONCLUSION

The preceding paragraphs have explained to the entirety, the necessity, significance and appropriateness of various types of maintenance of electrical equipment. All manufacturers of repute, deliver operation and maintenance procedures of their equipment. As mentioned elsewhere, every effort should be made to adhere to the plan, intervals and timings of maintenance given therein. The recommended visual inspections, operating precautions, duty cycles, condition monitoring and off-loading at specified checkpoints must be followed in letter and spirit. However, a brilliant maintenance manager will also keep an eye on the physical condition of the equipment. In view of that, he will ascertain whether it is economical to maintain and upkeep that equipment or replace it altogether. If the equipment is too old, if its physique and insulation is bitterly deteriorated, if its spare parts are obsolete or hard to find, if it has become incapacitated due to frequent repairs or if its maintenance costs are more than the benefits, then a wise decision will be to replace it with a new one. This is called equipment renewal plan and it should go side by side with the maintenance plan. Sometimes, technological innovations make the existing equipment either obsolete or less efficient compared to its new model. Equipment renewal plan, thus, suggests either replacing the old apparatus totally or upgrading it with change of important spare parts. In such cases, the maintenance manager has to decide what to do and guide the company management accordingly.

*** *Date: 22nd December 2002*

REFERENCES

[1] Maintenance of Electrical Installations, Project Management Engineering Systems, Reference Manual of PROMIS Dubai

[2] Monthly Power Engineering International, December 1999.

[3] Preventive Maintenance of Electrical Substations by Mitsubishi Electric Corporation.

ELECTRICAL SAFETY IN HEALTHCARE FACITILIES

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ABSTRACT

The increasing use of electrical diagnostic and treatment equipment in healthcare facilities has focused worldwide concerns upon electrical safety in healthcare facilities. This article gives an overview of the safety measures recommended by various national and international agencies through their standard specifications.

INTRODUCTION

The objective of this article is to highlight appropriate measures for a high level of electrical safety in healthcare facilities.

Most of the equipment used in healthcare facilities are electrically operated, such as; ECG machine, bedside monitor, anesthesia machine, ventilators, catheter machine, suction machine , laboratory equipment, radiology equipment (X-ray, C.T Scan, ultrasound, mammography etc) , incubators, infant warmer etc. As these equipments are often in contact with the staff or patient, the danger of

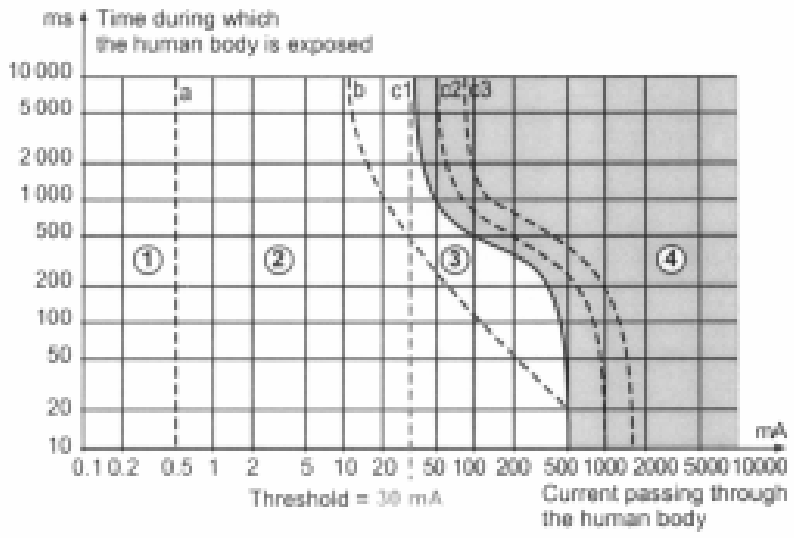

Figure 1: Time/Current Zones of AC Effects (15 Hz to 100 Hz) on Persons as in IEC 60479-1

electrical hazard always persists in such environment. According to the gravity of the Electric Shock and its duration, a person may experience:

- comfort
- muscular contraction
- a burn
- cardiac arrest (electrocution)

Time/Current relation with respect to human body is shown in Figure1.

The Current, in value and time, passing through the human body (particularly the heart) is the most dangerous aspect of electricity. In low voltage system, the impedance value of the body (an important aspect of which is skin resistance) changes according to environment i.e. dry and wet premises and damp premises.

Patients are particularly vulnerable when their natural protection is considerably reduced, especially when clinical procedures are in progress. With skin penetration giving a low resistance path or a low defense due to medication, or no defense due to anesthetic, the possibility of an electrical shock hazard under a fault condition is greatly enhanced.

In addition, during open heart surgery and when catheters are in use, great care has to be exercised to minimize leakage currents which may flow in a patient. Broken equipment earth connections offer greatest danger to the patient.

Various national and international standards address the requirements for electrical installations in healthcare premises, especially those in critical care areas. All with the objective to ensure the safe and reliable supply of power to patient connected medical equipment, especially life support equipment.

IMPORTANT MEASURES FOR ELECTRICAL SAFETY IN HEALTHCARE FACILITIES

SELECTION OF CORRECT POWER SUPPLY SYSTEM

It is important for patient safety, especially in operation theatres and ICU etc that a safe and secure source of power supply is available at all times. Essential power systems are designed to provide power, even in the event of mains failure. A secure local power system arrangement, which will not trip out even when a final sub-circuit supplying these areas suffers a first earth fault, is a further recommendation for these areas.

Type of power supply system used in a hospital is either TN-S (earthed) or IT (unearthed), based on the procedures carried out and/or medical equipment used in the area under consideration. These systems are briefly described as follows:

i) Use of TN-S System:

The TN-S system has separate neutral and protective conductors throughout the system and exposed conductive parts of the equipment are connected to the earthing conductor of the supply system. The TN-S system is shown in figure 2.

The use of the TN-S system (earthed system) in operating theatres is only considered acceptable for fixed equipment or non-critical equipment to patient life support or patient connected because first fault tripping of a protective device leads to an unannounced loss of power. Therefore, the TN-S system in combination with a Residual Current Device (RCD) must only be used for following devices:

- permanently installed or mobile x-ray equipment
- devices with a connected load > 5 KW
- room lighting (not theatre)
- operating theatre table

In addition, the use of a Residual Current Monitor (RCM) is also recommended. The RCM is able to detect small leakage currents before the RCD trips.

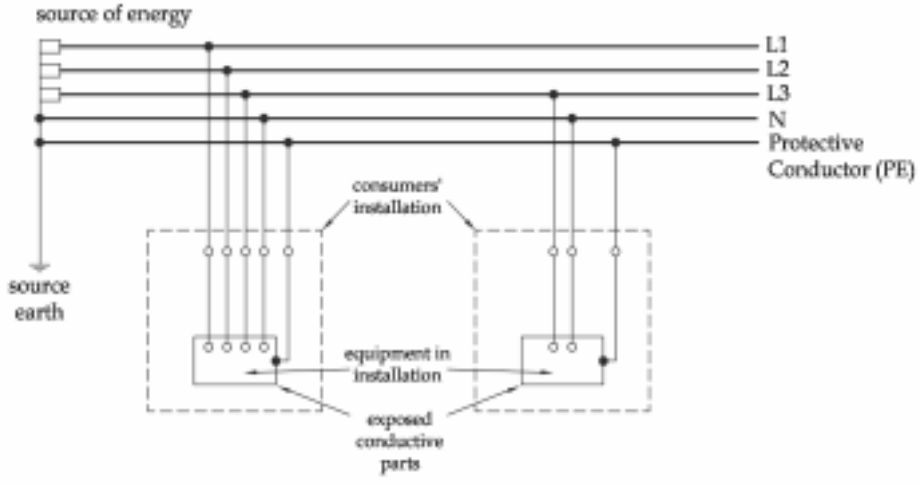

Figure 2: TN-S System: Separate Neutral and Protective Earthing Conductor Throughout

ii) Use of IT system:

IT system has no direct connection between live parts and earth and the exposed conductive parts of the equipment are earthed separately. In other words, the equipment is isolated from source earth. The IT system is shown in Figure 3.

The most common way to get an unearthed system from an earthed supply system is to use an Isolating Transformer with a ratio of primary winding to secondary winding as 1:1. As there is no direct connection between the primary coil of the transformer and the secondary coil of the transformer, the supply on the secondary side is completely isolated from the earthed system of the primary side. Since the current can not flow from either conductor of the isolated system to earth, there is no hazardous potential to ground in this system.

This system, being safer and more reliable, has been recommended by almost all internationally known standards for the critical areas such as Operating Theatres, Intensive Care Units (ICU),Coronary Care Units(CCU) and Emergency Room etc.

The use of ungrounded power supply system may be desirable for the following reasons:

- It improves the reliability of power supply in areas where power failure may cause safety hazards to patients and users.
- It reduces the leakage currents of devices to a low value, thus reducing the touch voltage of the protective conductor through which the leakage current may flow.

Internationally, the following three monitoring devices are used in an ungrounded system:

a. Monitoring of resistance with Insulation Monitoring Device (IMD)
b. Monitoring of impedance through Line Isolation Monitor (LIM)
c. Monitoring of load and temperature

The monitoring devices are briefly described as follows:

Resistance Monitoring With IMD

The IMD continuously monitors the insulation resistance between the active phase conductors and earth and reports a certain drop below a set value of the IT system. The IMD is able to sense a developing insulation fault at an early stage and to provide an alarm at an adjustable set-point, thus providing an improved level of safety. The alarm is raised visually and via a mutable audible alarm at the patient location.

Impedance Monitoring Through LIM

The LIM monitors the impedance of the conductors to earth. It is designed in such a way that a green LED alarm lights up when the system has reached sufficient impedance to earth. The red LED alarm lights up and sounds an audible warning signal as soon as the prospective fault current (consisting of resistive and capacitive leakage currents) of an ungrounded power supply system reaches the threshold of 5 mA (2 mA in Canada). Means are provided for re-setting the audible warning signal while leaving the red alarm LED activated. When the fault is eliminated and the green LED alarm lights up again, the audible alarm is automatically reset.

Load and Temperature Monitoring

To avoid overloading the isolating transformer a respective installation must be designated in order to protect the transformer and supply conductors between primary and secondary terminals and the distribution bus from overloading or overheating. When rated current or temperature is over ranged, an acoustic or optical alarm is released.

SAFETY THROUGH REDUNDANT POWER LINES

The system is supplied by two cables; in the event of the failure of first cable, the system automatically switches over to the other redundant source. The second cable

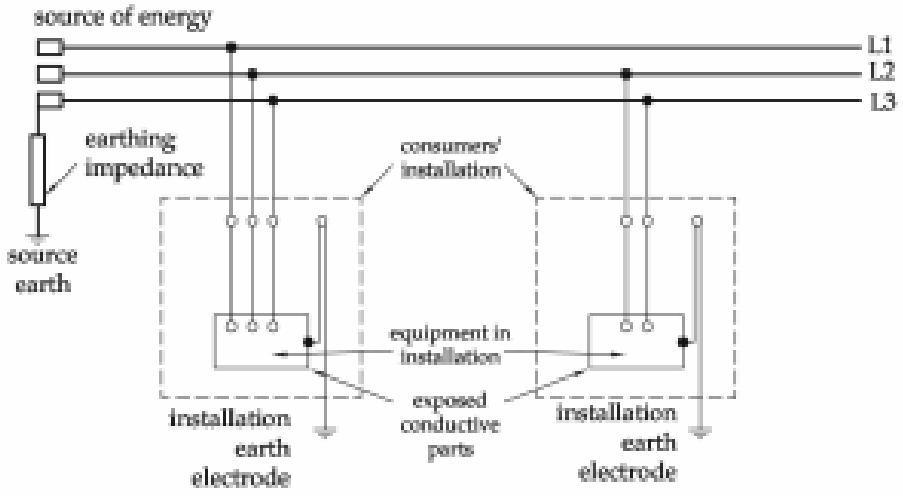

Figure 3: IT System: The Source is either Connected to Earth Through a Deliberately Introduced Earthing Impedance or Isolated from Earth. All Exposed Conductive Parts are Connected to Earth Electrode

derives the power from a safety power source backed up by batteries of Uninterruptible Power Supply (UPS). That ensures the supply of life-supporting devices, independently from the utility network and the emergency generator.

SAFETY OF ELECTRICAL DEVICES

An electrically safe environment requires also that the electrical devices are safe. A defective device may expose the personnel operating the device as well as the patient connected to the device to danger. It is, therefore, imperative to test all electrical and medical electrical equipment at regular intervals.

SAFETY MEASURES FOR MEDICAL ELECTRICAL DEVICES ACCORDING TO IEC 60601-1

Regular testing of medical electrical devices is an essential aspect of the safety concept in hospitals.

Today, the International Electrotechnical Commission Standard IEC 60601: 1998 and European Standard EN 60601-1:1990 are widely used for periodic tests. According to these standards the following tests are required to be conducted:

- resistance of protective conductor
- earth leakage current
- enclosure leakage current
- patient leakage current and
- patient auxiliary current

IEC 60601 is a standard for type tests and production tests for electrical medical equipment but it is also used for periodic tests since dedicated standards for periodic tests are not available in many countries.

SAFETY AGAINST STATIC ELECTRICITY IN ANESTHETISING AREAS

In addition to the safety measures for the electrical power supply and safe electrical devices, measures shall be taken to avoid electrostatic sparking hazard in rooms where flammable anesthetics are likely to be regularly administered by means of anesthetic apparatus having a closed or partially closed breathing circuit. The most effective means of eliminating the electrostatic ignition hazard is to exclude highly electrostatic materials and to provide an anti-static environment. This will be achieved by providing flooring having suitable anti-static properties. The electrical resistance of anti-static floors, however, should not be too low because it will then have the effect of increasing the electric shock hazard associated with equipment connected with electricity mains. The anti-static floors will normally be used only where flammable anesthetics are administered by means of apparatus having a closed or partially closed breathing circuit, such as operating theatres, anesthetic rooms and maternity units of abnormal deliveries. Anti-static floors are not recommended for recovery rooms, intensive care rooms, plaster rooms, x-ray rooms , patient rooms and rooms used for normal deliveries.

RECOMMENDED LIMITS OF ELECTRICAL RESISTANCE OF ANTI-STATIC FLOORS

The recommended limits of electrical resistance of anti-static floor, as recommended by Health Technical Memorandum No. 2 of U.K (HTM 2) are:

- **Upper limit:** The average value shall not exceed 2 mega ohms between two separate electrodes spaced 600 mm apart, with no individual reading exceeding 5 mega ohms.

- **Lower Limit:** The average value shall not be less than 50,000 ohms measured between two separate electrodes spaced 600 mm apart with no individual reading less than 20,000 ohms.

Sufficient tests should be made for the results to be representative of the resistivity of the whole floor. As a general indication, one test should be made for each two square meters of a new floor and at not less than five locations for routine tests on floors in service.

CONCLUSION

The highest degree of safety for the patients, doctors and their assistants in hospitals can only be achieved when installations are sufficiently safe according to the regulations and devices are maintained by trained responsible operators.

REFERENCES

[1] National Fire Protection Association of USA, NFPA 99-Standards For Healthcare Facilities.

[2] National Fire Protection Association of USA, NFPA 70-National Electrical Code.

[3] British Standard BS7671-Requirements for Electrical Installations.

[4] Health Technical Memorandum of UK, HTM 2 and HTM 2007

[5] International Electrotechnical Commission Standards IEC 364-7-710 & IEC 60601-1

[6] European Standard EN 60601-1:1990

[7] Hospital Engineering & Facilities Management-2003

[8] Published by World Markets Research Centre (http://www.wmrc.com).

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BOOK REVIEW
ON A CLASS OF INCOMPLETE GAMMA FUNCTIONS WITH APPLICATIONS

AUTHORS:
Dr. M. Aslam Choudhry
Dr. Syed M. Zubair

BOOK REVIEW BY:
Engr. Rizwan Ahmed
Al Naba Int'l, Dammam, Saudi Arabia

ABSTRACT

This book provides an in-depth study of incomplete Gamma functions, focusing on heat conduction problems with time dependent boundary conditions. It also includes useful generalizations and compositions of all incomplete Gamma functions. The book also covers Fresnel integral functions, their mathematical properties, recurrence relations and differentiation formulae and investigates new identities involving Fourier transforms for numerical and scientific computation. In addition, it also provides a unified approach to closed form solutions useful in moving heat source problems, particularly in laser- induced processing of materials.

INTRODUCTION

The book "*On a class of Incomplete Gamma Functions with Applications*" introduces a class of special functions, which are useful in the analytic study of several heat conduction problems. Problems in transient heat conduction problems associated with heat transfer in human tissues and special cases of laser sources are being discussed with the application of these special functions. Applications to astrophysics, probability theory and other problems in theory of functions are also explored. Fundamental solution to time- department laser sources with convective- type boundary conditions are provided. Engineering & applied Science an application of development requires thorough knowledge of applied mathematics and good understanding of special functions. The importance of the special functions and their formulae has increased tremendously due to the fast growth in computing power for analytical representations. The book comprises of eleven chapters and appendices at the end, which are now briefly discussed.

Chapter 1 deals with the generalized gamma and digamma functions. The basic definitions and properties of the Euler gamma function are stated for completeness. The Macdonald probability function is also introduced. The useful properties of the classical digamma function are stated. For computational and scientific purposes, a graphical and tabular representation of the function is also presented in this chapter.

Chapter 2 presents the incomplete generalized gamma functions introduced by the authors. The properties of the classical incomplete gamma functions are provided and the properties of the generalized incomplete gamma and KdF functions are stated. A graphical and tabular representation is presented as well.

Chapter 3 describes the family of the classical incomplete gamma functions, which are useful in the analytical study of problems in heat conduction and statistics. A graphical and tabular representation of the family is also presented.

Chapter 4 discusses the extensions yfÊ(f¿,x;b) and "¡v(f¿,x;b) of the generalized incomplete gamma function, which are useful in the closed-form representations of the Laplace and K-transforms of a class of functions. A generalization of the inverse Gaussian distribution is proposed as well.

Chapter 5 presents analogous to the extension of the Euler gamma function and the extended beta function. The extension is found to be useful in that most properties of the beta function carry over naturally and simply. It also provides connection with the Macdonald and Whittaker functions. An extension of the beta distribution is also proposed. A graphical and tabular representation of the function is presented as well.

Chapter 6 deals with a unified approach to the study of the generalized incomplete gamma functions. Analogous to the decomposition formula of the Euler gamma function, a decomposition formula for the Fox H-functions is also proved in the function.

Chapter 7 deals with the extended Riemann zeta functions and basic properties of the Bernoulli numbers and Bernoulli polynomials. Some useful properties of the Riemann zeta function are also provided. Two extensions of the zeta function are proposed and the extension procedure to the Hurwitz zeta function is also applied to obtain the corresponding extensions for it. The loop integrals related to the generalized Hurwitz zeta functions are discussed. The Hurwitz formula and the Riemann

functional equation are deduced as special cases of the relations satisfied by these loop integrals. A graphical and tabular representation of the generalized zeta functions is presented as well.

Chapter 8 includes phase-change problems where a solution to the classical Stefan-Neumann problem along with freezing of tissues around a capillary, and binary alloys in the presence of a mixed-phase region (mushy zone) is presented. A solution to the solidification problem of crystal growth with spherical symmetry is also presented.

Chapter 9 deals with a class of heat conduction problems with time-dependent boundary conditions. In this regard Duhamel's method is used to demonstrate closed-form solutions for exponential, pulse, steady periodic, starting periodic-type surface temperatures as well as surface heat fluxes. An illustrative example problem dealing with heating of malignant tissues for therapeutic purposes is also presented to show applications of the solutions presented in the chapter.

Chapter 10 provides a class of solutions dealing with laser heating of materials. A fundamental solution to time-dependent laser sources with convective-type boundary conditions, which was recently introduced by the authors, is presented. Special cases of instantaneous, constant, and exponential-type laser sources are shown, along with the case of a material whose initial temperature profile is given a problem common in connection with heat transfer in human tissues. Laser heating of a two-layer system with constant surface heat flux is also discussed in this chapter.

Chapter 11 presents a unified approach to closed-form solutions of heat source problems that are commonly encountered in laser-induced processing of materials. The solutions are presented for moving, point, line and plane heat source. It is also shown that the present analysis covers the classical temperature solution of a constant strength source under quasi-steady-state situations.

Appendices include an introduction to heat conduction, Fourier conduction, a table of Laplace transforms, and well-known results regarding the improper integrals. Filled with tabular and graphical representations for applications, this monograph offers a unique opportunity to add to your mathematical toolbox a new and useful class of special functions.

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1. **Dr..M. Aslam Chaudhry** is a Professor of Mathematics at King Fahd University of Petroleum and Minerals (KFUPM), Dhahran Saudi Arabia. He received the university *Gold Medal* from the Punjab University Lahore in 1979 for his M.Sc studies. He completed his Ph.D studies at Carleton University Ottawa, Canada in 1984. The university awarded him with "*The University Medal*" for his graduate work. He joined the King Fahd University of Petroleum and Minerals, Dhahran Saudi Arabia in 1984. In recognition of his teaching performance, the university awarded him in 1989, with the "*Distinguished Teaching Award*".

   Dr. Chaudhry's area of research includes *Applied Mathematics, Astro Physics, Heat Conduction, Generalized Functions,* and *Riemann Hypothesis*. The university awarded him the "*Distinguished Researcher Award*" for the years 1992-93 & 1997-98. He has Published more than 50 research papers in mathematics. He has delivered research seminars around the globe including, Europe, North America, and Asia.

2. **Dr. Syed M. Zubair** is a Professor of Mechanical Engineering at King Fahd University of Petroleum and Minerals (KFUPM), Dhahran, Saudi Arabia. He completed BSc. (Mechanical Engineering) from University of Engineering & Technology, Lahore, Pakistan in 1978, M.Sc. (Mechanical) from KFUPM, Dhahran, Saudi Arabia in 1980 and Ph.D. from Georgia Institute of Technology, Atlanta, Georgia, USA in 1985.

   Before joining KFUPM in 1986 he was Senior Project Engineer. (Research) at Copeland Corporation, U.S.A. He received "*Distinguished Teacher Award*" from the University for the academic year 1991-92 from College of Engineering Sciences as well as "*Distinguished Researcher Awards*" for academic years 1992-93 and 1997-98.

   Dr. Zubair's area of research includes in the fields of *Heat Transfer, Thermodynamics,* and *Refrigeration and Air-conditioning Systems.* A professional Gulf Cooperation Council (GCC) engineering group, GCC-CIGRE awarded him best "*Applied Research Project*" on "Electrical and Physical Properties of Soils in Saudi Arabia", in 1993. He has published more than 90 research papers in the areas of heat transfer refrigeration and air-conditioning systems, and applied mathematics. He has delivered several research seminars around the globe including Europe, North America and Asia.

Note: *The Book is being published by Chapman & Hall/CRC, 2000 N.W. Corporate Blvd., Boca Raton, Florida 33431-968, USA and can be ordered in North & South America, Asia & Australia by e-mail: orders@crcpress.com, OR Tel: 001-561-994-0555 for outside the continental U.S. For Europe, Middle East & Africa, please contact e-mail: enquiries@crcpress.com, crcpress@itps.co.uk Tel: 044(0)207450-5083. ISBN 1-58488-143-7, Library of Congress card No.200-10-35387.*

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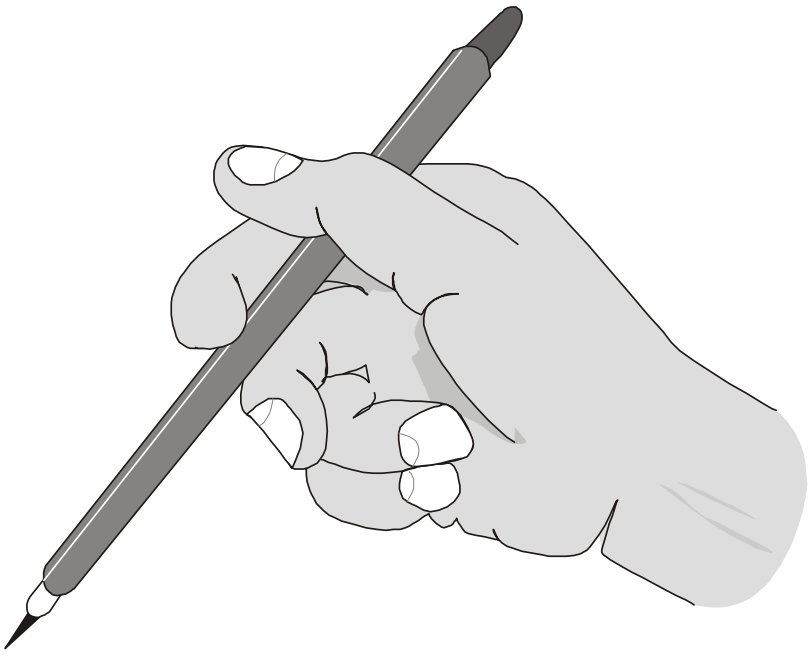

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27.	National College of Arts, Lahore,	31st Mar 1985
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29.	National University of Modern Languages, Islamabad	29th May 2000
30.	National University of Sciences & Technology, Rawalpindi	13th Mar 1993
31.	NED University of Engineering & Technology, Karachi	30th May 1977
32.	NWFP Agriculture University, Peshawar	4th Feb 1981
33.	NWFP University of Engineering & Technology, Peshawar	23rd Oct 1980
34.	Pakistan Institute of Engineering & Applied Sciences, Islamabad	22nd Mar 2000
35.	Pakistan Military Academy, Kakul, Abbottabad	1959
36.	Pakistan Naval Academy, Karachi	12th Nov 1965
37.	Peshawar University, Peshawar	30th Oct 1950
38.	Punjab University, Lahore	1882
39.	Quaid-e-Azam University, Islamabad	May 1965
40.	Quaid-I-Awam University of Engineering, Science and Technology, Nawabshah	7th Aug 1996
41.	Shah Abdul Latif University, Khairpur	8th Dec 1986
42.	Sindh Agriculture University, Tandojam	30th May 1977
43.	Sindh University, Jamshoro	1947
44.	University of Agriculture, Faisalabad.	1st Nov 1961
45.	University of Arid Agriculture, Rawalpindi	24th May 1995
46.	University of Education, Lahore	10th Sep 2002
47.	University of Engineering & Technology, Lahore	1961
48.	University of Engineering & Technology, Taxila	10th Oct 1993
49.	University of Hazara, Dodhial, Mansehra	Oct 2001
50.	University of Health Sciences, Lahore	28th Sep 2002
51.	University of Malakand, Chakdara, Dir, Malakand	27th Oct 2001
52.	University of Sargodha, Sargodha	16th Nov 2002
53.	University of Veterinary & Animal Sciences, Lahore	8th Jun 2002
54.	Virtual University, Lahore	11th Sep 2002

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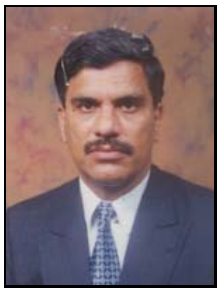

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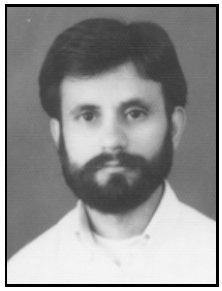

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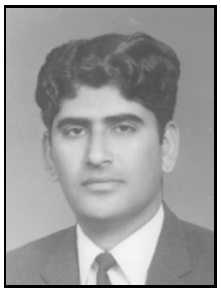

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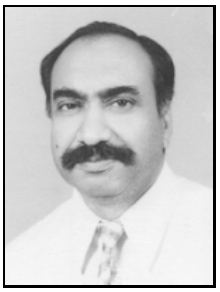

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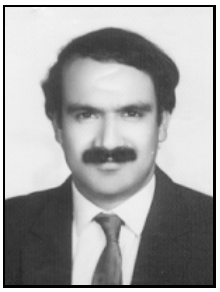

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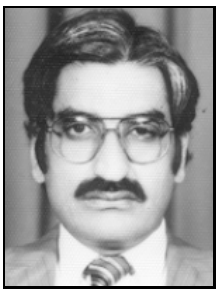

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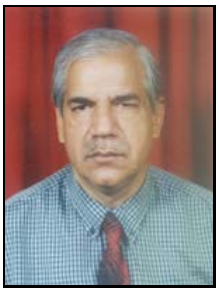

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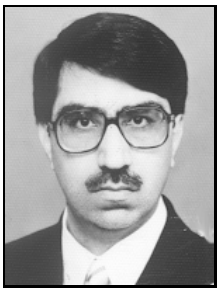

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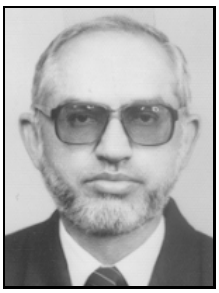

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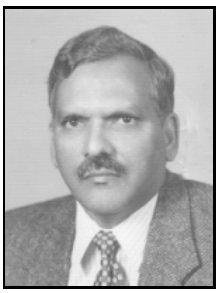

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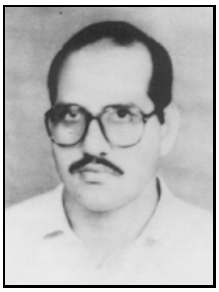

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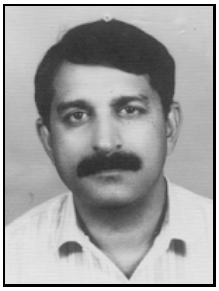

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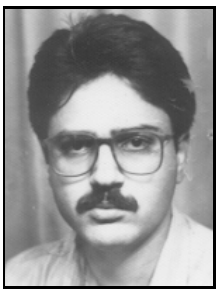

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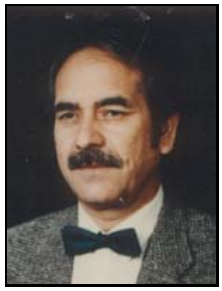

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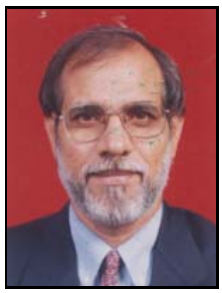

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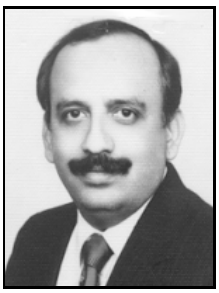

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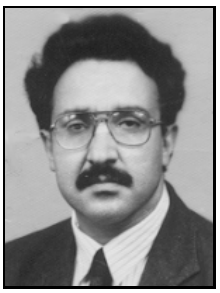

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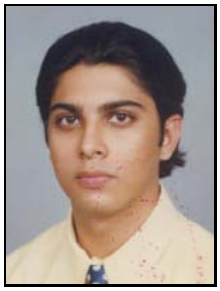

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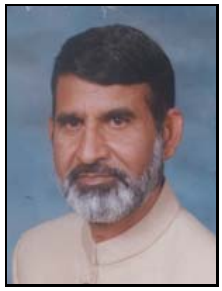

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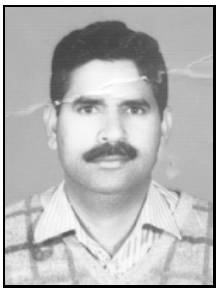

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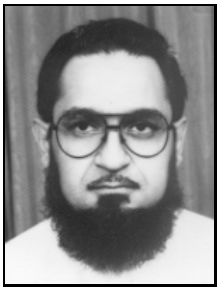

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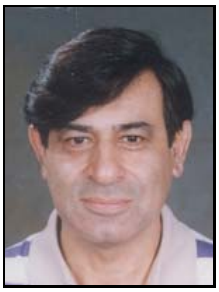

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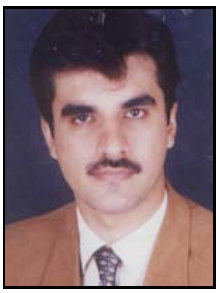

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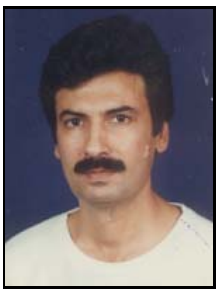

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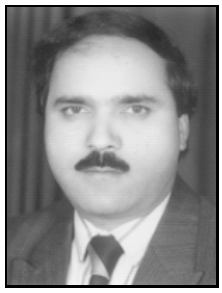

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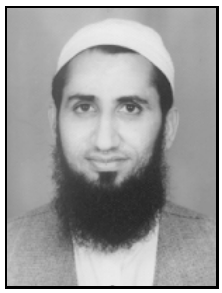

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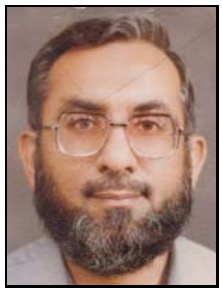

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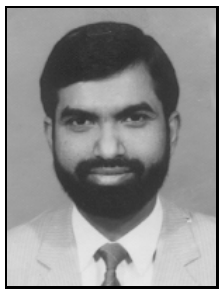

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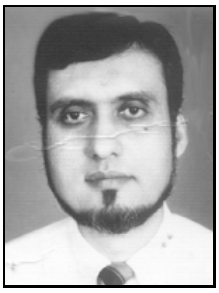

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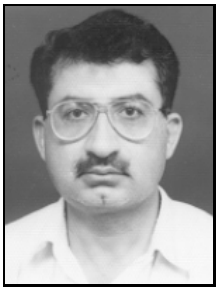

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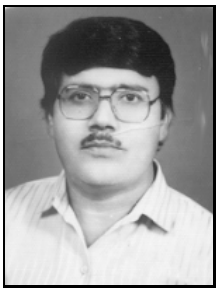

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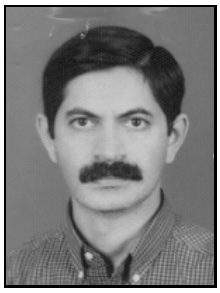

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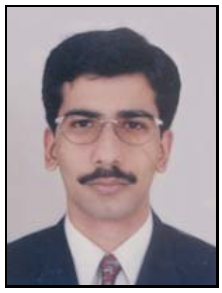

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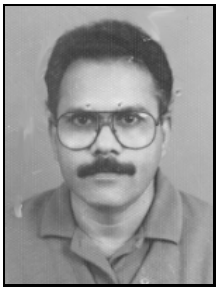

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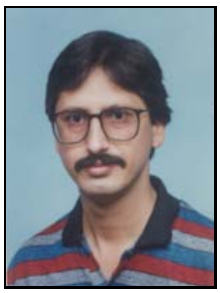

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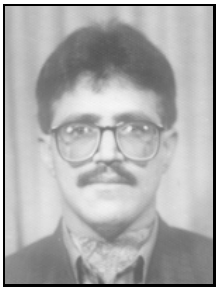

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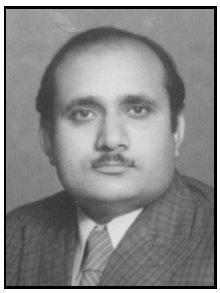

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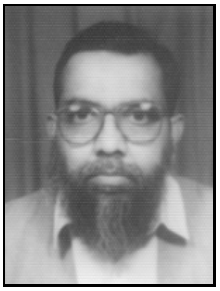

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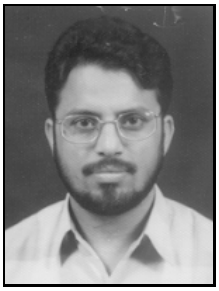

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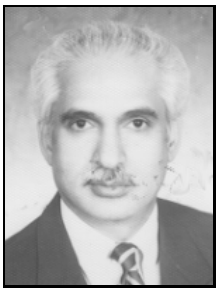

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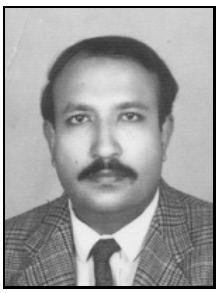

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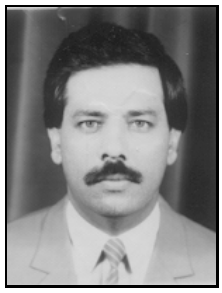

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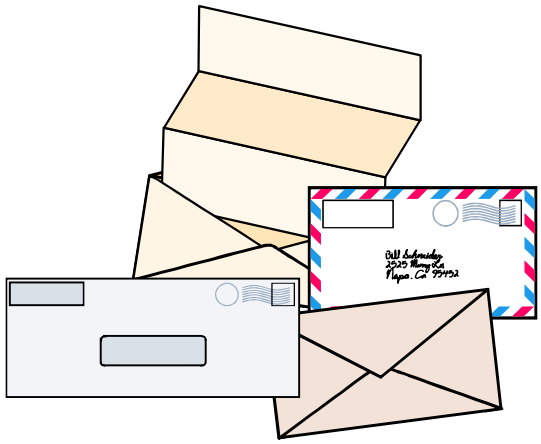

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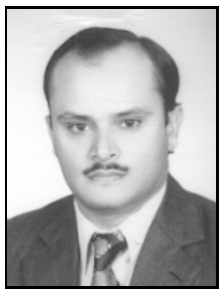

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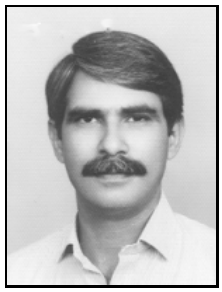

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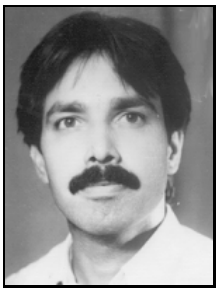

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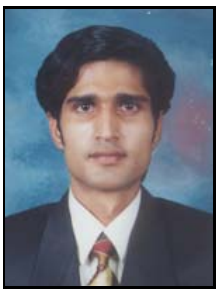

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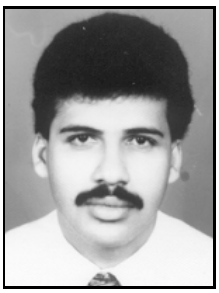

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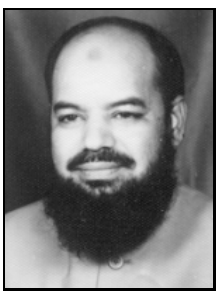

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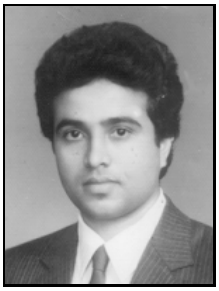

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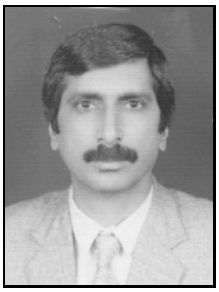

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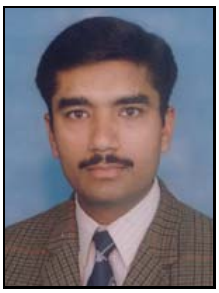

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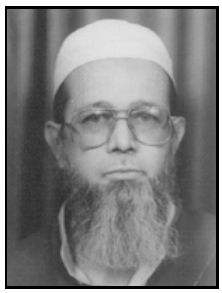

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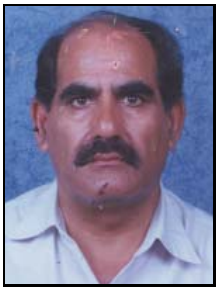

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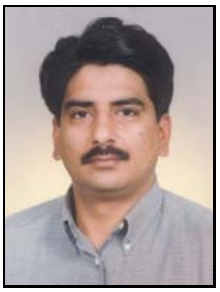

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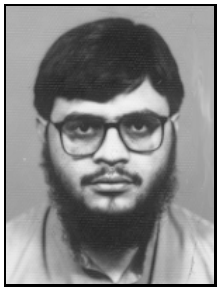

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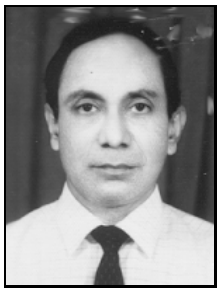

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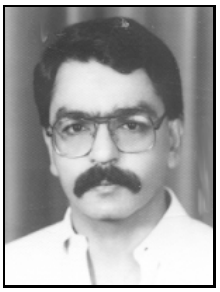

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CHARTERED UNIVERSITIES AND DEGREE AWARDING INSTITUTES OF PAKISTAN IN PRIVATE SECTOR

	CHARTERED UNIVERSITY / DEGREE AWARDING INSTITUTE	ESTABLISHED ON
1.	Aga Khan University, Karachi	2nd Mar 1983
2.	Al-Khair University, Mirpur, Azad Kashmir	11th Jul 1994
3.	Baqai Medical University, Karachi	26th May 1996
4.	CECOS University of Information Technology & Emerging Sciences, Peshawar	30th Aug 2001
5.	City University of Science & Information Technology, Peshawar	30th Aug 2001
6.	DHA Suffa University, Karachi	27th May 2002
7.	Foundation University, Islamabad	25th Oct 2002
8.	Gandhara University, Peshawar	23rd Nov 2002
9.	Ghulam Ishaq Khan Institute of Engg. Sciences & Technology, Topi, Swabi	18th Jul 1994
10.	Greenwich University, Karachi	3rd Feb 1998
11	Hajvery University, Lahore	2nd Oct 2002
12.	Hamdard University, Karachi	22nd Feb 1992
13.	Imperial College of Business Studies, Lahore	10th Apr 2002
14.	Indus Valley School of Art & Architecture, Karachi	27th Jul 1994
15.	Institute of Business Management, Korangi Creek, Karachi	27th Apr 1998
16.	Institute of Management & Technology, Lahore	10th Apr 2002
17.	Institute of Management Sciences, Lahore	10th Apr 2002
18.	Institute of South Asia, Lahore	27th Jul 2003
19.	Iqra University, Karachi	21st Jun 2000
20.	Iqra University, Quetta	2nd Nov 2002
21.	Isra University, Hyderabad	27th Sep 1997
22.	Jinnah University for Women, Karachi	2nd Jun 1998
23.	Karachi Institute of Economics and Technology, Karachi	24th May 2000
24.	Khadim Ali Shah Bokhari Institute of Technology, Karachi	28th Jun 2001
25.	Lahore School of Economics, Lahore	8th Jan 1997
26.	Lahore University of Management Sciences, Lahore	31st Mar 1985
27.	Mohammad Ali Jinnah University, Karachi	1st Jul 1998
28.	Mohi-ud-Din Islamic University, Nerian Sharif, Azad Kashmir	18th Jan 2000
29.	National College of Business Administration & Economics, Lahore	10th Apr 2002
30.	National University of Computer and Emerging Sciences, Islamabad	1st Jul 2000
31.	Newport Institute of Communications and Economics, Karachi	30th May 2002
32.	Northern University, Nowshera	2nd Nov 2002
33.	Preston Institute of Management Science and Technology, Karachi	31st Jul 2001
34.	Preston University, Kohat	23rd Nov 2002
35.	Qurtaba University of Science & Information Technology, D. I. Khan	30th Aug 2001
36.	Riphah International University, Islamabad	16th Oct 2002
37.	Sarhad University of Science & Information Technology, Peshawar	30th Aug 2001
38.	Shaheed Zulfikar Ali Bhutto Institute of Science & Technology, Karachi	25th Oct 1995
39.	Sir Syed University of Engineering & Technology, Karachi	25th Oct 1995
40.	Textile Institute of Pakistan, Karachi	21st Apr 2001
41.	University of Central Punjab, Lahore	10th Apr 2002
42.	University of Faisalabad, Faisalabad	2nd Oct 2002
43.	University of Lahore, Thokar Niaz Baig, Lahore	2nd Oct 2002
44.	Zia-ud-din Medical University, Karachi	8th Oct 1995

29 CHARTERED UNIVERSITIES + 15 DEGREE AWARDING INSTITUTES (TOTAL 44) IN PRIVATE SECTOR

NOTE: *The establishment of a university is a multi-step process. It involves fulfilling the legal formalities, making available the required physical, human and financial resources, meeting the academic and other requirements set by the Higher Education Commission (previously University Grants Commission), physical inspection of the facilities and infrastructure, and the submission of the case to Ministry of Education or to Provincial Education Department for grant of Charter.*

The Charter is granted subject to the jurisdiction of the relevant Federal Government or Provincial Government body, and is governed by the respective regulations prescribed by the charter granting body. Only the charter empowers an institution to award degrees.

ACRONYM AND ABBREVIATIONS

AE	Associate Engineer
AEC	Ahsanullah Engineering College, Dacca
Aero	Aeronautical Engineering
Agr	Agricultural
AIT	Asian Institute of Technology, Bangkok, Thailand
AMU	Aligarh Muslim University, India
AUB	Astonton University, Birmingham
AUUP	Allahabad University, UP, India
BCE	Bihar College of Engineering
BU	Baluchistan University, Pakistan
BUE	Birmingham University, England
CBA	College of Business Administration, Lahore
CE	Civil Engineering
CEI	Council of Engineering Institution, UK
CET	College of Engineering, Taxila, Pakistan
Chem	Chemical Engineering
CMSU	Central Missouri State University, USA
Comp	Computer
CPU	California Pacific University, USA
CSU	California State University, USA
DCET	Dawood College of Engineering & Technology, Karachi, Pakistan
DIT	Detroit Institute of Technology, USA
DU	Duke University, USA
DUP	Drexel University, Philadelphia, USA
E	Electrical
Ecs	Electronics
Env	Environmental
EE	Electrical Engineering
EPUET	East Pakistan University of Engineering & Technology, Dacca
ET	ENSAE Toulouse, France
GCTK	Govt. College of Technology, Karachi
GIK	G. I. K. Institute of Engineering and Technology, Topi, Pakistan
GPIS	Govt. Polytechnic Institute, Sialkot, Pakistan
GT	Georgia Tech, USA
GWU	George Washington University, USA
HP	Huddersfield Polytechnic, UK
HWU	Heroit Watt University Edinburg, UK
IBA	Institute of Business Administration, Karachi
ICES	Institute of Civil Engineering Surveyors, UK
ICUL	Imperial College University of London, UK
IEEL	Institution of Electrical Engineers London, UK
IEP	Institution of Engineers Pakistan Exam Section A&B
IIT	Illinois Institute of Technology, Chicago, USA
Ind	Industrial
IQA	Institution of Quality Assurance, UK
IU	International University
KCL	King's College London, UK
KFUPM	King Fahad University of Petroleum & Minerals, Dhahran, Saudi Arabia
KFUPM-RI	King Fahad University of Petroleum & Minerals-Research Institute
KU	Karachi University, Pakistan
KWU	Kennedy Western University, USA
LP	Liverpool Polytechnic
LU	Lamar University, Texas, USA
M.E.	Master of Engineering
M.S.	Master of Science
ME	Mechanical Engineering
MEH	Mehran Engineering University, Jamshoro
Met	Metallurgical Engineering
METU	Middle East Technical University, Ankara, Turkey
Min	Mining
MiSU	Mississippi State University, USA
MMU	Manchester Metropolitan University, UK
MOPTT	Ministry of Post, Telegraph and Telephone, Saudi Arabia
MSU	Michigan State University, USA
MTU	Michigan Technology University, USA
MUET	Mehran University of Engineering & Technology, Jamshoro
NCA	National College of Arts, Lahore
NCET	National College of Engg. & Technology, Karachi, Pakistan

ACRONYM AND ABBREVIATIONS

NED	NED College/University of Engineering & Technology, Karachi
NEU	Near East University
NU	Northrop University, USA
Nuc	Nuclear Engineering
NWFPUET	North West Frontier Province Uni. of Engg. & Tech., Peshawar, Pakistan
Off.	Office
OSU	Ohio State University
OU	Osmania University, Hyderabad
OUM	Oakland University, Michigan, USA
PAFCAE	Pakistan Air Force College of Aeronautical Engineering, Karachi
PCET	Punjab College of Engineering & Technology, Lahore
PCOA	Pakistan College of Aeronautical Engineering
PE	Petroleum Engineering
Pet	Petroleum
PGC	Post Graduate Course
PGD	Post Graduate Diploma
PIBR	Polytechnic Institute Bucharest, Rumania
PINSTC	Pakistan Institute of Science & Technology, Islamabad
PNEC	Pakistan Navy Engineering College
PSU	Penn. State University, USA
PU	Punjab University, Lahore
PUI	Purdue University, West Lafayette, Indiana, USA
PUK	Preston University, Karachi, Pakistan
QAU	Quaid-e-Azam University Islamabad
Res.	Residence
RU	Ranchi University, India
RUH	Rice University Huston, USA
S	Systems
SGW	Sir George Williams, Canada
SIU	Southern Illinois University, USA
Sr.	Senior
SSUET	Sir Syed University of Engineering and Technology, Karachi, Pakistan
SU	Sind University, Jamshoro, Pakistan
SUC	Stanford University, California, USA
TSC	Telecom. Staff College, Haripur, Pakistan
TUB	Technical University, Berlin, Germany
U	University
UB	University of Bahrain
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UM	University of Michigan, Ann Arber, USA
UNSW	University of New South Wales, Australia
UOB	University of Bradford, UK
UOBE	University of Birmingham, UK
UOC	University of California, USA
UOD	University of Detroit, Michigan, USA
UOF	University of Florida, USA
UOG	University of Glasgow, UK
UOI	University of Illinois, Urbana, USA
UOL	University of London
UOM	University of Manchester, UK
UOM	University of Minisotta, USA
UON	University of Nottingham, UK
UOP	University of Peshawar, Pakistan
UOS	University of Salford, UK
UOT	University of Engineering and Technology, Taxila
UOW	University of Waterloo, Canada
UPM	University of Petroleum & Minerals, Dhahran, Saudi Arabia
US	University of Southampton, UK
USC	University of Southern California, Los Angeles, USA
UTA	University of Texas, Austin, USA
UTC	University of Toronto, Canada
UW	University of Windsor, Ontario, Canada
WSU	Washington State University, USA
WU	Winconsin University, USA
x	Extension

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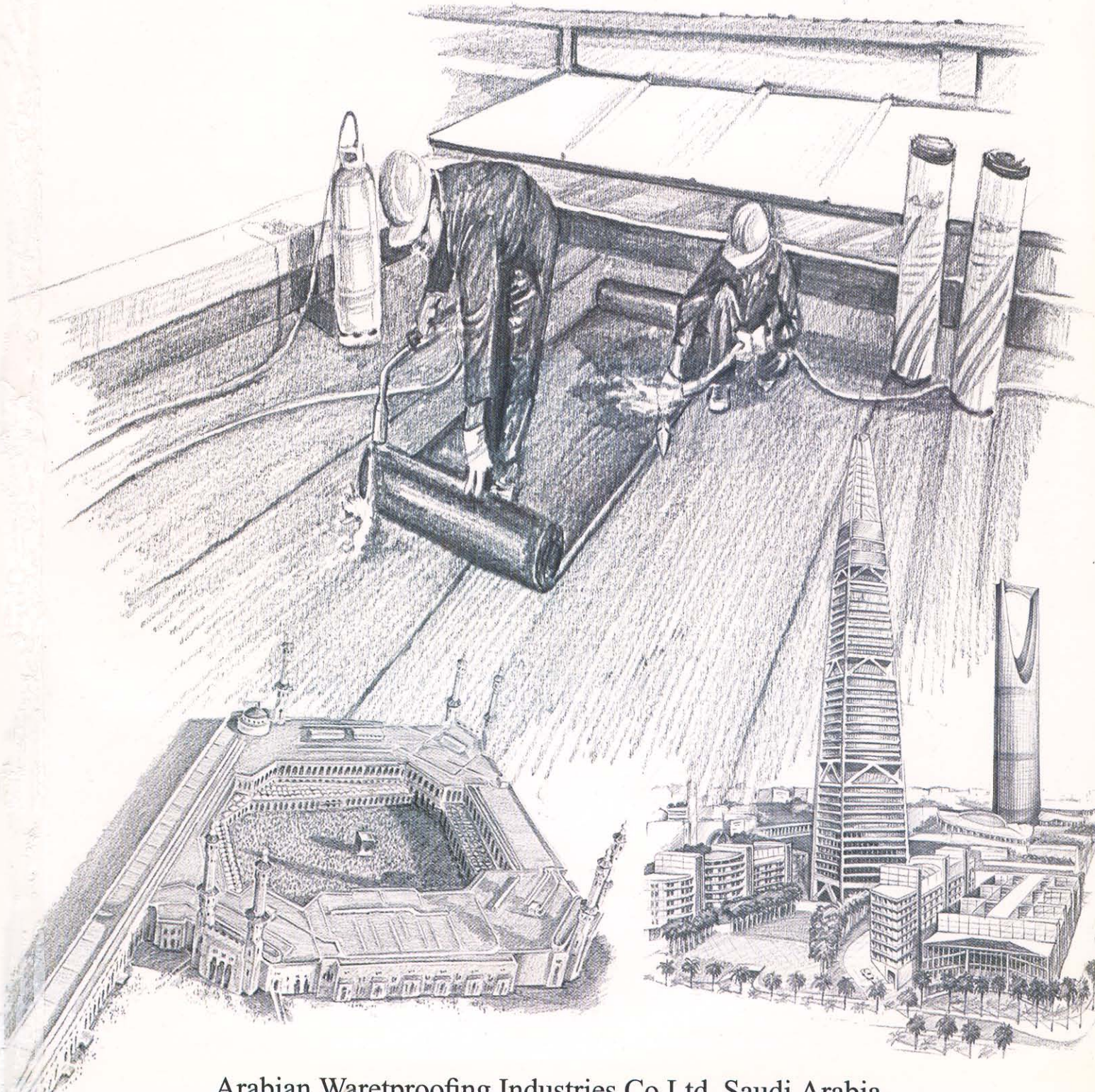

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