

GMR (Great Man-made River) Water Supply Project, Libya

Contracts were awarded in 2001-02 for the next phase of Libya's Great Man-Made River Project, an enormous, long-term undertaking to supply the country's needs by drawing water from aquifers beneath the Sahara and conveying it along a network of huge underground pipes.

In October 2001, the Great Man-Made River Authority (GMRA) awarded an \$82 million contract for the construction of major new pumping facilities to a consortium led by Frankenthal KSB Fluid Systems. In January the following year, the Nippon Koei / Halcrow consortium was selected to provide the preliminary engineering and design works for Phase III of the operation, worth \$15.5 million.

The pumping station is scheduled to be completed in the summer of 2004 and KSB will subsequently be responsible for servicing the plant and providing technical support for one year after completion. The preliminary stages of phase III run until June 2005, though it is anticipated that GMRA will invite tenders for the detailed design and construction works towards the end of 2004.

When completed, phase III, which requires an additional 1,200km of pipeline, will ultimately increase the total daily supply capacity of the existing system to 3.68 million m³ and provide a further 138,000m³/day to Tobruk and the coast.

Background

In 1953, the search for new oilfields in the deserts of southern Libya led to the discovery not only of the significant oil reserves, but also vast quantities of fresh water trapped in the underlying strata. The majority of this water was collected between 38,000 and 14,000 years ago, though some pockets are only 7,000 years old.

There are four major underground basins. The Kufra basin, lying in the south east, near the Egyptian border, covers an area of 350,000km², forming an aquifer layer over 2,000m deep, with an estimated capacity of 20,000km³ in the Libyan sector. The 600m-deep aquifer in the Sirt basin is estimated to hold over 10,000km³ of water, while the 450,000km² Murzuk basin, south of Jabal Fezzan, is estimated to hold 4,800km³. Further water lies in the Hamadah and Jufrah basins, which extend from the Qargaf Arch and Jabal Sawda to the coast.

The GMR project - the world's largest engineering venture - is intended to transport water from these aquifers to the northern coastal belt, to provide for the country's 5.6 million inhabitants and for irrigation. Intended to be the showpiece of the Libyan revolution, Colonel Moammar Gaddafi called it the "eighth wonder of the world".

First conceived in the late 1960s, the initial feasibility studies were conducted in 1974 and work began ten years later. The project, which still has an estimated 25 years to run, was designed in five phases. Each one is largely separate in itself but will eventually combine to form an integrated system.

Phases I & II

The first and largest phase, providing 2 million m³/day along a 1,200km pipeline from As-Sarir and Tazerbo to Benghazi and Sirt, via the Ajdabiya reservoir, was formally inaugurated in August 1991. This was a massive undertaking, using a quarter of a million sections of concrete pipe, 2.5 million t of cement, 13 million t of aggregate, 2 million km of pre-stressed wire and requiring 85 million m³ of excavation, for a finished cost of \$14 billion.

The Tazerbo wellfield consists of both production and piezometric observation wells and yields around 1 million m³/day at a rate of 120L/s per well. Only 98 of the 108 production wells are used, with the others on stand-by. A collection network conveys the water to a 170,000m³ off-line steel header tank. From here, the main conveyance system is routed 256km to the north, to two similar header tanks at Sarir, where the second Phase I wellfield is located. A further 1 million m³ is produced here, using 114 of the 126 production wells, at an average flow rate of 102L/s per well. The wells at both Tazerbo and Sarir are about 450m deep and are equipped with submersible pumps at a depth of 145m.

From Sarir, two parallel, 4m-diameter pipelines convey the now chlorine-treated water to the 4 million m³ Ajdabiya holding reservoir, 380km to the north. The water flows from this 900m-diameter reservoir through two pipelines, one heading west to Sirt and the other north to Benghazi. Each pipeline discharges into a circular earth embankment end reservoir, with a storage capacity of 6.8 million m³ at Sirt and 4.7 million m³ at Benghazi, which have been designed to balance fluctuations in supply and demand. In addition, large reservoirs - 37 million m³ in the Sirt area and 76 million m³ in Benghazi - have been built to act as storage facilities for summer or drought conditions.

Phase II delivers 1 million m³/day from the Fezzan region to the fertile Jeffara plain in the western coastal belt and also supplies Tripoli. The system starts at a wellfield at Sarir Qattusah, consisting of 127 wells distributed along three east-west collector pipelines and ultimately feeds a 28 million m³ terminal reservoir at Suq El Ahad.

Phase III

Phase III falls into two main parts. Firstly, it will provide the planned expansion of the existing Phase I system, adding an additional 1.68 million m³/day along with 700km of new pipeline and new pumping stations to produce a final total capacity to 3.68 million m³/day. Secondly, it will supply 138,000m³/day to Tobruk and the coast from a new wellfield at Al Jaghboub. This will require the construction of a reservoir south of Tobruk and the laying of a further 500km of pipeline.

The preliminary engineering and design contract runs for 41 months and includes geotechnical and topographic surveys. The conceptual designs phase features extensive consideration of pipeline routing and profiling, hydraulics, pumping stations, M&E,

control / communications system, reservoirs and other structures, corrosion control, power, operational support and maintenance provision. The evaluation of tenders for the detailed design is expected in the first quarter of 2005.

The last two phases of the project involve the extension of the distribution network together with the construction of a pipeline linking the Ajdabiya reservoir to Tobruk and finally the connection at Sirt of the eastern and western systems into a single network. When completed, irrigation water from the GMR will enable about 155,000ha of land to be cultivated - echoing the Libyan leader's original prediction that the project would make the desert as green as the country's flag.

Key Players

The project is owned by the Great Man-made River Authority and funded by the Libyan Government. Brown & Root and Price Brothers produced the original project design and the main contractor for the initial phases was Dong Ah, with Enka Construction and Al Nah acting as sub-contractors. The preliminary engineering and design contractor for Phase III is Nippon Koei / Halcrow consortium. The Frankenthal KSB consortium won the pumping station construction and technical support contract and SNC-Lavalin are responsible for the pipe production plant O&M. Libyan Cement supplied the concrete. Thane-Coat and Harkmel provided pipeline coating services and Corrintec supplied the cathodic protection system. Thyssen Krupp Fördertechnik provided technical services for the excavation planning and a number of local companies carried out elements of the construction and ancillary work.

Source: www.water-technology.net/project

James Hutton - The Founder of Modern Geology

James Hutton was born in Edinburgh (U.K.) on June 1926 and was the eldest son of Sarah and William Hutton. His father died when James Hutton was just two years old.

He was educated first at Edinburgh High School then, as teenager, at the University of Edinburgh where he came under the eye of Colin Maclaurin, who had worked with aging Newton in London. Maclaurin introduced Hutton about the Newton's idea notably the "Cycles of the Planets" which had marked influence on young Hutton. Maclaurin also introduced Hutton the idea "God had designed and credit the Universe as a perfect machine, then left it to run by it's own". This idea played a big role in Hutton's way of thinking and helped him to use that idea of ancient earth did not conflict with the biblical beliefs "The deluge".

At this time, there was nothing in James Hutton's mind to indicate his later interest in the formation of earth. When Hutton left the University in 1745, he went to the medical school to get trained as a Doctor.

As this period was full of local turmoil, Hutton had to leave the city in embarrassment. He went to Paris and there he studied medicine for the next five years. Strangely, though, he never seemed even for a moment to have contemplated becoming a doctor.

In 1750, Hutton went in for a business with an old Edinburgh friend to make 'Sal-Ammoniac' a key ingredient in the process of steel making in those days and this business provided him a moderate income all his life. In same year, Hutton also inherited the family farm at Sligh-house, south of Edinburgh and then he become an innovative and successful farmer.

In his initial years of farming, he had to travel extensively around Britain which he also used for studying landscapes and rocks, bringing samples after samples of rocks and mineral back home – A something quite new in those days and soon seems to have become known for his expertise on them. His close involvement with land had a crucial influence on his geological ideas by watching the land of his farm which as undergoing years after years with soil washed away by winter rain and to be replenished throughout the years as the rocks were weathered. Hutton's vision of endless 'cycles of erosion and renewal' and ideas already formed, got confirmed in 1760.

In 1770, Hutton moved back to Edinburgh from Sligh-house as by that time his farm was a well established farm in Edinburgh and this time he met David Hume (a Philosopher), Adam Smith (known for his book 'The Wealth of Nation'), Adam Smith (known for his book 'The Wealth of Nation'), James Watt (Steam engine) and Joseph black (the discoverer of CO₂). But in later days, Hutton became more closer to James Watt and Joseph Black.

Thus Watt, Black and Hutton teamed up to work to find the answer of – “Just how all different minerals of rocks are made from? Most mineralogist of that time just as Werner – believed that these are precipitated out of the universal ocean. If that is true, the minerals would have been dissolved in water, but that is not happening. Hutton & Black realized that it was, instead, the heat, from within the earth that was involved in that mineralization and not only the heat but heat and extreme pressures that are available at deeper levels within the earth.

Hutton's convincing 'Idea' got good support and in 1785 he decided to present it to the Royal Society of Edinburgh. Some people were stuck at once while others objected for the want of proof. For finding the proof, Hutton with his friend Sir John Clerk set out to visit mountains. Hutton knew that the granite rock (Igneous groups) formed from the molten magma coming out from inside of the earth, so he wanted to show it as a proof and also such 'out crops' of the granite rocks which often formed after, and not before as said by Werner, over the sediments underlying it. In 1788, to Hutton's excitement, they saw the graphic proof which he was searching for, in glen tilt of Grampian Mountains, where granite reins had clearly been injected into the surrounding rock. Later on in the summer, Hutton took the disagreeing scientists to a similar graphic and convinced them.

In 1793, a leading Irish academic Recharad Kirwan opined that Hutton's theories are blasphemous. Hutton was determined to respond but due to his illness (Kidney failure) 'Theory of Earth' containing his theories with proofs was incomplete. He died in 1797, before all the volumes of the book were complete. This incomplete book had little impact.

The then other disagreeing Scientists Playfair and Hall took up his cause. Playfair would write simple summary of Hutton's ideas and Hall would conduct experiment in lab to show that igneous rocks could form by mineral crystalization by simple cooling down slowly.

35 years later Charles Lyell (1797 – 1875) wrote his own famous book “Principles of Geology” which made Hutton's ideas as the foundation of the modern Geology and book Later-on provided Charles Robert Darwin, M.A. (1809 – 1882, U.K.) The inspirations for his theory of evolution.

Source: Farudon, John; Woolf, Alley; Rouney, Anne and Gogerly, Li.z (2006). James Hutton, The Great Scientists, Capella, Arturus Publishing Ltd., London, pp. 68-71.

ISRO Chief : Moon Mission shows India Means Business

The successful landing of the Moon impact probe on the lunar surface has not only boosted ISRO's confidence to undertake inter-planetary travel in future, but also conveyed a firm message to the world that India means business in the field of space, ISRO Chief G. Madhavan Nair said.

“It [the landing of the Moon Impact Probe (MIP) and the Chandrayaan-I mission] has validated many of our assumptions and many of the principles involved in interplanetary travel. It's really a big boon (for ISRO). We can now take up travel to any other planet with confidence,” a jubilant Nair said.

The Indian space programme achieved a unique feat with the placing of the Indian tricolour on the Moon's surface. The Indian flag was painted on the sides of MIP, one of 11 payloads of Chandrayaan-I spacecraft that successfully hit the lunar surface at 20:31 hrs on 14.11.2008. This is the first Indian built object to reach the surface of the Moon.

“I am extremely happy that the nation has responded very positively to this event (MIP landing and Chandrayaan-I)”. Nair, also the Secretary in the Department of Space, said.

“ISRO's name has been high all the time. This is another significant event. I am sure in the global community, we will have much more respect than what was (there) in the past,” he said.

After Chandrayaan-I, ISRO's immediate priority is on 'Aditya' (to study the outermost region of sun called corona), Astrosat (an astronomy satellite to be launched next year), Oceansat (which looks at the ocean very closely), radar imaging satellite and indigenous cryogenic stages.

Nair also indicated that ISRO and Russia's Federal Space Agency (Roskosmos) are expected to finalise exact sharing of work on Chandrayaan-II in December.

Source : Hindustan Times, 16.11.2008

ISRO Develops Hydrogen Fuel to Power Bus

India's space scientists have developed hydrogen fuel cells to power an automobile bus by leveraging their know-how of the home-grown cryogenic technology for rockets.

The two-year effort has yielded positive results and the scientists are now readying for the fuel cells to be fitted into a bus.

“That's not exactly cryogenic technology... (It's) liquid hydrogen handling and that's where we have some expertise. So, we have finalized the design. Tatas are taking the responsibility for the locomotive part of it, and hydrogen handling system also. The first protomodel has been assembled. The results are good. May be next year, it should be on the road”. Chairman of the Indian Space Research Organisation (ISRO) G, Madhavan Nair said.

According to ISRO's honorary adviser V. Ghana Gandhi “the hydrogen cells were a spin-off of the cryogenic technology that ISRO had been developing for the past few years. ISRO has a very rich technology in producing, storing and handling gaseous and liquid hydrogen in the past three decades. Our expertise is also in safety. We want to develop (hydrogen fuel cells for automobiles) for India, Hydrogen is the future energy”.

Source : The Tribune, Chandigarh, 18.11.2008

Internet Addiction is now a Clinical Disorder

Feeling irritated because you can't access the Internet? Well, may be it's time to seek medical help as Internet addiction is now considered a clinical disorder rather than a bad habit, according to a new Internet Addiction Disorder (IAD) diagnostic manual approved over the weekend by psychologists.

The two major symptoms of IAD are lingering online for more than six hours a day instead of working or studying and having adverse reactions from not being able to get online, reports China Daily.

According to the manual, IAD sufferers usually engage in five main activities – Online gaming, net pornography, excessive involvement in virtual social networking, too much Internet shopping and general cyber-surfing.

Source : The Tribune, Chandigarh, 12.11.2008

Running Out of Email Space? Try Zoho Mail

For most Internet users, the brand Zoho means an online Office-like productivity suite but recently AdventNet, the company that develops Zoho, has added a brand new product to their kitty. It's a web-based email program similar to Hotmail or Gmail and is called Zoho Mail.

It's obviously tough for a relatively small player like Zoho to compete with biggies like Google, Yahoo and Microsoft. To attract people, they have thrown in some features that aren't available in most other web mail programs.

For starters, Zoho Mail offers unlimited storage so you can now save all those emails with large video attachments without having to worry about exhausting the space limit ever. Gmail on the other hand offers 7 GB of free space.

Other popular email service providers in India like Rediff and Indiatimes too offer unlimited storage but Zoho neither inserts advertising in your mail nor in their web interface.

Google shown contextual advertising in Gmail based on the content of your email message and though it's all automated, some privacy advocates aren't too happy with ads in Gmail.

Now another big plus in Zoho is offline access. You can read and reply to your email in the browser even while you are not connected to the Internet. That means you will always have access to emails whether you are on the road or inside an airplane where there's no connection. This is made possible through Google Gears which is a Google technology but, surprisingly, not available for Gmail users yet.

Zoho Mail offers POP support too which, in simple English, means that you can download and read emails in any desktop mail software like Microsoft Outlook, Thunderbird, etc. But unlike Gmail, there's no IMAP support so if you delete a mail in Outlook, it's not deleted automatically from your Zoho Mail account.

There's also an auto-forward filter so you can use Zoho Mail without switching from your existing mail account.

Source : Hindustan Times, 12.11.2008

The Saint of God's Own Country

She suffered herself to heal the suffering of others – that was how Pope Benedict XVI described Kerala nun, Sister Alphonsa – as she was declared a saint at a canonisation ceremony at St. Peter's Square in Vatican City on 12.10.2008 (Sunday).

Hundred of kilometre's away, in Bharaninganam near Kottayam in Kerala, God's Own Country, tears welled up in the eyes of the devout kneeling before her tomb.

It was a special Sunday and these simple, god-fearing folks wanted to cherish this day for the rest of their lives. Their own Anna Kutty (as Sister Alphonsa was known when she walked among them), had become a saint.

After the canonisation ceremony at St. Peter's Square, Benedict said Alhonsa's "heroic virtues of patience, fortitude and perseverance in the midst of deep suffering remind us that God always provides the strength we need to overcome every trial".

Apart from being the first of its kind, Alphonsa's canonisation is a milestone for the Roman Catholic Church in India. The church dates back to the arrival of St. Thomas in 1st Century AD.

Alphonsa's sainthood coincides with the trying times the community is facing in the country. On violence against Christians in India, the Pope urged "the perpetrators of violence to renounce these acts and... work in building a civilization of love".

Braving rain, thousands thronged Alphonsa chapel in Bharaniganam and Alphonsa Bhavan in Kudamaloor – Alphonsa's birth place. Packed roads were lined with posters and hoardings that spoke of what she meant to them.

"It is a glorious moment for believers of the country," said Father Dominique Vechoor, Chancellor of Pala arch diocese.

Bells chimed and crackers set off in Kottayam as the Pope declared Alphonsa a saint at 1.30 IST. Packed believers took vantage points to see the live telecast from the St. Peters Basilica.

"We are camping in the area for the last three days. It is a memorable pilgrimage for us," said K.P. Kuriakose, who came all the way from northern Malabar.

Among the devout was Lakshmikutty Amma (now 99), one of the few survivors who enjoyed the Sister's love and warmth.

Alphonsa was born in 1910. She was very beautiful and disfigured herself at a young age to keep suitors away and enter the convent. She died at the age of 36. Soon after her death, Alphonsa's tomb became a pilgrimage spot and she was credited with several miracles.

The Saint's coming

It was 10 year old Jinil's experience with Sister Alphonsa that finally "earned" her canonisation.

Born club-footed, doctors wrote Jinil off. They said he would never walk in his life. When they lost all hope, Shaji Joseph and Lissy Shaji brought their crippled son to the Alphonsa Chapel and prayed. They prayed by blessed sister's tomb for hours, and continued even after nightfall. That night in 1999 was the last 'crippled' day for Jinil. Today, he walks like any other child of his age (*Her inner inspiration did not die with death of her body*).

Source : Hindustan Times, 13.10.2008

Mind Management Helps Direct Your Life

What is mind management?

Mind management is a way to control one's mind. To do this, we need to be cautious about our thinking process and also need a high level of understanding and meditation as well. Understanding is wisdom – 80 % of people are knowledgeable while 20 % are wise. Knowledgeable men take sides without reason. They feel sad seeing deprived people but jealous when they see happy people. They work in the guidance of others' inspiration, take unnecessary responsibility to keep themselves disturbed.

A wise person does not stand for or against any idea without concrete reason. He works according to the situation and capacity. He looks at everything intellectually. To him, failure is a stepping stone for future success. So depression and conflict are not seen. Like the phrase 'Stop, Look, Go', first one should see, and this needs patience. Meditation is necessary to control and manage mind which then becomes an easy task.

Why do we need mind management?

Unless we control or manage our mind, it is difficult to achieve success and peace. Psychologists say every interest is first born in the mind as a seed. Then it continues to grow. Later it takes its real form which everybody can see. The interest that first appears in the mind remains weak for the first three minutes and it becomes strong within the next five minutes. All the negative aspects should be deleted within the first three minutes. If not taken out, they would become stronger later and you can never throw them out. After taking control over the mind, we can control passion, interest and unrest.

Mind management is essential for a peaceful, successful and healthy life. The age of computer has thrown us on the escalator of aspirations but has robbed us of simple charms like falling asleep. The compulsions of hectic schedules burden the mind and cause stress. However, the joys that elude us can be regained by practicing power meditation. It creates tranquillity, simplifies life and cleanses the mind. It helps control indolence, ego and anger, and builds confidence and patience. With power meditation, negative thoughts get dissipated and a sense of happiness is achieved.

With happiness and spiritual knowledge, one can relearn the meaning of life. The picture of life's journey also becomes clearer. Osho said, "As science is not based on orthodox and blind beliefs and functions only on the principle of cause and effect, similarly power meditation doesn't function on age-old theories or communal thoughts but originates from rational and divine experience. It strives to make an individual free from the confining pressures of daily life".

The beauty of meditation is that it is independent of religion. According to modern medical science, combinations of factors like pollutants, imbalanced diet and high aspirations have rendered the human mind restless, thereby making the body perpetually ill.

Here is a meditation method, which will enable you to control stress. *Sit in the padmasan or sukhasan, cross-legged and erect. Keep your back, spine and neck*

straight. Keep your eyes closed. Sit in this position for 10 minutes. The method has two sages: for the first five minutes, breathe in slowly, hold it and then release it very slowly (Pranayam). Again, for the next five minutes, breathe and release your breath slowly.

*- Swami Dhruv, Founder Indian Institute of Mind Management
Source: The Times of India, 24.7.2006*

Blind Dash to 8 Gold Medals, the Phelps Way

Wearing that invisible armour of resilience and determination, Michael Phelps plunged into the Cube's blue waters on Wednesday in China Olympics and plucked his first gold in butterfly ahead of Hungary's Laszlo Cseh. The quest for eight gold medals could have been derailed by water filled goggles but Phelps took it in his stride creating the world Olympics history. He won 14 Olympic gold medals.

I couldn't have done anything either," he said, smiling at his helplessness. "I couldn't have stopped and pulled it away from my eyes. As soon as I dove in it was filled up." To think that even someone as programmed as him can have equipment malfunction.

"Going into the 150 wall and the finish, I couldn't see anything," Phelps said. "I went blind, so I just let it not disturb me. I remained focused and started to count my strokes. I am very good at that. I was just hoping that I was winning," said the world record holder who loves listening to music.

"I was upset it happened. But I did my best and won the gold." He ripped off the goggles to look at his time. He was in first in world-record pace and at the 100 and 150 m marks he led Cseh by 67s. Phelps bettered his world record by .06 seconds. "I know I could go faster than this. I hope I will do better next time," he said earnestly.

Attention please

This from a man who had his teacher's complaining to his mother "your son will never be able to focus on anything". Hear him now. "I have to remain focused all the time. I have to take one race at a time," said Phelps, who suffered from Attention Deficit Disorder as a child. He even was on medication, something his mother still feels bad about. He was put on Ritalin at nine to control hyperactivity for a very short period.

When asked about his childhood disorder, he just said: "it is pretty big to stay focus. This is my third Olympics and I have already swum in World Championships and major meets, so I have got used to it. These things helped me to develop an unwavering focus.

Light side of life

Asked whether he is in touch family in the USA, he said "I am and read out a text message he received from close a friend before Wednesday's first race. The message read: "How many times do we have to see your ugly face," That sent the packed house to peels of laughter.

Source: Hindustan Times dt. 14.8.2008 and 18.8.2008

Do it Now!

- If you have a kind word to say - say it now.
- If you have something to give - give it now.
- If you want to extend a helping hand - extend it now.
- If you can make some one glad or another less sad - Do it now, Do it now, Do it now.
- If you trust to bestow - show it now.
- If you have friendship to give - give it now.
- If there is pain you can ease or remove - you can please - Do it now, Do it now, Do it now.

- *Anonymous*

Source: K.K.Mitra, "Shakti Aanchal", Ashutosh Nagar, Lucknow

Facts about India

Some of the following facts may be known to you. These facts were recently published in a German magazine which deals with World History Facts about India.

1. According to the Forbes magazine, Sanskrit is the most suitable language for computer software.
2. Ayurveda is the earliest school of medicine known to humans.
3. The value of pi was first calculated by Budhayana, and he explained the concept of what is now known as the Pythagorean Theorem. British scholars have last year (1999) officially published that Budhayana's works dates to the 6th Century which is long before the European mathematicians.
4. Algebra, trigonometry and calculus came from India. Quadratic equations were by Sridharacharya in the 11th Century; the largest numbers the Greeks and the Romans used were 106 whereas Indians used numbers as big as 1053.
5. According to the Gemmological Institute of America, up until 1896, India was the only source of diamonds to the world.
6. USA based IEEE has proved what has been a century-old suspicion amongst academics that the pioneer of wireless communication was Professor Jagdeesh Chandra Bose and not Marconi.
7. The earliest reservoir and dam for irrigation was built in Saurashtra.
8. Saurashtra is the father of surgery. 20600 years ago he and health scientists of his time conducted surgeries like cesareans, cataract, fractures and urinary stones. Usage of anesthesia was well known in ancient India.
9. The place value system, the decimal system was developed in India in 100BC.
10. The world's first university was established in Takshila in 700BC. More than 10,500 students from all over the world studied more than 60 subjects. The University of Nalanda built in the 4th century BC was one of the greatest achievements of ancient India in the field of education.

Humour - Gujarati Common Sense

One day, many years ago at a school in South London, a teacher said to a class of five-year olds, "I'll give \$20 to the child who can tell me who was the most famous man who ever lived?"

An Irish boy said: "it was St. Patrick."

The teacher said sorry Alan, that's wrong.

A Scottish boy: "it was St. Andrew".

"That is not right either," the teacher replied. Finally, Jayant, a Gujarati boy, said, "Jesus Christ". That is right Jayant, and the teacher gave him \$20. But he said, "You are Gujarati, so I am surprised you said Jesus Christ."

Jayant replied: "Yes, in my heart I know it was Lord Krishna, but business is business."

Training Course

A Training course on “Rock Engineering for Drill-and-Blast and TBM Tunnelling, and Important Aspects of Rock Joint and Rock Mass Behaviour and Seismic Characterisation for Slopes, Dams, Tunnels and Reservoirs” was organized by ISRMTT in Association with CSMRS at New Delhi, India from December 10-12, 2008. Dr. Nick Barton, Norway was the resource person for delivering the lectures, whereas the course co-ordinator was Dr. Rajbal Singh, CSMRS, New Delhi, India.

The Indian Society for Rock Mechanics and Tunnelling Technology (ISRMTT) in association with Central Soil and Materials Research Station (CSMRS), New Delhi organized Training Course on “Rock Engineering”. Following lectures were delivered by Dr. Nick Barton from Norway on 10-12 December 2008 at CSMRS, New Delhi, India:

- Introduction to the Q-system of rock mass characterization.
- Linking Q to useful parameters for design.
- Tunnel support selection from Q classification, and support element properties.
- Pre-grouting and water control.
- TBM performance and prognoses.
- Risk to TBM tunnelling from faults.
- Characterization of rock joints and rock masses, considering strength, deformability, flow and seismic attributes: an overview.
- Q_{slope} method of characterizing rock slopes for deciding on safe slope angles.
- A unique metro accident in Brazil’s largest city caused by multiple factors, but especially by differential weathering.
- A 20-years old Q-system case record of cavern design in faulted rock in a major pumped-storage in Taiwan.
- Shear strength of rockfill-embankments, interfaces and rock joints, and their points of contact.
- Combining borehole characterization and various seismic measurements in tunnelling and dam foundation works.
- Important aspects of petroleum reservoir and crustal permeability and strength at several kilometers depth.

The elaborated contents of the training course provided a forum for interaction and sharing of about four decades experience of Dr. Nick Barton in the field of Rock Engineering and it would definitely be useful for construction of future projects in India. The proceeding of course materials along with CD was distributed to the participants for future use.

Chief guest Mr. S.K. Vij, Member (Engineering), Ministry of Railways inaugurated this training course. Mr. Murari Ratnam, Director, CSMRS welcomed the dignitaries and the delegates. Mr. D. Datta, President, ISRMTT and CMD, WAPCOS apprised the audience about ISRMTT and the training course. Dr. V.M. Sharma, Director AIMIL presided over the inaugural function and briefly introduced Dr. Nick Barton. Dr. Rajbal Singh, Honorary Secretary, ISRMTT and Joint Director, CSMRS proposed the vote of thanks.

This training course got overwhelming response from 35 organizations to nominate 143 delegates for attending the course within a very short notice of two weeks. This course would not have been possible without the association and support of CSMRS. The Training Course was sponsored by IRCON International Ltd. (Ministry of Railways) and Hindustan Construction Company Ltd.

The concluding session of the training course was chaired by Dr. V.M. Sharma. Mr. Haridev, Senior Research Officer, CSMRS analysed the feedback by the delegates. Majority of delegates were in favour of repetition of this training course with some field training. Dr. Nick Barton delivered his concluding speech. Dr. V.M. Sharma who attended the course summarised the 3 days proceedings of the training course. Finally, the vote of thanks was proposed by Dr. Rajbal Singh. The training course was completed successfully.

Source: Dr. Rajbal Singh, Honorary Secretary, ISRMTT