

Underground Pipeline System Could Relieve Traffic Congestion

Researchers in Germany at Ruhr-University Bochum are studying feasibility of an underground pipeline system that could serve as an alternative to trucking. The system is being studied as a means of relieving congestion in cities experiencing severe traffic jams on a daily basis. The interdisciplinary research project – Underground Transportation and Supply Systems – deals not only with the principles of mechanical, electrical and civil engineering but also with control techniques, law, and economics. The CargoCap system is based on individually driven, computer-controlled transport units. Each “cap” – or transportation unit – is a cylinder that is propelled by an electric motor and can accommodate two Euro pallets, a standardized freight unit measuring 800 by 1,200 by 1,050mm. The cylinders would have an average speed of 35.4km/h. CargoCap would transport consumer goods, bulk goods, production components, parcels, food, and other types of freight. According to researchers, it would release no emissions and would be driven electrically by conventional three-phase motors fed by frequency converters. The system could be set up quickly and in no way would interfere with traditional modes of transport. According to the Allgemeiner Deutscher Automobil Club, 10 per cent of the 11,000 km of federal motorways in Germany experience traffic congestion on a daily basis. To construct the system, trenchless technology – in particular, a pipe-jacking system-would be used to lay circular pipeline 1,600 mm in diameter alongside, below, or above such existing facets of infrastructure as supply and disposal lines, power and telecommunication cables, and road tunnels. The research project involved studying a model of a twin east-west route extending 80km through the Ruhr region, which with 5.4 million inhabitants is among the most densely populated areas in Europe. The route passes mainly under public rights-of-way along Autobahn BAB 40 from Unna via Dortmund, Bchum, Essen, and Oberhausen to Duisburg – areas that are chronically congested. Goods would be carried by truck to the edge of the congested areas and from there would be conveyed to their various locations by the underground system.

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Source: IEI News, Vol. 53 (N), No. 8, Nov. 2003*

Shielded TBM Rock Tunnelling in India

Rock tunnelling in India remains dominated by traditional drill and blast techniques which account for at least 95% of all tunnelling work carried out to date. Other than in a few notable cases, it appears that there has been little consideration given in the past for adopting the use of TBMs.

During the last decade, however, particularly in Europe, soft ground tunnelling techniques have been increasingly adopted in rock tunnelling.

Segmental tunnel linings are now used with both gripper type and, more recently, shield type TBMs. Gripper type TBMs are not ideally suited for the erection of precast segments which rely on an independent erector unit towed behind the TBM. Difficulties can occur when temporary ground support becomes necessary in the unsupported area between the tunnel face and the segment erector. Such difficulties are overcome by the use of a fully shielded TBM with segment erector whereby there is no unsupported ground behind the shield in the non-squeezing grounds, boulders and soils.

The recently completed Ghatkopar high level sewer tunnel in Mumbai is described and noted as being the only rock tunnel constructed in India by shielded rock TBM and segmental lining technique. Whilst this project was considered successful, with the 2670 m being driven in 12 months, comparison is made with a state-of-the-art tunnel drive on the Sorenberg project in Switzerland, where advances of over 200m per week were achieved and the 5300m long tunnel completed in just 11 months. Recent success is underground metro in Delhi in soils, boulders and weak rock masses in non-squeezing ground condition and non-flowing ground conditions. Specially designed Herrenknecht TBMs were used for both of these projects.

Source: Extracted from an article by James D Broomfield & David Denman, Seminar on "Productivity and Speed in Tunnelling", 26-27 June 2003, Dehradun, India, pp. 194-206

Bhimbetka Caves on Heritage List

After the Mahabodhi temple complex at Bodh Gaya last year, the rock paintings of Bhimbetka caves, 19 km from Bhopal (the capital of Indian State Madhya Pradesh), have found their place in UNESCO's list of World Heritage sites.

This decision was conveyed to Union Minister for Tourism and Culture Jagmohan by UNESCO's Paris office recently. In its letter, UNESCO wrote: "The proposal for declaring the site has been unanimously accepted by the World Heritage Committee in its 27th meeting held on July 3, 2003. The Bhimbetka site has been inscribed in the category of cultural landscape.

Reacting to the news, Mr. Jagmohan said: "This will go a long way in reinforcing the antiquity of Indian civilisation and promoting tourism."

Rock shelters of Bhimbetka cover an area of 19 sq. km. This area has the highest number, density and variety of painted rock shelters in India. The site also has a wealth of archaeological remains and presents evidence of a tradition continuing from the Paleolithic to the Medieval periods. The rock shelters are among the oldest found anywhere in the world.

The paintings in Bhimbetka are the earliest evidences of man's creativity and communication and are a great source of information about evolution. There are over 500 such paintings here.

While the site is protected under the ASI, the Union Ministry for tourism and Culture had recently declared the forest area around the caves as part of the protected complex. The ministry also has a separate scheme for the rejuvenation of this forest.

Source: Indian Express, July 6, 2003

Self Compacting Concrete: An Emerging Material for Tunnel Linings

Normal cement concrete depends heavily on its degree of compaction for its performance, viz. strength and durability. In some specific locations, when either the thickness of the structural element is very small or congested reinforcement makes it difficult to facilitate proper compaction through internal vibrations etc., the concrete may not be able to last for its designed life. Such situations are frequently encountered in the field, say in case of tunnel and shaft construction. In some situations, the concrete may be subjected to a humid environment (or sometimes, alternate wetting and drying conditions); resulting in rapid deterioration of the insufficiently compacted (porous concrete).

Rheo-plastic concrete requiring very little vibration to get compacted can be advantageously used in such situations. Also, self-compacting concrete (SCC) was developed in Japan in late 80's. In tunnel construction and rehabilitation works, SCC has started gaining acceptance. In one notable project "Trans-Kawasaki Route" in Japan, a tunnel structure "Daishi-Junction" is included, where SCC has been used with MMST method of construction. This tunnel has been constructed by connecting unit tunnels of steel segment construction through joint members and then filling with self compacting concrete to unify them into a large section tunnel. A tunnel rehabilitation project in Zurich, Switzerland in 2001 employed a concrete volume of 7000 cubic metres with SCC to get durable concrete in sections ranging from 10 cm to 6 cm thickness.

In SCC, full compaction of concrete is attained with its self-weight only. Such concrete fills spaces between the reinforcing bars and form-work completely without any vibration. The concrete is made up of usual ordinary portland cement and normal coarse aggregates and sand. However, it needs a higher powder content, so either flyash, ground granulated blast furnace slag or limestone powder may be used as powder material. Super-plasticiser is required to get high flowability of concrete. For this polycarboxylate ether based super-plasticisers have been observed to work better than either naphthalene based or melamine based ones. The use of zero energy admixtures facilitates early hydration and stripping of formwork may be resorted to in 8 hours. To control segregation at high flowability, viscosity modifying agents (VMA) are used. VMA addition makes the concrete mix stable. The aggregates remain suspended in the viscous mix of mortar. SCC mixes are cohesive due to large powder content.

In India, flyash is available widely and is an economical material. SCC mixes can be produced at site having a 28 day compressive strength in the range 40-60 MPa. Due to flyash addition, the flexural strength of such concretes is generally 10% to 25% higher than the normal concrete with similar compressive strength. However, compatibility of the particular brand of cement with the super-plasticiser proposed to be used, needs to be

established first. The concrete needs to be cured in a similar fashion as the normal concrete, but here, moist curing in the initial period is crucial for initiating the pozzolanic reaction of the flyash. Finishing of SCC is smooth and the permeability of the SCC is lower than the normal concrete of similar grades.

Thus SCC use may result in better concrete practices in tunnel linings, shafts and related applications where the thickness is small and proper compaction of conventional concrete may be a nightmare.

A Typical SCC Mixture would be approximately as follows:

Cement	400 kg/m ³	Coarse Aggregate	700 kg/m ³
Flyash	200 kg/m ³	Super-Plasticiser	8-10 kg/m ³
Fine Aggregate (Sand)	800 kg/m ³	Water	180 kg/m ³
Viscosity Modifying Agent	3-6 kg/m ³		

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Compressed Fuel for Vehicles

It is matter of pride that one of the most polluted cities of the world Delhi has out numbered 80 other global cities to become the first recipient of the Clean Cities International Partner of the Year Award. This award has been confirmed by the US Department of Energy for the progressive and the successful implementation of the CNG transport programme in the capital. Delhi, in fact, today has the largest eco-friendly CNG fleet in the world and the highest number of CNG vehicles operated on the road.

Compressed Natural Gas (CNG) is used as a fuel for vehicles, typically compressed up to 20,000 kPa in the gaseous state. IS 15320, the Indian Standard on 'Natural Gas-Designation of the Quality of Natural Gas for Use as a Compressed Fuel for Vehicles' is identical with ISO 15403 and has been adopted by the Bureau of Indian Standards. The aim of this standard is to provide manufacturers, vehicle operators, fuelling station operators and others involved in the compressed-natural-gas vehicle industry with information on the fuel quality for natural gas vehicles (NGVs) required to develop and operate compressed-natural-gas vehicle equipment successfully. Fuel meeting the requirements of this Standard should: a) provide for the safe operation of the vehicle and associated equipment needed for its fuelling and maintenance; b) protect the fuel system from the detrimental effects of corrosion, poisoning, and liquid or solid deposition; c) provide satisfactory vehicle performance under any and all conditions of climate and driving demands. Some aspects of this standard may also be applicable for the use of natural gas in stationary combustion engines.

The single most important safety requirement of CNG fuel is a very low water dew-point temperature to preclude the formation of liquid water at any time. Liquid water is a precursor to the formation of corrosive compounds through combination with components in natural gas, namely, carbon dioxide and hydrogen sulphide. The combination of corrosive agents, and the pressure cycling, caused by fuel consumption and subsequent refilling of the fuel storage container, can result in crack growth in metals and ultimate damage and failure. Also, liquid water itself can be detrimental as it may cause blockages, both liquid and solid, in the fuel system.

While hydrocarbon components contained in natural gas normally remain in the gaseous state in local distribution systems, the pressures and temperatures experienced by CNG may cause condensation. Changes in fuel composition due to revaporization of this liquid condensate at reduced tank pressures may affect the vehicle performance unless a self-adaptive system is applied.

Knock resistance of natural gas changes with composition. Methane is the major component of natural gas, and has a high knock resistance. Increasing amounts of heavier hydrocarbons like ethane and propane lower the fuel knock resistance. Calculation of methane number can be done from the gas composition analysis given in the standard.

Source : Standards India, Vol. 17, No.4, July 2003

Reasons for Serious Building Damage in Taiwan by Earthquake in 1999

1. Very high peak ground acceleration and peak ground velocity.
2. There is a standard structural system for fundamental schools, middle schools, high schools and street-front buildings.
3. Earthquake resistance is very strong in Y-direction and weak in X-direction.
4. Most of the low-rise RC buildings in disaster area failed in X-direction with an unique mode, i.e. strong beam and weak column.
5. Improper shear wall layout.
6. Bad construction quality.

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World Water Forum (WWF)

The 3rd WWF held in Japan from 16-23 March, 2003 closed with a declaration promising to make water issues a top priority among Governments. The following is a summary of the ministerial declaration adopted at Kyoto.

- Access to clean water is essential for sustainable development and the eradication of poverty and hunger.
- Doubling of the spending on water infrastructure in developing countries.

- Increased private-sector participation and public private partnerships (PPP) to tackle water issues.
- Devise integrated water-resources management plans by 2005, and to assist developing countries.
- Far more investment in water supply and sanitation is needed to halve the proportion of people without access to safe drinking water and basic sanitation by 2015.
- Collective efforts should be redoubled to mobilize financial and technical resources, both public and private, to achieve the goals.
- Effective and equitable management of water is required to eradicate poverty in rural areas.
- On-farm water management should be improved via innovative investment, research and development, and cooperation.
- Better legislative frameworks are necessary to protect water resources and prevent water pollution.
- Land-use regulations, disaster-warning systems and national risk-management systems are needed to limit the impact of floods and droughts.
- Data and knowledge should be shared between countries to minimise disaster damage.

International Commission on Irrigation & Drainage (ICID) having its secretariat in New Delhi, played a key role in sessions on “Agriculture, Food & Water”. “Integrated Water Resources Development and Management” (IWRDM) and on “Dams and Sustainable Development”. Some of the recommendations from various WWF sessions are as follows:

- Watershed is the meeting point or the interface between climatology & hydrogeology/hydrology. Watershed management should, therefore, be given priority to mitigate the effects harsh climatic patterns expected in next few years.
- Women play an important role in watershed management and in IWRDM.
- Particular attention should be given, in irrigation investment strategies, to pro-poor, affordable irrigation systems to effectively impact poverty reduction and food security in small rural communities.
- Substantive additional investments are needed for the rehabilitation and modernisation of existing irrigation systems and, where possible, new water resources development. Appropriate financing mechanisms should be established, together with an enabling environment for private investments in irrigation.
- *Dams are central for providing irrigation to augment worldwide food supplies. Many countries in the developing world still need to build new dams. They should evolve appropriate decision making procedures to enhance social and environmental benefits, while minimising the adverse impacts to acceptable level.*
- Increase area under agriculture by reclaiming wastelands, wherever possible. Increase area under irrigation by creating new storages especially in Africa and Asia. Also, enlarge irrigated areas through savings from increased water use efficiency and by recycling of waste-water.
- Adopt better and effective watershed management approach for rain-fed areas of the world.

Source: ICID Newsletter

Healing Energies of Water by Charlie Kyrie

Of course, we all know about the benefits of drinking water, eight glasses a day and so on. We all know about how our bodies are like any other finely-lubed machines which need to be constantly hydrated. But not many of us are aware of a few interesting facts.

- Did you know that sufficient hydration keeps our cognitive thinking clear and our reflexes fast? That's because three-quarters of our brains are water and if we shorten the supply, we dull our senses. Our muscles need water, but so does our brain.
- Water is a miracle cure and helps flush out toxins. Now that's obvious enough.
- But did you know studies have shown that good hydration helps to prevent exercise-induced asthma, and reduces the risk of kidney stones, bladder cancer, heart attacks and even strokes?
- Water deficit can lead to fatigue. Water constitutes 75% of your body, so even a slight shortage causes a serious deficit in your energy levels. An insufficient amount of water in your system causes a reduction in your blood volume, which means less oxygen gets to your working muscles.

Charlie Kyrie in *The Healing Energies of Water* explains that a 2% loss in the water surrounding your cells can mean a 20% decrease in energy levels.

In fact, some naturopaths and experts believe that staying well-hydrated contributes to long term high-energy by helping relieve body aches, constipation, indigestion, ulcers and stress.

- There are actual signs of dehydration - clammy hands, headache, nausea, fatigue and even a light-headed feeling while moving from a lying or sitting position to standing up.

Handy Hints:

- Drink two glasses of water first thing in the morning. It makes you feel great and it helps cleanse the kidneys and detox your system.
- Here's a tip from Dr. Bermanghelidj's book *Your Body's Many Cries for Water*. He recommends that you should drink at least half your body weight in ounces daily. So, if you weigh 140 pounds, then you should drink 70 ounces of water daily. No need to go around measuring that accurately, one gulp equals one ounce. So, the benchmark of a minimum of eight glasses a day, is more or less a good one.
- Avoid coffee and tea.
- Don't confuse hunger with thirst. Figure out what your body is craving for, drink a glass of water if you think you are hungry and see how you feel.
- If you must drink, then drink a glass of water with every glass of alcohol, to at least balance out the dehydrating effects of alcohol.

(Filtered Ganges water above Rishikesh in the Himalayan State Uttaranchal, India has additional medicinal qualities).

Source: Indian Express, July 6, 2003

Follow your Dream with Faith & Hope

Once there were three trees on a hill. They often discussed their hopes and dreams. The first tree said: "someday I hope to be a treasure chest. I could be filled with gold, silver and precious gems. I could be decorated with intricate carving and everyone would see my beauty."

The second tree said: "Someday I will be a mighty ship and I will take kings and queens across the waters and sail to the corners of the world. Everyone will feel safe during the journey because of the strength of my hull."

The third tree said: "I want to grow to be the tallest and straightest tree in the forest. People will see me on top of the hill and will think how close I am to God and the heavens. I will be the greatest tree of all time and people will always remember me."

A few years later, a group of woodsmen came upon the trees. Looking at the first tree, one woodsman said: "This looks like a strong tree, I think I should be able to sell the wood to a carpenter," and he began cutting it down. The tree was happy, because he knew that the carpenter would make him into a treasure chest.

At the second tree the woodsman said: "This looks like a strong tree, I should be able to sell it to the shipyard." The second tree was happy because he knew he was on his way to becoming a mighty ship.

When the woodsmen came upon the third tree, the tree was dismayed because if they cut him down, he would never realise his dream. The woodsmen said: "I don't need anything special, so I'll take this one," and he cut it down.

From the first tree, the carpenters made a feedbox for animals which was placed in a barn and filled with hay. The second tree was used to make a small fishing boat. His dreams of being a mighty ship carrying royalty were dashed to the ground. The third tree was cut into large pieces and stored in a dark place.

Years went by and the trees forgot about their dreams. Then one day, a man and a woman came to the barn. The woman gave birth and they placed the baby on the hay in the feed box made from the first tree which they found in the manger. The tree realised he was cradling the greatest treasure of all time.

Years later, a group of men set off in the fishing boat made from the second tree. One of them was tired and fell asleep. Soon a great storm arose and the tree didn't think it was strong enough to keep the men safe. The men roused the sleeping man awake and he stood up and said "Peace" and the storm stopped. The second tree (now a boat) knew now that he had carried the King of Kings across the waters.

Finally, someone came and got the third tree. It was carried through the streets and people mocked at the man who was carrying it. When they stopped, the man was nailed to the tree (now shaped like a cross) and was raised in the air to die at the top of a hill. The third tree came to realise that it was strong enough to stand at the top of the hill and was as close to God as was possible, because Jesus had been crucified on it.

So when things don't seem to be going your way, always know that God has a plan for you. If you place your trust in Him, He will give you great gifts.

Each of the trees got what they wanted, though not in the way they had imagined. We don't always know what god's plans are for us. Even if His ways are not our ways, they are always the best.

Source: The Speaking Tree, The Times of India, Nov. 29, 2003