Journal of Rock Mechanics & Tunnelling Technology (JRMTT)
20 (1) 2014 pp 3-4

Available online at www.isrmtt.com

Guest Editorial

Tunnelling has come of age in India. In past one decade or so, it has well and truly spread its tentacles much beyond the water sector it was largely confined to till not so long ago. As the infrastructure juggernaut continues to roll on in India, it was only a matter of time before tunnelling was accorded a greater attention in the country than it ever got earlier.

As Indian Society for Rock Mechanics and Tunnelling Technology (ISRMTT) has completed more than two decades of its vibrant existence, it is only natural to reflect on its achievements and how it has contributed to the growth of rock mechanics and tunnelling technology in India. It is, however, also important to look ahead and focus firmly on the direction tunnelling is expected to take in the country and the role that rock mechanics will play. But first, let us dwell upon, albeit briefly, on the current infrastructure scenario in the country.

In the current 5-year plan, the government is planning to almost double the investments in infrastructure to over 50 trillion Rupees. However, as the experience during the previous 5-year plans has shown, there are barriers in achieving these investment targets. The situation is further compounded by global economic slowdown. But, on the positive side, this kind of investment in infrastructure has the potential to transform the economy and put India's once famous growth story firmly back on track. The numbers pertaining to the projected investments are startling and enough to pop world's eyes out. The world is eying India for her impressive growth plans across sectors – power, railways, highways, ports, airports, water, oil & gas, telecom and storage.

One can go on and on to eulogize India's potential for growth and staggering investment plans in infrastructure but the ground reality is that the physical achievements may not match these impressive investment targets due to a multiplicity of roadblocks. We all have to play a role in trying to remove these roadblocks. Tunnelling is a small but significant part of the infrastructure growth plan and, with over 3000 km of tunnelling being planned across various sectors, we are looking at a substantial involvement of all of us in the tunnelling projects. It is here that we can contribute our mite to mitigation of some significant barriers that confront the growth of tunnelling in the country. Let us then first briefly examine these barriers before going on to discuss the trends in tunnelling and the direction this sector is expected to take.

Despite decades of experience of tunnelling and some technological advancement, the approach and mindset towards tunnelling remains essentially static except within a few progressive organizations. This gap in application of best practises thus continues to create problems across all stages of projects – right from investigations, through design, construction and into operation. Barriers to tunnelling exist both in technical and non-technical domains. Some of the significant barriers on the technical front are lack of well-planned geological investigations, lack of attention to monitoring by field instrumentation and probing ahead of the tunnel face, lack of confidence in some quarters in the use of Tunnel Boring Machines especially in the Himalayas, reluctance to use modern technology, lack of freedom to the designers to ask better and more inputs from investigation and to interact more closely with construction people during implementation of design etc.

Some of the non-technical barriers are disputed risk ownership, lack of timely and effective decision making, lack of flexibility in contractual arrangements, practice of "bait-&-switch", award of contract

to the lowest bidder, inadequate attention to employing suitable equipment, lack of "up-front" work by owner as preparation for the project, and long permitting processes.

As we look ahead at an exciting future for tunnelling in the country, these barriers need to be addressed in order to be able to translate the huge growth plans into actual physical achievements and, as mentioned earlier, the tunnelling and rock mechanics community has to play a greater role in removal of these barriers. Obviously, there are significant gaps evident between Indian and international practices for various stages of tunnelling projects. These gaps have to be identified and lessons need to be learnt from the best practices and implemented in the country.

Fortunately, a start has been made towards better tunnelling practices, although not in a coherent way, as indicated by recent adoption of some new technologies which also point towards the direction that tunnelling can take in this country in coming years. One of the most significant developments has been the use of Tunnel Boring Machines (TBM). While the TBMs have been used in India with success in Metro projects (Delhi, Bangalore, Chennai), their applicability in the long & deep tunnels in the Himalayas was always riddled with doubts, owing to their failures at almost all projects in the Himalayas in recent past. This perception is changing now with impressive TBM performance being reported from an ongoing tunnel project and with plans to deploy TBMs for some other projects in the Himalayas.

Apart from the increased use of TBMs for deep rock tunnels, some other significant tunnelling practices have been adopted that are here to stay. Largely driven by the modern railway and highway tunnels, the industry is moving towards improvements in tunnel liners and water proofing systems. Modern support systems, such as, pre-cast segmental liners, special dowels, fibre reinforced shotcrete, new types of rock bolts, lattice girders etc. are being used more regularly than before. Same is the case with the more frequent adoption of techniques for face and roof stability in poor grounds, such as fibre glass elements, pipe roof umbrella etc. To a large extent, this change has been driven by the modern tunnel design approach brought in by international design consultants, especially in the transportation sector. A stricter adherence to NATM approach and, therefore, to regular tunnel monitoring regime is also seen, again as a result of the effect of globalization.

As the coming years are likely to see growth in number, scale and difficulty of tunnel projects, the trends mentioned above can only gain further ground. It is also expected that some newer technologies will also see more application, such as, electronic detonator for blasting to facilitate larger round lengths while reducing vibration and overbreaks, mechanized shaft sinking for faster construction, robotic segment erectors for installing segmental lining, real-time profile control for excavators and shotcrete application. Besides these, it is expected that the use of TBMs, specially tailored to meet with the challenges of the difficult Himalayan ground conditions, will increase.

Thus, while significant shortcomings exist and will continue to exist in our current approach to tunnelling, the future is still exciting if the trends are any indication. Those of us from the rock mechanics fraternity who are associated with tunnelling will have a greater role to play, especially in the areas related to excavation and support systems, both in the design and construction stages, if the real benefits of the huge planned investments in tunnel projects are to be realized on ground.

- Dr. Manoj Verman
Vice President at Large
International Society for Rock Mechanics (ISRM)
(http://www.isrm.net/gca/index.php?id=1062)
and
Technical Director, Geodata Engineering