

# NEED FOR INNOVATIONS IN ROAD CONSTRUCTION

Road infrastructure projects account for huge public investments and are expected to provide services for very long periods of time. Their utility normally spans several generations during which society is bound to experience dramatic changes. This lengthy time span means that future developments in the transport of people and goods must be assessed and planned well in advance, not only for today, but also for tomorrow. The Government has set ambitious plan of building 20 km of National Highways a day. To achieve this target, it would not only need quicker mechanism and award process, but also advanced and innovative technology to expedite the project execution.

The combination of regular increase in traffic volumes and axle loads is speeding up developments like congestion, wear and tear of vehicles and structures, air pollution and noise emissions. This evolution is going on at a fast pace, in any case faster than over the past twenty years. It is, thus, our responsibility to initiate innovative changes and advancements today, so that future roads will continue to meet our growing transport needs, in a safer, more effective and comfortable way. These long term perspectives would require development of new concepts for high quality, cost-effective, low noise, environmentally friendly, safer, risk mitigating and low maintenance road infrastructure. Thanks to a strong presence of international players, India today has got access to high-end technology.

To achieve these ambitious goals, the industry must become more innovative and move faster towards redesigning existing concepts. This will, however, require significant efforts in the field of research and development. In this context and without minimizing the importance of other new materials/techniques, special attention could be considered to be given by all stakeholders, particularly in the areas as below;

- New age binder design technologies.

- Integrated models of urban roads design.
- Asset management tools.
- Modular prefabricated construction.
- Bridge eco-assessment.
- Optimizing tyre-road interaction.
- Energy controlled pavements.
- Non-Conventional Material
- Rehabilitation of existing assets.

Nevertheless, future research on infrastructure must be focussed on four main social questions/demands. These are: Reliability, Green, Safety & Security and Human-friendliness. It is a common knowledge that the road engineering sector, particularly in India, does not have the appeal of the most sparkling innovative industry. Through incremental upgrades, the sector has, somehow, managed to improve the performance of road infrastructure and meet the growing road transport demands over the last few decades. However, the complexity of problems requiring solutions is growing. Due to the complexity of infrastructure projects, existing concepts and testing facilities will no longer be able to generate adequate solutions in the long run. A new generation of problems requires a new generation of approaches, to face the future with confidence. In any case, whole-hearted co-operation of the stakeholders and governmental support are the key factors to success.

The State-of-the-Art reviews conducted in the developed countries have demonstrated the typical trends of innovative road construction, rehabilitation and maintenance techniques utilizing up-to-date scientific achievements. These reviews have suggested; the use of high quality basic materials with special treatment, wider use of recycling of bound pavement structural layers in order to reduce the need of primary basic materials, giving priority to low-energy pavement structural constituents to cope with the ever

increasing energy prices and the limited availability of crude oil supplies, wider use of industrial by-products in pavement without jeopardizing the performance of pavement and development of special measures for enhancing safety on roads.

The tests and specifications, which are applicable for conventional materials, may be inappropriate for evaluation of the new materials as their material properties may differ substantially from those of the conventional materials. It is essential that relevant tests and specifications be devised for the acceptability of new materials and technologies. This would ensure a desirable level of performance of the chosen new material, in terms of its permeability, volume stability, strength, hardness, toughness, fatigue, durability, shape, viscosity, specific gravity, purity, safety, temperature susceptibility etc., whichever are applicable for use in the pavement.

High-performance innovative materials for bridges and bridge components would give designers the flexibility to create unique, light structural shapes and which could be conveniently installed. Nevertheless, some minimum technical criteria, as outlined below, would have to be satisfied to judge which of these new construction materials would be better alternatives to conventional material;

- What is the material's ultimate strength?
- How durable is it?
- How do they extend or constrain the serviceable life of the overall structure? and
- If the new materials meet these technical requirements, the final criterion is cost: Which material provides the lowest-cost facility?

Improved techniques for bridge design, construction, bearings, joint systems, maintenance and field performance would be essential in providing the most economical structure. Cutting-edge research in new materials, advanced smart sensing and life-cycle management would provide the technology needed to construct more durable, maintenance free structures and to extend the life of older structures.

Adoption of latest technologies in construction equipment would lead to significant efficiency gains, enhance labour productivity and would also dramatically reduce time and cost overruns currently witnessed in the sector. As per new initiatives of the Government, the project sizes would get bigger, complex and so would be their demand for project specific equipment and machinery. Construction machinery performs multiple tasks. With the current focus on environment, most of the construction machinery should be improvised and geared up to perform with less noise, less vibration and low emissions besides, comfortable and efficient operation.

Besides the above suggested innovations, traffic disruptions, especially during construction, are a common sight on the roads in our country. Our already overstressed road network is not very resilient. Thus, disruptions of any sort, such as lane and road closures, particularly in major metropolitan cities and on key routes, cause massive traffic snarls. There is an urgent need to develop innovative measures to keep traffic moving during construction.

Durable and reliable infrastructure, available at socially acceptable costs, with low maintenance and quick rehabilitation techniques are the expectations of the people to-day. For meeting these expectations, the common empirical research approach is too time-consuming to respond to the intensity of new social demands. Increasingly, research has to cross the boundaries into the world of physics, chemistry and biology and apply the technologies to discover the phenomena forcing the degradation of construction technologies and materials. Knowledge and expertise at nanolevel are required to support the objective driven creation of new materials and technologies with pre-defined properties and behaviour.



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