Railways and Metro on Progressive Track

- Metro Projects
- Wagons and Coaches
- Dedicated Freight Corridors
- High Speed Railway
- Port Rail Connectivity
- Sustainability
- Data Analytics and AI
- Station Development
- Vendor Development
I am pleased to present the December 2018 issue of Sampada.

In November 2018, among other activities at the Chamber, we organised a major conference titled—

‘MahaConference on Railways and Metro’.

I am thankful to Hon’ble Shri Piyush Goyal, Minister for Railways and Coal—Government of India, for agreeing to send a very high powered delegation of 18 senior officials from Railways led by Shri Rajeev Agarwal—Member, Rolling Stock, Railway Board, to address the members of MCCIA at the MahaConference.

MahaConference brought several interesting insights to our members in the form of Dedicated Freight Corridors, High Speed Railways, Marathwada Coach Factory, Data Analytics, Station Development, Energy Efficiency and Waste Management, and of course the Metro Projects being implemented by MahaMetro and PMRDA in Pune region.

The Government of Maharashtra was represented by Cabinet Minister, Hon. Shri Sambhaji Patil Nilangekar who is also guardian Minister for Latur, where the Marathwada Coach Factory would be located.

At this conference, the district collector of Latur, Shri G. Shrikant, announced a red carpet for members of the Chamber to explore business opportunities as the Marathwada Coach Factory would also require ancillary units in the proximity.

Given the encouraging participation of our members and noting their requests, we have decided to dedicate this issue of Sampada to “Railways and Metro”. It includes a comprehensive report on the day’s proceedings as well as interesting articles highlighting the planned and proposed developments in the Railways and Metro sector. We hope that this month’s issue will be a collector’s edition for some of our members with interests in railways business, as it is packed with facts, insights and opinions of a few stakeholders who matter.

As the issue goes to print, we have just concluded our conclave on “Innovation” that focused on Industry-Academia collaborations. We intend to focus on the theme of “Innovations” in the next issue of Sampada to be published in the first half of January 2019.

If you have any feedback on this issue or suggestions for future ones, please feel free to write to us at sampada@mcciapune.com.

Let me wish you season’s greetings and a great New Year ahead full of business prospects!

With warm regards,
Prashant Girbane
Director General, MCCIA and Editor, Sampada
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Maharashtra is one of the important railway centres. Pune – Mumbai is one of the busiest routes in the Indian railway network. It is also a gateway to South, Central, Konkan and Western Railway Divisions. Indian Railways has important establishments in Mumbai and other parts of Maharashtra.

MCCIA believes that if SMEs are made aware about the enormous opportunities in partnering metro and railway projects in Maharashtra and other states of India, then these companies can support Government of India’s Make in India initiative.

The Mahaconference on Metro and Railways: Transforming India’s Transport sector was organised on 3rd November 2018 that attracted many stakeholders that included Indian Railways, CEOs, politicians, bureaucrats, members and officials from MCCIA, and the press. The focus of the conference was on the following:

- Rail coach factory at Latur and other coach factories in India.
- Station development initiative at 400 railway stations in India.
- Dedicated freight corridors in India (including proposed Indore-Manmad corridor).
- Electrification of rail lines.
- Use of analytics and artificial intelligence in further improving the efficiency of Railways.
- Metro Projects in Mumbai, Pune and Nagpur as well as other cities in India.
- Use of renewable energy in railways and at railway stations.
- Development of vendors for various projects of Ministry of Railways and its different undertakings.
- Station development initiative of the Railways.
- High Speed Railways in the country.

The inaugural session started with Shri Ravi Pandit, past President, MCCIA, delivering the welcome address in which he highlighted the modernisation of the Indian Railways and the opportunities for business.

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particularly Pune Metro and the proposed Hyperloop. **Shri Rajesh Agarwal**, Member, Rolling Stock, Railway Board spoke about collaborative development for sustained prosperity between industry chambers and Indian Railways. He was appreciative of role of MCCIA. He highlighted the host of initiatives taken by Indian Railways in modernising the Indian Railways, which is the economic lifeline of India. He made an interesting presentation on the Modern Coach Factory at Rae Bareli and the business opportunities for SMEs.

The Modern Coach Factory is a rail coach manufacturing unit at Lalganj near Rae Bareli in Uttar Pradesh. The factory produces railway compartments. It has been set up at a cost of about Rs. 3192 cr. to produce state of the art, stainless steel coaches (LHB type) with an annual capacity of 1000 coaches.

Excerpts:

Shri Sambhaji Patil Nilangekar spoke about the challenges of implementing various projects and the progressive policies of his government. He said Osmanabad has been termed as an ‘Aspirational district’ by the Central Government. Aspirational districts are being seen as the most backward districts in India with very little development or progress. The central and state governments are taking special efforts to improve the socio-economic status of these districts. The setting up of the Indian Railway’s coach factory at Latur is a step in that direction. This would create an ecosystem of socio-economic development.

Shri G. Shreekant, the dynamic and bright young collector, made an impassioned plea to the business community to consider investing in Latur. He spoke about the strategic importance of Latur, which has an increasing educated and talented pool of engineers. There is air, road and rail connectivity with other important cities and a dry port that will be linked to JNPT. He emphatically mentioned that there was no shortage of water in Latur. He welcomed SMEs to come and set up manufacturing facilities in Latur.

Metro projects in Pune region.

Speakers: **Shri Shrikant Limaye**, Technical advisor and member of the expert group, Pune Metro railway project and **Shri Sven De Watcher**, Managing Director, Involute Technologies.

Excerpts:

Pune Metro project has been undertaken by MAHA Metro, a SPV (Special Purpose Vehicle) of the Government of India and Government of Maharashtra. It will be safe, reliable, efficient, affordable, commuter friendly and environmentally sustainable rapid public transport system for the Pune Metro Region.
The unique features of the Pune Metro include
- State-of-the-art station development and world class multimodal integration
- Feeder bus services and citizens can use Metro access foot over bridges equipped with lifts and escalators.
- There would be bicycle schemes at metro stations and parking spaces for two wheelers in the vicinity of at least every alternate metro station.
- There would be a common mobility card
- Large scale use of solar energy

This will reduce traffic congestion, improve air quality, reduce accidents and provide faster travel time.

Freight corridors
Speakers: Shri Rajiv Tyagi, CPM, Dedicated Freight Corridor Corporation and Shri Arvind Bhatnagar, Advisor-Transport, Indian Port Railway Corporation.
Excerpts: The Indian Railways’ quadrilateral linking the four metropolitan cities of Delhi, Mumbai, Chennai and Kolkata. The Dedicated Freight Corridor Corporation of India (DFCCIL) has been set up to undertake planning and development, mobilisation of financial resources and construction, maintenance and operation of the Dedicated Freight Corridors. The dedicated freight corridors will help in decongestion of highways, create employment opportunities, boost Make In India and create industrial hubs.

Dedicated Freight Corridors are proposed to adopt world class and state-of-the-art technology. Significant improvement is to be made in the existing carrying capacity by modifying basic design which will allow longer and heavier trains to ply on the Dedicated Freight Corridors.

There are a lot of business opportunities for construction equipment and machinery, and manufacturing industry, setting up of logistics parks and economic zones on the pattern of DMIDC.

The Indian Port Railway Corporation
India is one of the fastest growing large economies in the world. Approximately 95% of India’s merchandise trade (by volume) passes through sea ports. Many ports in India are evolving into specialised centres of economic activities and services and are vital to sustain future economic growth of the country such as JNPT, Mundra Port, Sikka Port, Hazira Port, etc. The Indian Port Rail Corporation was set up as a SPV in order to execute the last mile connectivity, rail connectivity and internal rail projects of the major ports more effectively and efficiently.

However, Indian ports still have to address infrastructural and operational challenges. The last mile connectivity to ports is one of the major constraints in smooth movement of cargo to/from the hinterland. Around 87% of Indian freight uses either road or rail for transportation of goods. A significant share of this cargo experiences “idle time” during its transit to the ports due to capacity constraints on highways and railway lines connecting ports to production and consumption centres.
High Speed Railways and Station Development

Speakers: Shri Vijay Kumar, Director, National High Speed Rail Corporation, Shri Brijesh Dixit General Manager (Depot), NHSCRCL, Shri Vivek Bhushan Sood, General Manager (Civil), Indian Railway Station Development Corporation.

Excerpts:
The National High Speed Rail Corporation Limited (NHSRCL) is implementing the high speed train corridor between Ahmedabad and Mumbai. The total length of the proposed High Speed Railway Corridor is 508.17km and will pass through Maharashtra and Gujarat and Dadra and Nagar Haveli. Starting from Bandra Kurla Complex in Mumbai, it will end near Sabarmati Railway Station in Ahmedabad. NHSRCL is planning 15 such corridors in India.

The Mumbai-Ahmedabad high speed rail corridor would be developed using Japanese high speed rail technologies (Shinkansen system). Both Japan and India signed an agreement under which there would be business alliances between the companies of both nations for transfer of technology and 'Make in India'. It would include joint ventures between Indian and Japanese firms manufacturing in India, equity participation by Japanese firms in Indian firms manufacturing in India, Japanese firms would manufacture in India and transfer of technology to Indian firms manufacturing in India.

Station Development

Seven CS Indian Railway Station Development Corporation is a 'Nodal Agency' for station development programme. The main objectives are to develop/re-develop the existing or new railway stations of world class standard. Railway stations should become sources of income and revenue. IRDSDC has envisaged an investment of 1 lakh crore for 400 railway stations. The focus of stations would be 7Cs.

The parameters for setting up world class stations are
- Iconic structure
- Arrival and departure segregation
- Plan for 40 years
- Multi modal transit hub
- Integrating both sides of the city
- Enhancing passenger delight
- Energy efficient
- Disabled friendly

The stations in Maharashtra include Mumbai Central, Parel, Andheri, Dadar, Borivali, Shivaji nagar, Pune Central, Bhusaval, Nasik, Nagpur, Lokmanya Tilak Terminus and Solapur.

Sustainability

Speakers: Shri Shalabh Goel, Executive Director, Electrical Energy Management and Shri Shivendra Mohan, Executive Director, Mechanical Engineering

Excerpts:
Renewable energy in the Indian Railways

Indian Railways account for close to 1.8 per cent of the country's total electricity consumption and has been increasing over the years. Indian Railways has developed a long-term Energy Efficiency and Conservation Programme. The programme aims at progressively introducing a number of energy efficient technologies and measures in the railway system. Indian Railways has been taking steps towards energy efficiency and has been reducing its specific electricity consumption in both traction and non-traction areas.

Indian Railways has committed itself to the cause of reducing carbon emission by adopting renewable energy on priority. Solar panels on rooftop of coaches for train lighting system in four narrow gauge coaches have been initiated on a trial basis.

As part of the Intended Nationally Determined Contributions (INDC), the
ministry has set a target of 33% emission intensity reduction. The INDC was ratified by India and has officially mandated target of activities for meeting its INDC commitments for 2030.

**Waste management**

The Ministry of Railways has created an Environment Directorate in the Railway board. The initiatives include

- Prompt disposal of waste arising out of catering services at stations and in trains.
- Separate dustbins for dry waste and wet waste to enable segregation.
- Setting up solid waste management facilities including segregation and waste processing methods including composting, vermi-composting, bio-methanation for bio-degradable waste and recycling of recyclable waste.
- Pilot project for disposal of municipal solid waste (MSW) generated at railway terminals in an environment friendly manner, including conversion of waste to energy

**Integrated Solid Waste Management (ISWM)** is a strategic approach to manage MSW in a sustainable manner by considering all aspects of MSWM viz. generation, segregation, transfer, sorting, treatment, recovery and disposal in an integrated manner, with an emphasis on maximising resource use efficiency.

Two pilot plants are being set up for environment friendly disposal of complete Municipal Solid Waste (MSW) including conversion of bio-degradable 'Waste to Energy' (bio-methanation) at Jaipur and New Delhi railway stations.

**Data analytics and Artificial Intelligence**

Speakers: **Shri Vinod Bhatia**, General Manager, Centre for Railway Information Systems (CRIS), **Shri Sameer Dixit**, Persistent Systems

Excerpts:

The Centre for Railway Information systems has been actively working on various initiatives using data analytics and artificial intelligence in the areas of
passenger information systems, automatic vehicle location, automated fare collection and automated passenger counting.

Automated fare collection will include using ticket vending machine, smart card that provides access to all types of transit services across multiple operating agencies. AFC Analytics provides details of passengers using systems and identify trends and help improve the services.

Automated passenger counting includes tracking of the number of passengers boarding de-boarding each vehicle on a particular station. Prediction of increase in passengers using historical data and identifying peak hours in the day and peak months in a year. This will help in providing better services and in seeking insights on ridership trends.

Vendor development

Speakers: Shri A. K. Srivastava, Additional Director General, Research Design and Standards Organisation, Shri H. K. Raghu, Executive Director, Research Design and Standards Organisation, Shri Sachin Dighde, Director (QA), Research Design and Standards Organisation

Excerpts:

Research Design and Standards Organisation (RDSO) is an ISO 9001 research and development organisation under the Ministry of Railways and functions as the technical advisor to the Railway Board Zonal Railways and Production Units and is responsible for the following:

- Development of new and improved designs
- Development, adoption, absorption of new technology for use on Indian Railways
- Development of standards for materials and products specially needed by Indian Railways
- Technical investigation, statutory clearances, testing and providing consultancy services.
- Inspection of critical and safety items of rolling stock, locomotives, signalling and telecommunication equipment and track components.

There is a new Online Vendor Registration System for providing business opportunities for SMEs. The entire process online is simple and user friendly. The vendor can now deposit registration fee, submit documents, download technical drawings and specifications and interact with RDSO online. At each stage, the vendor would get a system-generated alert / acknowledgment regarding the status of his case with details.

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Glimpses of Pune Metro
Rational choices for Metro traction
Jaideep Srivastava

Kolkata Metro, planned way back in 70’s, works on 750 V Third Rail DC traction (750TR) that has also been adopted in its new sections (including East West link under KMRCL). Delhi Metro adopted 25 kV AC that has been replicated in other Metros like Chennai, Hyderabad, and Lucknow. In Kochi, Bangalore and Ahmedabad metro 750 V third rail system has been adopted. There are differing views regarding the choice between these two options, with compelling arguments for both. This issue has been quantitatively examined for a case restricted to lines with 1-1.5 km inter station distance and suburban operations with higher inter- station distances are not covered. Presumptions for comparative assessment include section length of 30 km, 6 car Metro Rolling stock, 30 kmph average speed, average substation spacing of 15 km and peak current of 120A for the 25 kV AC overhead supply and 1km/ 4000 A values for the third rail supply. Various other elated factors are also listed. 1500 Volt DC third rail has been used in Guangzhou Metro line 4 & 5 and Shenzhen Metro. In this the current and number of substations will reduce to half that in 750TR, reducing the I’Rt losses and the capital cost.

The main argument in favour of third rail is that it is maintenance free, better aesthetics no requirement of neutral section and no infringement with HV overhead crossing over metro corridor; for 25 kV AC having better regeneration capability are factored besides capability of handling higher PHPDT. However for achieving higher PHPDT inter distance of TSS has to be reduced besides increase in power rating of TSS which will be needed in 750TR system as well. 25 kV AC is maintenance intensive because of regular OHE attention.

Capital costs
For 750TR significant reduction in construction cost of tunnels and via ducts occurs with tunnel diameter at 5.2 m instead of 5.8 m in 25 kV (for standard gauge); there is increase in excavated earth by 13.7% and surface area of tunnel by 10.7% in 25kV.

Other aspects of 750 TR
The initial capital cost of 750TR traction is higher. A CAPEX comparison for alternatives is needed. The cost of electrification on via duct is taken as Rs 9.5 Cr per km for 25 kV which will be escalated to Rs 11 Cr in case of 10 km TSS distance for catering to 80000 PHPDT. Electrification cost in Kochi metro which is on 750 TR is around Rs 11.1 Cr per km with transformer-rectifier unit at average inter spacing of 2 km traction substation in a 25-km section. The cost of one substation in 750 TR system is around Rs 3.8 Cr with transformer-rectifier unit. Taking civil engineering costs into consideration, a Rs 5 Cr per substation cost can be assumed. The cost differential of four-quadrant substation is around 20% vis-
à-vis diode-rectifier unit, and an outlay of Rs 6 Cr of one substation with four-quadrant converter can be taken for estimation. With Rs 11.1 Cr per km in Kochi metro, the same cost should be escalated to around Rs 14.26 Cr per km with four quadrant substations with a substation spacing of 1 km for catering to 80000 PHPDT.

In Kochi Metro, rolling stock cost is Rs 7.5 Cr per coach but Rs 9.9 Cr in Chennai metro. The comparison of cost in different tenders is not accurate as specifications and other leading parameters differ. A correct way for comparison would be to compare the costs of both types, moderating parameters in the specifications. In the absence of such data, additions and deletion of equipment required to convert one type of coach to the other is the only way to left to arrive at a differential.

25 kV coach cost is higher compared to 750TR due to provision of two major assemblies i.e. transformer-converter in each unit: the cost for 25kV will equal that of 750TR stock plus cost of transformer and converter units. The cost of transformer (in DMRC’s RS-10 contract) is Rs 0.96 Cr and converter-inverter combined cost at Rs 2.68 Cr; Rs 1.34 Cr can be taken as converter cost for estimation. Thus, cost of one transformer-converter cost will be Rs 2.30 Cr per unit over the 750-volt DC stock.

For running trains at 1.5-minute headway in a typical 30 km metro, with average speed of 30 kph, 40 trains of 6 car each will be required. Considering, each train consisting of combination of 1 TC + 1 MC, there will be requirement of three units of transformer + converter unit in a train, generating additional cost of Rs 270 Cr. Total cost of 25 kV AC for a typical 30 km line will be Rs 330 Cr. Total capital cost of 750TR is lower by Rs 170 core (17.5%) besides substantial reduction in tunneling cost.

Replacement Costs

DPR for Nagpur Metro project projects a replacement requirement of 25% of the electrical works after 20 years and 25% after 30 years. Nevertheless, the initial capital cost of 25kV traction system is cheaper but in view of maintenance and replacement, life cycle costing of 25kV shall be higher. India manufacture factor has no significance on adoption of a system.

Regeneration

In 25 kV, the main step-down transformer and converter are both on board whereas in 750TR these two are in the traction substation. In most DC substations, diode rectifier units are used, and effective regeneration can only be achieved when more trains are available in the system to consume regenerated energy as energy cannot be transferred to the grid. For effective regeneration, it is essential to provide separate inverters at stations for feeding back power to the grid, making the system more complex.

However, power can be fed in either direction with use of four quadrant converters at 750TR substations. where four quadrant converters are used in place of diode rectifier unit at substations, there is technically no difference in basic configuration vis-à-vis 25kV AC except for placement of transformer converter unit in coach itself in 25 kV AC system and at substation in 750 TR. Thus, no difference in braking regeneration is envisaged, if four quadrant converters are used at 750TR substations.

Due to longer feeding range from the traction transformer in 25 KV more trains are available in the same subsection to receive regenerated energy. In case of 750TR, the feeding range of each substation is only 1-1.5 km and other trains are not available in the substation range. Hence, even if it is
not possible to feed back the regenerated energy to the grid, system can be made more receptive by a ring main on AC side between different substations. Substations provided with four quadrant converters and connected in ring main shall have the same line receptivity for regeneration as normally achieved in 25 kV.

**Lower tare weight**

In 25 kV, transformer and converter are installed in every motor coach, increasing the tare weight of every unit by approx. 5 t compared to 750TR: resulting in increased passenger carrying capacity, 5-6% less energy consumption on recurring basis and in improved acceleration under 750TR. Saving due to reduction in gross weight may get marginally offset due to higher resistive losses.

Increasing number of motor coaches is one option preferred for achieving higher regeneration and acceleration. In 750TR, it is possible to achieve 100% motoring. However, for 25 kV AC, the number of pantographs increases, enhancing wear and tear of contact wire and the dynamics of current collection becomes complex. There is a possibility of keeping one transformer for two motor coaches but that will reduce redundancy; in case of any failure on HT or transformer, two motor coaches will go out of service simultaneously. There is another option to use 25 kV coupler, but it will be susceptible to failure and always be an area of concern for reliability. Isolation of fault arising out of such HV coupler will be tedious and time consuming especially on via-duct and inside a tunnel.

**Wear and tear and reliability**

In all new 750TR metro systems, aluminum rail cladded with stainless steel top is now used, offering a lower resistivity compared to conventional steel rail. The cladded structure gives a maintenance free life of about 60 years.

25 kV AC is maintenance intensive, requires regular attention and the contact wire needs replacement every 15 years. There is always a possibility of entanglement of a foreign object with OHE causing power supply tripping and pantograph entanglement, with reliability adversely affected in stormy weather. In polluted urban environment, there is regular problem of electric puncturing of insulators and OHE snapping. Regular cleaning of OHE insulators is essential to maintain required stagger, clearance at turn out and tensions in the contact and catenary. OHE Maintenance is possible only using tower wagons and access is always a problem; getting a maintenance block is problematic during daytime. Time generally for breakdown repairs may exceed 2 hours.

On the other hand, reliability of 750TR is extremely good and the system can be maintenance free.

Reliability and maintenance requirement of system should be the most important criteria while deciding choice of traction system.
Resistive(I^2R) losses

There is a general impression that in 750TR line losses are more as current handled are much higher. The technology improvement with Aluminium composite third rail, the losses need to be assessed in both considering peak line currents in the worst-case scenario when the train accelerates from rest to 40 kph of 6000 A in 8 car operations and 4000 A in 6 car operations in 750TR vis-à-vis 180 A and 120 A respectively in 25 kV. It would be more appropriate to consider resistive losses up to on-board transformer assembly in 25 kV AC and up to the substation transformer in 750TR.

Resistive loss differential in both system is not very appreciable and is insignificant as compared to total energy consumption. In 25 kV AC, there will be additional continuous energy loss of approx. 4 kw per motor coach for the entire day because running of blower motor and oil pump motor of on board traction transformer. Keeping in view average running of train for 12 hour, there will be additional energy consumption of 192 kwh per day per train per 8 car train.

Stray current in third rail

Problem of leakage of stray current is due to return current flows back to substation through running rails, with the amount depending on the conductance of return tracks compared to soil and insulation between track and soil. Corrosion occurs when current leaves the structure and enters the soil; it does not occur for reverse flow. The stray current creates or accelerates electrolytic corrosion of metallic structure in proximity of the transit system and corrosion in the nearby metal pipes, earthing grid etc. Standard mitigation measures are available like using a polymer compound in a new Metro. In operational lines, stray current can be controlled through discharge bond provided in civil structures. In 25 kV damage by stray current is of no significance.

Conclusion

The choice of traction system is very critical for any metro key factors for consideration and should be decided based on inter station distance not on PHPDT requirement. 25 kV AC is the most suitable where inter station distance is in range of 3-4 km, t or there is requirement of high speed suburban or main line operation. For metro operation where inter station distance is 1-1.5 km, third rail system is most suitable. No OCS should be used in DC traction owing to higher maintenance and thus defeating the main purpose of highly reliable bulk transit system.

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Indian Railways – Exploring New Technologies

Indian Railways is one of the largest transportation and logistics networks of the world running more than 12000 freight and 7000 passenger trains carrying more than 23 million passengers and 3 million tonnes of freight per day. The network crisscrosses the length and breadth of the country connecting more than 7500 plus stations. Globally, the railways is considered as the most energy efficient mode of transport that offers a sustainable alternative to most other transport modes, both in terms of energy use and carbon emissions per passenger-kilometer or tonne-kilometer. India on its part has pledged in the December 2015 Paris Agreement to substantially increase the modal share of railways in the land-based freight transport from 36 percent to 45 percent in the coming years.

Railways all across the world have witnessed tremendous growth on the technology front. Fast pace developments and accelerated growth in the area of high speed operation, advanced signaling systems, superior track structure, advanced and reliable communication systems, automated inspection systems, use of Artificial Intelligence, Machine Learning, Internet-of-Things based technologies and smart algorithms for condition monitoring of rolling stock and railway infrastructure including track health, bridge health, signaling gear etc. have revolutionized this domain and has helped railways leapfrog to a much technically advanced, intelligent and Smart transportation and logistics platform offering better reliability, improved safety and better services to the customer in the form of passenger comfort and travel experience.

Indian Railways, with the kind of its size in terms of assets and the traffic pattern it handles, has lagged behind other railway systems of the world in the area of technological advancement and augmentation of capacities to keep pace with the growing demand and expectations of the customers. This has resulted in a scenario where 65 percent of the sections on the network have become over-saturated and are running at more than 100 percent of their designed capacity leading to severe network congestion. Focus is therefore on network decongestion and setting up of dedicated freight corridors is a step in that direction.

Under the present leadership, Indian Railways has received an all-time-high allocation as a part of massive push to modernize and upgrade the IR infrastructure. There is a huge focus on
building capacities and modernizing the Indian Railway infrastructure to make it a safe, reliable, fast and passenger friendly mode of transport. The sector is currently going through a major transformation in virtually all sectors of operation, be it modernization and upgradation of rolling stock, signaling systems, semi-high speed and high speed technologies, track renewals, route electrification, use of state-of-the-art cutting edge technologies for real time condition monitoring and graduating towards predictive maintenance regime in a phased manner or focus on station redevelopment, providing passenger amenities like escalators, food courts, mobile app based real time information on ticketing, train running status etc. Massive investments have been planned for the modernization and capacity building projects under execution and/or in pipeline. Projects like Mumbai-Ahmedabad High Speed Corridor, Dedicated Western and Eastern Freight Corridors, feasibility study for upgrading the identified IR network routes for introducing semi-high speed operation of these segments, introduction of ATP (Automatic Train Protection systems like TCAS, ETCS etc.), Induction of new design rolling stock like Train sets (eg.Train-18) equipped with the latest state-of-the-art cutting edge technologies at par with the best in the world, switching over to automated vehicle bound track-inspection systems, track renewals, route electrification, setting up dedicated test track facility, manufacture of state-of-the-art locomotives under PPP and many more are being executed in mission mode and are being monitored at the highest level, objective being to complete the projects without time and cost over-runs and ensure that the customer (passenger) gets the benefits of technology in terms of faster, safer and reliable transportation at affordable cost. There is therefore a huge opportunity for the Industry to come forward and engage with Indian Railways in the areas of their expertise and contribute in a big way in building railways of the future.

Indian Railways has always looked up to the industry for its technological needs and industry has never failed IR in matching up to its expectations. Industry and vendors have played a big role in technological advancement of railways over last 50 years. One of the major focus areas of Hon'ble Minister of Railways, Shri Piyush Goyal, and Chairman, Railway Board, Shri Ashwani Lohani, has been to encourage active participation of Industry in building Indian Railways of the future. Railways on its part is making efforts to realign its procedures to make the vendor interface more customer friendly, transparent and fast, objective being to improve the overall eco-system for greater “ease of doing business”.

RDSO, the sole R&D organization of Indian Railways, has also taken lot of steps during last one year to improve its vendor interface. Procedures for vendor registration have been simplified, the whole processing is now being done online through web based portal. System generated alerts are being flashed to all stake holders at every stage to keep them informed. All information pertaining to pending cases, activity and item specific timelines, item technical details (specifications, drawings etc.) have been made available on line. Open ended EOI
(Expression of Interest) has been invited by RDSO for all RDSO controlled items and the window has been kept open to facilitate the vendors to apply at their convenience. Details can be accessed through links provided on the RDSO's official website. Streamlining of vendor registration procedures have started yielding results. The process cycle time of the registration process has come down drastically and further improvements are expected in the coming months.

Further, RDSO has now adopted a proactive approach to improve its outreach and engage with Industry. Interactive Vendor meets, seminars and dialogues are being organized by RDSO in coordination with the local chapters of CII, FICCI, MSME in Tier-I, Tier-II cities across the country and industrial hubs. More than 35 such interactive vendor meets have already been successfully organized during the current year in various cities covering northern, southern, eastern and western parts of the country, objective being to explain to the industry the technological needs and product requirements of Indian Railways, increase awareness in the industry about the recent steps taken by RDSO to simplify the processes and acquiring productive feedback and suggestions for further simplification of the procedures and create an enabling Industry friendly platform. A team of RDSO officials is moving to various cities and participating in technical seminars and conferences as a part of knowledge sharing and inviting vendors to be a part of railway supply chain. Our participation in the recently held MCCIA’s Conference at Pune on Railways and Metro: “Transforming India's Transport sector” reiterates our commitment to proactively engage with industry for bringing in new technologies, improving quality and rationalizing the cost of acquisition and maintenance on Indian Railways. The response from the Industry to the recently held International Exhibition and Conference “InnoRail-2018” has been very encouraging. The event held at RDSO during 22nd to 24th November 2018 proved to be a huge success and has created lot of enthusiasm amongst the industry / vendors for becoming partners in the progress of Indian Railways. RDSO has also initiated a mechanism for regular dialogue with all stake holders onboard i.e. RDSO, Industry and Railway Board. First such interaction was held at RDSO on 3rd November 2018. To take the discussions forward, the second round of interaction is scheduled at RDSO on 7th December 2018.

Railways as we all know, forms an important part of basic infrastructure required for region's economic growth and with the massive push under the present leadership for modernization and technological upgradation of the overall infrastructure on Indian Railways, there cannot be a better time for industry to come forward and be our partners in making the railways of the future. Railways which is safer, faster, more reliable and provides improved passenger experience at an affordable cost.

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Pune Region is one of the fastest growing regions of the country. With an established Manufacturing, Information Technology, Agriculture and Food Processing and allied sectors and a wide range of services. It has been attracting substantial investments during the last few years from domestic and global industry. The trends/planned investments suggest that Pune will continue to attract major investments in the years to come as well. Infrastructure facilities particularly transportation infrastructure needs to keep pace with the same. One of the most critical facility is an efficient and wide spread Railway Network.

Critical Need
Pune, Pimpri Chinchwad and a host of surrounding towns and villages are inter-dependent. There is a large population which does not have good public transport and hence forced to use their own vehicles, from anywhere between 3-50 kilometers, if you take the case of people travelling in Pune region. If you consider population of Pune, Pimpri Chinchwad as well as other towns and villages in Pune district and the new construction activity on the outskirts of Pune and Pimpri Chinchwad, the situation is even worse. Similar is the plight of people going to the major industrial areas of Pimpri Chinchwad, Chakan, Rajgurunagar, Ranjangaon, Shirwal and others. Traffic jams consume lot of fuel, energy and precious time of all kinds of people. This is not only their individual loss, but also corporate and even national loss because we burn lot more fuel in transporting most of them in individual vehicles.

All these can be least partly addressed if an efficient railway network for carrying cargo and people can be developed on the periphery of Pune region. This network can be connected the existing rail routes. The proposal of Pune – Nasik Rail connectivity is already under active consideration of the Railways.

As a first step the Railways need to provide enough wagons on the Pune –Karjat-JNPT route so that the export and import cargo can be moved by railways through scheduled cargo trains. This will open a new revenue stream for the Railways and CONCOR.

Movement of cargo by rail on Pune-Nasik-Pune and Nasik-JNPT, Pune-JNPT as well as the surrounding industrial areas could ensure that the project is viable in the years to come.

The advantage will be that these routes can also serve the planned International Exhibition Centre and the Industrial Areas of Chakan, Rajgurunagar, Ranjangaon as well as the proposed New Airport near Purandar. This will also reduce a lot of pressure on the roads.

Possibility of Extension
This link then can go up to Nasik on one side and connect with Talegaon/Dehu Road or other suitable location on the existing rail route to go up to JNPT Port in Navi Mumbai for carrying cargo on the Nasik-JNPT route, Pune-Nasik-Pune route and passengers of these areas. Similar routes could be developed upto Shirwal and even Satara along the existing roads. The route could elevated on the existing rail route intersections and could be at the ground level wherever possible.
Need for Railway’s Involvement
The advantage of roping in Indian Railways and the Construction Arm of Railways will be that it is a credible organization which has developed many projects even in difficult terrain (take the case of Konkan Railway / Jammu and Kashmir or even many countries in the Gulf), it will also do a detailed cost-benefit study and engineering elements of all the sections. Some of the routes could be developed on BOT/BOOT basis as in the case of roadways.

Possible ways of Financing
Maharashtra State Government and its corporations as well as concerned local authorities along with the Railways and Central Government could be encouraged to contribute financially for building a rail network link in Pune region.

The Partnership model has been implemented in Navi Mumbai where CIDCO and Railway contributed for rail link between Navi Mumbai and existing Harbour line of Suburban network. In case of Navi Mumbai, the land belonged to Railways. CIDCO funded 67 % of the Project and Railways funded 33 % of the Project and CIDCO obtained special rights for commercial exploitation of land above the railway stations (which is normally not allowed). Several such Projects are being executed in other parts of Maharashtra.

The Project could also receive Budgetary Support, Viability Gap funding/Industrial Infrastructure Upgradation Scheme/financing from Infrastructure Finance Institutions in India and possibly other countries or even World Bank / Asian Development Bank or Special Financing by way of bonds. Funds under the Green Transport Fund of the Central Government could also possibly be available for the suburban network. We could even think of creating a Regional Transportation Infrastructure Organisation to take care of this Project on the lines of Konkan Railway Corporation or PMRDA can act as the nodal Agency along with Railways, similar to the Bharatmala Project where NHAI and PMRDA are working jointly to ensure success of the Project.

Benefits
If we develop Rail Routes like this than the region could be developed in a much more balanced way. Past experience suggests that wherever rail route has been developed, economic opportunities have increased manifold. This sort of an initiative has greater scope of benefiting far more people, industry and the local, state and central governments besides generating sizeable employment. It can bring faster development while addressing the public transport and cargo needs of Pune region and its industrial and residential areas as well as the neighbouring districts. This will be a sustainable and environmentally friendly project. Last but not the least, Railways can make a successful revenue model by operating cargo and passenger trains in Pune and surrounding districts. This will also generate a lot of business and employment opportunities as well as balanced regional development.

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Latur – the next powerhouse for the Railway Industry

G Sreekanth

Shri G Sreekanth, IAS is the young and dynamic Collector of Latur district. MCCIA had a talk with him about the development of Latur in the context of the Latur Coach Factory. Latur has a special place in his heart and he passionately talked about its development. He has a standing invitation for industrialists to come to Latur and set up their factories.

Q. How do you perceive the Latur Coach factory changing the development parameters of Latur?
A. Latur district was formed in 1982. Over a period of time Latur has developed into an educational hub. Till now there was no major factory to boast off. The city was always perceived to be backward as far as economic development was concerned. One of the reasons being there was no major industry of national importance. With the Latur Coach Factory coming up, it will bring about development in the city and the district.

Q. Can you give an estimate of the direct and indirect employment which will be generated as a result of this important project?
A. The Latur Coach Factory is going to be a game changer. The benefits are numerous. In terms of direct employment, it would be around 400 to 500. However indirect employment opportunities will be in tremendous, once the factory gets set up entirely.

Q. What will the Latur Coach factory produce for Railways and Metro Project which will be different from the present Rail Coach Factories?
A. The Latur Coach Factory will be different from the existing rail coach factories. This latest and most modern coach factory is in Rai Barelli which our bench mark. The Latur Coach Factory will be more advanced with state of the art technology. It will manufacture Electronic Motorised Units (EMUs) – specifically for metros and local trains which are called push and pull trains. Today, metro coaches are imported. We will be producing them here. The future is of the metros. There is going to be demand for metros as the country gets more...
urbanised where metros will be a requirement. This factory will also be exporting coaches to countries, where metro projects are being built.

Q. Can you estimate the number of ancillary units that could come up in Latur, other parts of Marathwada or the State in general?
A. Any big factory creates an ecosystem. There will be a demand for a lot of parts, material and services that would go into the making of the coaches. This would be the key driver for many ancillary units to set up in Latur.

Q. Can you give us some sense of the committed investment by Railways in this project?
A. There is an investment of Rs 600 cr for the first phase. Work has begun in full swing on 350 hectares. More so, MIDC is acquiring an additional 450 hectares for expansion to the existing coach factory. The land is in the final stages of acquisition.

The Latur Coach Factory will be renamed as Marathwada Coach Factory and will be the harbinger of growth of the entire region. Shri Sambhaji Patil Nilangekar, guardian minister for Latur district is taking an active interest and under his leadership and vision, this educational city is poised to fast track into the future. The emblem of the Latur, emblazoned on the metro coaches will go all over the country and across the world.

Latur is a very peaceful districts and its people are sensitive. There is ample skilled manpower, being an educational city. I welcome industrialists to come and set up their factories here. I assure you that permissions will be processed quickly in a single window system. The Chief Minister of Maharashtra has given instructions that permissions should be fast tracked. We will be happy to receive any industry in our district.

Shri G Sreekanth, IAS
Collector of Latur district.

Rajeev Tyagi
Understanding the Rail Infra Mega Project - Dedicated Freight Corridors

Rajeev Tyagi

- Indian Railways is the lifeline of the nation and the economic growth in India is highly dependent upon the Rail Transportation Capacity.

- Passenger & Freight trains are running on the same track leading in to lower preference in movement of freight trains.

- A number of important section of Indian Railways network are operating much above the operational capacity.

- To de-congest rail traffic and ensure smooth operation of both freight as well as passenger trains, decision was taken to build corridors dedicated to freight traffic only.

- To undertake planning, construction, maintenance and operation of Dedicated Freight Corridors, a special purpose vehicle was set up and Dedicated Freight Corridor Corporation of India Ltd. (DFCCIL) came into existence as a registered company under the Companies Act 1956 on 30th October, 2006.

- In the first phase, two corridors have been approved for construction-The Eastern Dedicated Freight Corridor (EDFC) and the Western Dedicated Freight Corridor (WDFC).

- Eastern DFC has total route length of approx.. 1856 km, from Ludhiana in Punjab to Dankuni (Near Kolkata) in West Bengal, passing through 6 states-Punjab, Haryana, Uttar Pradesh, Bihar, Jharkhand and West Bengal.

- Western DFC has total route length of approx.. 1504 km, from Dadri in Uttar Pradesh to Jawahar Lal Nehru Port Trust (JNPT) of Mumbai, passing through 5 states-Uttar Pradesh, Haryana, Rajasthan, Gujarat and Maharashtra.

- An investment of Rs. 81,459 crores is being made to complete the projects of Eastern and Western DFCs.

- Overall 98% tenders worth Rs. 52,387 crores have been awarded.

- 98% land acquisition (overall under section 20F) been achieved.

- Funding of Western DFC is being done with the loan from Japan International Cooperation Agency (JICA) whereas Eastern DFC is being partially funded by World Bank.

- Eastern DFC (except PPP section) and Western DFC has been targeted for full commissioning will start before that.
• Maximum speed of goods trains will increase from 75 to 100 kmph. Average speed is expected to increase 70 kmph against current 26 kmph.

• Good train will run on scheduled time table & fixed path on DFC routes.

• Infrastructure is being created to increase in train length presently approx. 700 meter to 1.5 km, which will facilitate to increase trailing load per train from 5,000 to 13,000 tonnes.

• Double stack containers on electrified lines will be introduced on Western DFC for the first time in India.

• DFC network will attract setting up of Multimodal Logistics Parks / Terminals along the corridors.

• Lean & thin organization with higher efficiency leading to reduced unit cost of transportation.

• DFC will help in shifting traffic from road to eco-friendly rail transportation. One DFC train will take 1300 trucks off road.

• DFC will significantly contribute to environment by saving 457 million tonnes of CO2 emissions in 30 years.

• Four new corridors to be developed: East-West Corridor (Kolkata-Mumbai) 2328 kms., North-South Corridor (Delhi-Chennai) 2327 kms. East Coast Corridor (Kharghar-Vijaywada) 1114 km. and Southern Corridor (Chennai-Goa) 829 km.

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Pune Metro Railway - A Game Changer
Shashikant Limaye

1. General:
Rapid urbanisation and unbridled growth of metropolitan cities all over the world has led to serious bottlenecks in inter-city transport. Lack of timely and well planned augmentation of public transport systems, particularly in ever-growing cities located in developing countries is a reality. Mumbai is a glaring example where the share of public transport has gone down from 75% in 1980s to about 50% at present. As a result, citizens are forced to switch over to private transport viz. two-wheelers and four-wheelers. Due to the growth of cities and failure to augment public transport systems, most of the cities in India are today grappling with the problem of traffic jams and pollution levels reaching limits much higher than permissible ones. The adverse effect of this situation on the health of citizens is now becoming perceptible.

Over the past two and a half decades, China has made serious efforts to equip their urban conglomerates with modern public transport systems in terms of Metro Railways, BRTS, Monorails, etc. China built a network of 3000 km of Metro Railways in 30 of their large cities in the past two decades.

2. Indian scenario:
India completed its first Metro Railway in Kolkata of 16 km length commissioned between mid 1980s and mid 1990s. The project took more than 15 years and very high escalation in cost. This lead to diffidence on the part of Indian Railways to undertake Metro Railway Projects and the Ministry of Railways withdrew from MetroRailway Construction in 1989. In the 1990s, the Government of India realised the need to augment public transport in Metropolitan Cities in India and thus was born the Delhi Metro Railway Corporation (DMRC), a joint venture public sector company between the Government of India and the Delhi Government.

Construction in 1989. In the 1990s, the Government of India realised the need to augment public transport in Metropolitan Cities in India and thus was born the Delhi Metro Railway Corporation (DMRC), a joint venture public sector company between the Government of India and the Delhi Government. The physical work on Delhi Metro commenced in 1998 under the leadership of the legendary Dr. E. Sreedharan. It is a matter of pride that today Delhi Metro network has grown to 313 km. India was able to showcase a world class metro railway network in such a short time-frame. Encouraged by the performance of DMRC while framing the National Urban Transport Policy of 2006, the Government of India took a holistic view of different modes of city public transport. It is as a sequel to this that several BRTS, Metro and Bus augmentation schemes were born in important cities of India.

Today, apart from Delhi and Kolkata, Metro Railway systems have become operational in Mumbai, Bengaluru, Gurugram, Jaipur, Chennai, Kochi, Lucknow, Hyderabad. The following table enumerates the present status of various Metro Railway Projects in India:

<table>
<thead>
<tr>
<th>Metro System</th>
<th>Cities Operational</th>
<th>Cities Under Construction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Delhi Metro</td>
<td>Mumbai, Bengaluru</td>
<td>Lucknow, Hyderabad, Kochi</td>
</tr>
<tr>
<td>Kolkata Metro</td>
<td>Kolkata, Bhubaneswar</td>
<td></td>
</tr>
<tr>
<td>Bangalore Metro</td>
<td>Bangalore</td>
<td></td>
</tr>
</tbody>
</table>

It can be noted that Mumbai and Pune, two of the major urban conglomerates, have lagged behind in the implementation of Metro Projects. The construction of 795 km of Metro, currently in progress, will involve an approximate investment of Rs. 3 Lakh Crore in the coming five years. To make up for the lost time, this thrust to construct Metro Railways in Indian cities is expected to continue over the next 20 to 25 years. A major feature of a Metro Railway Project is that it encompasses all disciplines of engineering. This offers a unique opportunity to civil contractors,
3. Pune and Pune Metropolitan Region

Today, Pune Metropolitan Area, which principally comprises Pune city, Pimpri-Chinchwad, Khadakli Cantt. and Pune Cantt., is one of the most rapidly growing urban centres in India. The growth has been of the order of 6% per annum over the last decade. The population of this conglomerate has increased from 45 lakhs in 2008 to 55 lakhs in 2011 and is projected to grow to 68 lakhs and 77 lakhs in 2021 and 2031 respectively. The service sector in terms of software parks alongwith automobile manufacturing sector on the outskirts of this conglomerate is continuing to give a rapid impetus to this growth. These developments were foreseen for a long time and formation of Pune Metropolitan Regional Development Authority (PMRDA) was on the anvil since the mid-1990s. The formation of PMRDA on 31st March 2015 is a welcome step to move towards a holistic development of this rapidly growing region. This region is expected to support a population of 1.25 crore by 2041. PMRDA is mandated with a task of evolving a development plan for a region encompassing 7000 sq.km. area which will address the entire gamut of land use, planning for water supply etc., commencing with putting in place a Comprehensive Mobility Plan. It is a matter of satisfaction that the first phase of Comprehensive Mobility Plan covering about 2000 sq. km. of PMR has already been approved in this month. Public transport encompassing railways (including new corridors), Metros, BRTS, buses etc. along with intermodal integration is the focus of this plan. Such an integrated and comprehensive approach is a welcome change from the earlier plans developed by the Urban Local Bodies from time to time.

4. Pune Metro Project- Phase I

4.1 Public transport in Pune and PCMC has not kept pace with the rapid increase in population. Keeping this situation in view, a number of traffic studies were undertaken by Pune Municipal Corporation during the past one and a half decades. A Comprehensive Mobility Plan (CMP) was evolved by IIT Bombay for Pune region in 2006. CMP conceived various projects to satisfy the transportation demand of commuters in Pune area by focusing on public transport systems. It comprised widening of roads, new arterial roads (ring roads etc.), BRTS and an efficient Metro Rail System. The objective was to increase the share of public transport from the present meager 18 % to a reasonable number. Non-availability of efficient public transport has led to unmanageable traffic congestions, unacceptable levels of air and noise pollution, increase in number of road accidents and adverse effects on the health of two wheeler riders.
4.2 As a follow up on CMP along with several other schemes under JNNURM, Pune Municipal Corporation appointed Delhi Metro Rail Corporation (DMRC) to prepare DPR for Pune Metro in 2008. DMRC submitted the DPR in 2009 prioritising two corridors under Phase I viz. (i) PCMC to Swargate (16.589 km) and (ii) Vanaz to Ramwadi (14.665 km). After a series of discussions and modifications, the project was approved by the Government of India in December 2016. The alignment was modified keeping in view following important aspects:

- Intermodal connectivity
- Interchange between metro corridors
- Compliance with provisions of Ancient Monuments and Archaeological Sites Act
- Connecting people to places
- Minimum acquisition of private property

The salient features of the two Std. Gauge (1435 mm) Metro Corridors being under implementation at present are tabulated below: (Table 2)

The two proposed corridors run along following routes:

**Corridor 1**: PCMC – Sant Tukaram Nagar – Bhosari (Nashik Phata) – Kasarwadi – Fugewadi – Dapodi – Bopodi – Khadki – Range Hill-Shivajinagar – Civil Court (Interchange) – Budhwar Peth – Mandai – Swargate(underground between Range Hill/Shivajinagar to Swargate)

**Corridor 2**: Vanaz (Kothrud) – Anand Nagar – Ideal Colony – Nal Stop – Garware College – Deccan Gymkhana – Sambhaji Udyvan - PMC – Civil Court (Interchange) – RTO - Pune Railway Station - Ruby Hall - Bund Garden – Yerwada – Kalyani Nagar - Ramwadi (fully elevated)

Two maintenance depots are planned, one for each corridor i.e. at Agricultural College Corridor 1) and Vanaz Katchara Depot (Corridor 2). The proposed elevated portions of the corridors generally run along arterial roads. In highly built up congested city areas i.e. from Agricultural College to Swargate (Corridor 1), the Metro is proposed as underground.

4.3 Estimated Cost

The estimated cost of the two corridors is as below: (Table 3)

The task of implementation of this project is assigned to Maharashtra Metro Railway Corporation a Public Sector JV Company between GoI and GoM in February 2017.

<table>
<thead>
<tr>
<th>Description</th>
<th>Length in km.</th>
<th>No. of Stations</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>UG</td>
<td>Elevated</td>
</tr>
<tr>
<td>Corridor 1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PCMC to Swargate</td>
<td>5.019</td>
<td>11.570</td>
</tr>
<tr>
<td>Corridor 2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vanaz to Ramwadi</td>
<td>NIL</td>
<td>14.665</td>
</tr>
</tbody>
</table>

**Table 2 – Pune Metro Corridors implemented by Mahametro**

<table>
<thead>
<tr>
<th>SHARE OF GoI, GoM and ULBs and Loan from EIB/ AFD</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Govt. of India</strong></td>
<td>20 %</td>
</tr>
<tr>
<td><strong>Govt. of Maharashtra</strong></td>
<td>20%</td>
</tr>
<tr>
<td><strong>Local Bodies</strong></td>
<td>0.30 %</td>
</tr>
<tr>
<td><strong>Loan</strong></td>
<td>59.70 %</td>
</tr>
<tr>
<td><strong>R &amp;R and subordinate debt for cost of land and state taxes</strong></td>
<td>State Govt.</td>
</tr>
<tr>
<td></td>
<td>ULBs</td>
</tr>
<tr>
<td><strong>Interest on loans during construction</strong></td>
<td>@ 1.40 %</td>
</tr>
<tr>
<td><strong>GRAND TOTAL COMPLETION COST</strong></td>
<td></td>
</tr>
</tbody>
</table>

**Table 3 – Estimated cost of the project**
In the financial computations, the completion period of this project is estimated as five years. The physical work on the project commenced in May 2017.

4.4 Sources of revenue
The following sources of revenue have been identified to sustain the project in terms of O & M and debt servicing:

- Fare Box Revenue
- Revenue from advertisements
- Revenue from increase in development charges by 100%
- Revenue from 1% surcharge on stamp duty registrations from both Municipal Corporations

Considering the above financial sources, Project FIRR is > 11% and the EIRR is 16%.

4.5 Land
Land requirement on this project has undergone a reduction as a result of modifications to the DPR as brought out below (Table 4).

The need for acquisition of private lands has been substantially reduced.

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Corridor</th>
<th>Station</th>
<th>Interchange between</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Corridor 1</td>
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<td>Metro &amp; MSRTC</td>
<td>Metro station located adjacent to MSRTC bus stand with access</td>
</tr>
<tr>
<td>2</td>
<td>Corridor 1</td>
<td>Bhosari</td>
<td>Railway &amp; BRTS</td>
<td>Metro station located adjacent to Kasarwadi Rly. Stn. with access</td>
</tr>
<tr>
<td>3</td>
<td>Corridor 1</td>
<td>Khadki</td>
<td>Railway</td>
<td>Metro station located adjacent to Khadki Rly. Stn.</td>
</tr>
<tr>
<td>4</td>
<td>Corridor 1</td>
<td>Shivajinagar</td>
<td>Railway, MSRTC, PMPML, Metro 3</td>
<td>Underground station integrating MSRTC bus terminus, railway station with access to Metro Corridor 3 (Hinjewadi- Shivajinagr) at Simla Office.</td>
</tr>
<tr>
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</tr>
<tr>
<td>6</td>
<td>Corridor 1</td>
<td>Swargate</td>
<td>MSRTC, PMPML</td>
<td>State of the art interchange between the three modes with a modern commercial complex</td>
</tr>
<tr>
<td>7</td>
<td>Corridor 2</td>
<td>Nal Stop/ SNDT</td>
<td>PMPML</td>
<td>Adjacent to Canal road at SNDT</td>
</tr>
<tr>
<td>8</td>
<td>Corridor 2</td>
<td>Deccan Gymkhana</td>
<td>PMPML</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Corridor 2</td>
<td>PMC</td>
<td>PMPML</td>
<td>Metro station located above the PMPML terminus</td>
</tr>
<tr>
<td>10</td>
<td>Corridor 2</td>
<td>Pune Rly. Station</td>
<td>Railways, PMPML MSRTC</td>
<td>Elevated station located on RBNM Road with Rly. Foot Bridge directly entering its concourse</td>
</tr>
<tr>
<td>11</td>
<td>Corridor 2</td>
<td>Yerwada</td>
<td>BRTS</td>
<td>BRTS commuters will directly access Metro Concourse without crossing the road.</td>
</tr>
<tr>
<td>12</td>
<td>Corridor 2</td>
<td>Ramwadi</td>
<td>BRTS</td>
<td></td>
</tr>
</tbody>
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Table 4 – Land acquisition requirement

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<td>BRTS</td>
<td></td>
</tr>
</tbody>
</table>

Table 5 – Multimodal integration
In the financial computations, the completion period of this project is estimated as five years. The physical work on the project commenced in May 2017.

4.4 Sources of revenue
The following sources of revenue have been identified to sustain the project in terms of O & M and debt servicing:

• Fare Box Revenue
• Revenue from advertisements
• Revenue from increase in development charges by 100%
• Revenue from 1% surcharge on stamp duty registrations from both Municipal Corporations

Considering the above financial sources, Project FIRR is > 11% and the EIRR is 16%.

4.5 Land
Land requirement on this project has undergone a reduction as a result of modifications to the DPR as brought out below (Table 4). The need for acquisition of private lands has been substantially reduced.

4.6 Pune Metro important features
Keeping in view the satisfactory and adverse experience gained thus far and environmental consciousness, Pune Metro Project is incorporating several novel features in its construction. Some of these are as below:

• State-of-the-art station development
• World class multimodal integration
• Feeder bus services at metro stations
• Citizens permitted to use Metro Access Foot Over Bridges equipped with lifts and escalators
• Facilitation of bicycle schemes at metro stations
• Parking spaces for two wheelers in the vicinity of at least every alternate metro station
• Common Mobility Card
• Large scale use of solar energy by installing solar panels on station roof tops.
• Recycling of waste water.
• Replanting of fully grown trees thus reducing tree cutting to a minimum.

5 Multimodal Integration – An important feature of Pune Metro
Special attention is paid to multimodal integration to ensure seamless transfer of commuters from one transit mode to another. The salient features of the same are as below: (Table 5)

6 Progress
Mahametro has achieved a weighted progress of 23% over the past 1 year and 9 months and work is progressing at a rapid pace on the elevated sections along Mumbai Pune Road, Paud Road, Karve Road, River Bank, RBM Road and Bund Garden Road. The work on underground section needed a detailed working and this work is in the process of being allocated to a competent agency.

7 Metro Rail – Future Corridors
The third elevated Metro corridor of 23 km. length from Shivajinagar to Hinjewadi has already received the approval of GoI. It is being implemented on Public Private Partnership basis by PMRDA. This corridor will connect to the two corridors being implemented by Maharashtra Metro Railway Corporation at Civil Court interchange and also Corridor 1 at Simla Office/Shivajinagar. Mahametro is also in the process of submitting DPRs for extensions to Corridor 1 from PCMC to Nigdi and Swargate to Katraj.

Further, the CMP of PMRDA has incorporated following corridors / extensions. This is in addition to the 55 km Metro corridors underway. Following additional corridors are included in the CMP. (Table 6).

Thus, a total Metro network of 129 km is envisaged.

4 Conclusion
No doubt that construction of Pune Metro is an ambitious project and its implementation does pose numerous challenges. However, with several achievements of much higher order in implementation of a number of complex projects behind us, there is no need for any kind of diffidence. It is the first time ever that a project of this magnitude is being implemented in Pune and PCMC. This project will bring about a qualitative change in the work culture on major projects and also become a jewel in the crown of the beautiful city of Pune endowed with salubrious weather conditions throughout the year. It will become a principal mode of travel for citizens as well as thousands of students who come to study in this Oxford of the east. This project also provides a unique opportunity to the industries in Pune to get into manufacturing of railway components.

Table 6 – Future Metro Corridors

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>New Corridor</th>
<th>Approximate Length km.</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>From</td>
<td>To</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>PCMC</td>
<td>Nigdi</td>
<td>5</td>
</tr>
<tr>
<td>2</td>
<td>Swargate</td>
<td>Katraj</td>
<td>8</td>
</tr>
<tr>
<td>3</td>
<td>Vanaz</td>
<td>Chandani Chk.</td>
<td>3</td>
</tr>
<tr>
<td>4</td>
<td>Ramwadi</td>
<td>Wagholi</td>
<td>7</td>
</tr>
<tr>
<td>5</td>
<td>Civil Court</td>
<td>Hadapsar</td>
<td>12</td>
</tr>
<tr>
<td>6</td>
<td>Hinjewadi</td>
<td>Chakan</td>
<td>30</td>
</tr>
<tr>
<td>7</td>
<td>Sinhagad Rd.</td>
<td>Pune Cantt.</td>
<td>9</td>
</tr>
<tr>
<td>TOTAL</td>
<td></td>
<td></td>
<td>74</td>
</tr>
</tbody>
</table>

----------------------------------------------------
Shashikant Limaye
Technical Advisor and Member of the Expert Group - Pune Metro Railway Project
Email: sdlimaye2000@yahoo.com
Pune Metropolitan Region Development Authority (PMRDA) is the planning and development authority for the Pune Metro Region with an outlook towards channelising growth in a strategic and orderly manner. The Pune Metro Region is the third largest metropolitan region in the country after Delhi and Bengaluru-Mysuru metro authorities. In terms of urban expanse, it is one of the fastest growing centres in the country, with approximately 60-70 lakh people set to be added to the region’s population.

PMRDA is working on a blueprint for development for the next 30-40 years and taking up projects to ensure the sustainable development of the region by offering high quality public infrastructure. The Comprehensive Mobility Plan (CMP) is the long term transport vision document for mobility for the city.

Projects include the Metro Line 3, a proposed Hyperloop between Pune and Mumbai to reduce the travel time to a few minutes and a suburban ring railway network around Pune for passengers and goods movement.

The Metro Line 3
The Metro Line 3 will serve IT professionals and residential areas. The 23 km Hinjawadi-Shivajinagar metro route is based on the public-private partnership model and is aimed at decongesting Pune traffic by improving connectivity within the Pune metropolitan region.

The first phase of the project (Hinjawadi – Balewadi) is expected to be completed by June 2019 and the entire route would be completed by 2021. The contract for the project was awarded to a joint venture between Tata Realty Infra and Siemens. The estimated cost of the project is Rs 8,313 crore. The central government has cleared the project under its new Metro policy 2017.

The Hyperloop
Hyperloop is a new mode of transportation that moves freight and people quickly, safely, on-demand and direct from origin to destination. Passengers or cargo are loaded into the hyperloop vehicle and accelerate gradually via electric propulsion through a low-pressure tube. The vehicle floats above the track using magnetic levitation and glides at airline speeds for long distances due to ultra-low aerodynamic drag.

PMRDA signed an MOU with Virgin Hyperloop One with a mission to reinvent transportation and unlock vast economic opportunities. Virgin Hyperloop One systems will be built on...
columns or tunneled below ground to avoid dangerous grade crossings and wildlife. It's fully autonomous and enclosed, eliminating pilot error and weather hazards. It’s safe and clean, with no direct carbon emissions. A demonstration track will first be built and tested.

Ring Railway - need for a railway network in Pune region for industrial cargo and passenger movement

As Pune region witnesses accelerated growth, one of the key challenges is the smooth movement of industrial cargo and passenger traffic. Infrastructure facilities particularly transportation infrastructure needs to keep pace of which there is a need for an efficient and wide spread railway network. Pune Region includes Pune city and important industrial areas like Pimpri-Chinchwad, Chakan, Rajgurunagar, Ranjangoan, Shirival. Industrial and residential activity has grown by leaps and bounds, but mobility is a problem.

The Comprehensive Mobility Plan (CMP) proposes a suburban ring rail and goods bypass line around Pune.
- Pune - Lonavala to be quadrupled
- Pune - Daund to be quadrupled
- Pune - Miraj will be doubled
- A new line connecting industrial areas like Talegaon, Chakan, Shikrapur, Loni kalbhor or Uruli Kanchan, further to Phursungi and connecting the proposed Saswad Airport via an extension from Rajewadi station. This line will not only serve Pune - Nasik but will also help in movement of cargo and act as a suburban ring rail around Pune, helping to decongest Pune station.

The benefits of such a suburban rail and goods bypass line around Pune will result in faster development, generate sizeable employment and address the public mobility and cargo needs of Pune region and the surrounding districts.
Review of Waste Management in Indian Railways and Railway Stations….Status & Future Prospects

Dr. Harshvardhan Modak

Preamble:
When we talk of Indian Railways, a picture of unclean platforms, dirty toilets, garbage flowing in and around the tracks comes to our mind. However, with the advent of Clean India Mission, the picture is now being changed. Let us review how.

India Railways (IR) is India’s railway transport system, operated by the Ministry of Railways, Government of India. It is the fourth-largest railway network in the world by size, with 121,407 kilometres of total track. IR runs more than 20,000 passenger trains daily, on both long-distance and suburban routes, from 7,349 major stations across India. In the freight segment, IR runs more than 9,200 trains daily. In the year ending March 2018, IR carried 8.26 billion passengers and transported 1.16 billion tons of freight. (Ref. https://en.wikipedia.org/wiki/Indian_Railways)

Now, such a huge system has several management aspects, but the environmental aspect was so far neglected. MSW Rules 2016 in April 2016, which prescribe Waste Management, describe vide its Para (2), “Areas under control of Indian Railways”. Thus, it follows that rules now cover areas under various stations, railway colonies, offices, railway factories etc., sp also the area under and on both sides of the tracks and the area within the railway bogies too. It is not that IR was not answerable for its waste management earlier; but after such clear-cut coverage of entire IR by a specific waste management law, it has become more answerable to public through Courts. One reflection of the same is in terms of fine imposed by National Green Tribunal (NGT) in Oct. 2017 on IR for improper waste management at stations in Delhi area. (https://www.business-standard.com/article/current-affairs/ngt-to-penalise-indian-railways-over-station-waste-management-in-delhi-ncr-117102300501_1.html).


Identification of main categories of wastes in IR:
1. MSW in IR: This is generated both in moving trains as well as at the stations. As is generally observed in any municipal body, the IR (inside its...
trains as well as at stations and adjoining areas) also generates exactly similar type of waste, which is also classified as Municipal Solid Waste (MSW). It also has biodegradable \& non-biodegradable portions. The biodegradable portions constitute food and vegetable waste; while the non-biodegradable waste constitutes packaging waste, paper, etc.

2. Other wastes in IR: The other types of wastes, as defined by Para 3 (46) of MSW Rules 2016 viz. e-Waste, sanitation wastes, etc. (except of course radioactive waste) are also generated in IR.

3. Sanitation waste: In IR, this mainly constitutes two sub-categories: (a) Waste in Trains: consisting of human excreta (solid \& liquid) along with water (used as means of transporting it). [The clothes and body washings are almost negligible in this waste, for obvious reasons. It has been a subject of criticism, especially in station areas, since it is evident to public eyes.] (b) Sewage waste in stations/factories: This arises from washing of trains, tracks and railway station buildings and factories.

Present practice of waste management in IR:

Now, having identified the main categories of wastes in IR, let us look at the way in which its disposal is carried out at present.

MSW in IR:

1. The MSW generated in moving trains is handled in an informal manner by rag pickers, who generate income both by collecting some money from passengers and selling the recyclable goods collected from waste. However, any items useless to them are strewn across the outside tracks. They are always seen along the railway tracks everywhere in India.

Formal contractors or informal rag pickers handle the MSW generated in stations. Here too, useless items are dumped somewhere around the station and the balance is either recycled or handed over to local municipal body for dumping at their respective locations.

2. Other waste generated in IR does not have any specific waste management system on lines similar to municipal bodies. Dumping is only prevalent in all categories, except the recyclable valuables ones like e-Waste, electrical waste, etc.

3. Sanitation waste, mainly human excreta, is traditionally being thrown along the tracks. There are many so-called advantages in such practice, main being railway management does not have to bother about its disposal. At almost nil cost, this biodegradable waste spills on tracks and degrades naturally. One may wonder as to what is the practice in developed countries on disposal of this waste. However, surprisingly, the same practice continues even today in many developed countries. The railway is a boon given to India by the British. But in England too, the same practice continues. (ref: http://londonist.com/2014/03/mind-the-crap-the-continuing-problem-of-poo-on-the-tracks). It will be interesting to read about the practices
activity etc. were issued for stations, outsourcing of sanitation within IR. A slew of commercial circulars created cell for Environment Management should be observed at all IR related locations and within the trains. IR started systematically surveying major railway stations in terms of housekeeping. Through a newly created and separate Transformation Cell, IR started taking positive steps for transforming itself for its betterment in all aspects. Newly created cell for Environment Management saw specific actions for betterment of environmental practices within IR. A slew of commercial circulars about cleanliness, pay and use toilets at stations, outsourcing of sanitation activity etc. were issued for improvement. One interesting, but commercially very important fact emerged from out of these exercises.

An important audit report at p.63, (ref. https://cag.gov.in/sites/default/files/audit_report_files/Union_Performance_Environment_Management_Unio n_Government_Railways_21_2012_C hapter_4.pdf), highlighted the consequence of not maintaining bio-toilets in train compartments and allowing dropping of human excreta on rail tracks. “An expert committee reviewing railway safety observed that the toilet droppings are one among the primary causes for rail corrosion and resulting rail failure. The Anil Kakodkar Committee also observed that human excreta had corroded a significant percentage of the country’s total 1.1 lakh kilometres of tracks because of the pH of the toilet discharge and thereby adding to the cost of running the massive railway network”.

Major actions for improvement of waste management in IR:

MSW in IR:

At stations and in trains: The IR stations and establishments saw sustained efforts in sweeping and cleanliness. The activity was outsourced to specific contractors with responsibility and accountability. The results were monitored periodically. This has resulted into cleaner platforms and surroundings. The contractors have been asked to submit the collected and segregated MSW to local municipal body for its ultimate disposal. The proper soak pit systems and bio-toilets were installed at many locations to arrest human excreta going into surroundings. Implementation of Pay and Use toilet system has seen cleaner toilets and passenger satisfaction. Some of the major railway stations like Delhi, Jaipur, have come up with projects of waste to energy for disposal of MSW, wherein the finally discarded waste will be incinerated to produce electricity. Various technologies are being considered for ultimate disposal of MSW within the precincts of stations.

Sanitary waste in trains: The toilets in trains have been the main issue, especially at stations. There are a few alternatives to the same, wherein a) the sludge (faecal waste, urine plus water) is held into a tank, which is released onto tracks, only after train reaching a speed of 40km/hr. This avoids release of faecal waste onto tracks within stations. (b) The sludge is stored into similar tanks, which are discharged into treatment tanks at stations (c) A vacuum system like those in aircrafts, sucks all the sludge into a large holding tank, which is discharged into treatment units at stations. (c) Bio-toilets designed to degrade the sludge in every compartment within 24hrs. No transfer of sludge is envisaged, but the degraded product like gas and non-polluting water are discharged onto tracks.

Indian Railways generates approximately 6000 tons solid waste from trains and passengers at railway stations every day. Hence, IR has undertaken a massive programme of...
implementation of bio-toilets. The “bio-toilet project” of Indian Railways is the first of its kind, being used by any railroad in the world for on-board accelerated digestion of human waste. The bio-toilets in trains are installed underneath the lavatories and the human waste discharged into them is then degraded by a colony of anaerobic bacteria. It undergoes accelerated digestion. A special strain of bacteria brought from Antarctica, which can be active even at low temperatures was brought for this purpose. Till March 2018, the national transporter has fitted about 1,25,000 bio-toilets in its coaches, says a Railway Ministry release. The ‘Make in India’ bio-toilets in Indian Railways have been developed jointly by Indian Railways’ Engineers and DRDO’s scientists. However, an audit of the same has revealed that the functioning of the same is not yet up to the desired mark and improvement is in progress.

The following figure (source from railways) illustrates how the bio-toilet degrades the waste into non-polluting products. The construction of the same is also illustrated, which is located below the toilet block in the compartment. The water is discharged onto tracks after due chlorination.

Imagine if your toilet tank once filled, won't need refilling for the next 15 years. The civil engineering department of IIT Kharagpur has built an award-winning self-sustainable bio-toilet with a giant flush capacity of 500 litres of water, which recycles itself for a ‘lifetime’ use. It can also help generate electricity using human waste. The bio-toilet has microbial fuel cell (MFC) reactors which work on the water being used in every flush and completely recycle it. Once recycled and clean, this water is then sent to a reservoir on top of the toilet, where it is stored for reuse. The electricity can be used to illuminate the toilet at night. During the day, the electricity can be used to charge mobile phones. It has won the PM’s Swachh Bharat Award. This innovation could go a long way in arid villages where the supply of water is meager, and the problem of open defecation is jarring. Join with me to congratulate team IIT Kharagpur.

Vacuum toilets: It will also be pertinent to see how vacuum toilets work, as given in following figure. As informed earlier, at the press of a button, they create vacuum and thus enable removal of toilet sludge into a holding tank or treatment tank etc. depending on the situation. They are capital and maintenance intensive. However, they are being considered for some deluxe trains.

Suggestion: Irrespective of all economic aspects, the vacuum system can be developed into an altogether new type of toilet waste disposal system in a moving train itself. The concept is as follows: the vacuum system brings all the waste sludge into a holding tank in a separate compartment in the moving train. It is discharged into a small reactor within same compartment, carrying out a process called hydrothermal carbonisation. This process enables conversion of wet sludge into carbon material and water. The filtration will discharge the harmless water (containing phosphorus salts) after chlorine dosing, onto rail tracks. The carbon material is collected and sold as fuel. This scheme requires some work to be done. But it will fetch technoeconomic feasible solution for disposal of human waste sludge.

Sewage in railway stations and buildings: The IR is now geared up not only for sewage treatment, but also for recycling of water. Overall water conservation measures are being taken. The projects to set up proper modern sewage treatment units are being undertaken.

Other waste material disposal: IR, after being covered by MSW Rules 2016, has again geared up to outsource the activity of proper collection and segregation of e-Waste etc. from IR establishments. The contractors will ensure proper recycling and disposal of various other wastes.

Conclusion: In conclusion, it can be said that with the advent of Clean India Mission, Indian Railways (IR) has risen to the huge challenge of achieving clean stations, clean toilets at stations and in trains, water conservation and recycling, cleaner surroundings around tracks and better environment management. Passengers can indeed look forward to seeing this drive sustain and bring about a sea change in IR to compete at a global level, in terms of cleanliness.
Mahratta Chamber of Commerce, Industries and Agriculture

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160 Countries as export destinations

7911 Documents certified by MCCIA

1043 Exporters who availed the services

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If not, you are welcome to contact:
Ms. Snigdha Goliwadekar
Tel.: 020-25709271
Email: snigdhag@mcciapune.com

mcciapune.com
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16th January, 2019
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Breaking barriers to growth
A high-level delegation led by Councillor Ms. Julie Flaherty, Lord Mayor of Armagh City Banbridge & Craigavon Borough Council, Northern Ireland, visited Pune on 28 November 2018. The delegates included Mr. Paul Greenfield, Councillor and senior officials of the Council and several business delegates. Participants from Pune got an opportunity to interact with the visiting delegates. The delegates were from various sectors such as clinical services, environment technologies, construction technology, processed food products (syrups), sports equipment, textiles, waste disposal incinerators, home care, etc.

Mr. Pradeep Bhargava - President, MCCIA, delivered the welcome address on this occasion. MCCIA also made presentation about the strengths of Pune region and MCCIA’s initiatives to the visiting delegates. Mr. Roger Wilson, Chief Executive of Armagh City Banbridge & Craigavon Borough Council made a presentation about the strengths of that region. The Lord Mayor of Armagh City Banbridge & Craigavon Borough has extended an invitation to MCCIA members to visit the place for exploring opportunities. MCCIA has requested the Borough to facilitate exchange of business enquiries and further delegations through a dialogue with relevant Chambers of Commerce in Northern Ireland.

MCCIA and Consulate General of Canada in Mumbai, in association with EEPC India and Defence Equipment Manufacturers Association, had organised a roundtable discussion in Pune to facilitate a dialogue about business collaborations with Canadian companies for manufacturing of spare parts for the defence and engineering sectors on 26 November 2018. As per estimates, the opportunity for manufacturing defence spare parts and components for the Indian defence establishment is expected to touch USD 2.5 billion by 2025. During the roundtable discussion, participants had the opportunity to interact with officials from Canadian engineering companies that are interested in having collaborations with Indian engineering companies for parts manufacturing in the defence sector. Canadian mould making companies provided the design and tooling for defence spare parts and manufacturing will be taken up by the Indian partner.

Mr. Sudhanwa Kopardekar, Director - MCCIA, Mr. Kishor Mundargi - Trade Commissioner for Canada in Mumbai, Mr. S. C. Deshmukh - President, Defence Equipment Manufacturers’ Association and Mr. Rajat Srivastava - Regional Director - EEPC India - Mumbai Region and delegates from Canada addressed the participants at this event.

Meeting with members of a business delegation from Northern Ireland 28 November 2018

MCCIA News
Interactive session with delegates from Canadian companies from Defence and Engineering Sector - 26th November 2018

MCCIA and Consulate General of Canada in Mumbai, in association with EEPC India and Defence Equipment Manufacturers Association, had organised a roundtable discussion in Pune to facilitate a dialogue about business collaborations with Canadian companies for manufacturing of spare parts for the defence and engineering sectors on 26th November 2018.

As per estimates, the opportunity for manufacturing defence spare parts and components for the Indian defence establishment is expected to touch USD 2.5 billion by 2025. During the roundtable discussion, participants had the opportunity to interact with officials from Canadian engineering companies that are interested in having collaborations with Indian engineering companies for parts manufacturing in the defence sector. Canadian mould making companies provided the design and tooling for defence spare parts and manufacturing will be taken up by the Indian partner.

Mr. Sudhanwa Koperdekar, Director - MCCIA, Mr. Kishor Mundargi - Trade Commissioner for Canada in Mumbai, Mr. S. C. Deshmukh - President, Defence Equipment Manufacturers' Association and Mr. Rajat Srivastava - Regional Director - EEPC India - Mumbai Region and delegates from Canada addressed the participants at this event.

Meeting with members of a business delegation from Northern Ireland 28th November 2018

A high-level delegation led by Councillor Ms. Julie Flaherty, Lord Mayor of Armagh City Banbridge & Craigavon Borough Council, Northern Ireland, visited Pune on 28th November 2018. The delegates included Mr. Paul Greenfield, Councillor and senior officials of the Council and several business delegates. Participants from Pune got an opportunity to interact with the visiting delegates. The delegates were from various sectors such as clinical services, environment technologies, construction technology, processed food products (syrups), sports equipment, textiles, waste disposal incinerators, home care, etc. Mr. Pradeep Bhargava - President, MCCIA, delivered the welcome address on this occasion. MCCIA also made presentation about the strengths of that region. The Lord Mayor of Armagh City Banbridge & Craigavon Borough has extended an invitation to MCCIA members to visit the place for exploring opportunities. MCCIA has requested the Borough to facilitate exchange of business enquiries and further delegations through a dialogue with relevant Chambers of Commerce in Northern Ireland.
The 7th China India Forum was organised by International Business Linkage Forum in association with Mahratta Chamber of Commerce, Industries and Agriculture on 26th and 27th October 2018 in Pune. Government of Maharashtra was the host partner state. The Event was a Huge Success. It was highly appreciated by one and all.

As an important activity between two countries, the Forum showcased the Chinese dragon and the Indian elephant harmonizing together in the IT Capital of Maharashtra, Creating future of economic and trade integration together with the concept of mutual learning among civilizations and gathering people's intelligence.

**Highlights of 7th China India Forum:**
- Over 500 Delegates - including 200+ Chinese delegates
- Mr. Pradeep Bhargava, President-MCCIA delivered the Opening Remarks and highlighted the strengths of Pune, MCCIA initiatives and prospects for business between Pune and China
- Hon. Mr. Suresh Prabhu, Minister of Commerce & Industry and Civil Aviation-Government of India - Chief Guest at Inauguration Ceremony (via Video message)
- Hon. Mr. Subhash Desai- Minister for Industries –Government of Maharashtra - Chief Guest at Welcome Evening
- Hon. Mr Jaykumar Rawal, Minister for Tourism Minister-Government of Maharashtra - Guest of Honour at the Inauguration Ceremony
- 5 MOUs Signed worth $100 million
- MCCIA signed an MoU with International Business Linkages Forum to facilitate promotion of business and institutional links between Pune region and China
- Presentation of CHINDIA Awards - 10 Companies commended for their contributions in improving bilateral relations
- Top companies from multiple sectors of China and India attended
- Business Networking among delegates representing companies and organisations in India and China.

**International Speakers and Delegates on topics such as**
- § India Calling China – Perspectives about about promoting cooperation amongst Indian and Chinese companies
- § China Calling India – about Chinese Presence in Indian economy
- § Focus Maharashtra-To promote infrastructure projects in Pune and other parts of Maharashtra and discuss possibilities of cooperation in Tourism and Culture
- § Block Chain & Finance – Capabilities in India and China and application of Block Chain in various sectors
- § The Rising Sectors – Manufacturing, Fintech, Agriculture, Automobiles, Education, Infrastructure and Finance
- § Cooperation in Film making between India and China
MCCIA – Hadapsar branch organised an interactive meeting with Mr. Sunder Latpate, Superintending Engineer, Urban Circle, MSEDCL - Rastapeth, regarding issues related to industry power and tariff on Wednesday, 28 November 2018.

While addressing the delegates, Mr. Latpate spoke on the current power scenario in Pune and MSEDCL initiatives and plans for Pune industry. He said that since all basic necessary functions of MSEDCL are now online, there is a lot more transparency as well as ease of business for the industry.

While addressing a query on requirement of separate sub-stations for Hadapsar and Ramtekdi areas, he said that an area of approx. 600 sq. mtrs. is required for having such a station and, on receipt of suitable proposal, the feasibility can be explored. He also said that there has been no load-shedding in the past 2-3 years and whatever power outages have happened were mainly due to other constraints like aging infrastructure, which was also the reason for closures during Thursdays. He added that as the feeders are old and catering to a large number of consumers in different areas, for routine maintenance purpose, once a feeder is switched off, all consumers connected on that feeder are affected. MSEDCL is planning to address this constraint in the near future. He announced that he would be happy to have more such interactions with MCCIA members in the future.

Mr. Yogendra Talware, Regulator Expert, also gave a presentation on tariff determination regulatory process, changes in tariff w.e.f. 1st Sept 2018 and actions/precautions to be taken by the industry to avoid penalties and get maximum benefits available in the tariff, which was well received by the audience.

Ms. Rujuta Jagtap, Member of the Executive Board of MCCIA, was especially present for this interaction in which 80 delegates representing 65 companies participated in this interaction.
What do we mean by major decisions?

● The ability to envisage risks and uncertainties associated with major decisions is crucial. Therefore, in general, following are some characteristics of major decisions:

● These are decisions that bind the business or firm for many years, a role in guiding us to make the decisions correctly.

● The amount involved is usually large.

● These decisions could bring the existence of the business or firm for many years.

● The amount involved could be highly disruptive.

● There are many financial conditions to be agreed upon.

● The financials of the project or major decision being analysed.

● Relevant means which arises because of such a decision, incremental in other conditions.

● The financials could be highly disruptive.

● Relevant costs and benefits:

   a. Relevant costs and benefits

   b. Risk analysis

   c. NPV, IRR, Payback period, BE point

● Risk analysis subjects each of such assumptions to rigorous scrutiny based on certain assumptions about the estimates of costs and revenues are important.

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● The ability to envisage risks and uncertainties associated with major decisions is crucial.
In this article, we will see some major decisions one has to make and how finance can play an important role in guiding us to make decisions correctly.

What do we mean by major decisions?
- These are decisions that bind the business or firm for many years
- The amount involved is usually large
- If these decisions go wrong, they could bring the existence of the business in danger
- Therefore, in general, following are the important things to bear in mind:
  - Since the decisions commit the business or firm for many years, a careful analysis is required beforehand.
  - As the amount involved is large, means of financing and terms and conditions to be agreed upon need to be appropriate.
  - The ability to envisage risks and their effective management throughout the implementation becomes a key success factor.

Some of the major decisions and related financial analysis are discussed below.

1. Spend decisions - capex, new plant, shifting plant

Decisions of incurring capital expenditure for expansion of business, new plant at new site or sometimes shifting a plant are undoubtedly major decisions for any business or firm. The main analytical tools are as follows:

a. Relevant costs and benefits

One needs to carefully list out relevant costs and benefits for such a decision.

Costs would include capital expenditure as well as additional revenue expenditure. Benefits would include revenue from sale of products from new plant, any savings and so on. Relevant means which arises because of such a decision, incremental in other words. Some times this phase is skipped citing reasons of inevitability of a decision. E.g. “we have no choice but to move to new ERP”. So what is the use of listing costs and benefits. But one must do this rigorously. Sometimes errors happen not only on cost side but also on revenue side. E.g., if a new plant produces a product which is expected to cannibalise product from an old plant, this fact needs to be considered.

b. Risk analysis

One needs to realise that future estimates of costs and revenues are based on certain assumptions about the future. Risk analysis subjects each of such assumptions to rigorous scrutiny and does a ‘what-if’ analysis.

It is more important to closely scrutinise assumptions relating to market size, customers, changes in technology because not only are they outside the direct control of the business unit but also changes in these areas could be highly disruptive.

c. NPV, IRR, Payback period, BE point, EVA

There are many financial calculations which can indicate health of financials of the project or major decision being analysed.

Payback period indicates the time within which inflow of cash equals the initial outflow of capex. Break even (BE) point means % utilisation of plant at which it
measures could be as follows

1. Fixed costs
   - Some of these expenses like rent, repairs are available for some campaigns, one needs to establish a proper system for analysing effectiveness of these expenses. There are no easily available yardsticks as are available for some expenses like rent, repairs. Some of the measures could be as follows
     i. Establishing specific effects expected and measuring them e.g. increase in market share or increase in distribution (i.e. no of outlets)
     ii. Increase in brand value
     iii. Increase in pricing power or improved contribution/margin

b. Research & Development
   Similar is the case of R&D expenses. Of course, R&D would have some capex also. These are discretionary costs and have to be related to the strategy of the firm. The outlook has to be necessarily long term. How to measure effectiveness of R&D or how to decide how much to spend is indeed not an easy task for even experienced players. The analytical approach could include the following elements
     i. Establishing a mechanism for measuring effectiveness as for brand expenses above
     ii. Another aspect which applies to R&D more than it applies to brand building is to plan for failures. How to spot failures early and possibly do mid-course correction is one aspect. The other aspect is to maintain is a pipeline of initiatives bearing in mind that not every effort will be successful. Many in SME may think basic research is out of their reach, but thinking is required for development efforts for new products. Also, SMEs can pool efforts or can think of tying up with institutions like IITs

c. Equity vs. Debt
   Financing is as important as spend analysis. Many times, these are long term decisions. Some issues involved are as follows
     a. Equity vs. Debt
        Sometimes firms plan to take as much as debt as possible and keep the remaining amount for equity. This is like walking on the edge of a cliff. While smaller entrepreneurs would have financial constraints in raising equity, some steps would go a long way in augmenting/preserving equity
           i. Prudent pay-out of dividend
           ii. Not investing in non-productive assets

   2. Revenue expenditure of major amounts
      a. Brand building/ advertising
         Though these expenses are revenue in nature i.e. charged off to Profit and Loss Account in the year of incurrence, from management angle one needs to consider these on a different footing. Since the expenses could be significant for some type of businesses and for some campaigns, one needs to establish a proper system for analysing effectiveness of these expenses. There are no easily available yardsticks as are available for some expenses like rent, repairs. Some of the measures could be as follows
b. Debt - Short Term vs. Long Term
Sometimes there is a mismatch between duration of loans and assets for which they are used. The worrisome part is when short term loans are used to meet long term requirements. It may happen sometimes because short term finance is available more easily. On the deployment side, it is obvious that fixed assets are for the long term, but also core part of working capital is long term because business will always use that much cash at the minimum level.

c. Equity - Own, PE or VC, Listing
Within equity funding there are 3 options as listed below
i. Promoters’ own equity
ii. Private equity or Venture capital funding
iii. Public funding obtained by listing on stock exchange

The important part is to understand that funds that come in pose a responsibility on the management and promoters.

● First point is they lose part of control.
● Second point is every investor has expectations of return. So, if a company raises say Rs. 500 crores in an IPO, and there is a return expectation of 16%, then that company needs to have a plan of how to make additional Rs. 80 crores profit and grow it.
● Third point is governance has to be of a higher order. E.g. related party transactions like remuneration to promoter directors have to be at arm’s length.

4. M&A
a. When the firm acquires another business
This is a major decision for any business. If not analysed and executed with care, it has the potential to derail the parent company. Some key points to be kept in mind are:
i. Acquisition has to be in line with strategy. Acquisition for the sake of acquisition cannot be a strategy. The reasons for acquisition could be either completing a product portfolio or acquiring a technology or increasing presence in a region which is strategically important.
ii. Cultural fit is very important especially when acquisition involves taking people on board
iii. Price paid is an important determinant of future success of acquisition. Many times, benefits of acquisition like synergy, possibility of turnaround are overstated in internal analytics and could lead to failures later on

b. When the firm gets an offer to get acquired
Some of the key points
i. The promoter family should take a decision together
ii. In analysing future prospects of business without getting acquired, when one considers competitive scenario, one should avoid both extremes of optimism and pessimism.
iii. If the decision is going in favour of getting acquired, the alternative businesses that can be pursued is an important consideration.

5. Other important decisions
a. Make or buy
This is essentially a decision whether some of the processes can be done inside or outside.
i. Financial analysis is one aspect but not the only one
ii. Strategic importance of the process is another. E.g. at one time, a processor within a PC was a component. But Intel found a way of commanding premium thereby making PC a commodity play, so to speak. Sometimes information technology is outsourced, but if it is a platform to gain competitive advantage, then the decision needs a review in that light.

b. Design
Design of a product is a long-term decision if it is difficult to change. Long term profitability depends on design. Many times this aspect is lost while designing a product. It is true that design is a mix of science and art and one may feel that it should not be subjected to a boring criterion of cost. But in that case one needs to insist that superior work needs to fetch more revenue to make up for higher cost. In calculating cost, the obvious part is material and labour / machining cost. Hidden cost would be set up cost. Also, some costs would show up in customer's accounts like depreciation over life of product, possibility of failures and repair costs.

Organisational imperatives:
One would realise that proper decision making in the above type of cases requires good team work by top management and cannot be left to only some of them.

To summarise, business encounters many situations where a decision is required to be taken, which commits itself to a long term. The above list of decisions and required analytics may sound simplistic to some and tedious to others. The important point is to have a studied view of the future as a basis to decision. Also, criteria for a decision should be documented as reference points for the future. Anyway, the analysis should not be static. It should account for uncertainties that arise because of change in assumptions e.g., interest rates. It should consider uncertainties because of competitors' actions. The future is more difficult to predict when it is more distant. Having a margin of safety is one of the ways but not sufficient enough to face the odds. One needs to actually visualise disruptive events and plan counteractions against at least some of them.
The famous statement ‘One should always work towards some goals in life’ takes a lot of credit points in the scorecard of any individual's lifetime. Maybe the word 'goal' gets redefined in various phases as we progress in life and understand the value of all that contributes towards making us feel accomplished and successful. Being happy with whatever one gets as a share of our contributions at home or work or anywhere is what we accept as our share of achievement. With a standard job, family to look after and other personal commitments, I understood that I have got 'too settled' in my comfort zone of achievement. Every day was just like the previous day with nothing to aspire for and no direction towards any goal for personal development. I had to stirrup a strong mental battle to shake myself out of my self-conceived world of 'no time to learn - very busy to do anything'.

Early in 2016, one morning I saw a group of men and women running near my house. Around the same time I read about the running events organised by different organisations to promote some particular idea about health and fitness within the community. Fortunately I could get in touch with the running group near me and I understood that running will be that one thing where we can be free from fear of judgments and comparison. This will be that one activity which will be dedicated solely for the development of my soul!

I started with baby steps with small distances of 5Km or 10Km. I still remember the occasion when I completed my first 5km run and returned home with my finisher’s medal, my entire family was at the door to welcome me. Everyone was excited and full of pride while talking about my achievement. It is with the same excitement and pride with which they now share my story of running from Mumbai to Pune. Here I want to emphasise that if any of us has set a goal (however small or big it may be) and is determined to work towards its success with honesty, feel sure that your family, friends and for that matter the elements of nature, all will ensure that you reach your desired destination.

Running Inter-city Mumbai to Pune covering a distance of 100 miles (approximately 160 Kms) is not something one thinks of doing in the standard line of thought. Some good amount of inspiration and confidence needs to be added to believe in this idea! When I got introduced to this concept of running long distance, running a half marathon (21kms) or for that matter a full marathon (42kms) was the ultimate goal in terms of achievement. Hence, when I heard someone mention about running from Mumbai to Pune, the first thought that came to me was that this is meant for others or that maybe people who are really, really very strong physically think of something like this or this is for professional athletes who do these kinds of extreme things regularly. I was thinking hard to convince myself to
believe in the idea that I can really do this! By taking up this challenge, I wanted to find out the real sense of determination and commitment I could put up for myself. This would be one of those rare opportunities where I can set up an incredible goal and be a hero for myself by being true to the best of my abilities.

While training and preparing for running Inter-city Mumbai to Pune is when I understood that there is a lot to learn than just running. Here is where I was able to redefine my aspirations. My family has always been the source of strength and courage and somewhere throughout the whole journey, they kept strengthening the unspoken rule of trust. Sometimes while training when I had self-doubt if at all I should go ahead, my friends from the running team did not want me to give up. Here is when I realised that this not my ambition alone but I have to keep the faith alive for all those who have placed their trust in me and believe in the spirit of goodness. My mentors from the Kothrud Deccan Running Group have been around at every step in my journey towards this goal. On each occasion, with their encouragement and guidance, they proved that the spirit of compassion is what helps everyone achieve beyond thought.

During the trainings, we were expected to run distances ranging from 30km to 60km in a day and this helped us in understanding the concept of ‘mind over body’. At times we felt like giving up mid-way during the practice runs. But team members held on to each other and ensured that each of us completed the target distance.

Now when I look back and think about the time I spent preparing to reach my goal of running 160 km Mumbai to Pune, I understand it was the journey that was more enriching than the destination itself. The values and life skills I picked up while training has given me a complete attitude makeover. Cherishing our opportunities and not being judgmental towards any situation is what helps in bringing out the best in all of us.

United Sisters Foundation’s Pinkathon, an initiative by Milind Soman, conceptualised this Inter-city Spirit of Pinkathon run from Mumbai to Pune between 25th to 27th October 2018. A team of 12 girls from Pune qualified to be a part of the team after completing various check points during the 10 months of training. All women who participated in this intercity run are from normal walks of life with no professional athletic records. This establishes the idea that it's not always the past which influences any result but the attitude towards commitment and determination which one invests in achieving a future goal. Each of us in some way or the other can try to be of goodness in helping people around us in achieving more and being the best we can be. It is the value of ethics and honesty that keeps an individual on the right path.

Till then keep believing...keep inspiring!!

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Adopting Industry 4.0. in India's Aerospace and Defence manufacturing sector

Kishore Jayaraman

India’s manufacturing sector

The Indian Government estimates India’s manufacturing sector would breach US$ 1 trillion by 2025. To that end, the Government’s ‘Make in India’ initiative is providing the groundwork for both small and large companies to develop advanced manufacturing capabilities and to invest in technology upgradation.

The aerospace and defence (A&D) sector, in particular, has seen a resurgence with the launch of Make in India initiative. The Government’s priority to indigenise the A&D industry, attract global players to manufacture in India and lower the dependency on imports has provided the necessary boost to the sector. Today, the country has spring-boarded into international focus, not just as a hub for R&D but also as a centre for precision manufacturing of complex components.

Aerospace and Defence manufacturing

With encouraging regulatory policies and enablers, increased private sector participation and global attention, India’s A&D manufacturing seems to be set on positive growth trajectory. Additionally, the growth in domestic demand for commercial, military, and general aviation aircraft, as well as Maintenance, Repair, and Overhaul (MRO) services coupled with availability of skilled talent is ensuring the swift and sustained development of A&D manufacturing in the country.

Over the years, the A&D sector in India has shown a remarkable level of maturity, adapting quickly to support the growth of aerospace manufacturing by adopting international quality standards and establishing technologically advanced manufacturing facilities. Several Indian companies have proven themselves capable of providing first-time correct quality comparable to global standards.

However, what needs to be kept in mind is that aerospace and defence is a highly technologically, capital and skill intensive industry. As India pursues manufacturing-led growth, it needs to move away from low-cost manufacturing and align with the global trend of embracing Industry 4.0 to boost its competitive edge.
Benefits of adopting Industry 4.0.
Apart from building long-term competitiveness on the global stage, India’s A&D sector stands to gain significantly from adopting Industry 4.0.

First, it will allow manufacturers to improve productivity, efficiency, safety and performance and help position India as a global manufacturing hub. For example, technology deployment across manufacturing methods, processes and equipment will enable companies to track the production process from start to finish, analyse data across machines, and get real-time feedback on raw material availability, equipment condition etc., resulting in efficient processes and higher-quality products at optimised costs.

Manufacturers can even implement data analytics to improve forecasting, predict and prevent manufacturing down times, manage supply chain and enhance production capacity and quality. For instance, Rolls-Royce has more than 13,000 commercial aircraft engines in service around the world. Using a range of smart data analysis capabilities, predictive tools, and engineering expertise, we help airlines monitor and reduce fuel usage, fly routes more efficiently, and ensure the right teams and equipment are in place to service engines more quickly and maintain the highest levels of availability.

Second, Small and Medium enterprises (SMEs), which form the backbone of Indian A&D manufacturing, can leverage Industry 4.0 technologies to become more agile, enhance productivity, streamline costs and reduce risks. The sooner they evolve to meet modern business needs, the more they will stay relevant and secure new business on a global scale.

Third, employers will be able to increase the skills of their workforce. While some jobs may be lost, new ones will be created in the new economy. New technologies inadvertently require new skills and trained Industry 4.0-ready workforce especially in areas of cognitive robotics, advanced automation and industrial ICT. Training in safety-related skills will also come into play with an increased level of human-machine cooperation.

Fourth, adopting Industry 4.0 could help A&D manufacturers in India to move beyond the present status, characterised by manual inputs, lack of ICT integration in manufacturing, to fill the critical technology gaps and move to the innovation-led and high-value manufacturing stage.

Finally, opportunities for creating new business models will be another major advantage for advanced A&D manufacturers. With real-time data insights, they can not only improve existing after sales service but also drive revenue by offering customers value-added services. For example, Rolls-Royce is adopting a ‘power-by-the-hour’ business model when selling engines: customers pay a fixed rate per hour of operation and Rolls-Royce provides predictive maintenance services based on insights from its ‘connected’ engines that wirelessly send machine data to Rolls-Royce centres for monitoring and analysis.

Next steps
Most of the elements that makeup a successful A&D manufacturing ecosystem are already present in India. Increased focus on infrastructure and skill development, Industry 4.0 adoption as well as encouraging private sector partnerships will be critical for pursuing a sustainable growth in the sector.

For example, incentivising industrial clusters and creating dedicated financing options will help manufacturers, especially SMEs, to expedite implementation of Industry 4.0. Encouraging vocational education and training programmes should become a priority to ensure a continuous supply of highly qualified talent. Finally, a more collaborative effort across multiple stakeholders – academia, public and private industry, and service providers – will be important to propel India into a global hub for A&D manufacturing.

With a calibrated approach, India’s A&D manufacturing sector will be able to leapfrog traditional phases of development, and help achieve the country’s self-reliance ambitions.

Kishore Jayaraman
President, Rolls-Royce – India & South Asia
Creating A New Footprint in Precision Products

Huned Contractor

Sylvac, a Swiss manufacturer of precision measuring instruments, has set up a subsidiary in India to provide the engineering and other sectors a wide portfolio of their products. In this interview with Huned Contractor, Sylvac Metrology India (P) Limited’s Director Arun Kudale elaborates about the company’s plans.

Could you provide an overview of the operations of Sylvac India and its products?

Sylvac Metrology India is a subsidiary company of Swiss precision instrument manufacturer Sylvac SA. Currently, Sylvac India has a training centre and office in Pune. Our products are digital measuring instruments which are categorised as hand tools and our speciality is Bluetooth facility for transmission of measured data up to 15 metres from the shop floor to the computer. Sylvac has also introduced scanning and vision measurement systems in the world market. These products will also be marketed in India.

Sylvac SA’s headquarters is located in Crissier, near Lausanne in Switzerland. They are a renowned manufacturer of precision instruments, categorised as smart digital measuring instruments such as dial gauge, calliper, micrometre, inside micrometre, height gauges, bevel protractors, linear probes, digital readout system, etc. The Bluetooth technology implemented in Sylvac instruments is very compact and unique. The company also manufactures scan and vision non-contact type measuring machines used for inspection in mass production.

What is the size of the precision instruments’ market in India and how strong is the presence of Sylvac Metrology India in this sector?

The approximate size of the precision instrument market in India is Rs. 200 crores. Sylvac is a fairly new entrant in this market and our current share is 2.5%, which will increase to 10% in the next few years.

What is the objective of opening a training centre in Pune?

The objective of opening a training centre is to give hands-on training to our customers, agents and end-users since Sylvac products are very precision products manufactured in Switzerland with state-of-the-art technology. The training will help our end-users get acclimatised to the new technology and use it at their workplaces. This centre will also provide after-sales service under our customer care activities and will create confidence in the minds of users about the reliability of our products. At a later stage, we will think of training selected engineering students who are interested in metrology as their career.

Are there any products of Sylvac that will be useful for industries implementing Industry 4.0?

All the Sylvac products will be useful to Indian industries to implement Industry 4.0 strategies. They will collect measured data from the shop floor, will transmit it to the computer which in turn will process it and give instructions to the manufacturing machines for the corrections wherever required.

Which are the industrial sectors that Sylvac is targeting for the sale of its products?

Our customers will be almost all the engineering industries, auto component manufacturers, automotive industries, pharmaceutical industries, defence, railways and all the other industries using mass production techniques.

What are the manufacturing plans of Sylvac for India?

We have yet not finalised our...
manufacturing plans but will definitely intend to respond positively to the 'Make in India' drive of the Indian government in the next few years.

**What kind of expansion strategy does Sylvac have for India?**

Currently we have a sales office and training centre here in Pune, which caters to our over 100 direct customers and 16 agents and distributors. We will strengthen our distribution system first. We want to provide very satisfactory service to the Indian industry at world-class speed with Swiss quality. Gradually, we will plan for assemblies of knocked-down components and finally manufacturing. Ours is a very precision product which is high-tech in nature and hence the penetration of technology will take place gradually and firmly to suit the Indian industrial climate.

**What about exports to neighbouring countries?**

We are currently exporting a very small quantity to the neighbouring countries from here. This activity will also grow gradually.

**Does Sylvac India engage in research and development activities specifically for Indian customers?**

We have no plans at present in this direction. However, once we start manufacturing here to some extent, we will think of doing some research and development in India. India is very strong in exporting software. We can primarily think on those lines first.

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Sylvac India

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MCCIA Members

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* Refundable Deposit Rs. 5,000/-
* NOTE: All Charges will be 25% more on all Saturdays & Sundays & Holidays of the Chamber. Cheque/DD in favour of MCCIA
* Booking will be confirmed & Hall will be allotted on receipt of full payment in advance ONLY
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(10 am. to 5 pm. - on all working days of MCCIA)
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