

Bosch India modernises manufacturing to create Factory of the Future

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Manufacturing is under rapid transformation in terms of technology and systems. Digitalization, Industry 4.0 and Artificial intelligence are changing manufacturing plants into smart factories. Machines and people are connected.

Within our manufacturing strategy for the local plants, in 2015 itself we had identified Industry 4.0 as a key enabler. Since then more than 160 projects have been successfully implemented, many of them developed in India with our Engineering and Business entity. This includes artificial intelligence for vision systems, digital twins for optimization of our manufacturing lines and a device bridge for connecting old machines to the Internet of Things.

In order to be prepared for new exhaust gas and safety legislation we have implemented new process technologies as well as high precision machining and precision assembly. With these technologies we are able to produce state of the art technology in India, e.g. BS-6 fuel injection, exhaust gas sensors etc. Bosch is focusing on electromobility as well. This requires different and new competencies like Power electronics and Battery management system.

We do these activities together with partners in the Bosch network as well as external partners. It is important to focus on increasing automation level in manufacturing.



We have initiated 44 projects, of which 26 are for smart automation and robots, including co-bots (collaborative robots). Through these projects we could improve our productivity significantly. In order to support these activities we have implemented a center of competence for smart automation.

We have special departments that help manage manufacturing. They include: Simultaneous engineering team (Manufacturing + Technology + Development + Purchase), connected industry team, Bosch Production systems team and Lean project team.

Most of the technologies we apply are sourced through direct transfer and from in-house R&D. We are a member of the Bosch IPN (International Production Network) as well. Standard solutions for

technology globally are transferred to us, and also vice versa. Collaboration with local partners (e.g. for automation and robots) is getting more and more important. We have implemented in our plants complete solutions for automation together with local vendors very successfully.

Joint ventures will play an important role for us in future. This will allow us to limit the risks, to be more agile and to have access not only to new technology, but to data as well. Data is becoming more important than hardware; it is the "new crude oil".

□ Skill development

For skill development of the human resources in Bosch India we focus on the following key topics.

Learning of Basics: Technologies, Front line manager empowerment programme.

Methods training: Q and problem solving, Scrum and agile methods.

New skills: Connectivity, IoT, AI, programming.

Behavioural skills: Coaching, Collaborating

We have set up multiple academies across the plants in India on Safety, connected industry and quality. In 2018 in Bosch Limited alone we spent more than Rs 47million and had 65,804 man-hours for up-skilling our teams. The

programmes address all layers in the organization.

TQM, TPM

TPM goes hand in hand with Quality and Operational excellence. In order to accomplish our ambitious growth and profitability targets we need to use systematic methods and involve as many employees as possible in continuous improvement activities. The Key focus areas are:

- **Problem solving methodology:** We have trained more than 121 problem-solving specialists and completed 70 projects in 2018, leading to substantial amount of savings.
- **Continuous improvement:** In most of our plants we have initiated daily CIP. As an example, this approach has delivered almost 10,000 improvements/year in a single product line. In the entire organization we received over 39,000 suggestions in 2018.
- **Maintenance:** Both preventive and predictive maintenance using Industry 4.0 technology. For example spindle monitoring

and oil monitoring help to come from preventive to predictive maintenance.

- **5S in shop floor:** With this we could go to almost zero reportable accidents in the entire organization in the past 3 years.
- **Faster response time on shops** for higher customer satisfaction. In one of our value streams we have reduced the lead time by almost 50% in the last 3 years.
- **Focus on KPIs** like Internal Defect cost, MTTR, MTBF, change over time, standardized work, TQM, Q mindset campaign, systematic problem solving and value stream improvements which have almost 33% less customer related incidents over last year.

□ Digitalisation

We have a Bosch India connected industry strategy and a smart automation strategy. From 2016, we have increased both the number of projects and their maturity. There are more than 300 projects implemented in our plants, and these are solutions made in India for

India and the world. The use case depends on the business case and return on investment. Smart copy between plants is encouraged to co-create the Factory of the Future.

In terms of Industry 4.0 we are definitely one of the leading solution providers as well as users in India. To date 40% of all our machines are connected. By 2020 this will go up to at least 60%. This number is considering the fact that not all of our machines and production lines are new. This shows what is possible even with limited investment budgets.

In some projects we have seen significant productivity improvement through smart automation, co-bots, ergonomics and lean line design. In some other projects we have seen 10% productivity gain through connectivity. This has helped us gain more volumes and market share. In 2018 Bosch India has outperformed the market growth. For the upcoming years we have many more of these projects in the pipeline. **ACI**

