

EXECUTIVE SUMMARY

The country needs accelerated economic growth to meet the socio-economic challenges of a growing population, and enhancing manufacturing growth is one of the ways to accelerate economic growth. National Manufacturing Policy therefore envisaged achievement of 25 per cent contribution of manufacturing in the GDP till 2020. MSMEs play a significant role in the country's total manufacturing. However, the Indian MSMEs face *inter alia* the challenges of productivity, quality, competitiveness and efficiency, at a time when climate change agenda deliberates for lesser emission of GHGs and switching over to clean technologies.

In such a situation striking a balance between high manufacturing growth and low carbon footprints, particularly in MSMEs, is undoubtedly a difficult proposition, that too when they lack financial strength to invest in clean technologies, have little knowledge of energy efficiency measures and are unaware of in-house solutions to transform themselves into productive, competitive, efficient and ecologically responsible manufacturing units.

Lean manufacturing is one of the ways which can help MSMEs to attain the desired growth path of productive and competitive manufacturing. It has shown encouraging results in many industry clusters. Lean techniques coupled with energy efficiency measures can be a better solution for an efficiency and sustainable manufacturing.

The present study has explored the impact of lean manufacturing on productivity and competitiveness in Indian MSMEs. It has established the linkages between lean implementation and energy efficiency enhancement, which leads to green growth in small industries. Keeping in view the importance of human interface in lean manufacturing, effect of certain management practices on successful lean implementation and impact of lean adoption on improving workplace environment have also been studied.

The results of the study show that MSMEs are using on an average ten lean tools. However, it is learnt that the usage of low hanging lean tools like 5S, Visual Control, Standard Operating Procedures, Inventory Reduction and Employee's Education is very common while industries are averse to using high hanging lean tools like 6Sigma, JIT, Kaizen, Poka-Yoke and Automation (Jidoka) which require more process rigour in their implementation.

It is evident from the study that the lean implementation substantially enhances the productivity, reduces wastage and improves energy efficiency in the MSMEs. In addition to this, it makes industries more competitive by in-house solutions, innovation, quality improvement and design interventions. Furthermore, lean manufacturing significantly improves the overall environment of the workplace. As a result of lean implementation, the bondage between the management and employees becomes stronger and mutually beneficial, which leads to instilling the lean philosophy of consistent improvement in the industry.

The study also unravels that lean and green manufacturing is a productive, cost effective and profitable model, as industries are found to agree that lean implementation reduces wastes and energy consumption and enhances the energy efficiency significantly. It helps them to become cost effective. However lack of knowledge of right technology, lack of finance and lack of capable consultants in market, *inter alia*, are some hurdles which hamper industries in adopting lean and green manufacturing practice.

The study delineates that lean and green manufacturing is the stepping stone for industries in attaining the growth path of innovations, design, productization and consistent improvement. It leads industries to enter into the orbit of global knowledge economy.

The study further deconstructs the thesis that converging and superimposing the various schemes and programmes being run by the governments and stakeholders can leverage better results and have multiplier effects. The implementation of schemes in SPVs or industry clusters seems to be a far more reliable and effective model to harness the benefits and resource maximization. The successful SPVs will become flag bearer clusters for others to follow and replicate the successful model of lean and green manufacturing and become globally competitive manufacturing hubs.