ABSTRACT

The manufacturing systems have been witnessing a key transition from mass manufacturing to lean manufacturing. Mass manufacturing focuses on high volume production with limited product variety. Lean manufacturing is focused on elimination of wastes thereby streamlining the processes and facilitating cost reduction. Lean manufacturing focuses on elimination of seven wastes namely overproduction, over processing, waiting, transportation, defects, inventory and storage. Recently underutilization of creativity of workforce is added as eighth waste and environmental waste, ninth waste. Some of the vital tools of lean manufacturing include Value Stream Mapping (VSM), Kaizen, Total Productive Maintenance (TPM), 5S, Work cells, line balancing etc. VSM is one of the vital tools of lean manufacturing which needs to be implemented first for enabling lean practices. VSM involves construction of current state map, identification of improvement proposals and implementing in future state map.

The improvement proposals need to be prioritized and a suitable mapping to be devised for relating the wastes and improvement proposals. In this context, this doctoral work presents the integration of Quality Function Deployment (QFD) to prioritize the improvement proposals. In order to cope up with vagueness and impreciseness associated with data, fuzzy QFD has been used in this doctoral work. Four case studies are being reported in this thesis. The first study has been carried out in a pump manufacturing organization. The current state map has been developed by gathering required data. Then fuzzy QFD has been used for prioritizing the improvement proposals followed by the development of future state map. The prioritized wastes include inventory, waiting, defects and transport;
prioritized techniques include Kanban, Single Piece Flow, Quick changeover and Kaizen.

The prioritized tools are implemented in the in the case organization and the improvement in lean performance measures are computed. The second study has been conducted in an automotive component manufacturing organization. The company desires to achieve 100% quality performance. The current state map has been developed, followed by deploying fuzzy QFD and developing future state map. The improvements being implemented include 5S concept, Quick change over practices, super market concept, Autonomous maintenance and Work cells. The benefits are being reported from the reduction of non-value added time, total cycle time reduction and Work In Process (WIP) inventory reduction. The improvements in lean performance measures were quantified. The third study has been conducted in valves manufacturing organization. The current state map has been developed. The required improvements in our case study include work place cleanliness, reduction of WIP, reduction of changeover time, reduction of manpower, reduction of transportation.

The identified tools include 5S, QCO, Poka Yoke, Work cell, Kanban. Fuzzy QFD has been used for prioritization. The prioritized improvements are being subjected to implementation in the case organization by the development of future state map. The fourth study has been conducted from the perspective of extending VSM approach to incorporate environmental data.
were quantified. The industrial and managerial implications were presented. The conduct of this doctoral work would enable the systematic deployment of VSM framework incorporated with environmental data.