

LEAN PRODUCTION

Lean production utilises the PDCA cycle (Plan – Do – Check – Act).

FPC is guided by the following principles in developing and improving its lean production technologies:

- Customer focus
- Focus on the process

- Production process flexibility
- Standardisation
- Elimination of waste
- Transparency
- Error proofing
- Excellence.

LEAN PRODUCTION TOOLS USED IN FPC TO ELIMINATE WASTE

- Just in time
- 5S
- TPM (Total Productive Maintenance)
- Brainstorming
- Pareto chart
- Risk matrix
- Innovation ideas
- Time and motion study
- Value stream mapping
- Process description, defining indicators
- Kanban

TASKS TO BE TACKLED BY THE USE OF LEAN PRODUCTION TOOLS

- Elimination of process defects and errors
- Elimination of process waste
- Efficient use of equipment, means of control
- Reduction of process times and total cycle time
- Elimination of unnecessary transportation
- Reduction of excess inventory
- Optimisation of warehousing and production floor space

| LEAN PRODUCTION TOOL | DESCRIPTION | EFFECT |
|-------------------------------------|---|---|
| Just In Time (JIT) system | <p>A production management concept that is aimed at reducing excess inventory. Under this concept, the right parts and materials are delivered in the right quantity at the right place at the right time.</p> <p>JIT goals:</p> <ul style="list-style-type: none"> • Zero defects • Zero set-up time (reduced set-up time leads to reduced production cycle and inventory) • Zero inventory (inventory, including materials that are being processed, installed or assembled, should be near zero) • Zero non-value-added activities • Zero lead-time | <p>The JIT approach boosts production efficiency by eliminating waste. Waste means any operations that increase the cost, but not the value of a product, such as unnecessary movements of materials, excessive inventory, etc.</p> |
| 5S system | <p>A system for efficient workplace organisation. Like other lean production tools, it contributes to the work area manageability and helps save time.</p> <p>It includes the following steps:</p> <ul style="list-style-type: none"> • Sort • Set in order • Shine • Standardise • Sustain. <p>The 5S system helps reduce the number of errors in documents, create a comfortable working environment, and boost performance</p> | <p>The 5S system is implemented:</p> <ul style="list-style-type: none"> • at workplaces in passenger carriage depots/sites • at spare parts and materials warehouses • at train crews' workplaces • in the offices of FPC's central administration, branches and their structural units. <p>The average score of the 5S system across FPC is 4.6 out of 5</p> |
| Total Productive Maintenance | <p>The concept of production equipment management aimed at boosting maintenance efficiency. The focus is on prevention and early detection of equipment faults that may lead to more severe issues</p> | <p>The method of universal equipment care is based on stabilization and continuous improvement of maintenance processes, a system of planned preventive repairs, work on the principle of Zero Defects and systematic elimination of all sources of losses</p> |

| LEAN PRODUCTION TOOL | DESCRIPTION | EFFECT |
|------------------------------|---|---|
| Brainstorming | Method of Brainstorming (brainstorming attack) – A rapid problem-solving method based on stimulation of creativity. This method's key advantage is in encouraging creativity, with ideas generated in a comfortable, creative environment | All participants are enthusiastic about generating and discussing ideas among equals, which helps unlock creative freedom, intuition, imagination, originality, and out-of-the-box thinking |
| Pareto chart | A tool that helps spread the effort to solve problems and identify principal root causes of defects | The Pareto principle states that 20% of effort generates 80% of the result, and the other 80% only accounts for 20% of the result. By identifying 20% of the most significant causes of defects, the reject rates can be reduced by 80% |
| Risk matrix | A risk matrix is a tool within FPC's risk management system used to reduce the Company's losses | A risk matrix is a tool that enables ranking and reflecting risks through identifying their probability and severity |
| Time and motion study | Time and motion study is a method to study working time through observing and measuring the working time components, usually throughout one shift (or any part of a shift) | This method helps: <ul style="list-style-type: none"> • study the work process and equipment utilisation in great detail • obtain absolute (in seconds, minutes, hours) and highly accurate data • identify actual working time throughout the study period and obtain data on the sequence of process elements • identify rational approaches to ways and methods of working, causes for waste, and suboptimal use of time |

| LEAN PRODUCTION TOOL | DESCRIPTION | EFFECT |
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| Value stream mapping | Value stream mapping means analysing and visualising the material flow and the relevant information flow throughout the value stream across processes between the supplier of materials and the customer | This tool makes it possible to: <ul style="list-style-type: none"> • visualise the entire value stream • identify the causes of waste in the value stream • use a common language for discussing production processes between specialists • make many solutions related to the value stream clear, coherent and easy to discuss • integrate lean production concepts and methods that help avoid “missing the forest for the trees” • establish a base for a lean production implementation plan • demonstrate relations between the information and material flows |
| Innovation ideas | Innovation ideas is a powerful tool to boost the Company’s efficiency and performance by unlocking the staff’s creative potential | Innovation activities help: <ul style="list-style-type: none"> • kickstart and develop FPC employees’ technical creativity • provide legal protection for innovations and inventions • boost FPC employees’ commitment to their work through financial and non-financial stimulation of technical creativity |
| Process description, defining indicators | A process is a sequence of interdependent and/or interacting activities that use inputs to achieve a planned result. To be manageable, a process needs to be described, and its indicators need to be defined. The indicators should reflect the performance and efficiency of the process | A process description is a key tool for identifying areas of process improvement |
| Kanban | The most widespread type of the Just in Time system, Kanban ensures a continuous material flow with zero inventory: the material is supplied in small batches to the production process where it is needed | Kanban Cards are used in business units to avoid cluttering storage and work areas with spare parts stored in advance |