Connected Worker Blueprint for increasing your OEE

A guide to leveraging digital technologies combined with manufacturing best practices to increase OEE in your plant.

Overall Equipment Effectiveness
= Availability X Performance X Quality

Legend
- ▼ Prevent defect recurrence
- ▲ Increase resolution speed

Key Performance Indicators

Availability
Operating time / Scheduled time

Performance
= (Ideal Cycle Time x Total Count) / Run Time

Quality
= Good Count / Total Count

Common Problems (Six Big Losses)

Unplanned Stops
Equipment Failure

Planned Stops
Setup and Adjustments

Small Stops
Idling and Minor Stops

Slow Cycles
Reduced Speed

Production Rejects
Process Defects

Startup Rejects
Reduced Yield

Poor Repair Practice

Poor Planned Maintenance

Poor Operational Practice

Machine Function Analysis

Failure Code

Breakdown Report
Using all details from the deviation, a breakdown report is created automatically.

Predictive Maintenance

Preventative Maintenance

Corrective Maintenance

DMAIC to eliminate deviation
Define, Measure, Analyze, Improve, and Control. A structured project improvement methodology that helps improve your chance of successfully solving a problem.
▲

Breakdown Analysis
A breakdown analysis is meant to find the root cause and plan follow-up actions to prevent the same issue from occurring again.
▼

Maintenance
Maintenance is often done to correct problems instead of being planned. Using a DMOS, required tasks can be identified, scheduled and assigned to take place before equipment is due for it, avoiding a breakdown.
▼

SoP, OPL, Training, Skill & Knowledge
Incorrect execution of SoPs such as Tightening, Cleaning or Lubrication. Or lack of knowledge to perform task (i.e. no available OPL for Setup/Changeover).
▼ ▲

SMED Quick Changeover
Changeover times can be dramatically reduced. Each element of the changeover is analyzed to see if it can be eliminated, moved, simplified or streamlined.
▼

Physical Reasons

Operator Reasons

Six Sigma
Six Sigma is a disciplined, statistic-based, data-driven approach and continuous improvement methodology for eliminating defects in a product.
▼

Analysis to Prevent Recurrence

Using available analysis tools, find the root cause and plan countermeasure(s). Update the knowledge base and equipment plan. Each deviation (see Six Big Losses, above) could potentially be prevented.

FMEA Analysis
Failure Modes and Effects Analysis (FMEA) is a systematic, proactive method for evaluating a process to identify where and how it might fail.
*Will be included in the next version.
▼

Fishbone Analysis
A fishbone diagram, also called a cause and effect diagram or Ishikawa diagram, is a visualization tool for categorizing the potential causes of a problem in order to identify its root cause(s).
*Will be included in the next version.
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5 Why Analysis
The 5 Whys is a technique used in the Analyze phase of the Six Sigma DMAIC (Define, Measure, Analyze, Improve, Control) methodology. By repeatedly asking the question "Why", you can peel away the layers of symptoms.
▼

Execute Countermeasures
Communicate countermeasures to workers, execute as needed

Update Equipment Plan
Use root cause to update Equipment Plan and Knowledge Base.

Countermeasure
When a problem cannot be resolved immediately, a temporary "band-aid" action is taken to prevent the problem from continuing to occur in the process.
▲

Fuguai Tag / Deviation
Any abnormality, deviation or defect is to be registered digitally (via mobile device). By solving the deviation, prime operating conditions can be restored. Solutions will automatically be documented for further analysis.
▲

Task
A simple task not based upon any particular SOP. It could be a follow-up after a failed 5S audit, an inspection gone wrong or an idea for improvement from a shopfloor worker.
▲

Restore Prime Operating Conditions
Execute different types of tasks on an ad-hoc basis to restore basic operation conditions as quickly as possible.

Equipment Information Management System

A system that connects your operators to plant equipment and the knowledge required for them to optimally maintain it. Plant personnel can easily define, plan, execute and report on tasks tied to specific factory equipment and work processes.

Define
The Knowledge Base contains digital assets that help operators and engineers to perform their work while increasing the effectiveness of the production line. These digital equivalents provide direct support and input for operators.

Knowledge Base
- Policies
- One Point Lessons
- Manuals
- Maintenance Template
- Inspections
- Changeover Plan
- Audits
- Standard Operating Procedures

Plan
Automatically plan actions defined in the knowledge base as actionable tasks to be executed.

Equipment Plan
- Maintenance Schedule
- Inspection & Audit Schedule
- Task Schedule

Task Management System

Execute
A mobile-enabled task management interface allows supervisors and operators to easily plan, assign and execute tasks. Specific tasks can be designed using a pre-defined or standardized set of work instructions that are executed in checklist (click-through) form to ensure consistency and quality.

Planned Tasks
- Inspection
- Standard Operating Procedure
- Countermeasure
- Maintenance
- Task
- Safe Work Permit
- Audits
- Asessments

Unplanned Tasks
- Deviation
- Countermeasure
- SHE Issue
- Analysis

Insights
- Dashboard
- Daily Control System
- Kanban
- Report

Digital Technology to Support MOS

A mobile-enabled manufacturing platform that layers on top of all your existing systems to create a single pane of glass for your operators to perform their jobs efficiently and effectively. The platform should automate factory workflows and simplify work processes including but not limited to Autonomous Maintenance, Planned Maintenance, Quality Maintenance, Early Equipment Maintenance, Safety, Health & Environment (SHE) and Focused Improvement.

Mobile-enabled Operator
A mobile-ready Digital MOS gives operators the ability to easily track and execute their tasks. The ability to find suggestions for common problems or SOPs/OPLs directly from the task they are executing reduces resolution times and increases OEE.

Machine Learning
Machine Learning has many uses in a digital MOS. It can automatically suggest solutions based upon historical data or from the Knowledge Base. It can also predict deviations and automatically plan preventive maintenance.

Single Database
Everything related to jobs, issues and performance in one database simplifies work for your operators, creates visibility for supervisors, and provides a big picture view of plant operations.

Industrial Internet of Things (IIoT)
Connecting plant assets allows you to monitor and immediately detect any deviations from the norm. It also provides a comprehensive view of plant performance to glean actionable insights for continuous improvement.

Digital Poka Yoke
Automating and standardizing work processes to help operators avoid mistakes. Especially effective for workers following defined job instructions via mobile, it can eliminate product defects or downtime by preventing, correcting, or recognizing human error as or before it occurs.

Analytics
Capture information related to factory work processes, inspections, defects, tags, maintenance, equipment, performance and more, in one place. Dashboard reporting can identify relationships between each and reveal actionable insights for continuous improvement.

Digital Twin*
A digital twin visualizes equipment data in dashboards for analysis, allowing you to spot root causes, plan changes or adjust your planning. Using information source streams like IoT, you can auto-schedule actions that are defined in your EIMS. The digital twin generates a virtual equipment replica incl. data in 4Industry.

The 4Industry Manufacturing Platform
The 4Industry platform was built to simplify and automate factory work processes, with the operator in mind. It is a mobile-enabled digital workflow application which workers, operators and supervisors use to manage all aspects of day-to-day activities on the shopfloor.

Industry 4.0
Industry 4.0 refers to the shift of manual, antiquated factory operations to digital, intelligent operations that leverage technologies of the future. Specifically, it is defined as the widespread integration of information and communication technology in industrial manufacturing, along with a cultural shift in the workforce to adopt and realize the value behind integration of those technologies.

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