Six Big Losses in Manufacturing

Defining the Six Big Losses

One of the major goals of TPM and OEE programs is to reduce and/or eliminate what are called the **Six Big Losses** – the most common causes of efficiency loss in manufacturing. The following table lists the Six Big Losses, and shows how they relate to the OEE Loss categories.

Six Big Loss Category	OEE Loss Category	Event Examples	Comment
Breakdowns	Down Time Loss	• Tooling Failures • Unplanned Maintenance • General Breakdowns • Equipment Failure	There is flexibility on where to set the threshold between a Breakdown (Down Time Loss) and a Small Stop (Speed Loss).
Setup and Adjustments	Down Time Loss	• Setup/Changeover • Material Shortages • Operator Shortages • Major Adjustments • Warm-Up Time	This loss is often addressed through setup time reduction programs.
Small Stops	Speed Loss	• Obstructed Product Flow • Component Jams • Misfeeds • Sensor Blocked • Delivery Blocked • Cleaning/Checking	Typically only includes stops that are under five minutes and that do not require maintenance personnel.
Reduced Speed	Speed Loss	• Rough Running • Under Nameplate Capacity • Under Design Capacity • Equipment Wear • Operator Inefficiency	Anything that keeps the process from running at its theoretical maximum speed (a.k.a. Ideal Run Rate or Nameplate Capacity).
Startup Rejects	Quality Loss	• Scrap • Rework • In-Process Damage • In-Process Expiration • Incorrect Assembly	Rejects during warm-up, startup or other early production. May be due to improper setup, warm-up period, etc.

Production Rejects	Quality Loss	• Scrap • Rework • In-Process Damage • In-Process Expiration • Incorrect Assembly	Rejects during steady-state production.

Addressing the Six Big Losses

Now that we know what the Six Big Losses are and some of the events that contribute to these losses, we can focus on ways to monitor and correct them. Categorizing data makes loss analysis much easier, and a key goal should be fast and efficient data collection, with data put to use throughout the day and in real-time.

Breakdowns

Eliminating unplanned **Down Time** is critical to improving OEE. Other OEE Factors cannot be addressed if the process is down. It is not only important to know how much Down Time your process is experiencing (and when) but also to be able to attribute the lost time to the specific source or reason for the loss (tabulated through **Reason Codes**). With Down Time and Reason Code data tabulated, **Root Cause Analysis** is applied starting with the most severe loss categories.

Setup and Adjustments

Setup and Adjustment time is generally measured as the time between the last good part produced before Setup to the first consistent good parts produced after Setup. This often includes substantial adjustment and/or warm-up time in order to consistently produce parts that meet quality standards.

Tracking **Setup Time** is critical to reducing this loss, together with an active program to reduce this time (such as an SMED - Single Minute Exchange of Dies program).

Many companies use creative methods of reducing Setup Time including assembling changeover carts with all tools and supplies necessary for the changeover in one place, pinned or marked settings so that coarse adjustments are no longer necessary, and use of prefabricated setup gauges.

Small Stops and Reduced Speed

Small Stops and Reduced Speed are the most difficult of the Six Big Losses to monitor and record. **Cycle Time Analysis** should be utilized to pinpoint these loss types. In most processes recording data for Cycle Time Analysis needs to be automated since cycles are quick and repetitive events that do not leave adequate time for manual data-logging.

By comparing all completed cycles to the Ideal Cycle Time and filtering the data through a Small Stop Threshold and Reduced Speed Threshold the errant cycles can be automatically categorized for analysis. The reason for analyzing Small Stops separately from Reduced Speed is that the root causes are typically very different, as can be seen from the Event Examples in the previous table.

Startup Rejects and Production Rejects

Startup Rejects and Production Rejects are differentiated, since often the root causes are different between startup and steady-state production. Parts that require rework of any kind should be considered rejects. Tracking when rejects occur during a shift and/or job run can help pinpoint potential causes, and in many cases patterns will be discovered.

Often a **Six Sigma** program, where a common metric is achieving a defect rate of less than 3.4 defects per million “opportunities”, is used to focus attention on a goal of achieving “near perfect” quality.