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OEE 103

Productivity

- Overview
- What causes low productivity?
- Improving productivity through process optimization
- Calculating productivity

Overview

How can I improve OEE by increasing productivity?

While the **availability** portion of Overall Equipment Effectiveness describes the percentage of available operating time that equipment is actually running, **productivity** measures how much is produced during that run time.

Many process plants are capable of higher productivity than they currently achieve. The difference between current and potential productivity is an opportunity to increase output — and profits.

This course covers some of the causes of low productivity in process plants, an approach for improving productivity, and how to calculate the results as part of Overall Equipment Effectiveness.

Hint: As you go through the topics in this course, watch for answers to these questions:

- *Why might operators decide not to use the optimum setpoints for a process?*
- *What is the role of process control in improving productivity?*
- *How is productivity calculated?*

What causes low productivity?

Possible reasons for low productivity include poor quality materials that can only go through the equipment at slower speeds, or lack of operator expertise because of poor training. A process may be run slowly to match the supply of materials or parts from a preceding process, or to reduce the perceived risk of equipment breakdowns.

In many cases, no matter what control strategy is implemented, operators will set the individual process variable setpoints at "safe" — but not necessarily optimum — targets. Until operators are confident the regulatory control system is capable of safe and reliable operation — at or near process limits — this "operator safe factor" can reduce throughput and therefore productivity.

For example, operators may be reluctant to let the control system set a control valve at its design position. Instead, they will leave the valve at a very conservative position. This conservatism can reduce attainable throughput by as much as 5%

The PlantWeb advantage

The device diagnostics and the AMS Suite software in PlantWeb architecture can help avoid this problem by

- accurately reporting the actual valve position
- ensuring that the correctly-sized valve is in use
- diagnosing hysteresis and other valve problems
- signaling if the loop is off control.

This generally increases the operators' confidence in the correct operation of the valves, so they'll be more likely to allow the process to run closer to optimum.

Improving productivity through process optimization

One strategy for addressing low productivity is to carry excess production capacity — for example, by building a plant slightly larger than necessary so product can be inventoried to cover unplanned downtime, or by carrying spare units to replace those that fail. However, this strategy is costly because of the capital to purchase the additional capacity, as well as the added maintenance expenses associated with a larger facility.

A better approach is optimize the process so that it runs as smoothly — and productively — as possible.

Process optimization helps ensure that the equipment throughout the plant is working as effectively as possible over the entire control range. Load changes and setpoint changes are controlled with optimal effectiveness, and unplanned upsets are minimized.

Data analysis and statistical tools available for process optimization make it possible to effectively diagnose and troubleshoot poor performance, whether from improper controller tuning or poorly designed or maintained process equipment. They are great tools to determine

where to spend capital dollars. For the best return, look at economic optimization of the entire unit, rather than just productivity optimization of a particular piece of equipment.

Whether you use large-scale, model-based advanced process control software, or a small-scale modular approach to process optimization, solid process control is the foundation for success.

When process control is no longer a constraint, bottlenecks caused by other factors show up more clearly — so you can focus attention and efforts where they're most needed to improve productivity.

Calculating productivity

Productivity can be calculated by looking at the actual output produced by the equipment as a percentage of the theoretical output, given its optimum speed and actual running time.

Here's an example:

The sustained capacity of a plant is 600,000 tons per year. Last year it produced 560,000 tons.

$$\text{\% Productivity} = \frac{\text{actual production}}{\text{optimum capacity}} = \frac{\text{560,000 tons}}{\text{600,000 tons}} = \text{93\%}$$