

Run Length Optimization



CHEMICALS & PETROCHEMICALS,
OIL & GAS, MINING & METALS,
FOOD & BEVERAGE

Data Sources

- Process Data Historian (OSIsoft PI, AspenTech IP21, Honeywell PHD, Wonderware, etc.)

Data Cleansing

- Invalid data was removed
- Capsules were created for the different production campaigns

Reporting & Collaboration

- The summary of this analysis was added to an Organizer Topic report that is run after the first few days of each product campaign. It's used to evaluate production rate, degradation rate, and inform operations whether continuous (degrading) operation or periodic shutdown and maintenance will achieve their desired production outcome sooner.

Challenge

Many continuous manufacturing units run into process throughput constraints over the course of a run. These constraints are often reversible but come with the high cost of shutting down to clean or maintain equipment. The manufacturing plant must balance the cost of the shutdown with the regained efficiencies to optimize the overall production rate to meet its targets as soon as possible. Meeting targets sooner translates into more production and increased profits in the long term. Developing solutions to these types of optimization problems can be complex and often requires advanced modeling packages and programming experience.

Solution

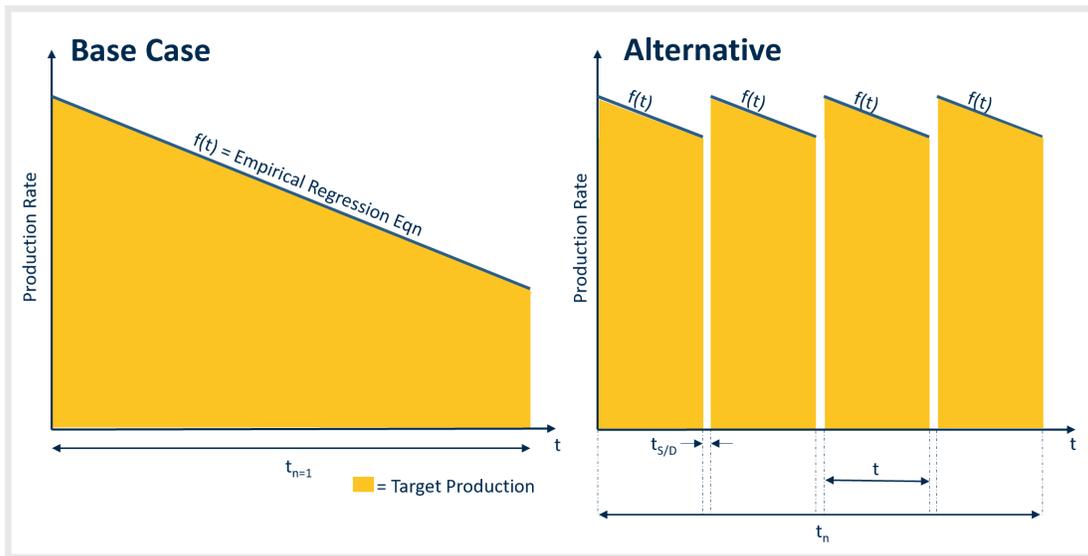
Seeq Formula can be used to calculate the number of shutdowns that minimize the total time required to produce a given order size. Once the number of shutdowns is determined, engineering teams can calculate the length of the run times between shutdowns and create a golden profile of these run cycles. The forecasted profile can then be used to compare against the actual production rate to understand if the operation is on track to meet their best-case order fulfillment date.

Results

A sold-out production unit has been looking at ways to increase capacity in tiny increments. By implementing this proactive, optimized downtime strategy, they were able to meet supply chain targets an average of 11% sooner over the course of the year. This allowed them to increase production volumes for multiple products, growing sales and market share.

Calculations & Conditions

- Seeq Formula was used to:
 - > Identify the current run's existing data set
 - > Create a continuous signal for the time elapsed since the start of the run
 - > Create a running production totalizer
 - > Calculate the number of downtimes that would be required for a given order quantity
 - > Calculate the total cycle time (time between downtimes) for a given order quantity
- Signal from Condition was used to calculate the minimum cycle time for the order size
- A capsule was created from the start of the run to the point of optimum cycle time
- A Reference Profile was built to project optimal cycles for monitoring performance from the best case



A geometric description of the run length optimization problem to be solved.



A screenshot of the Seeq Workbench showing the critical step of identifying the number of short maintenance shutdowns that optimizes total production run time.

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