# Clean in Place Optimization

PHARMA/BIOPHARMA

## Data Sources

- OSIsoft PI historian

## Data Cleansing

- Filter noise from level, temperature, and flow signals.

## Calculations & Conditions

- Define phases for each step in the batch cycle using process variables.
- Calculate the duration of each phase and compare to historical benchmarks.
- Calculate the downtime for each phase and quantify the downtime as lost value.

## Reporting & Collaboration

- Dashboard with automatic updates to show phase duration of each batch.

## Challenge

For pharmaceutical manufacturers, the Clean in Place (CIP) process is critical as it helps safeguard product quality. Cleaning equipment between batches ensures no impurities are introduced into the product. At the same time, it is important to keep CIP cycle times as short as possible to avoid wasting time and resources. Traditionally, it has been difficult for drug companies to identify CIP cycle inconsistencies, which potentially leads to overcleaning and inefficiency. The lack of CIP optimization can lengthen the time between pharmaceutical production runs.

A large drug company needed to optimize CIP processes to improve efficiency while maintaining quality. Typically, its CIP cycles would follow routine time-based cleaning cycles to ensure equipment cleanliness. These standardized cleaning cycles inevitably built in some inefficiency. The process engineering team knew they could save time and resources by optimizing their CIP processes.

From a technical standpoint, the challenge was to identify which time series were relevant for CIP analysis and to aggregate time-series data during cleaning periods. The goal was to quantify results by both assets and CIP loops, enabling the engineers to identify targets for improvement. Reducing CIP cycle time by just an hour can produce substantial cost savings for utilities and additional time in production.

## Solution

To characterize the CIP process, the company needed to identify where it was spending time on CIP and to create process models directly from the data. Then, the engineers would be able to apply the model across different circuits, using all the available data to validate and improve the model.

Using Seeq, the team developed process models for each of the company's CIP units. By analyzing Seeq's circuit and phase capsules, the team was able to identify excessively long procedures that represented overcleaning events.

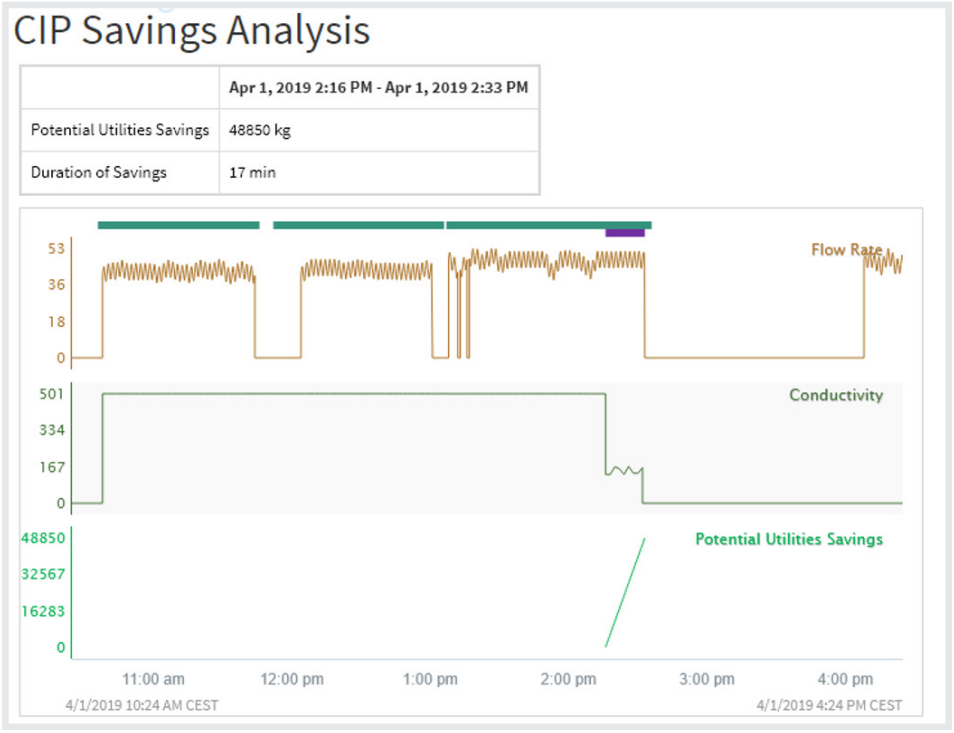
With Seeq Organizer, the team created a report that monitors for CIP cycle deviations across units. The team uses this report to justify proposed changes to the established cycle times, quantifying the potential savings. The team developed key metrics for each mode, including:

- Total and % time per mode
- Total water usage per CIP cycle
- Peak conductivity per CIP cycle

## Results

Optimizing CIP cycle times produced a number of benefits for the pharmaceutical company:

- Reduced CIP dryer cycle time, giving administrative control rather than feedback closed-loop control.
- Increased consistency of overall CIP operation, creating a baseline and glidepath.
- Enabled clear visualization on CIP durations to troubleshoot root causes.
- Identified near-term opportunities for process improvement, including tracking water consumption by circuit and conductivity-sensor monitoring by circuit.

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