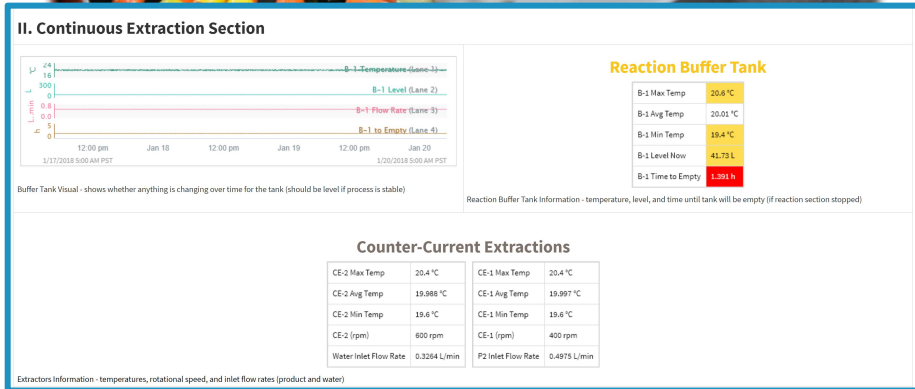




Use cases -
Operational Effectiveness/Productivity Analytics

Continuous Manufacturing



CHALLENGE

- **Difficult to:**
 - Aggregate data and perform analytics across multiple assets
 - Monitor KPIs for continuous pharmaceutical processes in near-real-time



SOLUTION

- **A continuously updating operational dashboard to monitor KPIs**
 - Identify deviations and trends outside tolerable ranges
 - Calculate time until manual operations (e.g., reagent loading) are required
 - Track downtime deviations and idle time



RESULTS

- **Enable rapid response to production issues, increasing product quality, and process efficiency**
- **Save an average of 30 minutes per day, per engineer, in data aggregation**

Batch Tracking and Cycle Time Analysis



Daily Batch Tracking and Cycle Times

Batch Details	Jan 1, 2019 12:10 PM - Jan 1, 2019 4:14 PM	Jan 1, 2019 8:18 PM - Jan 2, 2019 12:12 AM	Jan 2, 2019 4:24 AM - Jan 2, 2019 8:14 AM
Product ID	High Grade	High Grade	High Grade
Batch ID	5	7	8
Pump In Time	28.933 min	29.8 min	30.54 min
Heatup Time	48.778 min	56.535 min	45.405 min
Cat Addition Time	87.818 min	74 min	75.778 min
Pump Out Time	26.52 min	26.84 min	28.64 min
Total Idle Time	14.017 min	15.152 min	12.937 min
High Grade Batch Duration	207.78 min	197.78 min	193.27 min



CHALLENGE

- Reducing cycle time in batch manufacturing processes is difficult due to challenges in:
 - Defining and analyzing phases to find batch-to-batch variation and idle time
 - Determining focuses for process and capital improvement



SOLUTION

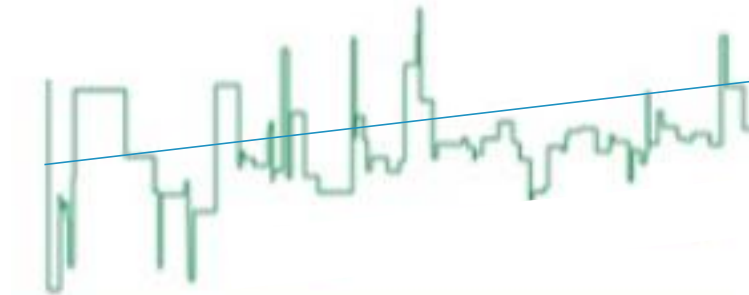
- Use process variables, formulas, and string signals to separate each batch into phases
- Identify 'best' cycle time for each phase and tune production variables to replicate the ideal cycle
- Produce a batch monitoring scorecard showing phase and idle duration to drive continuous improvement



RESULTS

- Eliminate idle time within batches and time between batches
- Small improvements in cycle time and reduced batch-to-batch variation have significant financial impact over time

Power Plant Boiler Efficiency



CHALLENGE



SOLUTION



RESULTS

- **Understand and manage the rate of boiler fouling to enable more efficient operation and better maintenance planning**
 - Create real-time and historical measurement for boiler fouling
- **Normal operations vary greatly and make analysis difficult.**
- **Seeq followed a 1-year failed effort to solve with Excel**
- **Categorize operating data to identify time periods where all operating conditions are comparable**
- **During those “apples-to-apples” conditions, plot how hard the boiler is working to meet a specific output level**
- **Entire Seeq solution implemented in < 1 hr**
- **Use to assess and improve**
 - impact of operations – understand what modes of operation increase or decrease fouling
 - impact of maintenance and treatments
 - shutdown planning by predicting when fouling will reach unacceptable level
 - Represent fouling impact in dollars (fuel costs)
- **Savings measured in \$100Ks per year**