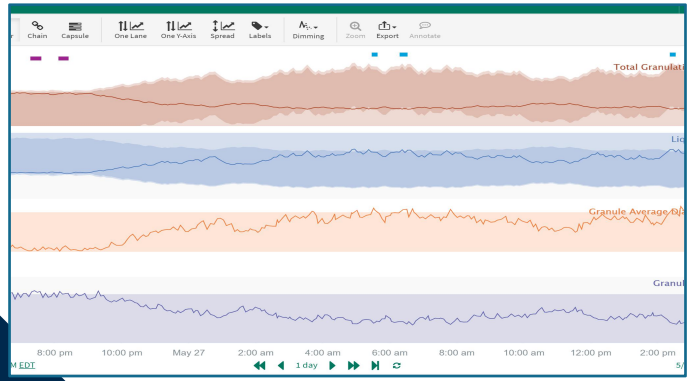

Seeq
Tridiagonal
Solutions
Use Cases-
Quality & Traceability Analytics

Continuous Drug Product Quality by Design (QbD) Model



CHALLENGE

- Information loss during technical transfer from R&D to commercial production
- Difficult to apply process monitoring for a multivariate design space

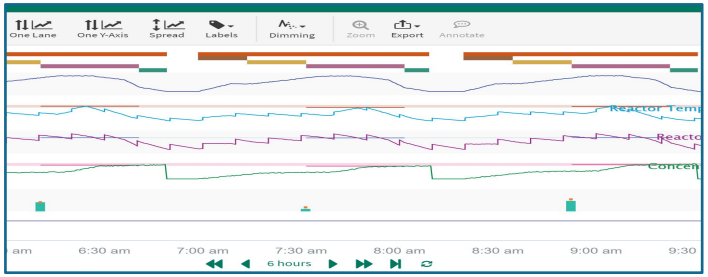
SOLUTION

- Time warp signals to align based on sensor location
- Cleanse Design of Experiments (DOE) data to steady-state operation
- Develop design space model for quality parameters

RESULTS

- Minimize quality deviations by flagging deviations in near real time

Batch Quality Prediction



CHALLENGE

- Delayed lab results make it difficult to optimize inputs of the process to control the batch yield
- Process inputs are set with a known value which can lead to wasted energy and raw materials

SOLUTION

- Create an on-line model for the yield based upon the concentration, volume, and temperature; in near real-time

RESULTS

- Rapid identification and root cause analyses of abnormal batches saving millions of dollars
  - Reduce wasted energy and materials
  - Reduce out-of-specification batches by adjusting process parameters during the batch

Clinker Production Reports

Clinker

	Mar 3, 2019 6:00 PM - Mar 4, 2019 6:00 AM	Mar 4, 2019 6:00 AM - Mar 4, 2019 6:00 PM	Mar 4, 2019 6:00 PM - Mar 5, 2019 6:00 AM
Kiln 1 Clinker Per Shift	1527.3 h	1031.4 h	1930.8 h
Kiln 2 Clinker Per Shift	1863.1 h	1352.1 h	1930.7 h
Kiln 3 Clinker Per Shift	1202.3 h	1351.6 h	1929.1 h

CHALLENGE

- Aggregating clinker production by shift is standard reporting for cement plants but is hard to quantify due to different modes of operation

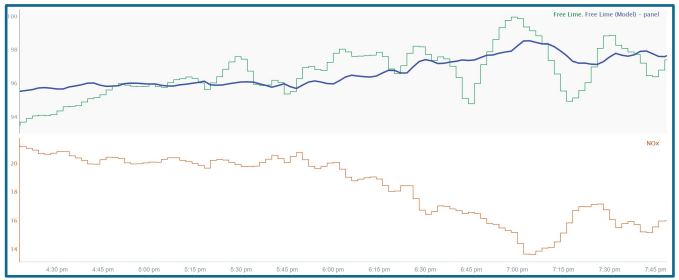
SOLUTION

- Calculate clinker from kiln feed and kiln slag signals
- Identify time periods for shifts and operation modes when clinker was produced

RESULTS

- Provide organized template for daily stand-up meeting saving 4 hours of supervisor time per day
- Quickly identify shifts not meeting production goals
- Compare calculated clinker to measured values to monitor sensor accuracy

Free Lime Modeling



CHALLENGE

- **Difficult to optimize lime addition to minimize NOx emissions and free lime in clinker**
  - It is difficult for operators to adjust the lime addition with 1-2 hour delays in the lab samples
  - Too much lime addition wastes fuel; too little produces poor quality clinker

SOLUTION

- **Create an on-line model for the clinker free lime based upon the NOx so the operator can adjust the fuel addition in near real-time**

RESULTS

- **Improve clinker quality with free lime between 1 – 2%**
- **Reduce wasted lime additions, saving raw material costs**