



splunk>

# Building Smart Factories

## Process Monitoring and Machine Learning in the Sugar Industry

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October 2018



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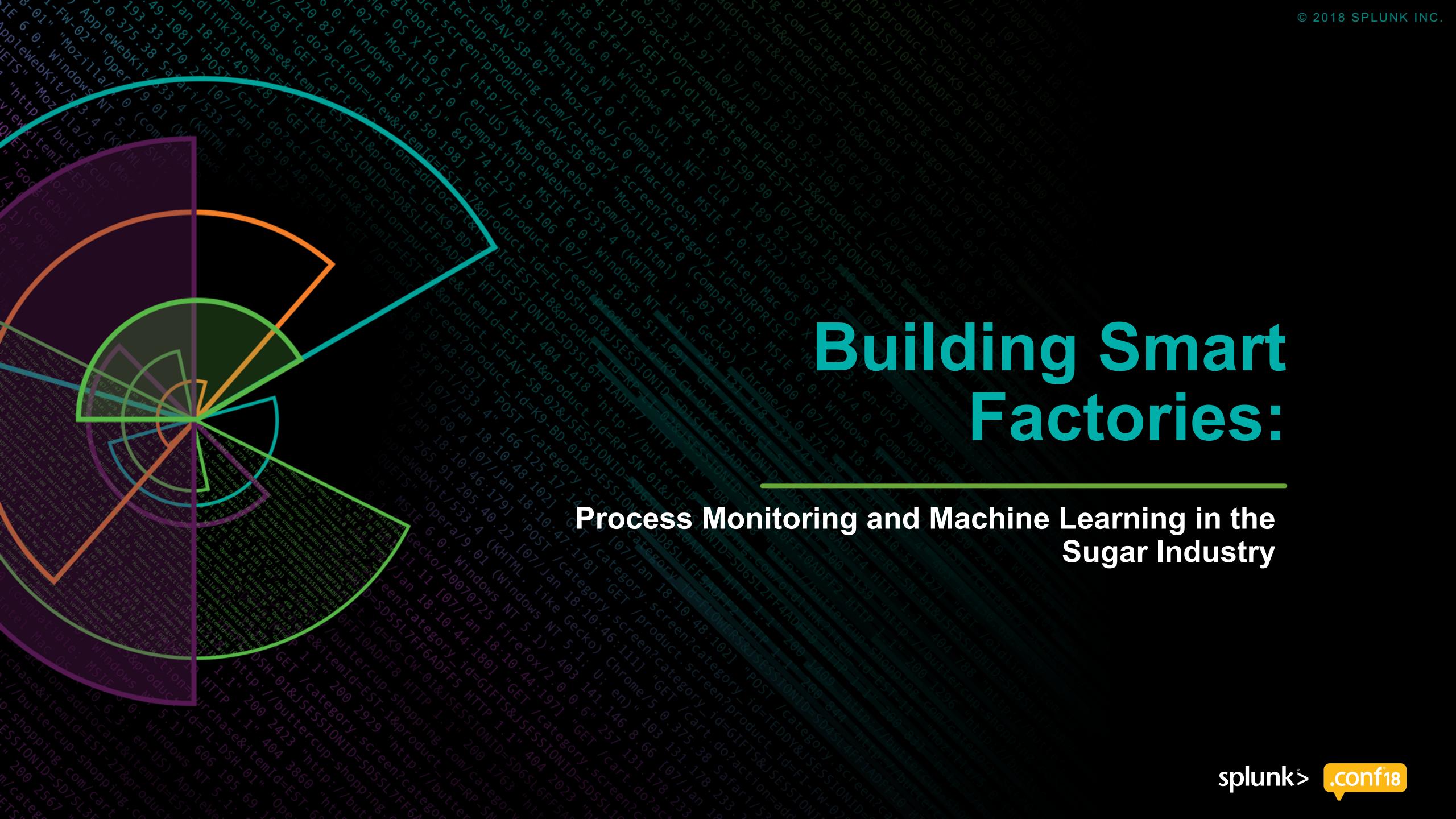
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# Building Smart Factories:

## Process Monitoring and Machine Learning in the Sugar Industry





Engineering und Software-Entwicklung

## Operational Divisions

- ▶ Rail Operations
- ▶ Automotive Production
- ▶ Manufacturing Industry

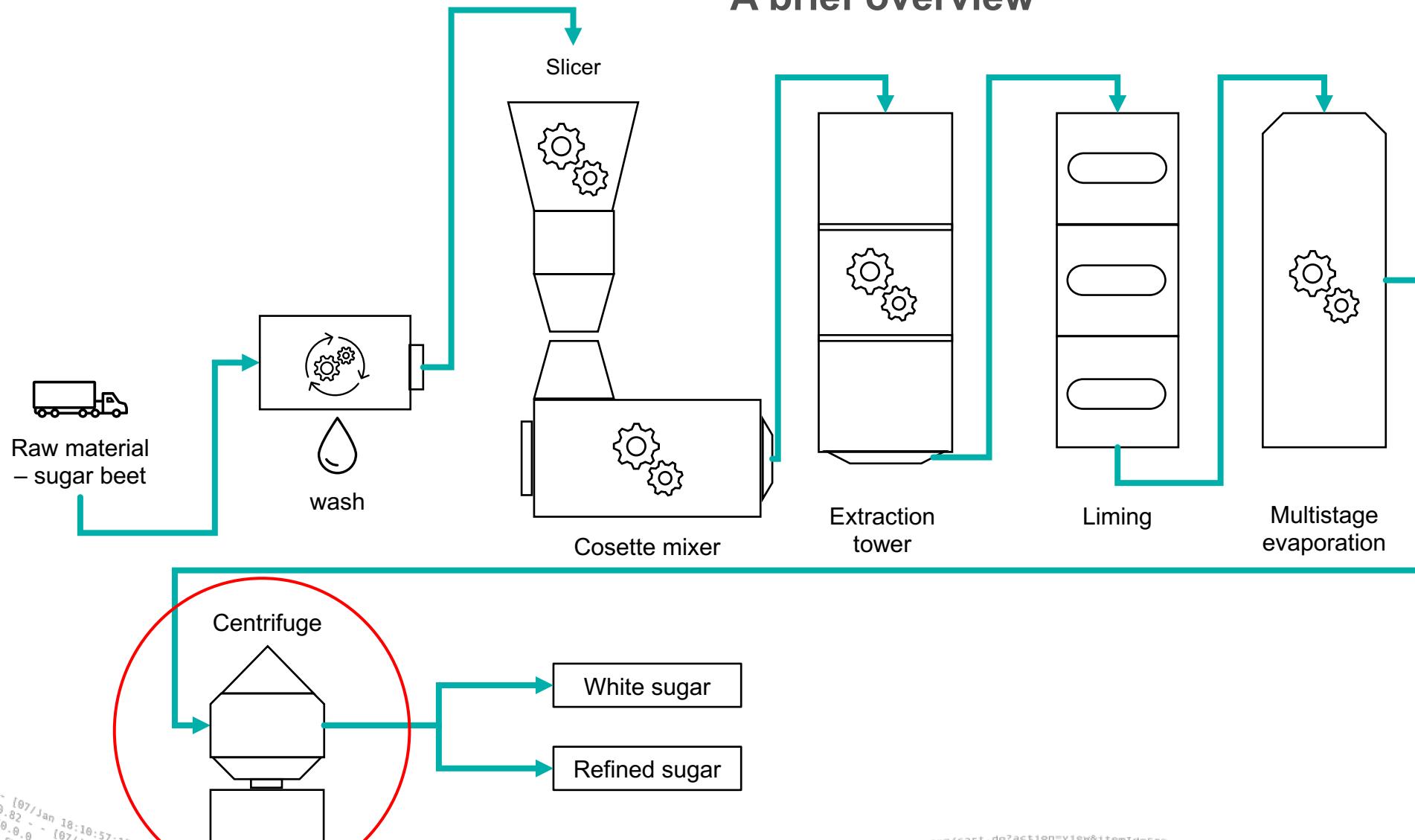
## Range Of Services

- ▶ Software-Engineering
- ▶ Testing & Verification
- ▶ Assessment-Services
- ▶ Data Analytics



# Sugar production process Slide

## A brief overview



# Key optimizations in the centrifuge process

# How Splunk can help



# Increase sugar output



# Increase runs per day



# Avoid machine failures



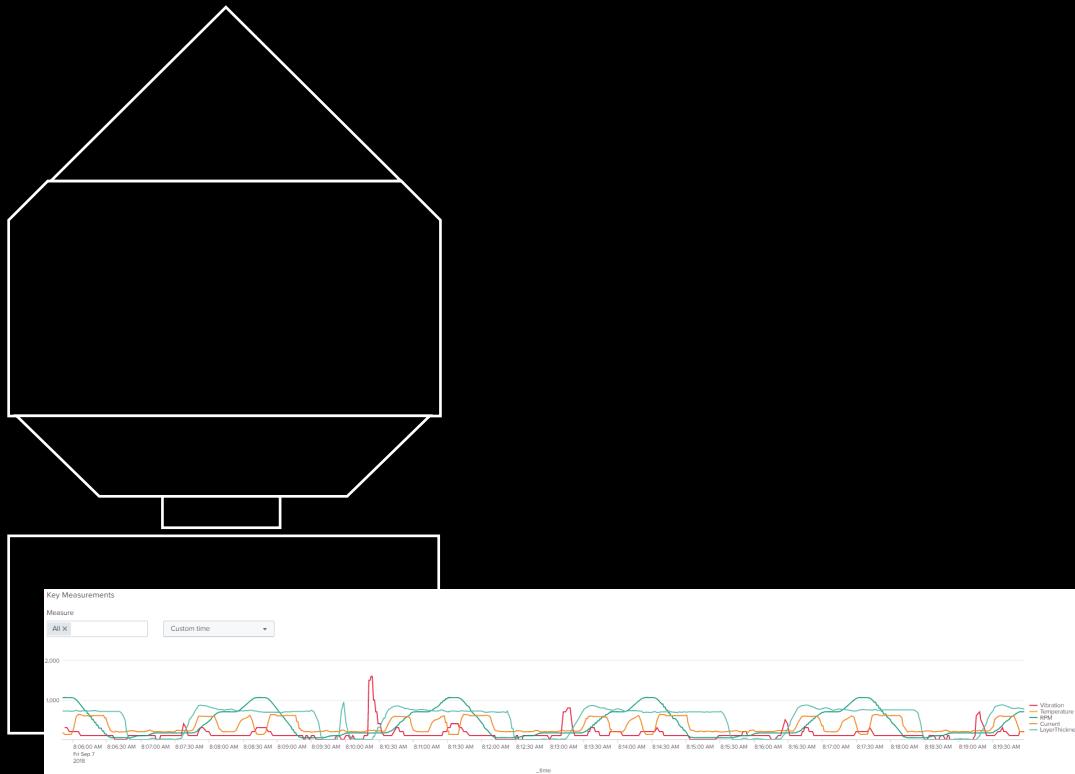
# Monitor Health Index of centrifuges



# Find the best settings for centrifuge by using Splunk MLTK

# How Centrifuging works

## From Massecuite to White Sugar

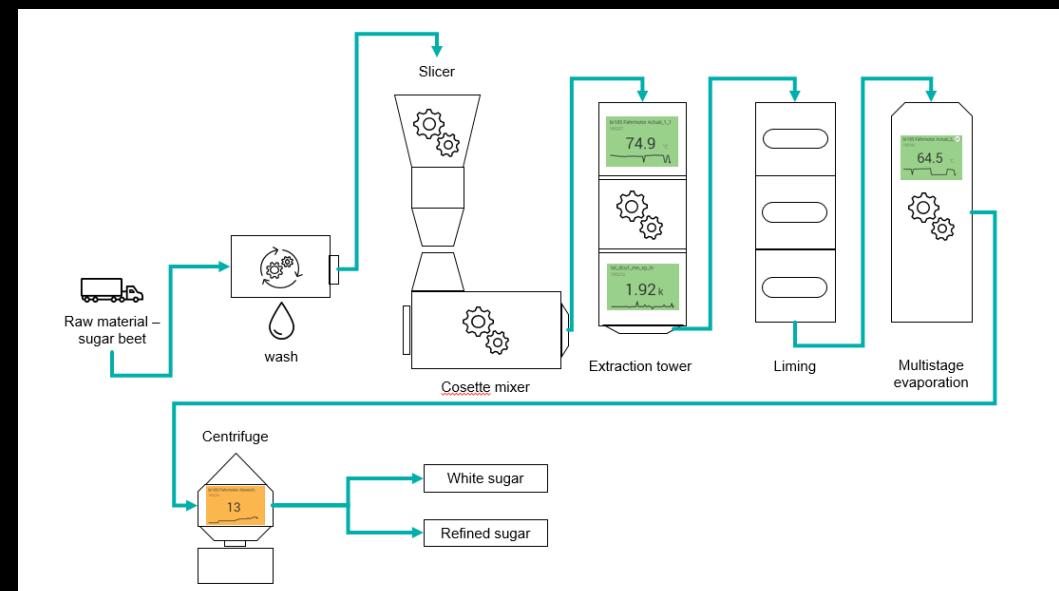
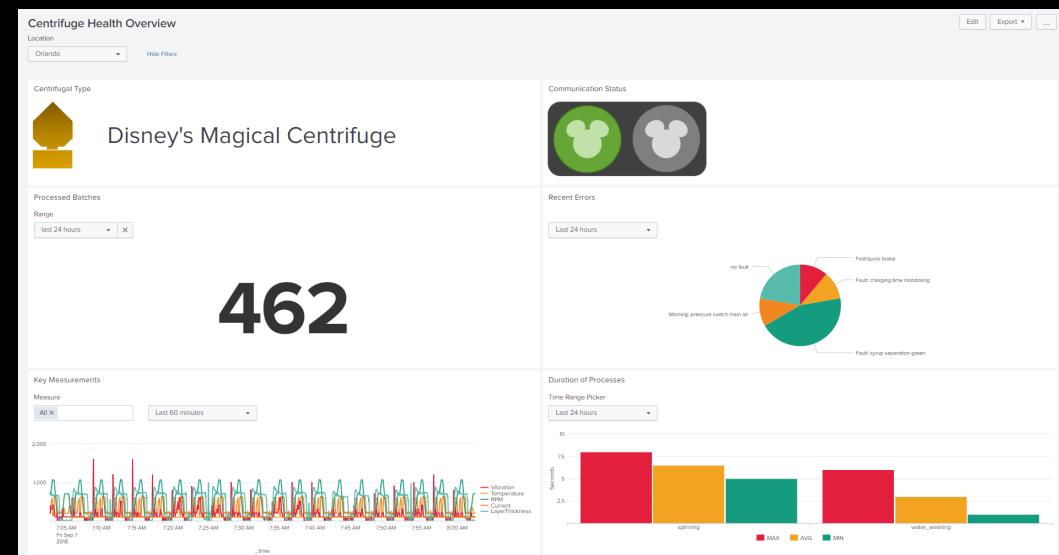


- The centrifuge is the most dynamic process in sugar industry
  - Separation of crystals from the syrup using strong centrifugal forces
  - Syrup is pushed through sieve sleeve of the centrifugal drums
  - Sugar is washed with steam to remove the remaining syrup

# Use Case

## Process Monitoring and Machine Learning in the Sugar Industry

- ▶ Monitor sugar production process
  - monitor machine data
  - outlier detection
  - build a glass table
  - **increase your output**



# Three steps to get the most out of industrial machine data

Let your assets speak!



1

## Data Onboarding

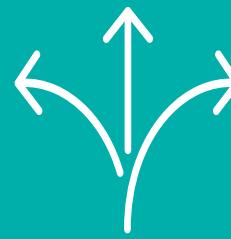
- selection of technology
- installation of technology
- transmission architecture
- connectivity provider



2

## Using Splunk

- analysis of the data
- appropriate visualizations
- application of machine learning algorithms



3

## Implementing Changes

- integration in the customer's systems
- change of processes

# Three steps to get the most out of industrial machine data

Let your assets speak!



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## Data Onboarding

- selection of technology
- installation of technology
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2

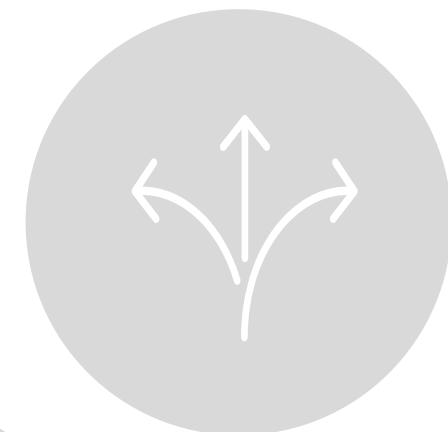
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- analysis of the data
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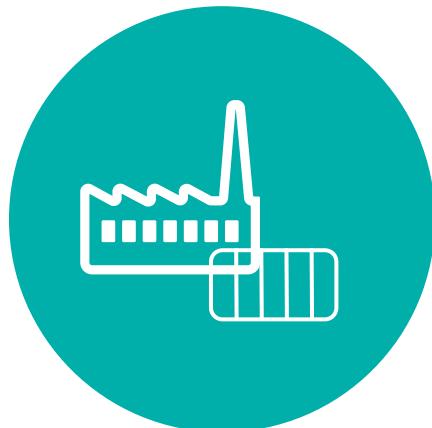
## Implementing Changes

- integration in the customer's systems
- change of processes



# 1. Data Onboarding

## Setup for the Data Transfer



### PLC

PLC's collect machine data

Data transmission via industrial standard protocols possible



### Machine Gateway

Data Preprocessing

Intermediate Storage

Transmission to Server/Cloud



### Splunk Data Onboarding

E.g. make use HTTP Event Collector

# 1. Data Onboarding

Protocols & Data Types: Most Common OPC UA + JSON

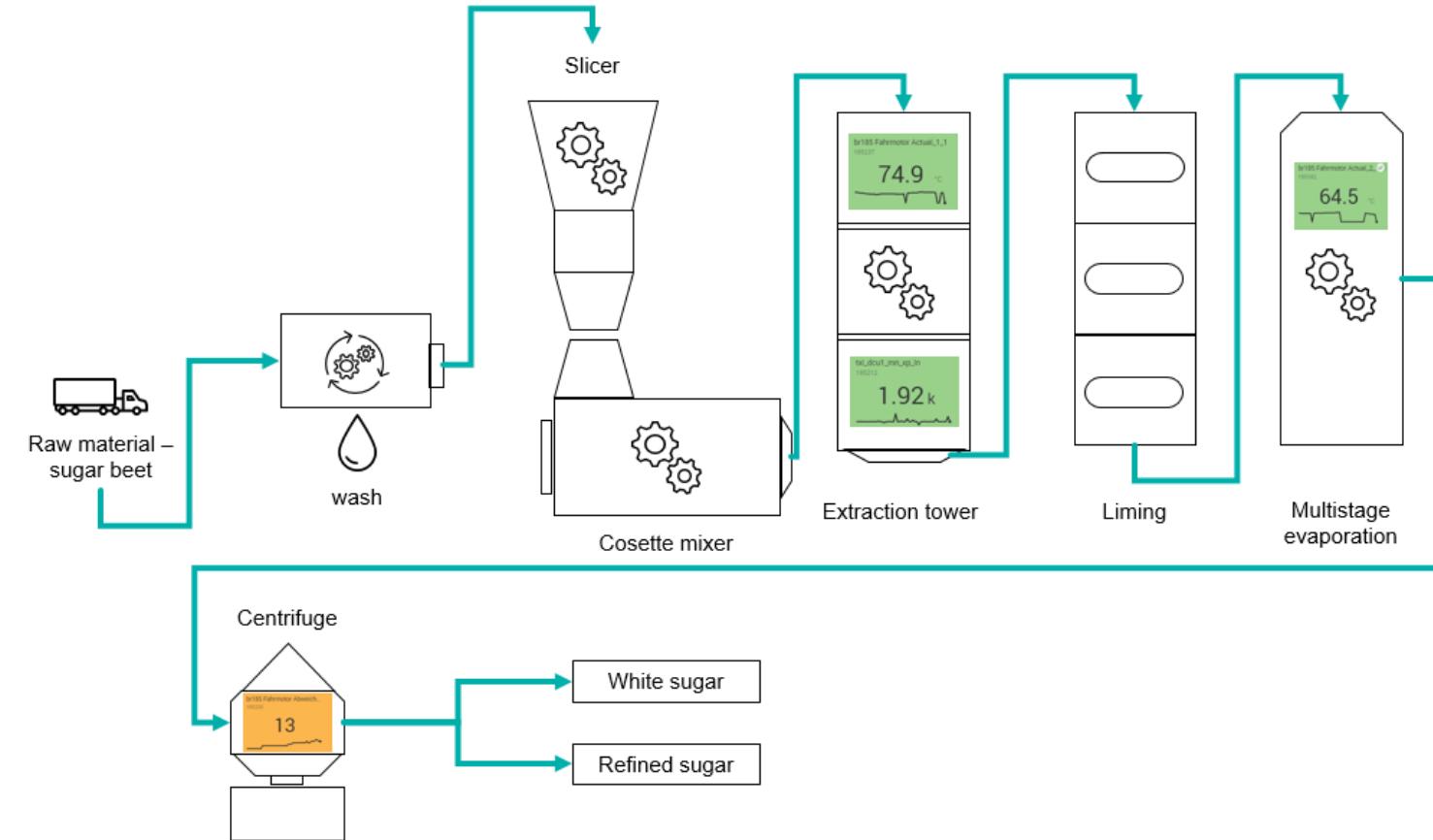
- ▶ Protocol: OPCUA
- ▶ Data Format: JSON -> Structured Data
- ▶ Indexing Data in Metric Store results in a Performance Boost

Field Names	Field Values
_time	Measurement Time
metric_name	Measurement
_value	Measure
dimension1	Plant
dimension2	Centrifuge

## 2. Using Splunk

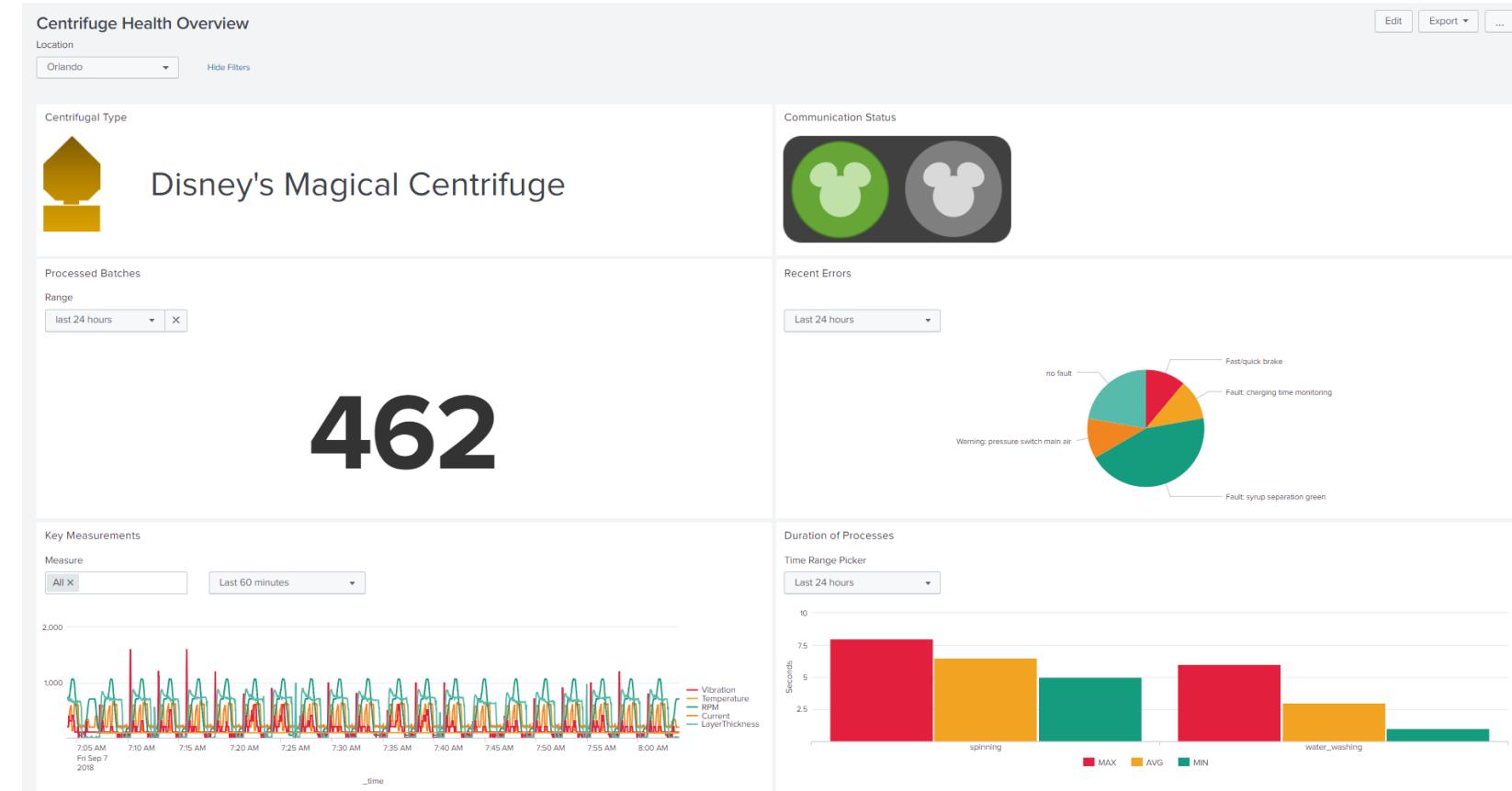
### Splunk Industrial Asset Intelligence

Glass Table for an  
Overview of the Sugar  
Production Process



## 2. Using Splunk Splunk Enterprise Dashboard

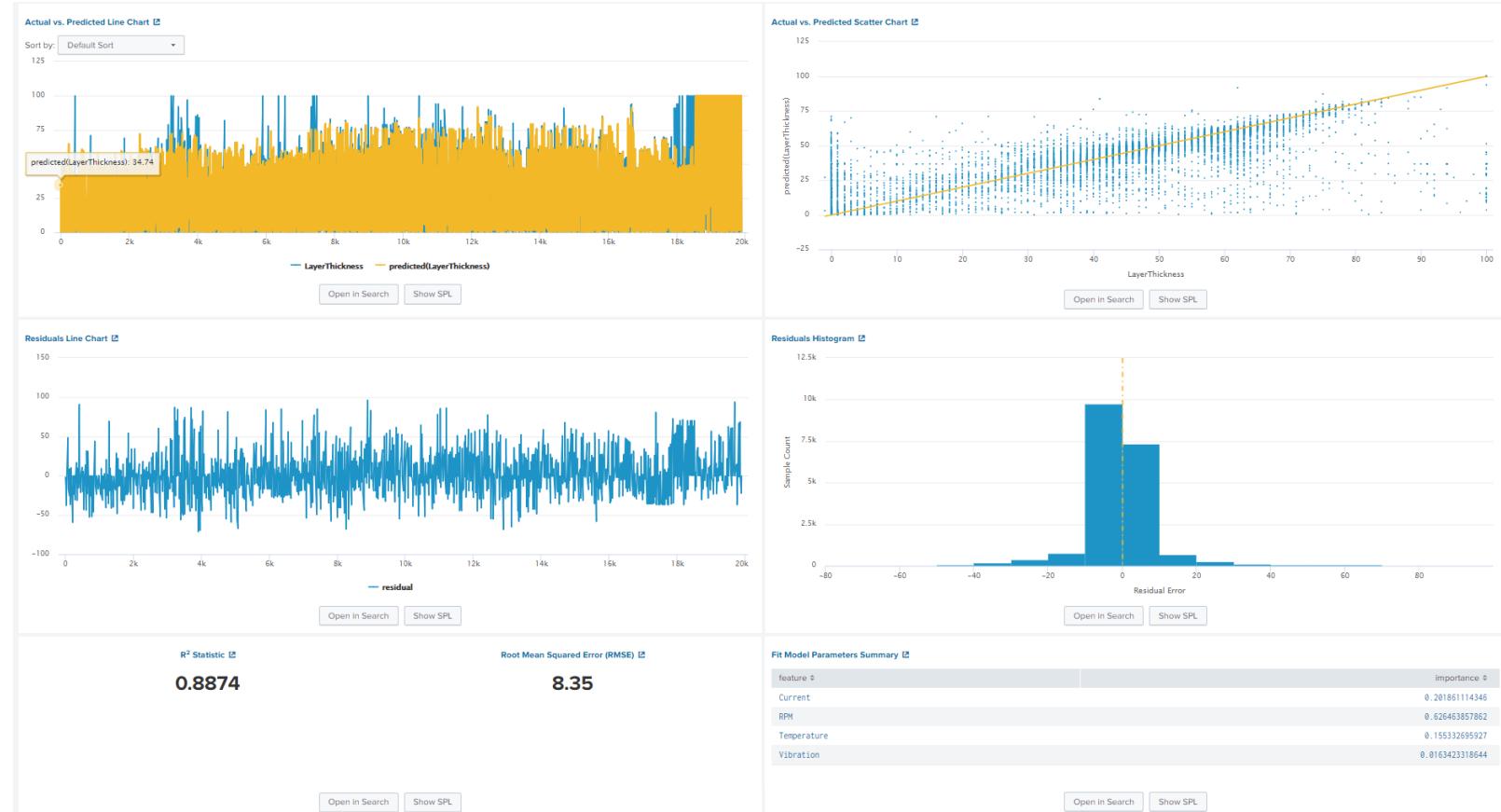
Deep Dive into the  
Centrifuge's Health Status



## 2. Using Splunk

### Splunk Machine Learning Toolkit

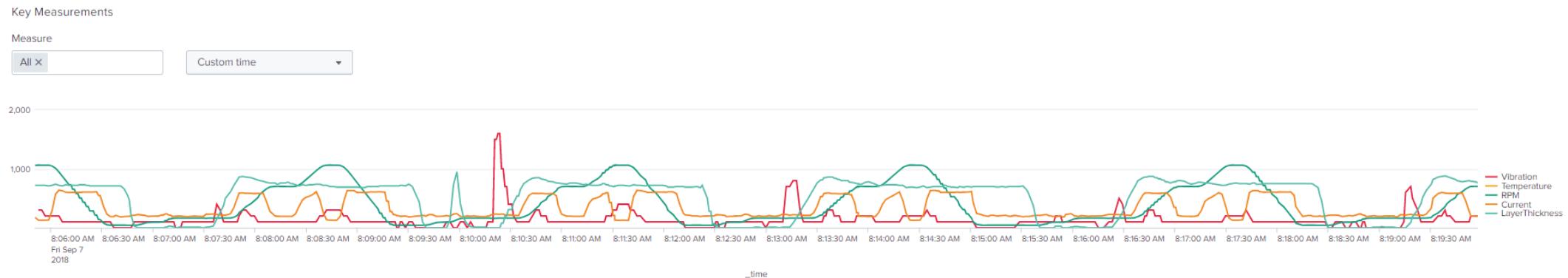
Gain insights into the centrifuge's behavior



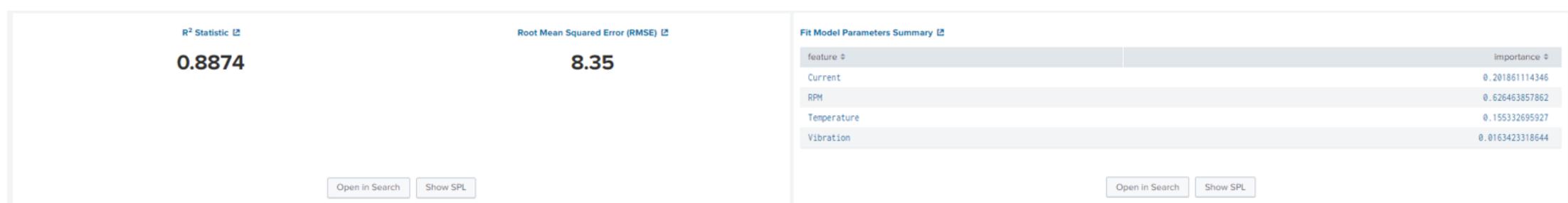
# Dependencies of the Measurements

# Prediction of the Layer Thickness with Random Forest Algorithm

## ► Periodic behavior of the graphs



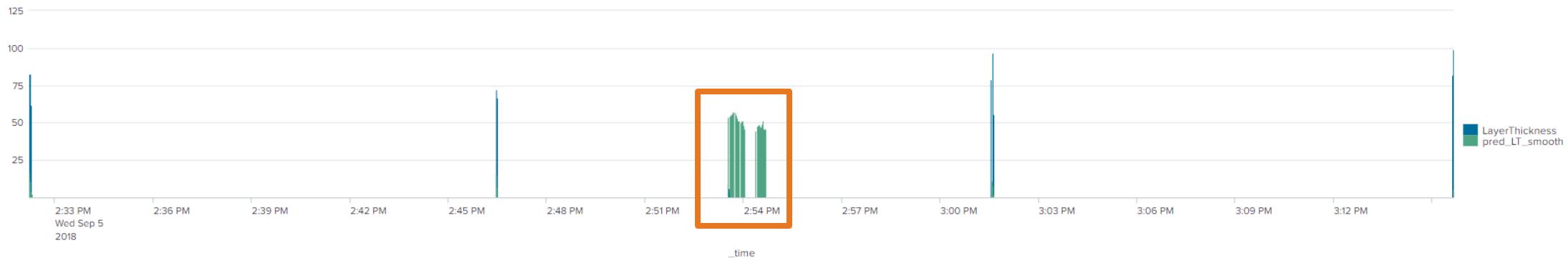
- ▶ Explanation of layer thickness using four indicators



# Layer Thickness & Predicted Layer Thickness

## Detect outliers

- ## ► Outliers by time



- ▶ Storage of “outlier situations“ for deeper analysis in summary index
  - ▶ Search for indicators in data as well as the production process
  - ▶ Improvement of machine operation

# Benefits

# Detection of failures before they appear

Increase the **uptime** of the machines

# Remote monitoring of the factory's status

**Accelerate maintenance time, save maintenance costs  
and increase the uptime of the machine**

Figure out the optimal configuration of the machine

**Increase the **output**, shorten the **cycle time****

# Key Takeaways

## Building Smart Factories

1. Use Splunk IAI to get a brief overview of your process.
2. Every process can be optimized.
3. Start working proactively instead of reactively.
4. Let your assets speak!

# Q&A

**Janina Kropf | Data Analyst**  
**Daniel Pal | Data Analyst**

# Thank You

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