Predictive Maintenance

Using advance analytics on Machine Learning to monitor machine performance

What we Need?

- downtime event
- machine active hour
- parameters

What we Get?

- reduce downtime
- extend machine life
- optimize output
- lower safety risks

All Data INTERNATIONAL

ML Solution

Data Collection

Data(e.g sensor) shows equipment condition before, during and after downtime

Source:

- Diverse schema/formats
- Batch/Streaming

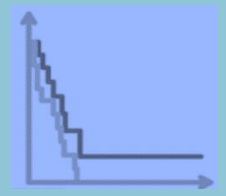
Data Ingest

Big Data platform
Real Time Data Ingest
Analytics Tool

Data Processing

Identification features condition(e.g missing value,etc), Draw preliminary insight such as variable conditions when machine is down

Data Modelling



Predict Downtime/failure
Calculate and predict probable events and schedule maintenance to analyze downtime

Data Visualization

Visualize analytical results into dashboards and create alert system for monitoring

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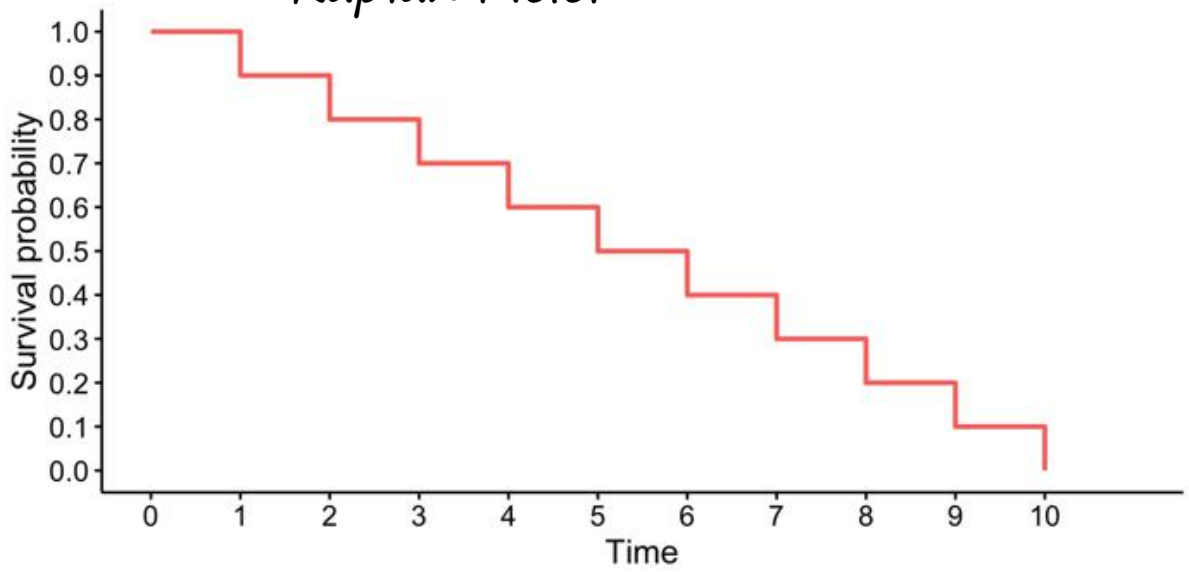
Algorithm

The survival analysis method to predict possible production process disruptions consisting in machine failure and employing the obtained knowledge to provide robust production schedule

What was the chance of the thing survive for the past 20 months

What factors influence the specific event to occur

Kaplan Meier



ML Algorithm

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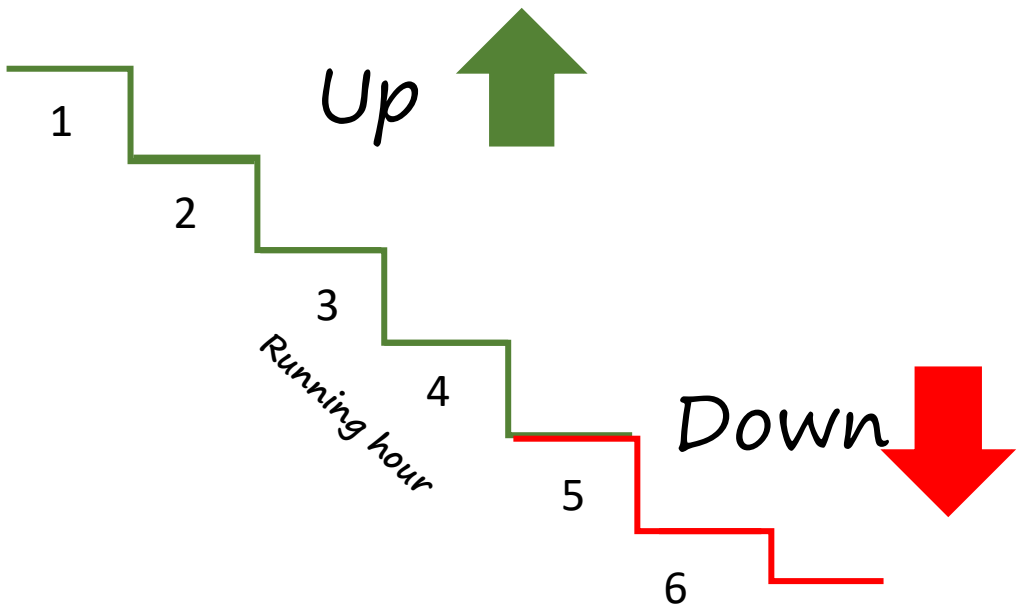
Case

Evaluate downtime event of machines and overall performance by its parameters on Clinker Production

Clinker Production

- Preheater Stage 1
- Preheater Stage 2
- Preheater Stage 3
- Preheater Stage 4
- Calciner
- Exit Gas Kiln
- Exit Gas Preheater
- Kiln
- Burner
- Cooler
- Others

Performance



Parameters

Temp (°C)

Press (mBar)

Speed

Etc..

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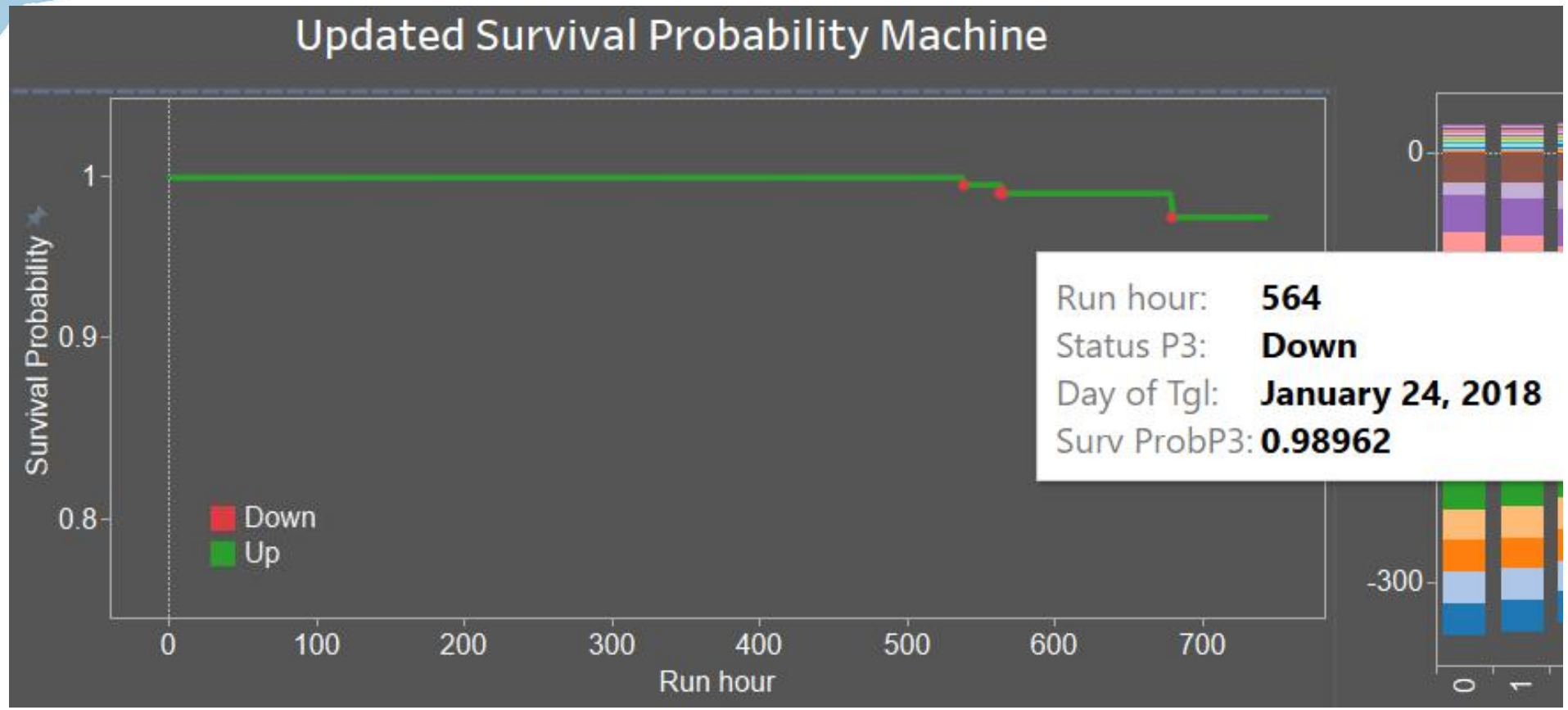
Results



Preheater Stage 3 Machine was down at 564 cumulative running hour, it yields 98.9% cumulative survival probability of machine on 24 January,2018

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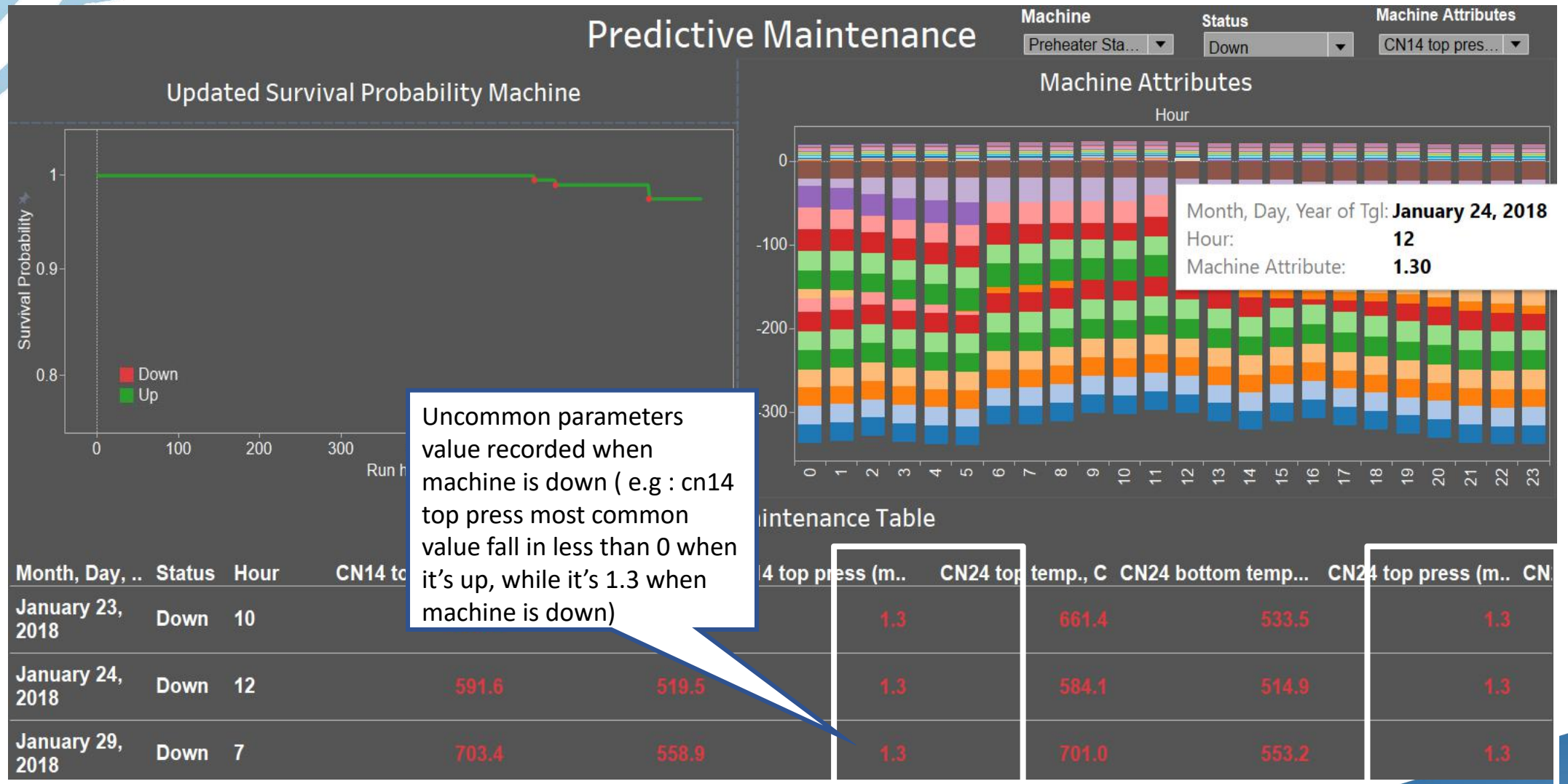
Results



Uncommon parameters value recorded when machine is down (e.g : cn14 top press most common value fall in less than 0 when it's up, while it's 1.3 when machine is down)

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