TrendMiner
A SOFTWARE AG COMPANY

INDUSTRY
Chemical

PROCESS TYPE
Continuous Processing

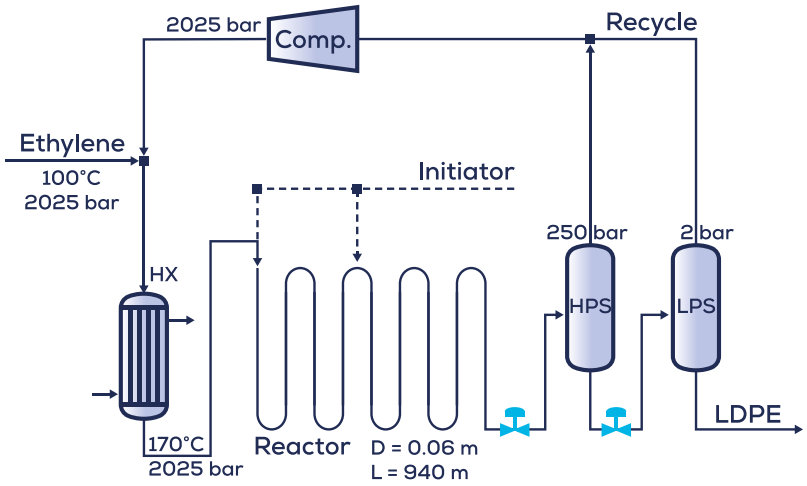
ANALYTICS TYPE
Diagnostic Analytics

KEY OBJECTIVE
Downtime Reduction

Preventing Emergency Shutdown in a Low-Density Polyethylene Reactor

BACKGROUND

Low density polyethylene (LDPE) is produced continuously in tubular reactor under high pressure conditions at this European polyethylene plant. To keep the rate continuous, the goal is to reach constantly high throughput and operate the process under secure conditions. After the reactor has been shut down because of cleaning, it is restarted under safe conditions. Ideally, this start-up is performed as fast as possible to avoid downtime.



CHALLENGE

During start-up of the LDPE plant, engineers observed an unexpected, sharp, 240-bar drop in the high-pressure circuit. The pressure drop resulted in an emergency shutdown. Process experts began troubleshooting as part of the emergency shutdown procedure. Engineers wanted to find the root cause of the pressure drop on startup under stable and safe conditions and avoid additional downtime caused by mandatory emergency procedures.

SOLUTION

- Perform an analysis in TrendMiner on influence factors, and identify correlating tags as potential root causes
- Evaluate potential candidates—such as temperatures, pressures, valve positions, and others by process engineers in process context—with high correlations to the shutdown
- Generate a hypothesis based on the influence factors with high correlations to the event, and test the hypothesis

Challenges

- The plant has procedures for troubleshooting during an emergency shutdown. However, these procedures do not cover all processes and do not provide good root cause analysis.
- Previous experience with analyzing trends includes a historian trend client and spreadsheets

RESULT

- After evaluating the possible influence factors in TrendMiner, process experts discovered a valve had been opened manually, but the valve was not supposed to be opened during start up
- The correlation analysis also revealed influence factors that are not checked in standard emergency troubleshooting procedure
- Engineers have immediate access to root cause analysis if the problem happens again, which can save hundreds of thousands in lost production time

TRENDMINER FEATURES USED

SIMILARITY SEARCH

Using pattern recognition technology, TrendMiner uses a similarity search feature to find similar past patterns. The most important part of the pattern can be emphasized with a graphical weighing factor to improve accuracy of the search results.

COMPARE TABLE

TrendMiner helps to discover tags with significantly different values by comparing layers or time periods. Comparing statistical data distributions and evolutions is beneficial in finding performance anomalies. The value of each tag per layer is shown as columns in a resulting table, and the value of each tag in comparison to the reference layer is shown as rows in the same table.

TAG BUILDER

TrendMiner's tag builder allows the creation of time series data with formulas and aggregations of the tags. The results of these tags can be visualized just like any other tag. The tag builder also can be used for importing time series data via a CSV file.

INFLUENCE FACTORS & TIME SHIFT

TrendMiner helps find influence factors to discover the root cause of process anomalies. In some cases, the influencing factor may lay hours upstream in the process. With the use of an automatic time shift detection, the most likely influence factor can be found – even if it took place long before the tag was impacted.

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