



# Key Capabilities White Paper

Control Business Outcomes & Improve Operational  
Excellence With Self-Service Industrial Analytics



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1

# Introducing TrendMiner

Process manufacturing companies are continuously striving to optimize overall equipment effectiveness, performance, and profitability, all while complying with applicable regulations. One of the best ways to accomplish this is by turning historical process data into actionable information - and that's where TrendMiner comes in.

TrendMiner is a high-performance self-service analytics platform for time series and context data. With TrendMiner, process engineers and operators can easily search for trends and question their process data directly – without help from a data scientist.

With TrendMiner, now process and asset experts can:

- Solve previously unsolved questions, such as identifying the root causes of performance drops.
- Test and verify the validity of a hypothesis, so it can be addressed or ruled out.
- Find new ways to improve performance through insights obtained from data.
- Use actionable dashboards to monitor operational performance in real-time.
- Use contextual information from 3rd party business applications to gain additional awareness into operational performance.





# Key characteristics

## VALUE OUT OF THE BOX

TrendMiner's platform connects with your existing enterprise data infrastructure, enabling immediate analysis of time series data. Setup and integration is completed through configuration rather than customization.

## ROBUST, EASY TO USE

TrendMiner quickly searches through large datasets containing thousands of tags looking for events of interest and correlations. It is a self-service intuitive software designed for easy use; as easy as using Google.

## DESIGNED FOR PROCESS EXPERTS

TrendMiner allows operational experts to improve production performance by providing fast and flexible answers directly when needed, without data science expertise.

## PLUG 'N PLAY

TrendMiner can be used immediately after being downloaded and deployed. Our software fits seamlessly into your existing IT landscape on top of a variety of historians, either at a single site or across the globe.

## ACCESS ANYWHERE

TrendMiner's user interface is developed with modern design principles and is fully tailored for process experts. The state-of-the-art HTML5 easy to use web interface requires no additional installation on desktops or laptops allowing users around the globe to connect and benefit from each other's expertise.

## FLEXIBLE DEPLOYMENT

TrendMiner can be deployed on premises, in a customer management cloud environment (e.g. Azure) or as a full SaaS solution. Once TrendMiner is connected to the historian server(s), process engineers and operators can start using it to collaborate in a globally-mixed IT environment.

## HIGHLY SCALABLE

TrendMiner supports single node architectures ranging from a couple of thousand tags to scaled-out architectures of 50M tags or more. It can be used to support single sites or globally operating business units with consolidation of dispersed historians which helps to optimize fleet performance.

## INTEGRATE TO INNOVATE

TrendMiner's integrations are bi-directional. Data silos can be unlocked within the platform and analytics results can be used in other applications via import-export techniques, our software's APIs, webhooks for workflow integration, or web Methods for configuring integration with 3rd party business applications.



YOKOGAWA



GE Digital

Honeywell



## 2

# Start Your Analytics Journey

Process manufacturing companies have been gathering sensor-generated time-series data for many years. Data analytics is not new, but the way it can be done is.

Through pattern recognition and an easy user interface, each process expert can use the data to make analytics-driven decisions to help control business outcomes. Process engineers, who are not data scientists can easily analyze their process data to answer questions such as:

- How is our production process performing?
- How often did this problem occur?
- What is the root cause of the issue?
- Can I monitor deviations of good behavior?
- What is likely to happen next?
- Can I predict when maintenance is needed?

Additionally, contextual information residing in various sources (maintenance data, operator logs, etc.) can be used to enrich the time series data in order to better understand operational performances. This contextual information can be analyzed separately to get deeper insights into processes and assets.

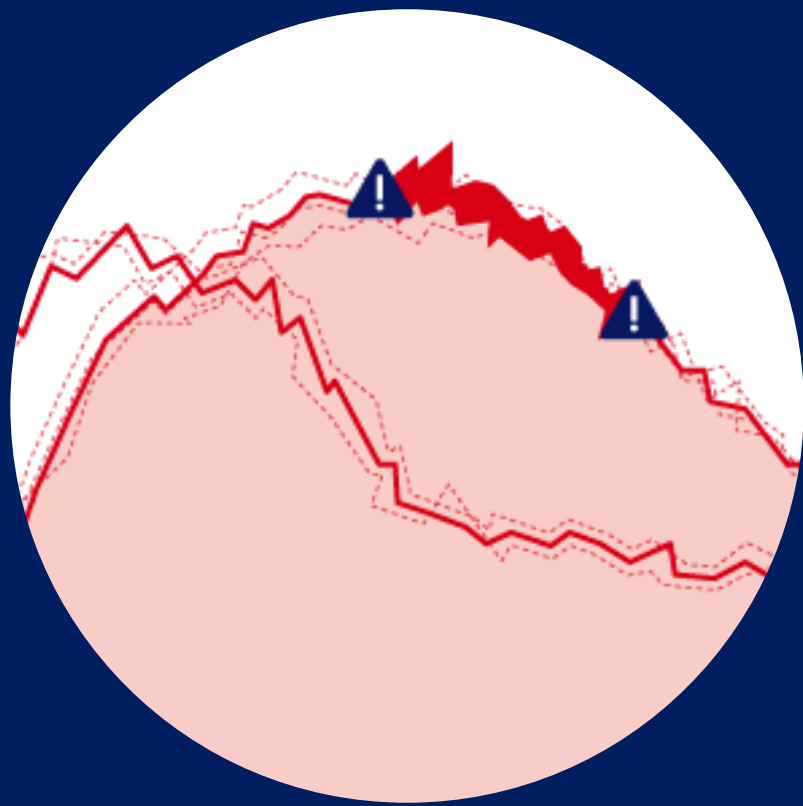
Lastly, analytics-driven dashboards can be created with live data so that each stakeholder from “the control room to the board room” can control business outcomes.





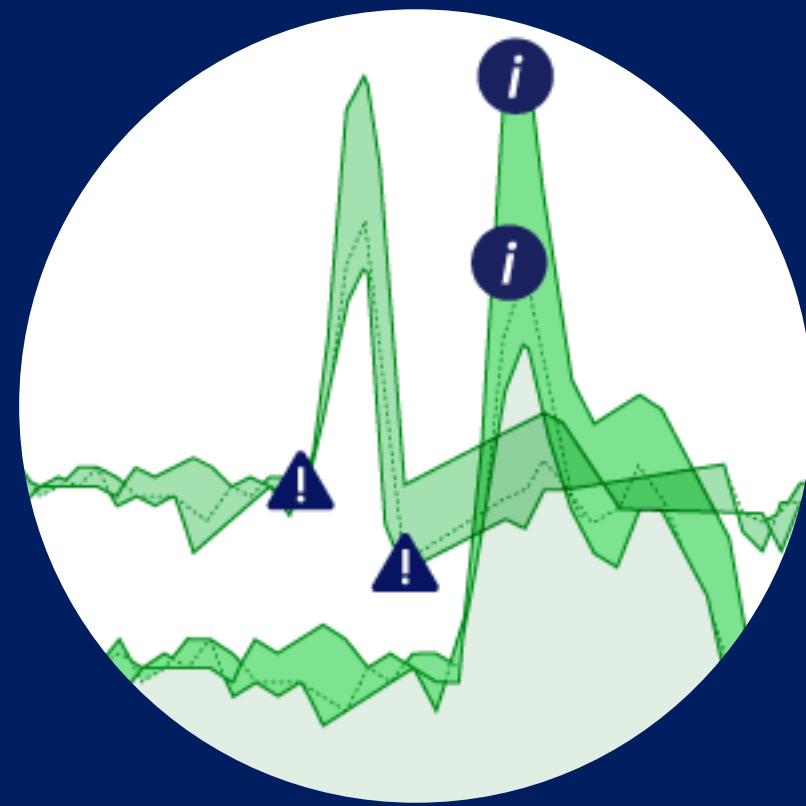
# What you can do with Trendminer

## Analyze



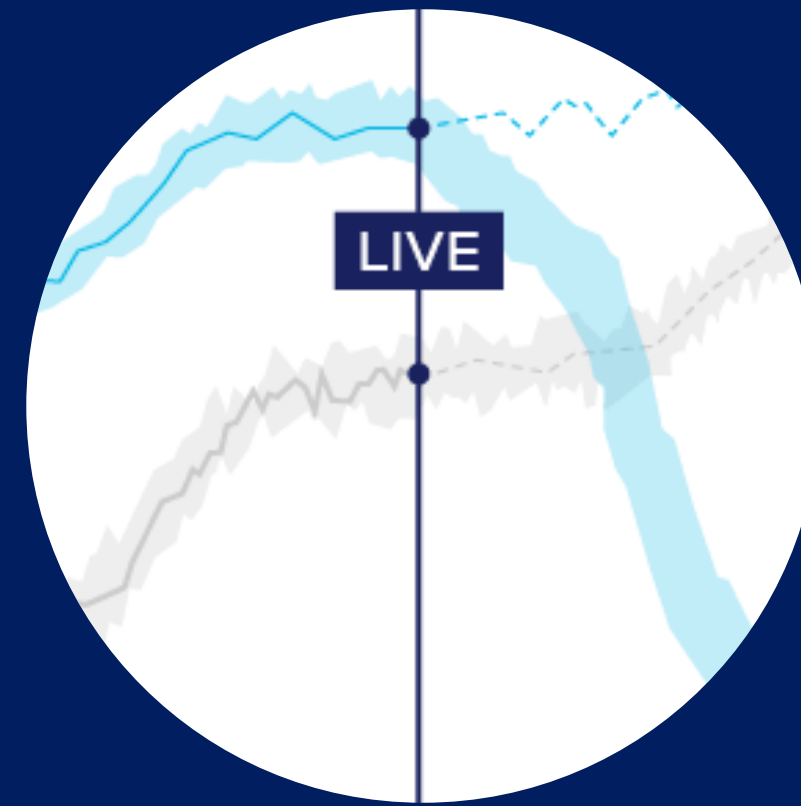
to find root causes fast  
p.7

## Monitor



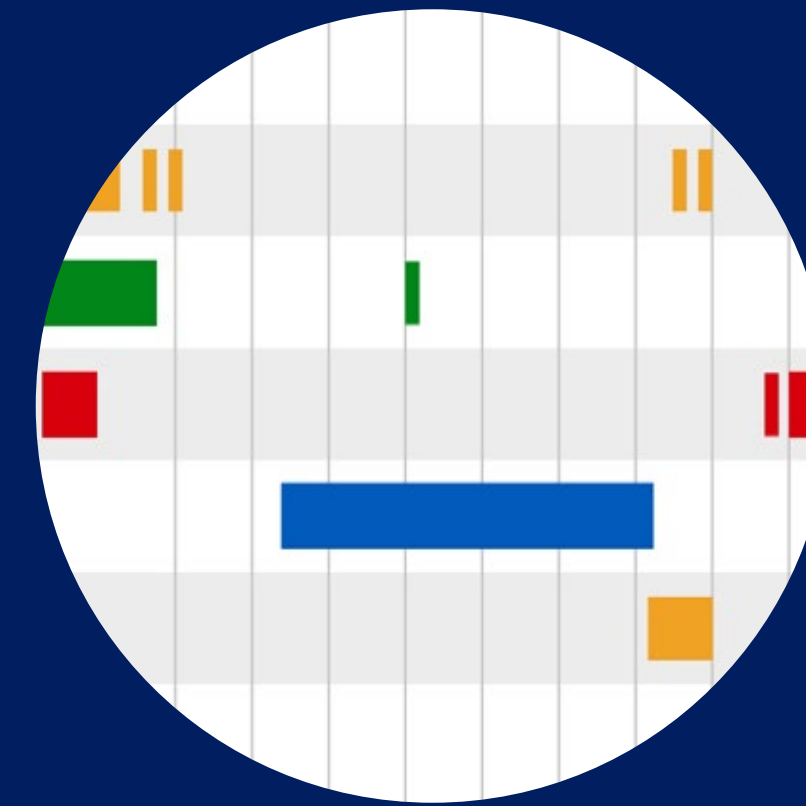
to get early warnings  
p.12

## Predict



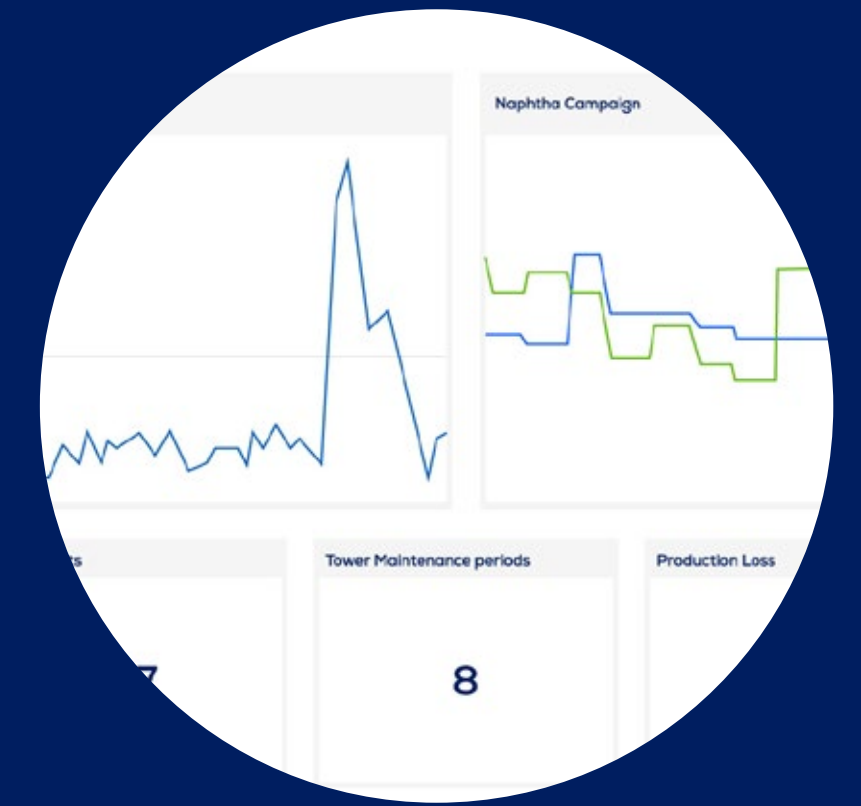
to know what's likely to happen  
p.15

## Contextualize



to continuously improve operational performance  
p.18

## Visualize



to obtain analytics-driven story-telling  
p.22

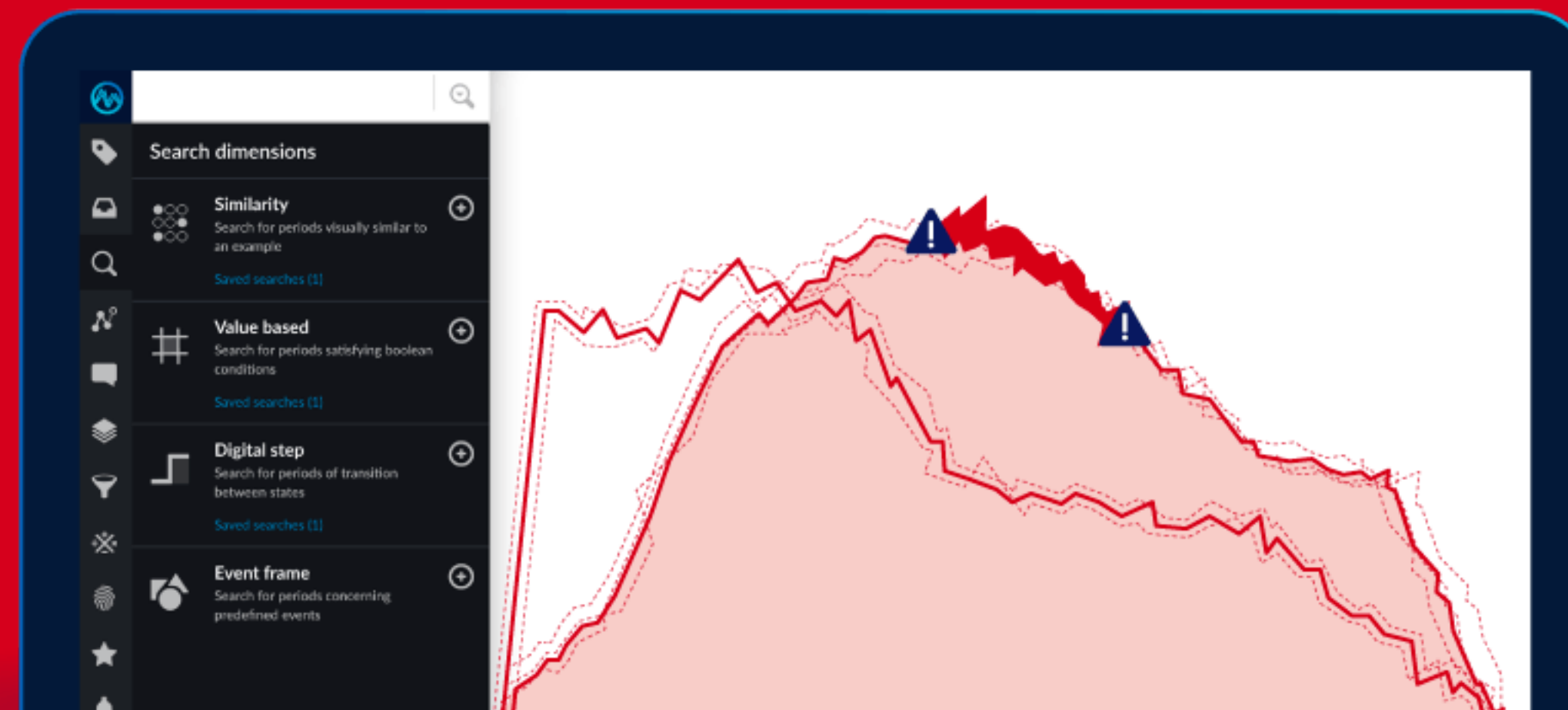


# 3

## Analyze Find root causes fast

When there is a process problem, answers are needed and needed fast. With a high-speed search engine, patented pattern recognition technology, and advanced filter options, our self-service analytics platform delivers fast and interactive data-driven insights on production processes and asset performance, and it does this on global scale. Additionally, advanced search algorithms, combined with pattern recognition, proactively provide recommendations to uncover previously hidden correlations and identifies possible causes of process issues.

TrendMiner's software speeds up root cause analysis and also identifies new areas for optimization. **With direct access to analytics insights, actionable information becomes available at all levels of the plant, allowing process experts to improve the production process across all stages.**



**Jan Meireleire**  
Engineering Manager at Ashland

Analyzing influence factors on product quality and resulting actions finally increased the on-target production of GMP products at Ashland Doel from 70% to over 95%, an achievement for which the value is even clear without translating it into euros.

**"We wouldn't be where we are today in overachieving our goals without TrendMiner."**



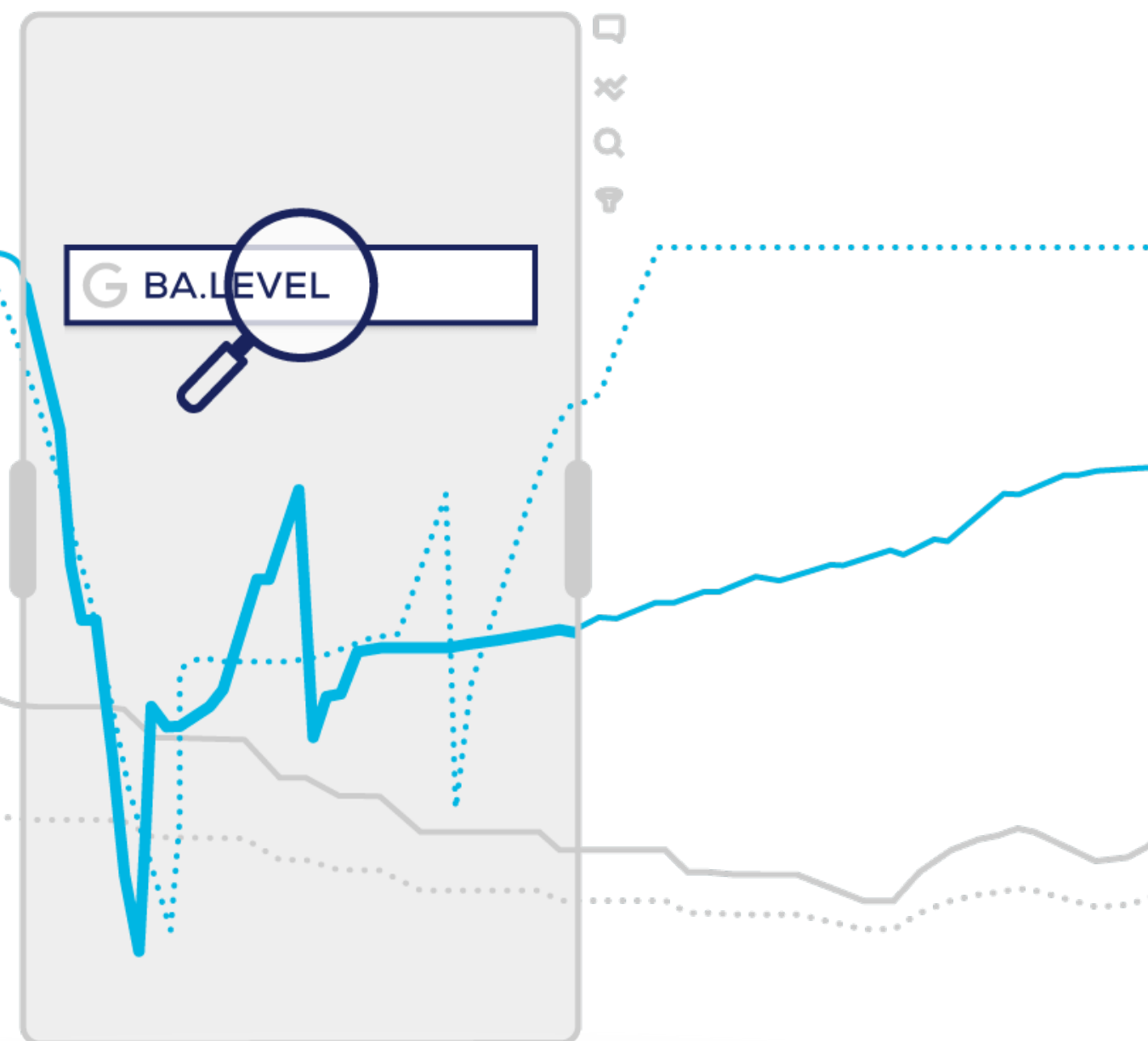


# Descriptive analytics

## What has happened?

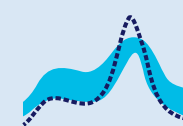
TrendMiner starts with a state-of-the-art trend viewer that provides process experts with a graphical representation of the vast amount of historical time series data captured in one or more historians.

A graphical interaction with the process data is much easier to navigate than long listings of numbers in a spreadsheet. For example, with advanced filtering capabilities, certain periods can be excluded or included to assess process performance and find specific issues.



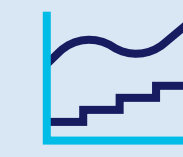
### GOOGLE LIKE SEARCH

TrendMiner allows for an easy click and search for tags, just like using Google. While typing, our software auto fills best matching terms to speed up the analysis search. In addition, the asset framework structure can be used to retrieve tags of interest hierarchically, and the time series data of the tag of interest is then displayed for visual inspection. Multiple tags can also be visualized at the same time to see graphical correlations.



### FAST FILTERING

TrendMiner makes it easy to exclude irrelevant time periods from an analysis. Time based filters are static filters applied to certain time periods. These filters can be created manually or on top of search results. Furthermore, dynamic criteria-based filters can be created and are automatically applied to both historical and new/incoming data.



### DATA VISUALIZATION MODES

TrendMiner offers various visualization modes for analyzing time series data. Besides the common time trend, time series data of multiple tags can be shown in a stacked mode for specific time sequences or can be grouped together in a “swim lane”. For multivariate analysis, our software offers a multi scatter plot that shows tag histograms and multiple histograms of each pair of the selected tags.



### TAG BUILDER

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



# Discovery analytics

## Did it happen before?

When incidents happen, the first question process experts ask is “Did this happened before?” TrendMiner helps answer this question by identifying similar historical behavior through patented pattern recognition. Pattern based searches for time series data show when similar behavior happened, how often it happened, and in what context in happened.”

Besides pattern based search capabilities, TrendMiner also provides value based search capabilities by using criteria and formulas to find periods of interest and then by matching operational process and asset behavior. The result? Day-to-day search questions related to oscillations, steps, Boolean conditions, and slopes, etc., can be answered.

### SIMILARITY SEARCH AND OTHER ADVANCED SEARCH OPTIONS

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. Other search options offered by TrendMiner are the following:

#### Digital Step

Used for a switch or transition in process performance, for example, for a grade change.

#### Value based search

Used to find anomalies in the time series data by analyzing criteria, numerical values, and limits.

#### Area Search

Used to gain new pattern-based insights to detect anomalies outside best operating zones and is achieved by combining two tags.

#### Context Item Search

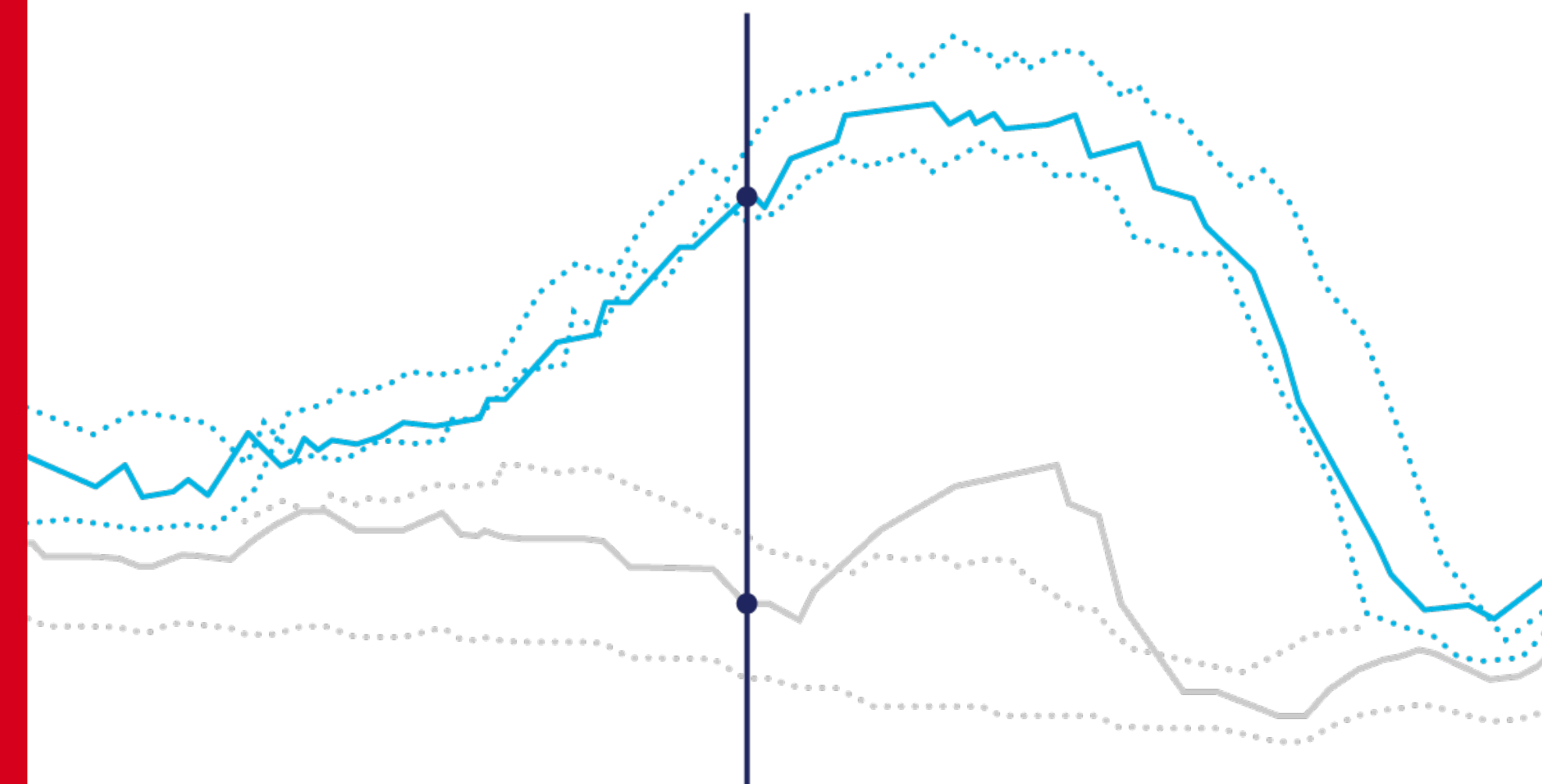
Search for similar past annotations by analyzing automatically, manually, or externally created context items.

#### Actions on Search Results

 Sorting  Context  Exporting  Filters  Layers  Calculations

### CROSS ASSET SEARCH

Allows you to search through similar assets based on pre-defined templates in your Asset Framework. Easily analyze data from parallel reactors or production lines, multiple pumps or heat exchangers of the same type and compare the data across your production plant or even multiple plants worldwide.





# Diagnostic analytics

## What was the root cause?

TrendMiner can be used to avoid deviating behaviors by helping to find the root cause of these behaviors. Our software compares good and bad stretches of data and uses an interactive influence factor to find hidden root causes.

Whether analyzing batch or continuous processes, TrendMiner helps generate explanations allowing process experts to quickly resolve anomalies.



### LAYER COMPARE

Periods of time can be easily overlaid to compare patterns and understand how they are different. TrendMiner instantly finds similar looking patterns over multiple years of process behaviour. Periods with a similar pattern can be overlaid enabling to better understand historical performance of the process.



### 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.



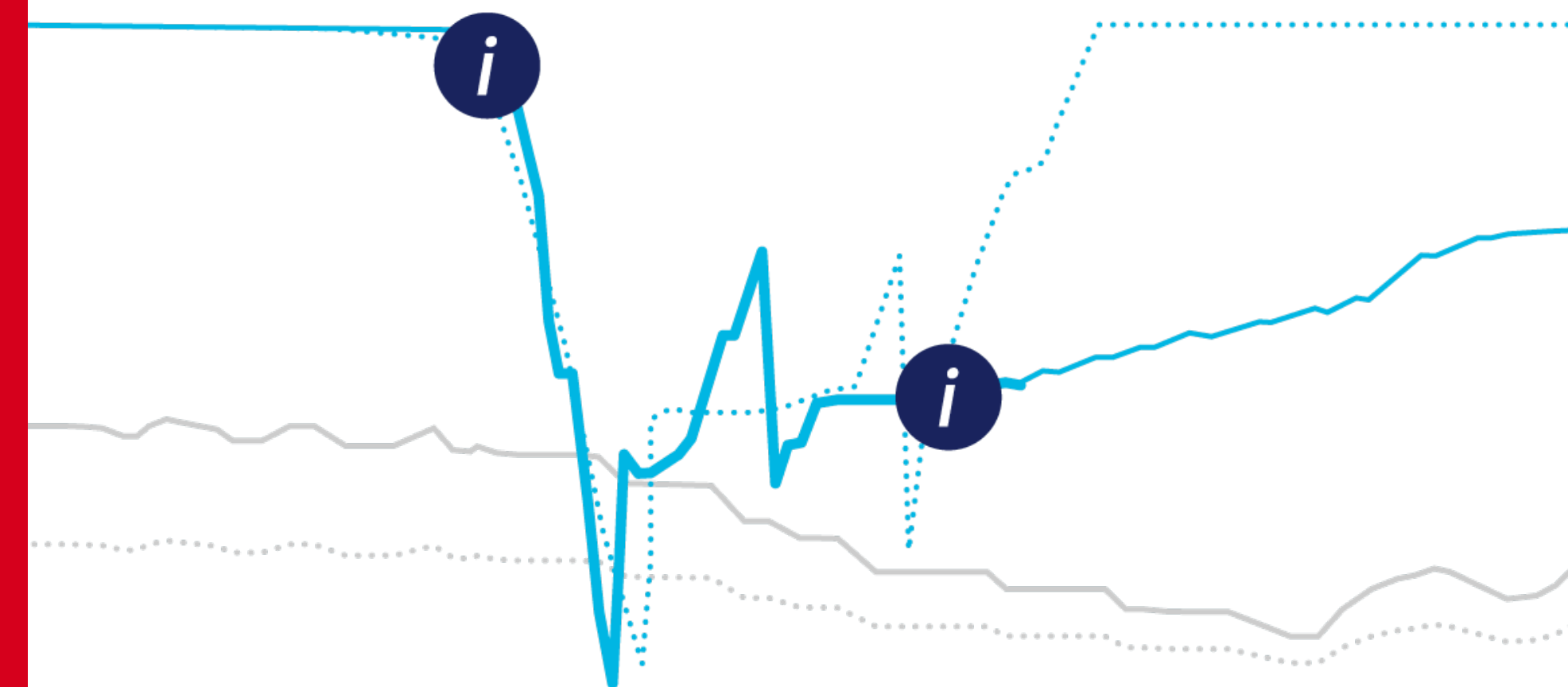
### INFLUENCE FACTORS & TIME SHIFT

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.

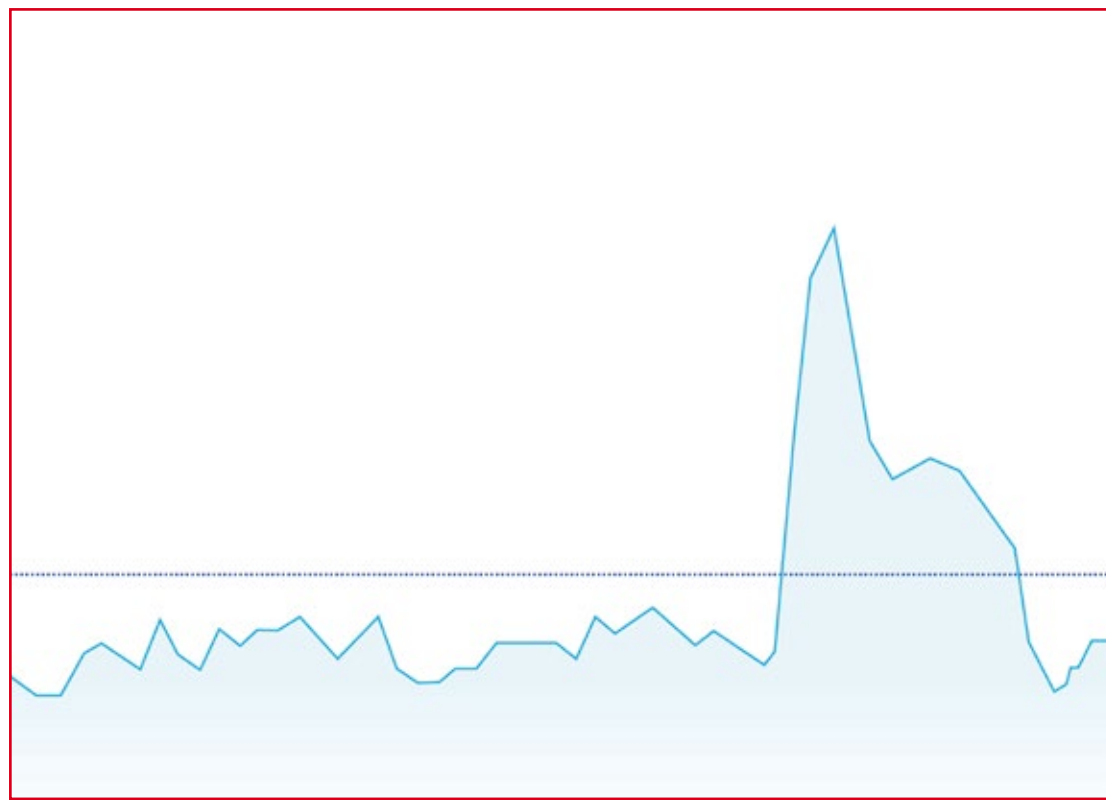


### RECOMMENDATION ENGINE

TrendMiner's recommendation engine gives suggestions for correlations and fingerprint deviations based on selected time frames, tags and layers. Our software provides an almost instant analysis across all indexed tags by combining information from multiple similar situations thus avoiding false correlations. Using automatic time shifts, it helps detect early indicators of deviating behavior.

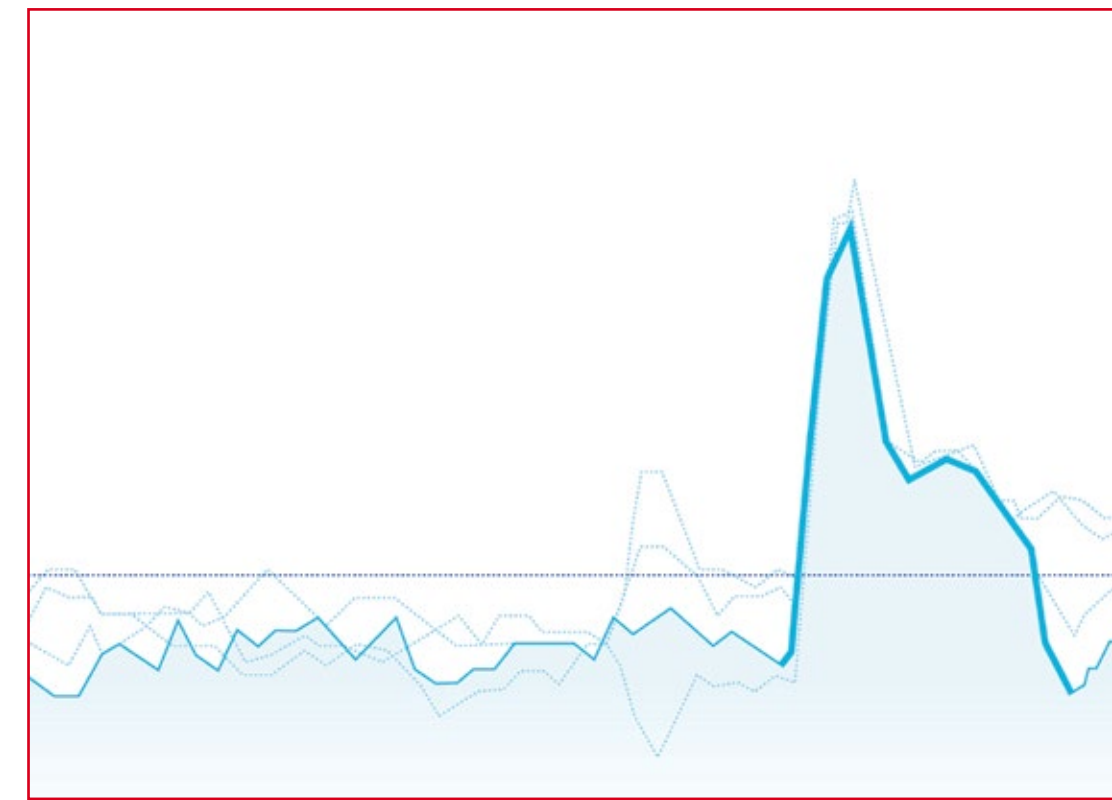






### What has happened?

What if, that during the night shift, an operator reported a spike in the temperature? The engineer has two easy options to find out what has happened: search for the tag of interest and use a visual search to find the reported spike or use a value-based search to find the situation where the temperature is above normal operation.



### Did it happen before?

The next step is to find out if the incident is a one-off or if the incident has happened before. The process expert can do this by giving the spike in the pattern a weighing factor, thus marking it as important. TrendMiner can then run a similarity search to find all periods with a similar pattern, sorting all possibilities according to the percentage of pattern matching.



### What was the root cause?

It's clear now that the temperature spiked more than once. What caused it? Process engineers can use TrendMiner to find out. Our software has two features that suggest possible root causes: its influence factors and its recommendation engine. The process engineer can look over the list of possibilities, decide on the likely cause, and take the appropriate mitigation action.

## Customer Case

### RCA of quality swings

The customer had difficulty controlling a continuous process in the column for producing acetone cyanohydrin; the process also tended to swing between operating points. Trimming the control based on lab analyzes led to energy and production loss.

The customer spent months trying to establish a good data model to solve this problem. The problem was solved within hours after using TrendMiner. Our software was used to conduct a global search to determine a set of influencing parameters which lead to creating and validating a multivariate model.

The result? An improvement of a 1% yield increase and a reduction in energy consumption for the purification cycle resulting in a savings of approximately €2 million per year.

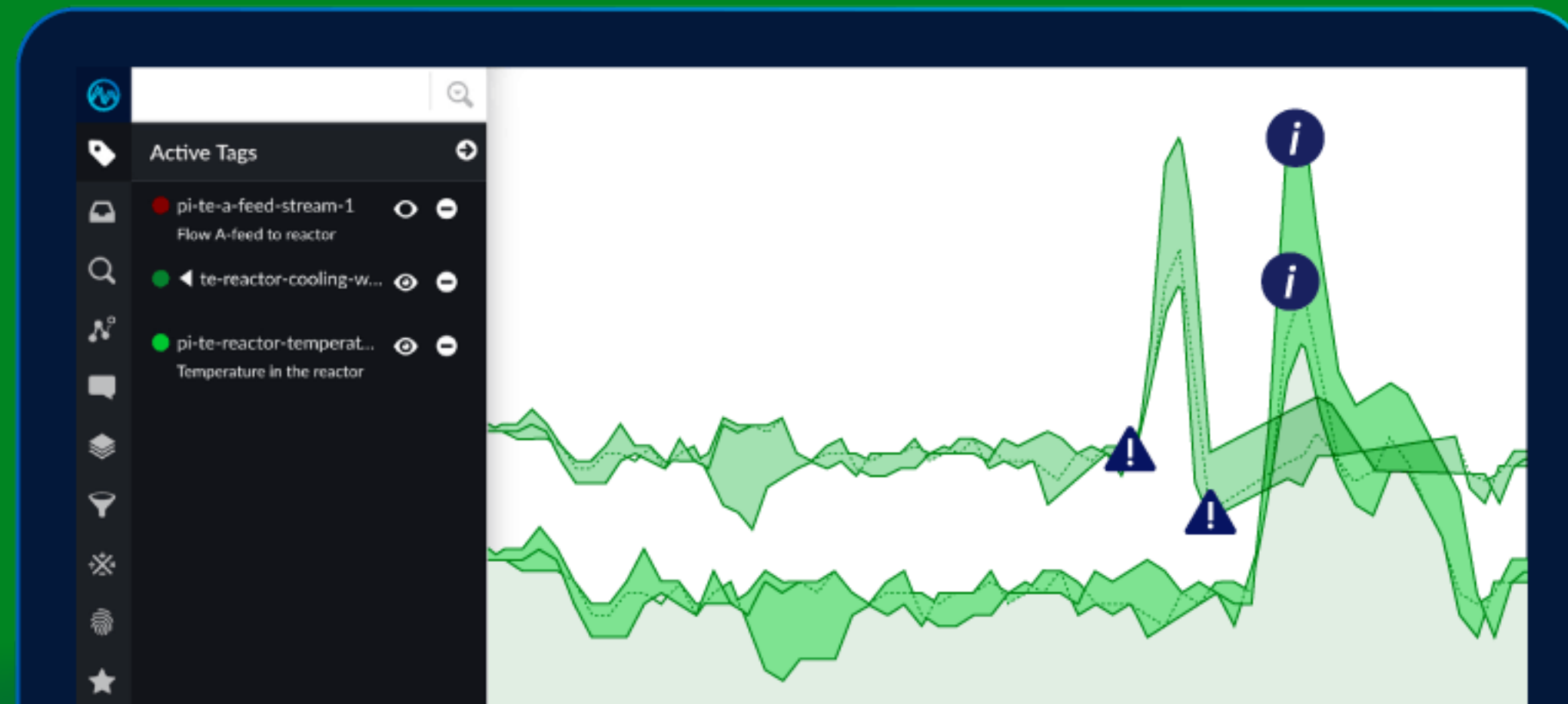
## Practical Use Case

# Root cause analysis (RCA) of a temperature spike



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## Monitor Data never sleeps, neither does our software



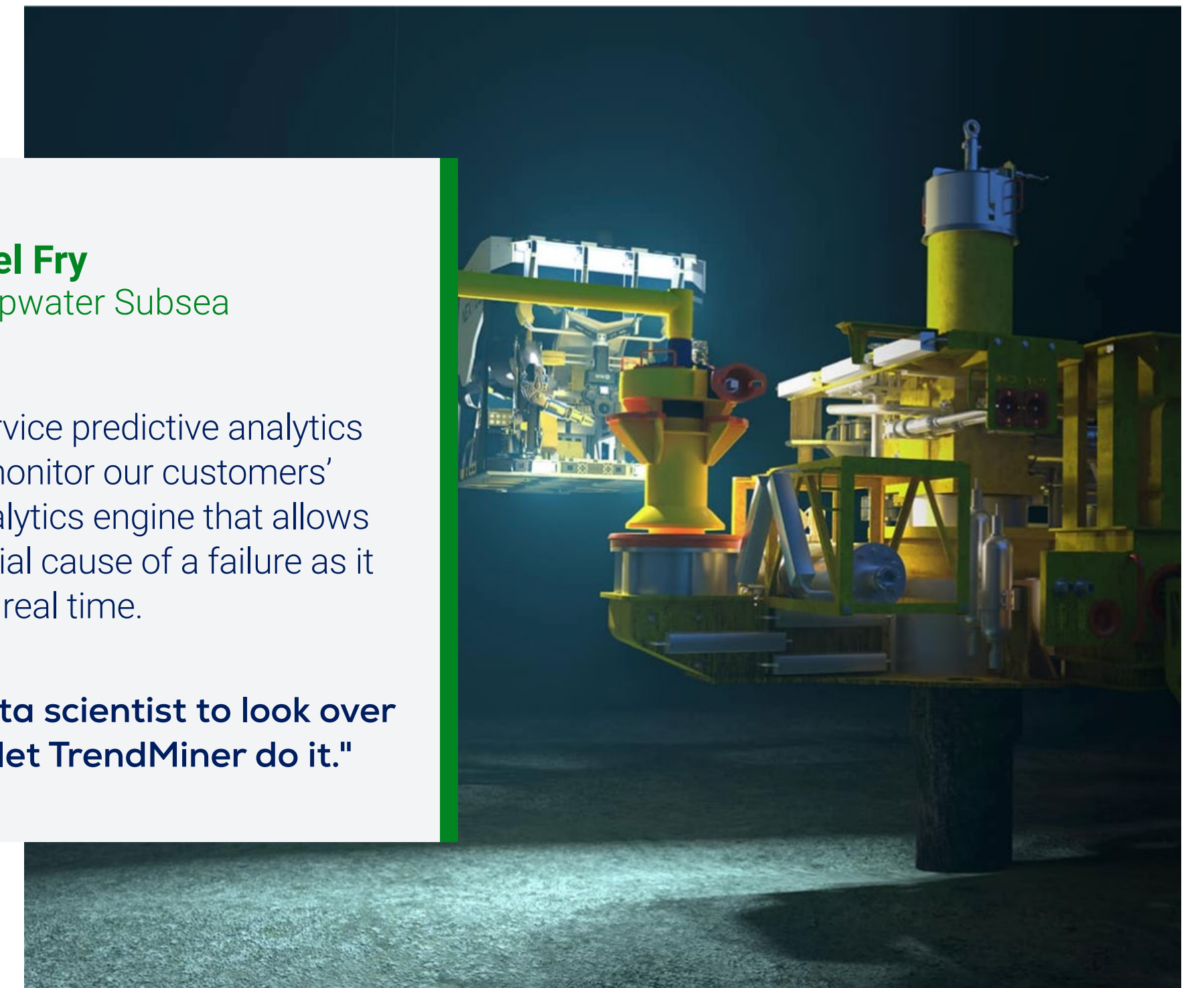
Events that occur “once” will likely occur again. Our software helps to prevent repeating production issues by guarding live data like a watchdog. It monitors processes 24/7 sending notifications when patterns of interest are detected and can customize messages to prescribe the best response for the given circumstances, allowing process experts to take appropriate actions before there is a problem.

With the ability to automatically annotate and label events, TrendMiner can be used to capture and share lessons from the past and to monitor good behavior. **Through acquired knowledge of events and machine learning, our software helps process experts avoid abnormal situations.**

**Michael Fry**  
President of Deepwater Subsea

With TrendMiner's self-service predictive analytics platform, we can now monitor our customers' equipment with a data analytics engine that allows us to determine the potential cause of a failure as it happens in real time.

**"We no longer need a data scientist to look over the systems... We just let TrendMiner do it."**





# Guard Operational Behavior

TrendMiner is like a watchdog; it continuously monitors processes and sends notifications when deviations from predefined fingerprints, process conditions, or operating zones occur. These early warnings improve plant output by allowing the plant to run at optimal energy consumption and waste reduction and at the same time, to comply with safety, health and environmental regulations.



## FINGERPRINTING

The search capabilities of TrendMiner can be used to find and overlay the optimal dynamic behavior, such as the best batches, transitions, and start-ups, etc. With a click of a button, multiple periods of the best performance can be combined into an envelope or fingerprint which can then be used for process monitoring purposes.



## BEST OPERATING ZONE

Besides fingerprints, scatter plots based on “best operating zones” can be created with TrendMiner. The designated “best operating zones” can be used in the same way as a fingerprint. Alarms can be put in place to notify process experts when deviations from these zones are detected. Monitoring the best operating zones reduces unnecessary equipment stress, increases asset reliability, and extends equipment lifetime.



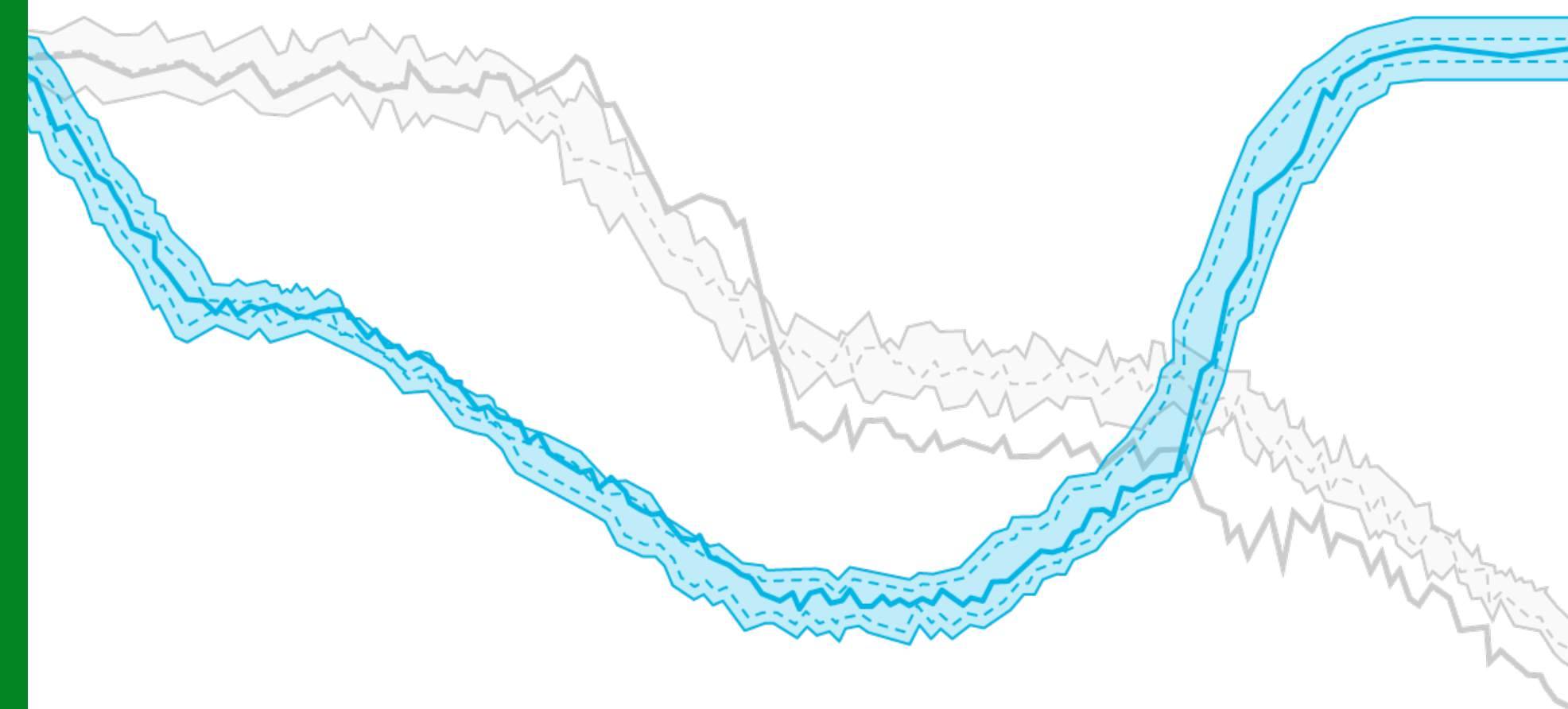
## ALERTS & NOTIFICATIONS

Process experts can use TrendMiner to create batch fingerprints and monitor production processes in relation to these fingerprints. Automatic notifications can be inputted into our software to alert engineers and operators when patterns of interest are detected. TrendMiner supports various notification mechanisms, including embedded inbox and email alerts. These notifications also include suggested courses of action and can be designated to trigger a webhook to fire a workflow in other business applications, such as the maintenance management system.

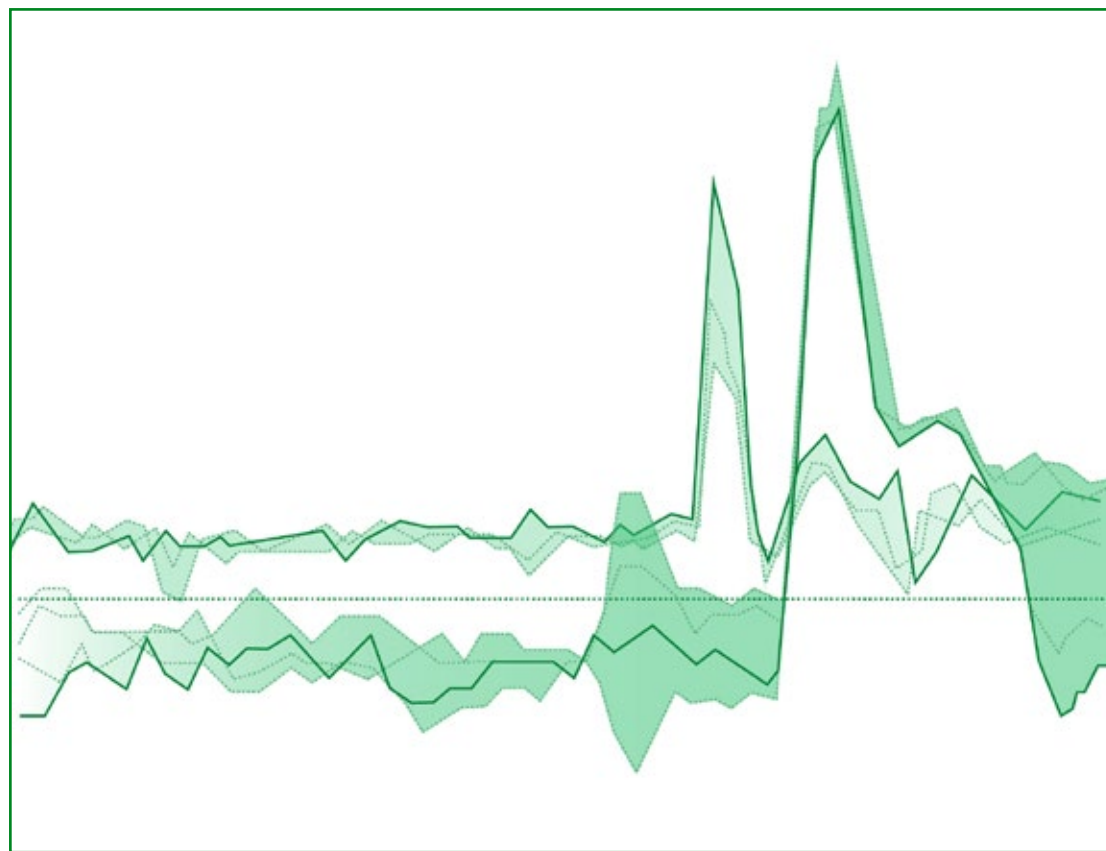


## CAPTURE EVENTS OF INTEREST

Specific occurrences can be captured as events and labeled automatically, based on monitoring alerts for saved search patterns, fingerprints, and rules. The captured events can be used to monitor how often these events happen and even to prevent and control overall production performance.

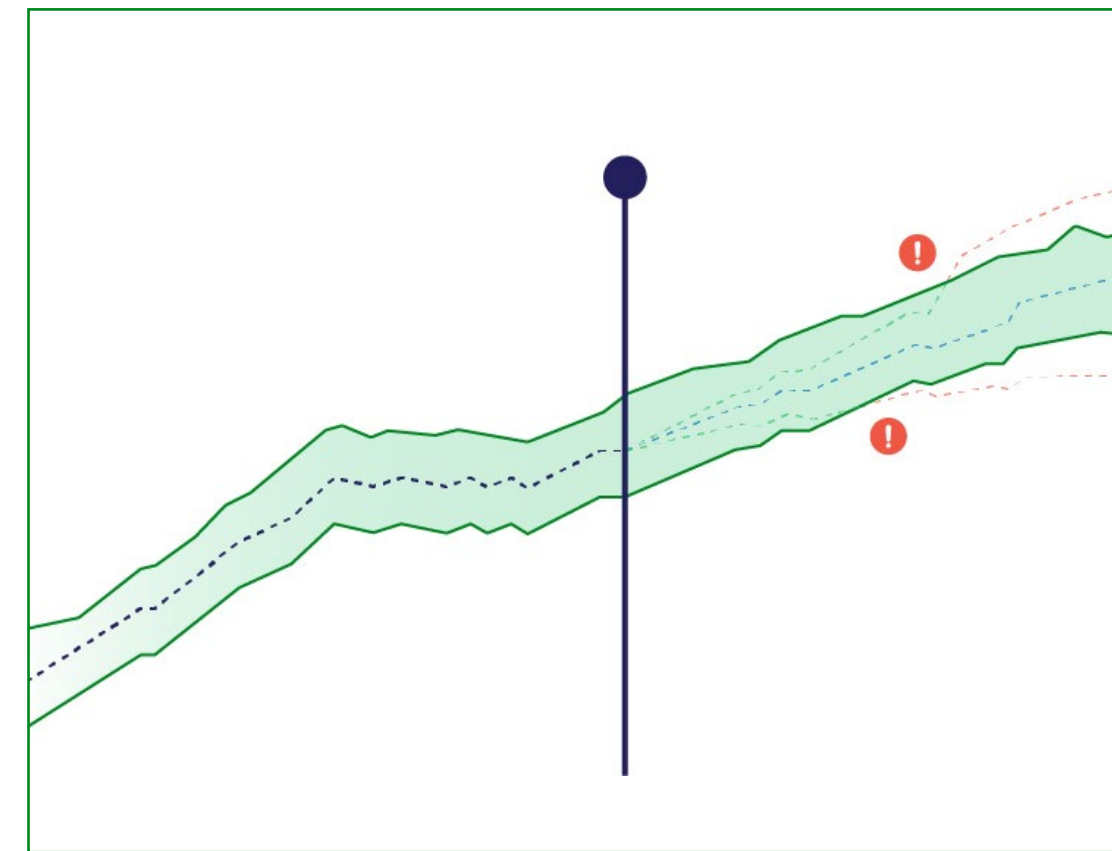






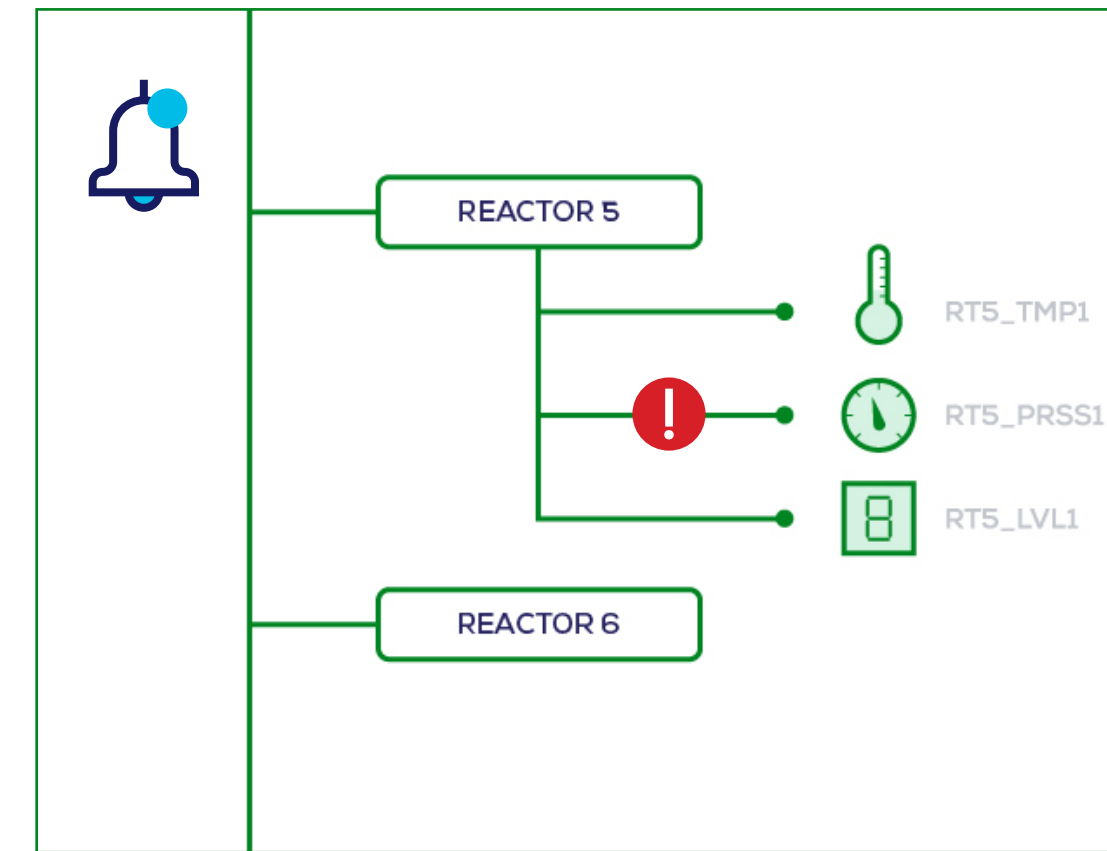
### Fingerprint good operational behaviour

Multiple periods of best process performance can be overlaid in TrendMiner and combined into a fingerprint. Finger prints can be created for multiple tags and various production situations, such as the startup of a continuous process or quality control of a production batch.



### Deploy early warning and create annotations

Fingerprints can be used for monitoring deviations and also for assuring the process is within specifications. For both situations, TrendMiner can capture the event and label it automatically. Based on root causes found upstream and use of the fingerprints, early warnings can be used to improve control over the production process.



### Warn operator with prescription

Early warnings and soft sensors can be used not only to capture events for future analysis and knowledge building, but also to warn operators. With previously analyzed situations, TrendMiner alerts the operator in the control room about a process situation and suggests a course of action that is within specifications.

## Customer Case

### Reduce energy consumption for demineralizing water

In a reverse osmosis plant, two redundant installations work next to each other. Whenever a flow of more than 300 m<sup>3</sup>/h is needed (especially at low temperatures), both installations need to run simultaneously.

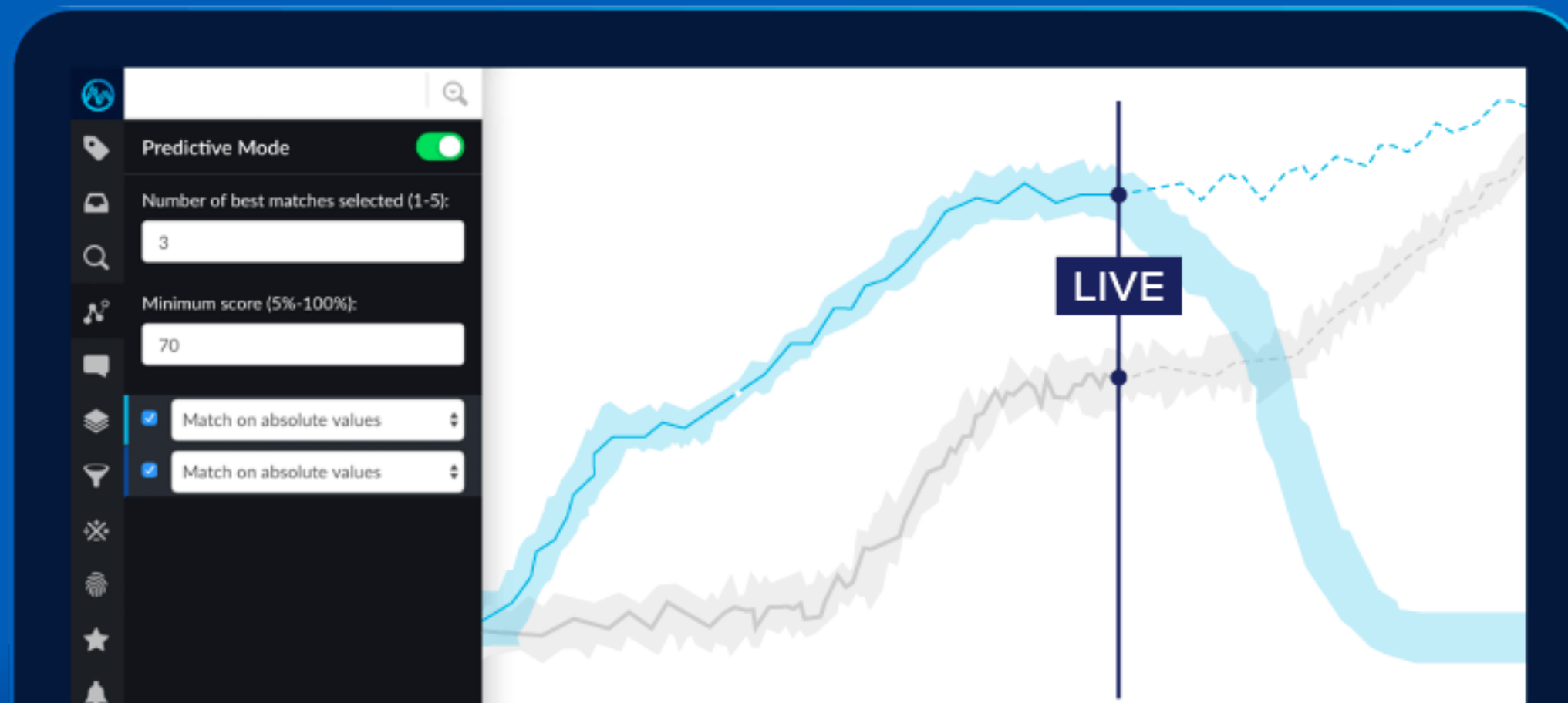
With the use of digital tags, layer compares, scatterplots, and fingerprints, TrendMiner proved there was a dependency between the flow rate and the energy consumption.

As a result, the customer was able to achieve their goal of reducing energy consumption. By optimizing the number of reverse osmosis units for a given flow, the team saved energy, reduced fines, and saved costs and will continue to do so in the future.

# Practical Use Case

## Early warnings for operators





# 5 Predict Anticipate future performance

Traditionally, predictive analytics is about defining the scope of prediction, collecting the data, developing and testing a data model, validating the outcomes and deploying the predictive model to the organization. With TrendMiner almost all of these steps can be skipped. Predicting process behavior with TrendMiner does not require a data scientist. **Your process and asset engineers can immediately apply their expertise to solve potential production issues before they occur.**

Predicting process behavior with TrendMiner does not require a data scientist. Using our software, process and asset engineers can immediately apply their expertise to solve potential production issues before they occur. Process evolution can be used for early warnings and can also be extended to the level of predictive maintenance. With the captured events and prescriptions from the engineers, the organization can receive appropriate instructions on what needs to be done and when the work can be scheduled.

**Gerd Decramer**  
Engineer at Sitech for OCI Nitrogen

"The data-driven discovery, monitoring and predictive capabilities of TrendMiner were a game changer in our constant quest for operational excellence."

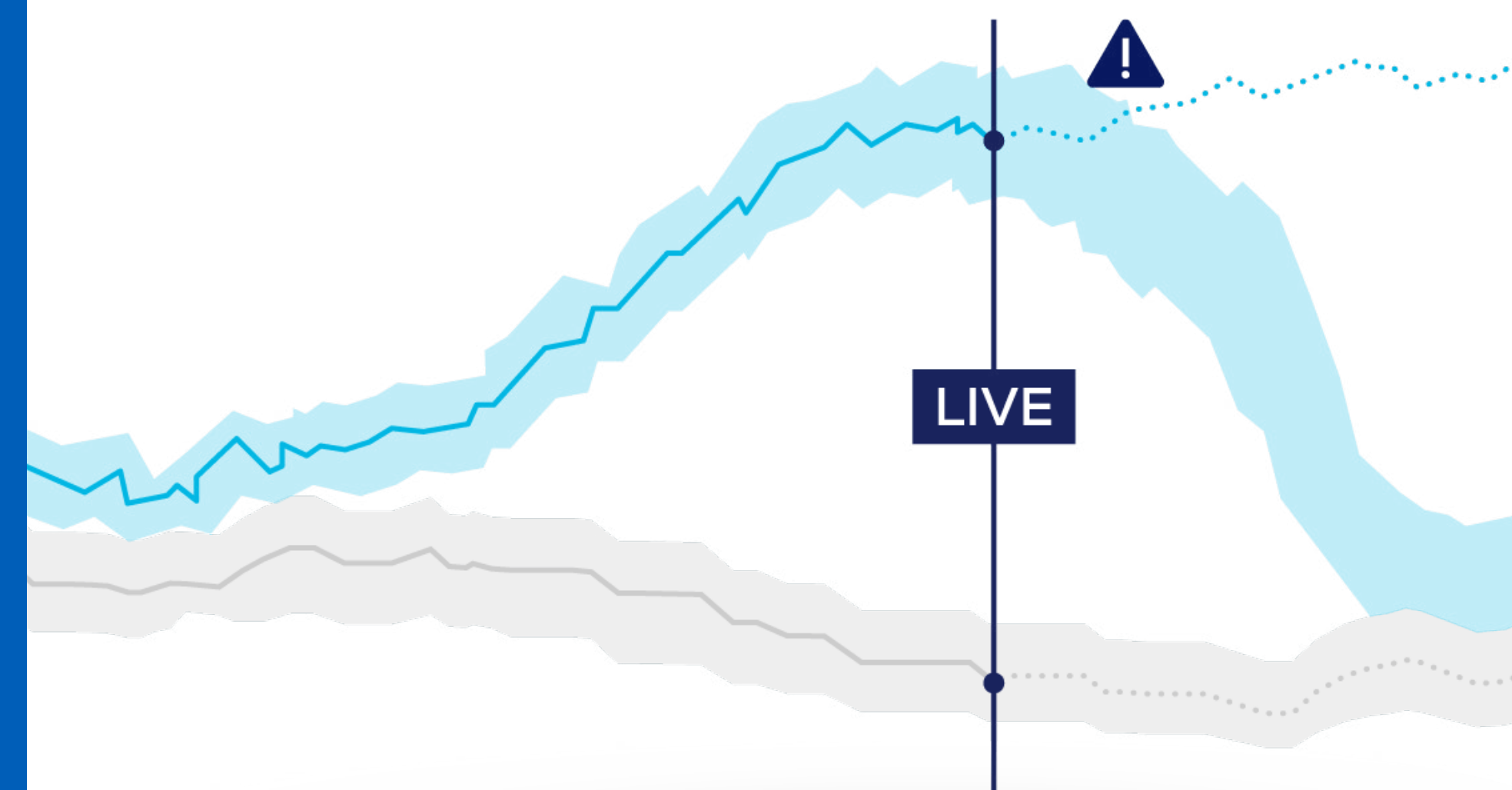




# Predictive analytics

The goal of predictive maintenance is to be able to perform maintenance at a time not only when it is the most cost effective, but also when it will have the least impact on operations, and knowing this requires a good understanding of the process performance.

Process and asset engineers are in the best position to analyze good and bad performance. Their knowledge and experience form the basis to monitor performance, safeguard best operating zones, and predict when maintenance is best scheduled.



## MODEL-FREE PREDICTIVE MODE

TrendMiner's interactive and model-free predictive mode is based on patented technology and fundamentally works differently from classical model-based predictive technologies. Our software calculates possible trajectories of the process and predicts future evolutions of key variables and process behaviors.



## INTERACTIVE SOFT SENSOR DESIGN

TrendMiner supports creating and deploying soft sensors using an interactive and step-by-step approach with access to all process data. Process and asset experts can build predictors for future performance without the need for a data science project.



## EARLY WARNINGS

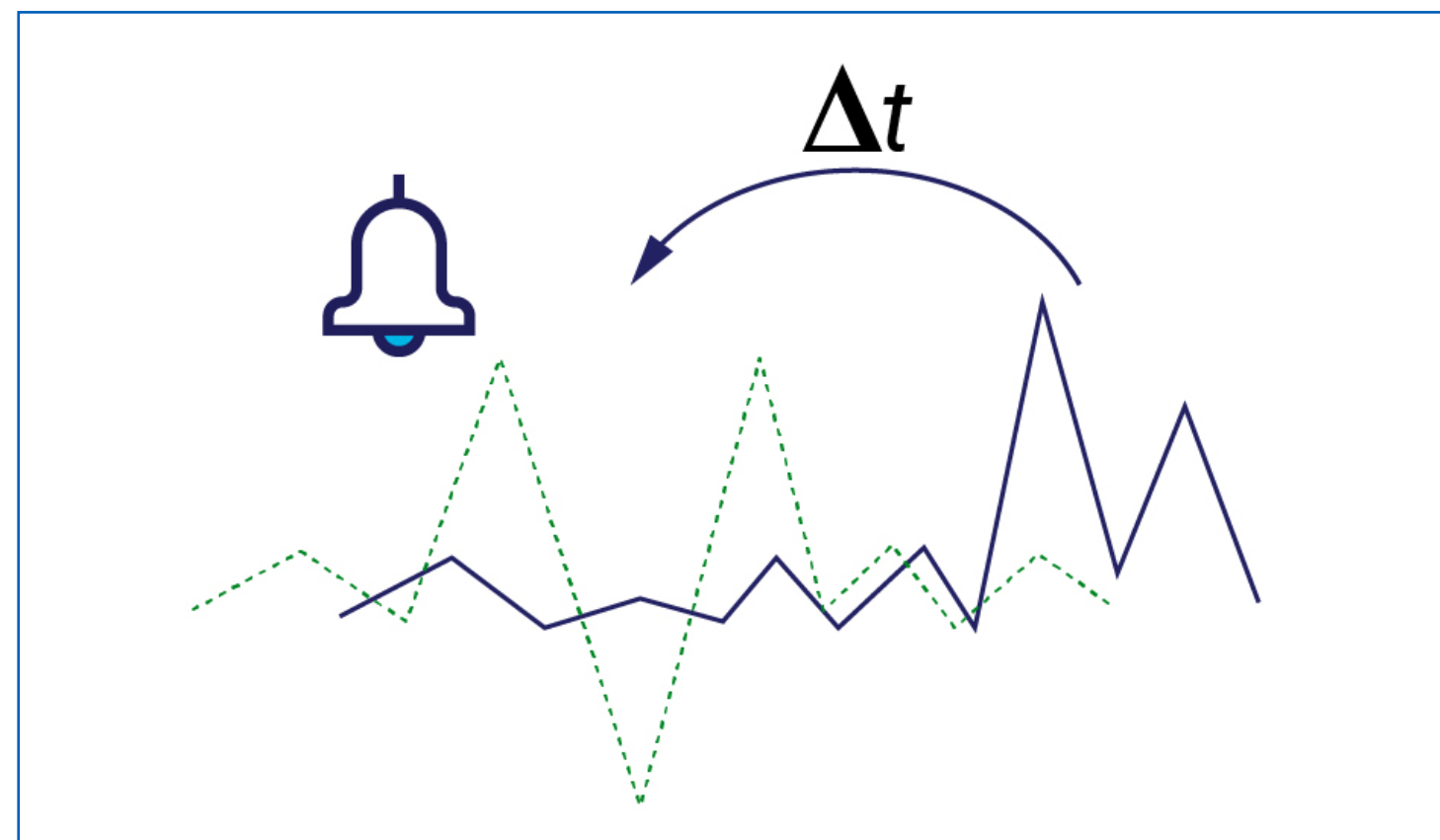
Users are presented with early indicators for anomalies of interest. Key stakeholders are notified either by sent alerts, by email or external apps. Warning messages can include instructions about what to do given the predicted situation, allowing process experts to proactively adjust the process for avoiding waste and ensure product quality.



## PREDICTIVE MAINTENANCE

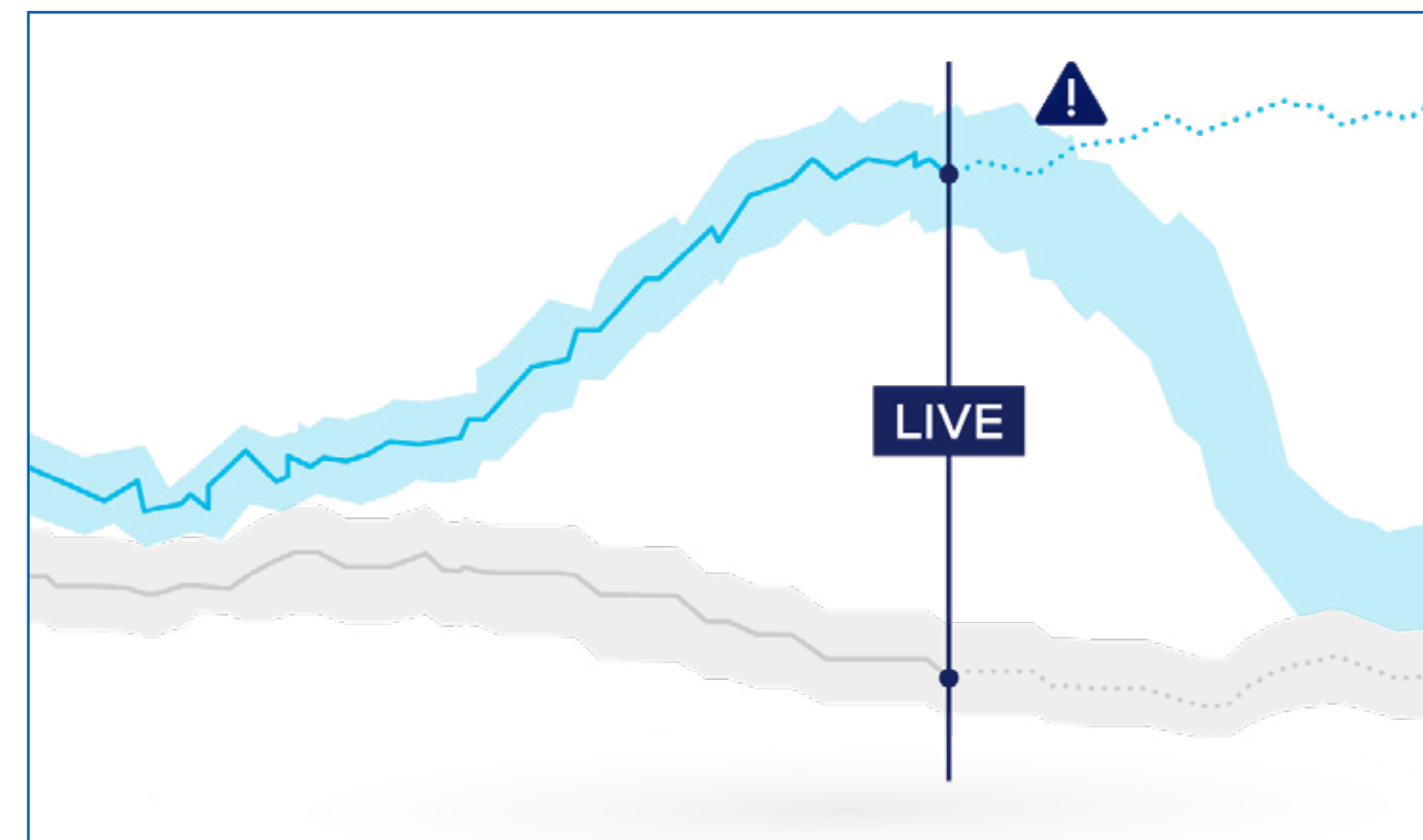
Traditional predictive maintenance with the use of data models is often time consuming and isolated from the subject matter experts. Therefore, it's only feasible for the most critical assets. By using and thus analyzing the information within the time series data, process experts can assess every asset for performance and predictive maintenance.





### Event based prediction and logging

Besides calculating the possible trajectories of a process and predicting future evolutions of key variables, TrendMiner can also monitor degrading asset performance overtime. An example is heat exchanger fouling. This type of prediction is called event based prediction with use of sensor generated data.



### Inform maintenance to plan work orders

When events are captured and stored in the database, a notification can be sent to the maintenance engineer that it's time to plan work. Another option to notify that work is needed is by using a workflow trigger that can be sent to a maintenance application, for example SAP PM. With use of a webhook, the workflow for creating a maintenance request in SAP can be triggered for the job planner to prioritize.

## Customer Case

### Predictive maintenance of a regenerative stripper in an alkylation unit

Within a continuous refinery process, a catalyst is drained in a drum based on the level in a column. The time it takes to fill the drum is dependent upon the acid flow to the stripper column. Being able to predict when the regenerative stripper drain drum is full would make it easier to plan maintenance.

Process experts can use TrendMiner's predictive mode to do this, which also reduces maintenance costs as well as increases the reliability of the production process.

# Practical Use Case

## Predictive maintenance based on process data

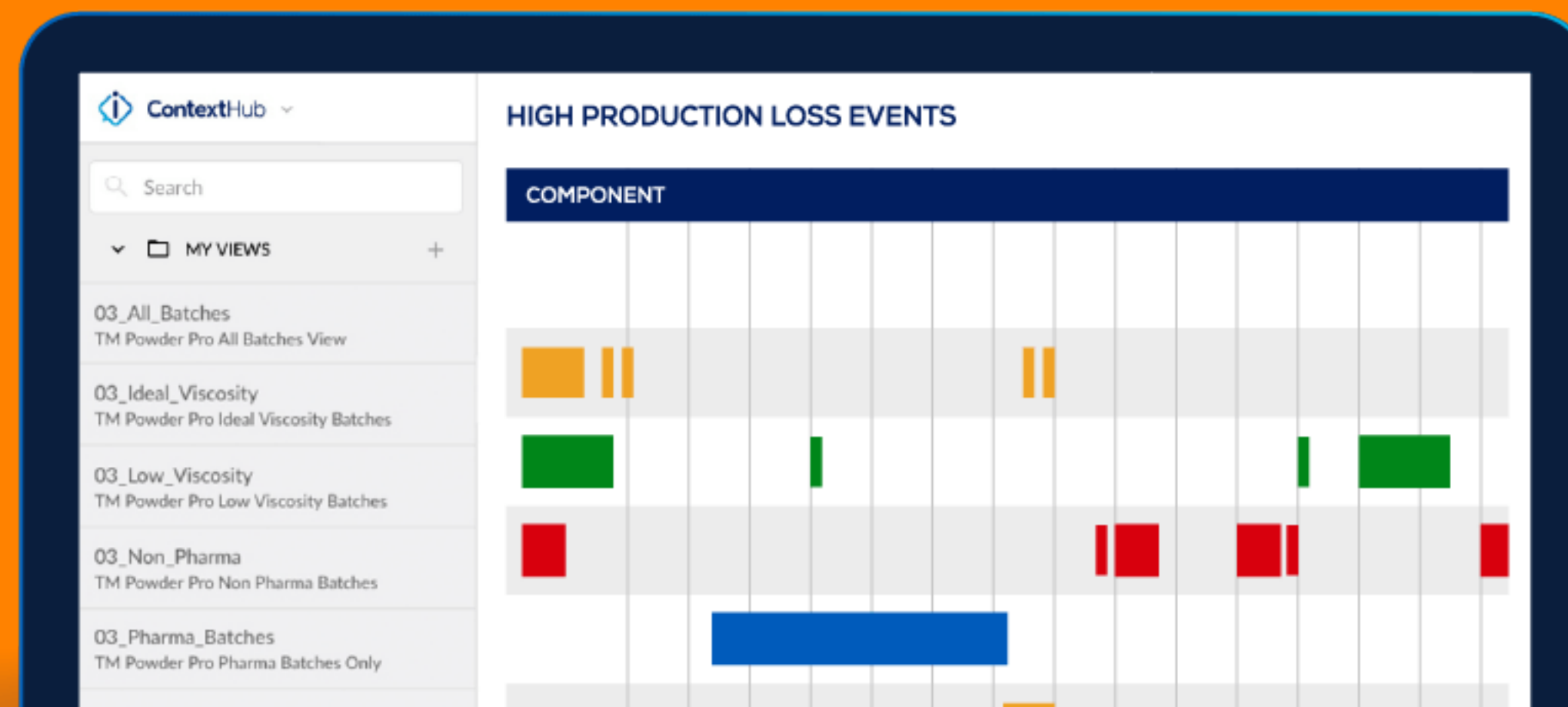


# 6

## Contextualize Make better decisions faster

All kinds of events may impact operational performance. Capturing and combining critical events with time series analytics will shed new light on production processes. This context helps shift performance to the next gear. By illuminating time series data in order to better understand it within its context, process experts can get a clear view of operational behavior.

Contextual information may reside in various data silos, such as the LIMS, MMS or OEE systems. Through self-service analytics, **captured contextual information can be leveraged to make data-driven decisions in the control room and can be the starting point for continuously improving operational excellence.**



**Tim Timmermans**  
2nd Utilities Manager at Covestro

TrendMiner enables us to bring process information within our data by annotation. I believe that if we can maximize knowledge transfer, this will bring us to innovation.

**"Process data tells stories, all you need to do is capture them."**

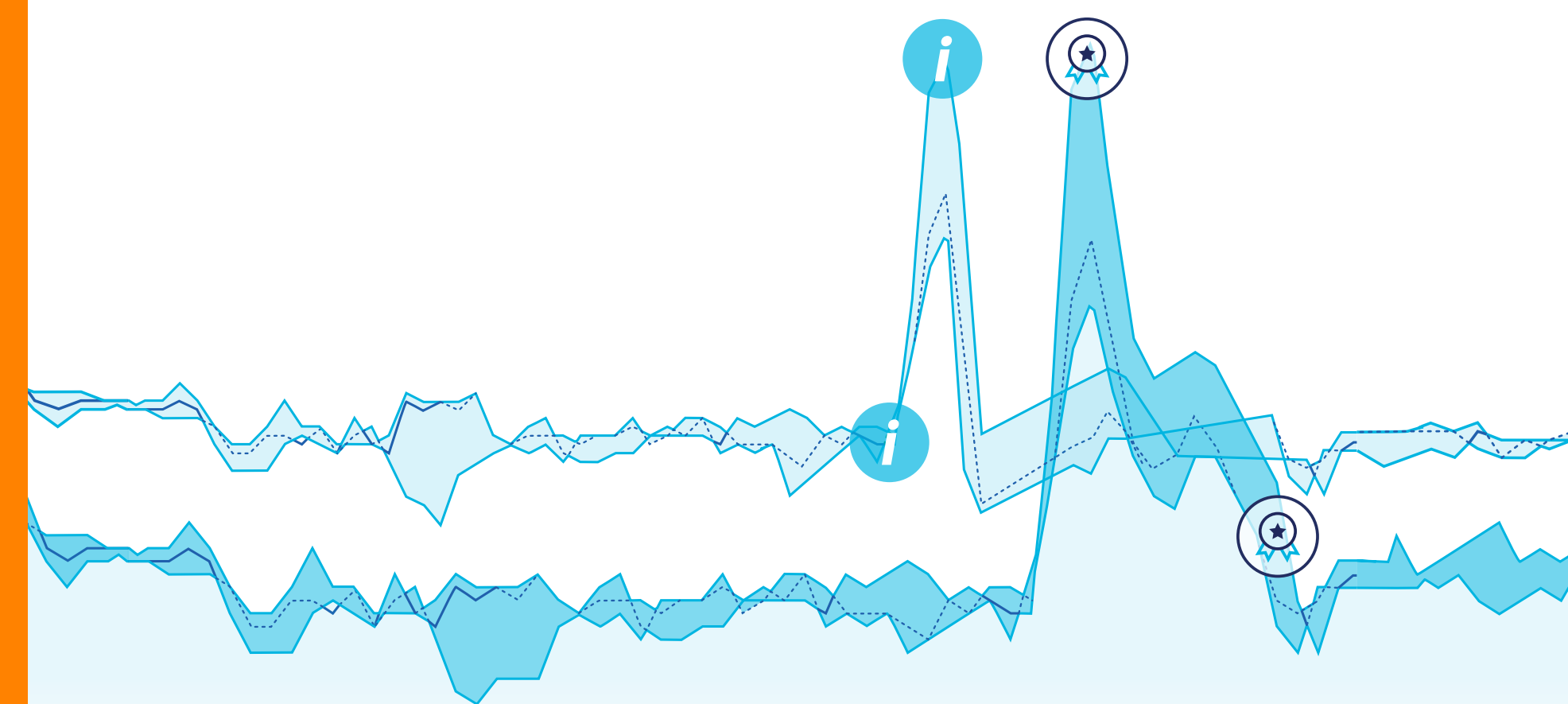




# Smarter analytics to operate in the fast lane

Being able to search for context items gives users the power to actively utilize captured context within the time series data analysis itself.

Through saved views of contextual data, users can visualize, filter, and overlay time periods in the trend views. With this feature, context items are a good place to start trend analysis, effectively speeding up root cause analysis. In addition, new fingerprints can be created along with monitors that send notifications to the control room, so process experts can take appropriate action to ensure production runs according to specifications.



## CAPTURE EVENTS

With the use of fingerprints and monitors, context items not only can be captured automatically but also can be entered manually. All context items help to speed up the search and filter actions in time series trend data. Context items can be classified by type and assigned specific notifications which include suggestions for appropriate action to be taken.



## COMMENTING & COLLABORATION

A context item can have many properties which can be viewed by opening the item. In the context item panel on the screen, users can also add comments, start discussions with other specialists in the organization, and even attach files for further clarification and instructions for issue resolution.



## GANTT VIEW OF CONTEXT

All contextual information has a start and end time which is used to represent the events in a sequence diagram or Gantt chart. Per asset, all related tags are grouped and vertically listed, and for each tag, all context types are represented in a time series fashion. This view gives a different starting point for operational performance analysis and provides new insights.



## LIVE EVENT UPDATES

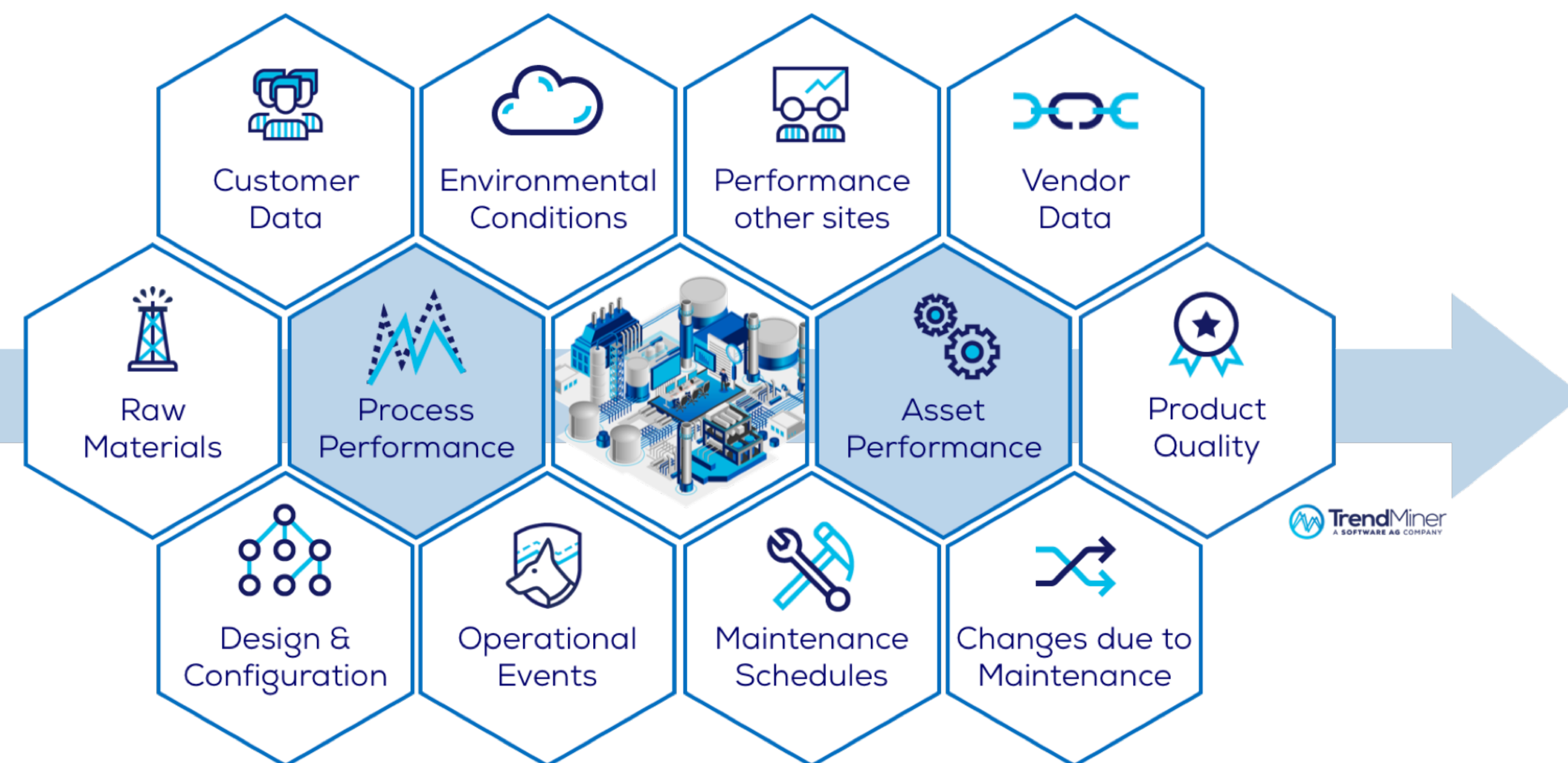
Events will be generated automatically through live monitoring of process performance. The new events can be shown directly in the Gantt view or event listing tables. These displays provide an operational view of the events happening, in addition, to early warnings in near real-time.



# Unlock data silos

As the digitalization of organizations continues, more sources of business-critical information are available but often remain in data silos. TrendMiner's ContextHub brings all this information together in its self-service analytics platform, enabling process experts to make true data-driven decisions to improve overall plant profitability.

Engineers can see which plant assets experience the most downtime by easily gathering available data and analyzing the worst performer. Decisions can be based on data rather than relying on best guesses.



## INTEGRATE TO INNOVATE

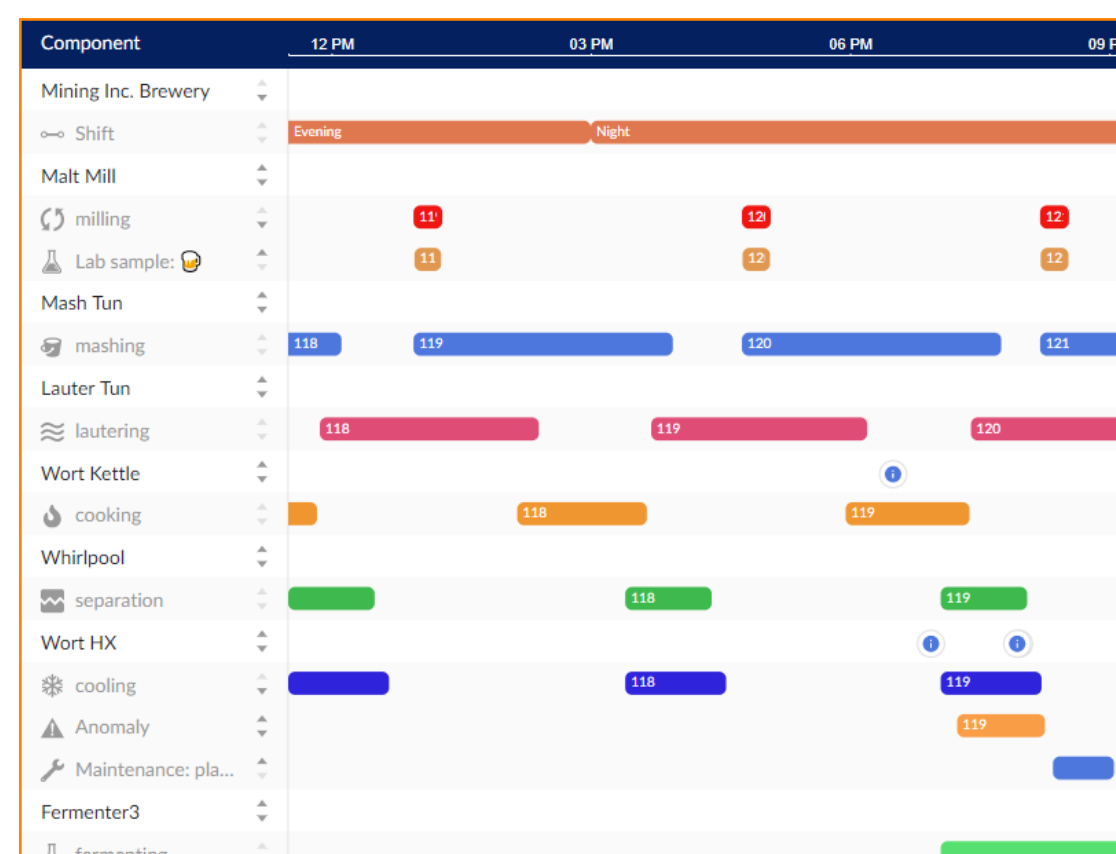
Contextual information may reside in many data sources. We natively integrate bi-directional with OSIsoft PI Event Frames. For other business applications like SAP for Plant Maintenance, Lab Information systems, OEE, batch, etc. systems we can use our APIs to integrate or Software AG's webMethods.io. Finally, through webhooks an event in another application can be triggered to start a workflow.



## CONTEXT BY ASSET STRUCTURE

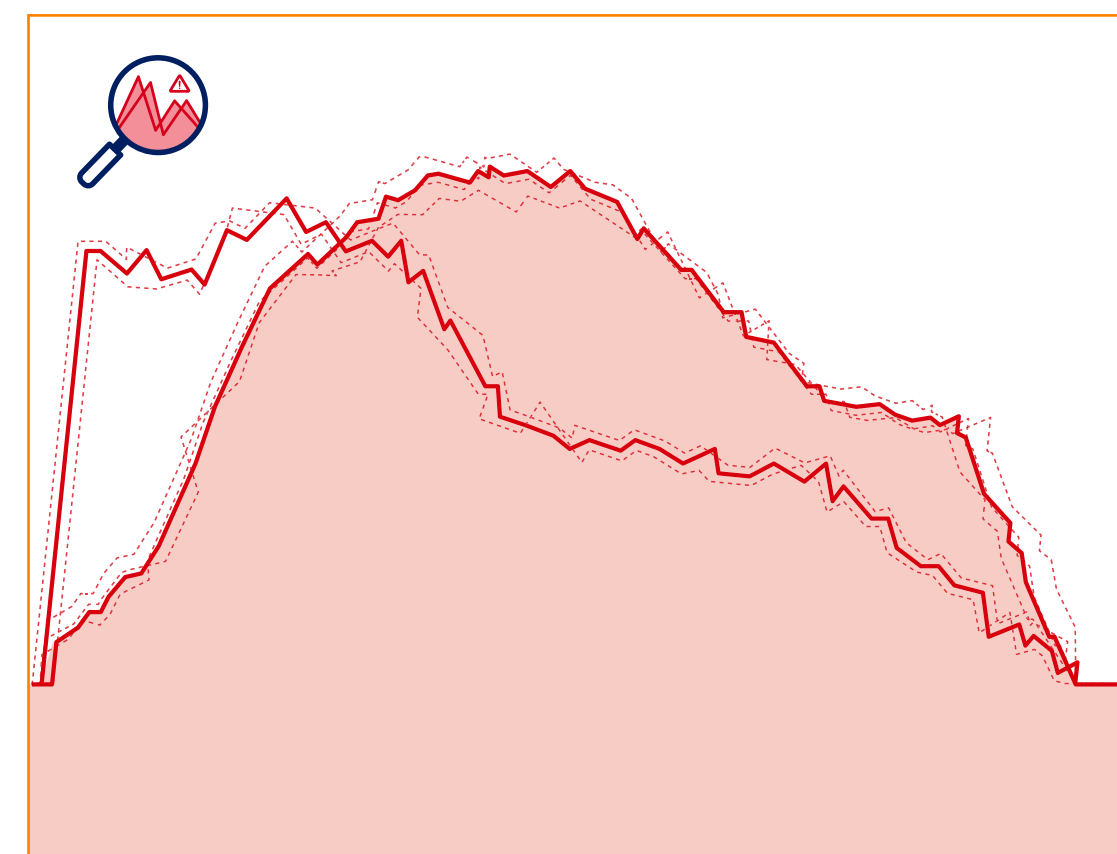
The manually created or imported asset structure (from OSIsoft AF or other systems) can be used to get a clear understanding of asset performance. With using cross asset trend analysis and context data across business applications, a deeper understanding of asset performance can be achieved. Moreover, comparing performance will help reduce maintenance costs and improve asset reliability.





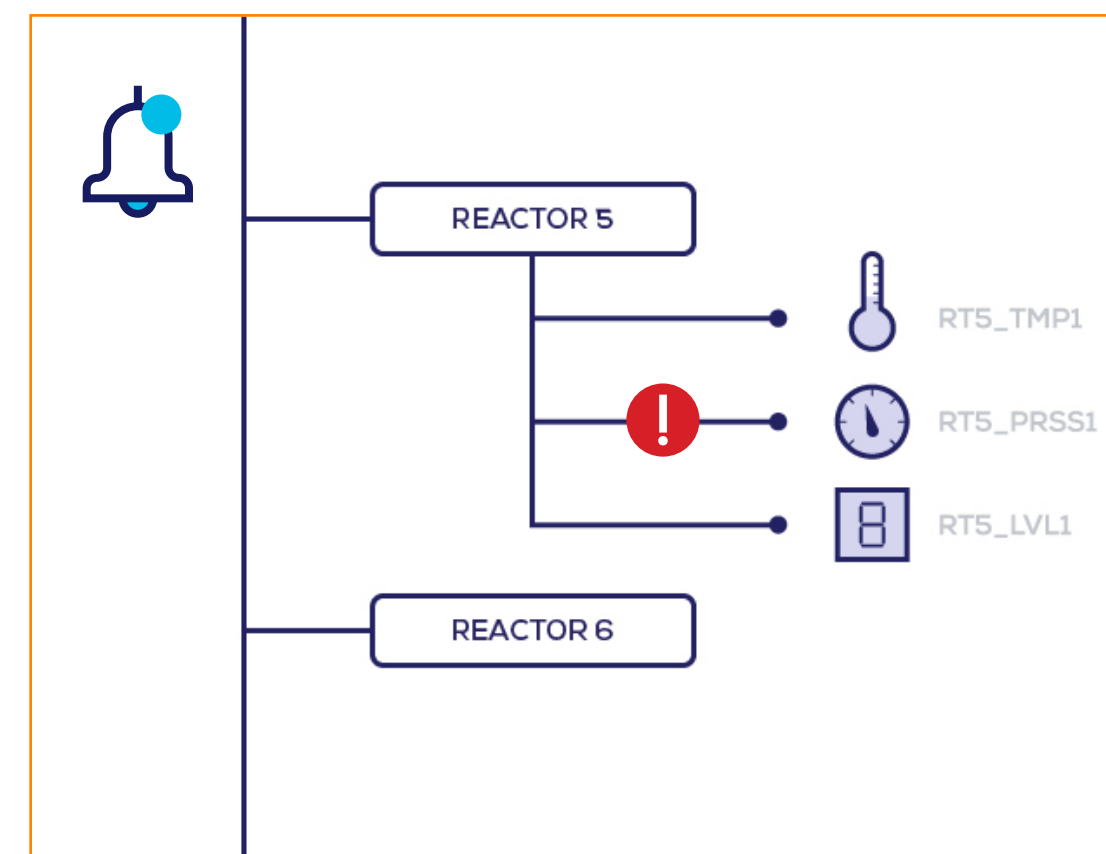
## Bring together all operational data

Contextual process performance information can result from events captured through TrendMiner fingerprints, manual entry of events, or data residing in other 3rd party business applications. Using the asset structure in combination with all this data gives a new view on operational performance. Now, events can be used to start analyzing operational performance.



## Analyse bad actors (quality, asset health, etc.)

Some events can trigger a notification. Others are not severe enough, but the events are logged in the system anyway. When smaller events occur more frequently, it may signal the starting point for a deeper analysis. Events with additional comments from controllers via the in-box may also give cause for a deeper analysis of the situation. Optionally with use of specialist in your organization on a remote site.



## Optimize monitors & control the process

After analyzing the operational performance and finding root causes for the behavior, the best performance can be turned into a fingerprint. Once the process has been run again, the logging can be analyzed to see if the performance has become better or if further investigation is needed. With the use of contextual operational data, this analysis helps to continuously improve performance.

## Customer Case Brewery controlling beer bitterness

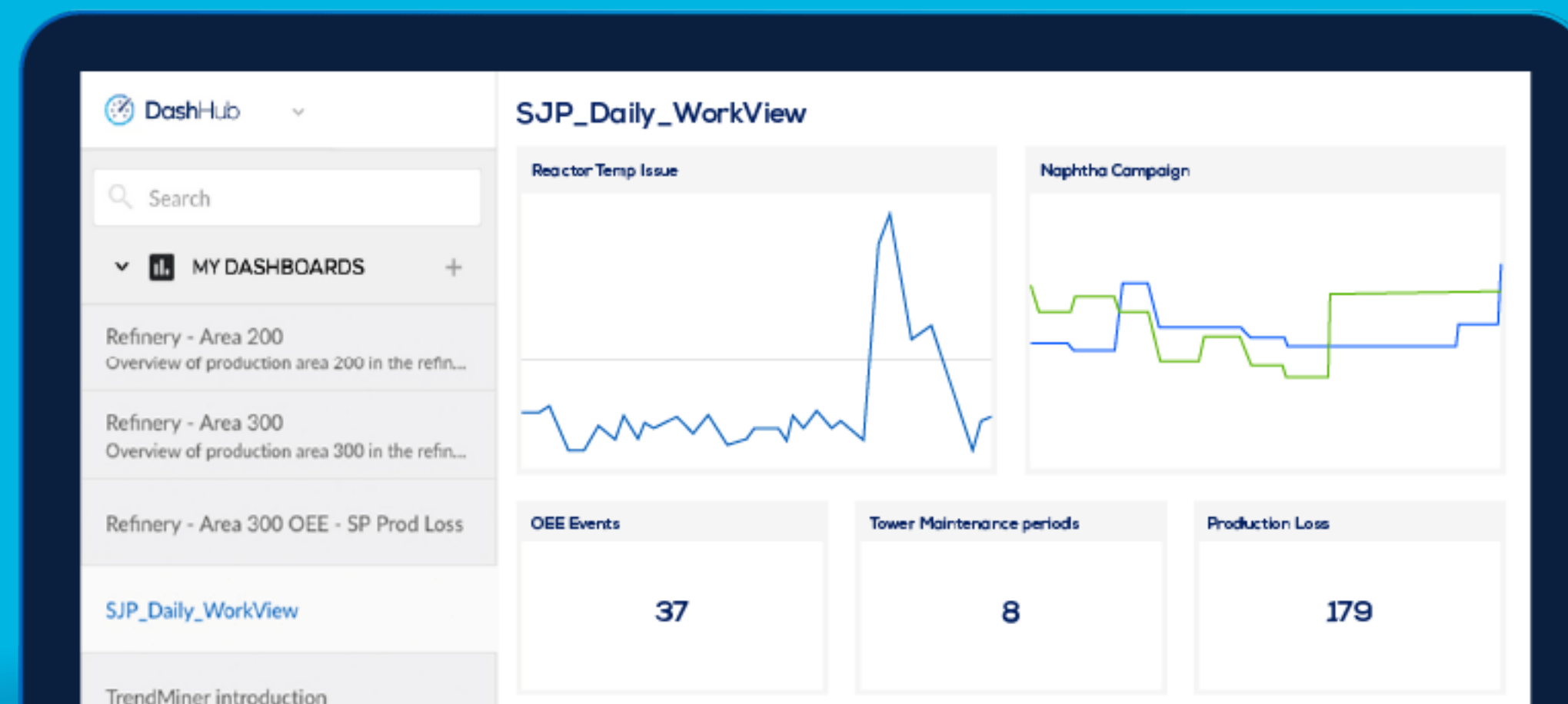
The operational performance of each part of the production line can be shown in a Gantt view based on the asset breakdown structure. This view can be extended with data from external systems, such as the lab data. For example, the IBU value for beer bitterness is tied to the batch, and by using TrendMiner, engineers can immediately select the batch with an extra high bitterness value. Switching over to the trend data of the specific batch allows deeper analysis of sensor generated time series data.

After finding the root cause of the high bitterness of the specific batch, a monitor and early warning can be created to notify the control room when a similar situation occurs. The events will be captured again and can be used for shift meetings.

# Practical Use Case

## Create and use context to accelerate performance





# 7 Visualize Analytics-driven Storytelling

Monitoring performance in the control room doesn't tell the full story. **Having an analytics-driven visualization of your operational KPIs does, and it helps engineers and operators make educated decisions.**

Each stakeholder can use personal dashboards using specific trends or context views as KPIs and can see which parts of the process require extra attention or further analysis. These trends can be shared across the company and used to directly start investigating process anomalies, production losses, or equipment inefficiencies, either via the context item listings or the dynamic trend views.

**Bruno Steenssens**  
Operations Director at Eval Kuraray

**"TrendMiner helps us to quickly collect the data we need to optimize our production process, with regard to cost, safety, quality and production volume."**





# Create your own production cockpit

All stakeholders from "the control room to the boardroom" can have their own actionable Production Cockpit complete with dashboards, analytics suites, and agile communications facilities. They can create and share complete and live overviews of the statuses and performances of production processes.

With TrendMiner's early warning capabilities, the Production Cockpit provides operators with the opportunity to act and optimize operational performance before issues arise.



## PERSONALISED OPERATIONAL DASHBOARDS

Each operational stakeholder is interested in a different part of the production processing and likes to create personal dashboards to monitor performance. Trend views or context item listings created by engineers can be added to their dashboard. In that way everybody gets empowered with actionable analytics-driven information, from the shop floor to boardroom.



## TOP DOWN INVESTIGATION THROUGH TILES

Each tile on a dashboard allows process experts to further explore the represented information. If the dashboard shows an out-of-spec performance, experts can directly investigate what was different from good performance, search for root causes, and take appropriate action. Additionally, they can add comments for others to take action.



## ANALYTICS DRIVEN DECISION MAKING

Today, business applications are converting data into actionable information. With many systems in place, it's difficult to know which information to focus on. With TrendMiner, experts can create dashboards based on advanced analytics work and 3rd party contextual information. These dashboards help individuals to quickly make the right analytics-driven decisions.



## SHIFT HANDOVER SUPPORT

TrendMiner dashboards help streamline the flow of information between shifts, and between shift teams and engineers through live production views combined with historical performance. This information flow can be reproduced anywhere, even from the remotest factory with experts located anywhere, increasing global collaboration to make informed decisions.







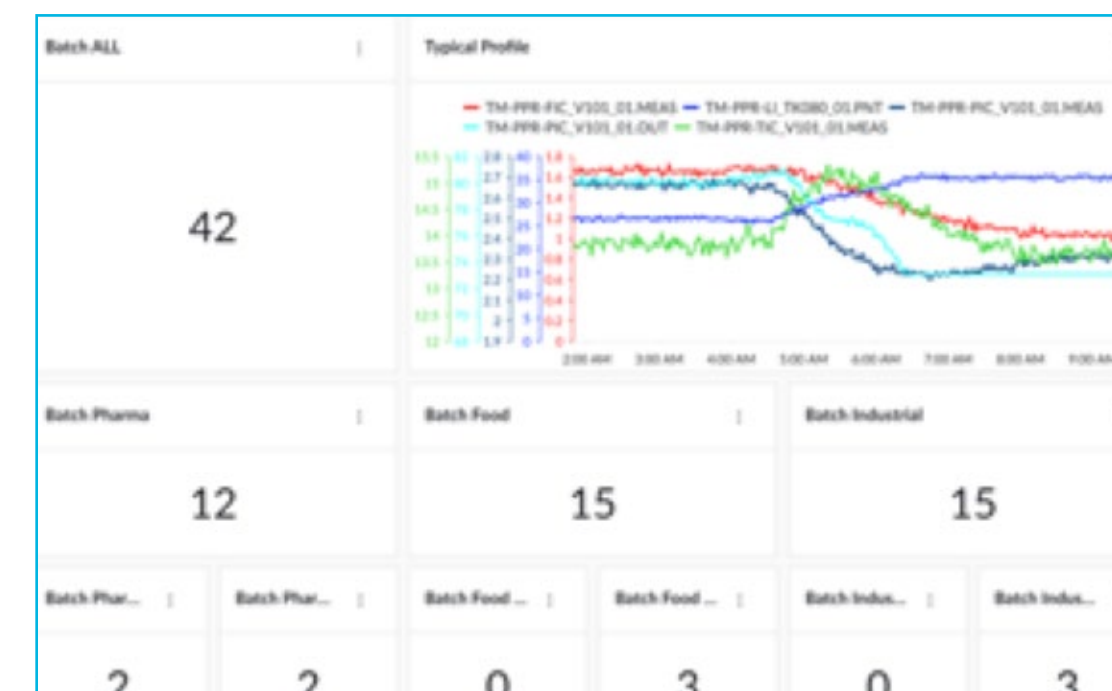
## Process performance monitoring

The Production Cockpit helps experts to monitor and analyze the live production process and to compare its progress to historical production runs. The cockpit also displays diagnostics, quality statuses, and predictions to both production operators or management through individually designed dashboards.



## Predictive maintenance dashboard

TrendMiner's visualization capability can be used to create a predictive maintenance dashboard where good and bad performances of multiple assets can be shown. In combination with the predictive capabilities of our software, experts can use dashboards to help assess when maintenance is required. This feature can also show planned work orders from the Maintenance Management system.



## Shift Handover & Incident Reporting

Dashboards help streamline the flow of information between shifts, and between shift teams and engineers and can provide live production views and historical analysis from experts in the remotest factory to experts located anywhere in the world, allowing them to make rapid and informed decisions. They no longer have to guess about how an asset performed because they have direct access to underlying data for further inspection of the performance.

## Customer Case

### Continuously reduce production losses in refinery

Sulfur recovery units are used to capture sulfur, reduce emissions, and ensure regulatory compliance. A monitor in the TrendMiner production cockpit showed that the non-converted Hydrogen Sulfide ( $H_2S$ ) was higher than expected, indicating a decrease in recovery rate. The issues were not immediately clear using the tags around the  $H_2S$  analyzer. TrendMiner's recommendation engine suggested a correlation between the temperature after the first clause unit upstream and the  $H_2S$  analyzer value. An immediate call was placed to bring the process back to produce the correct amount of recovery. Additionally, fluctuations and steam in the sulfur flow around the first clause unit and the inlet temperature were monitored to stabilize the process.



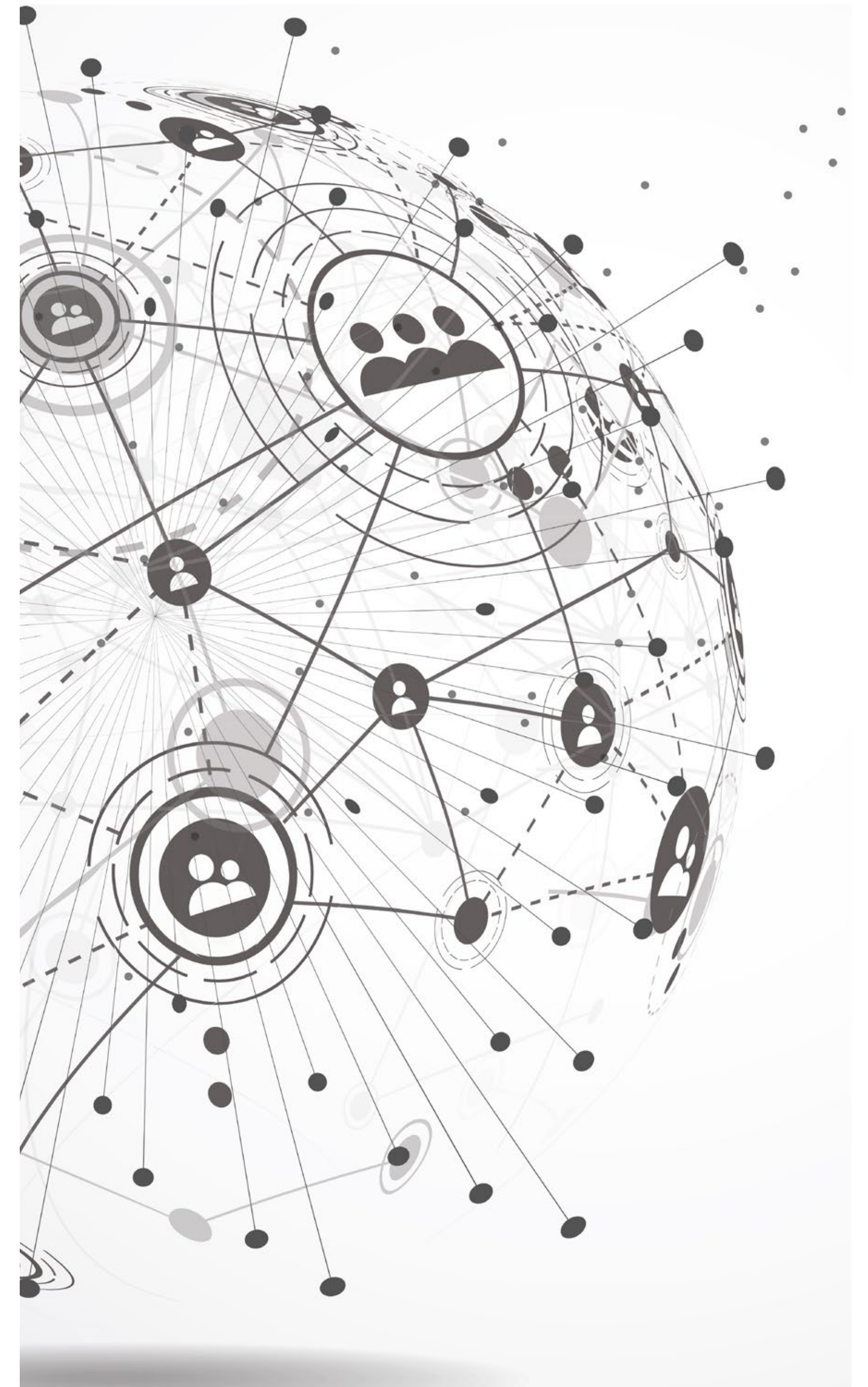
## 8

# Collaboration in a Global Organization

With TrendMiner, users can easily work together to solve process performance issues, share their work, and make use of findings at other sites. Search settings and filters can be saved and shared with other process experts. Because it is web-based, users can do their analyses anywhere in the world and act on automatically provided notifications.

Analytics-driven dashboards allow for the flow of information between all levels of the operation “from the control room to the board room”, providing live process and historical analysis views for company sites around the globe.

**With commenting, reporting, import and export functionalities, tools to integrate business applications, collaboration across boundaries, across silos and across cultures becomes seamless.**





# Share & Learn to accelerate performance

It's crucial to capture any type of event in a production process, but it's just as crucial that each team member is informed about such an event in order to help increase performance outcomes, to mitigate issues, and to run an efficient and effective operation.

TrendMiner is designed to keep each team member constantly informed with the latest information concerning the production process.”



## WORK ORGANIZATION

TrendMiner easily allows for an effective team collaboration. Experts from anywhere in the world can share and discuss information for a more beneficial analysis and problem resolution. Resources on all levels, both human and machine, are used to their fullest potential to maximize plant operation.



## REPORTING

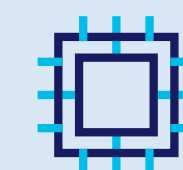
TrendMiner provides various reporting options which can be tailored for individual organizational needs: embed a view in a report, print a relevant chart, create reports of notifications captured during production, trigger a shift handover report, or download periodic loss accounting reports.



## WORK SHARING

Using TrendMiner, team members can easily collaborate through various ways such as

- sharing views, dashboards, and fingerprints in the work organizer
- writing comments and opening conversations about context items and requesting
- issuing approvals for context items and sending attachments based on access permissions



## API'S, WEBHOOKS, IMPORT & EXPORT

TrendMiner is not an endpoint but a building block in any analytics landscape and provides data import and export facilities, APIs, and OPC tools that allow integration with various business applications. Our software allows filtered time series data to be imported and exported to other tools.



# About TrendMiner

## Next generation productivity

### DEMOCRATIZE ANALYTICS

TrendMiner is a software company that provides self-service analytics for the process manufacturing industry. Our software helps users analyze, monitor, predict, and contextualize the causes of process performance problems. We put the power of the data into the hands of the people who understand what it means: process experts. By giving these experts a self-service analytics solution, we help them contribute to overall plant profitability.

TrendMiner was created by engineers who saw the need for specialized analytics for the process industry. They developed a user-friendly software platform that meets the high demands of time series industrial analytics - but which is designed to be used by non-data scientists.

Our software creates next-generation productivity by enabling experts to make faster analytics-driven decisions. Experts no longer have to wait for time-consuming implementation projects because data scientists are not required to interpret the “black box” of analytics. Experts get instant and accurate insights, along with trustworthy answers to day-to-day questions.

### INDUSTRIAL ANALYTICS MADE EASY

We help companies to optimize production processes, increase plant productivity, and improve asset effectiveness. We make getting these results simple by giving actionable insights from analytics to the people who need answers: process experts.

With self-service industrial analytics, our customers can find new ways to further optimize their production processes by harnessing the knowledge of their experts and the plant’s historical process data.

We make this happen by providing analytics software based on advanced search technology built with pattern recognition and machine learning.

Our software easily connects with existing data sources and allows users to gain insights into process data, to monitor production, and to predict problems early on.



# The business value TrendMiner brings



## Increase resource efficiency

Self-service analytics will allow process experts to perform tasks more efficiently, solve more production issues, and implement improvements faster. This, while avoiding the manual work of making sense of complicated Excel files and spending time on exporting huge data files. The result is considerably better time management with all its benefits.



## Analyze process behaviour

Impact analysis and hypothesis testing based on process data will lead to better conclusions and project justifications. For example, based on data analysis, investments that seem wise could be proven unprofitable or process improvements that would not be previously executed might actually be implemented.



## Find Root Causes Fast

A typical use case of self-service analytics is to identify and solve root causes of process problems. Another use case is to set up a monitor to prevent an issue from happening. These actions result in an associated cost-savings value easily calculated based on the impact of the problem.



## Drive operational performance

Process and asset experts can look into process optimizations without the need of building data models. Optimizing production processes will lead to increased revenue, decreased costs, or controlled quality to market demand, all directly transferable into monetized value.



## Increase company-wide collaboration

Self-service analytics tools enable global collaboration within a company and allow experts to have better insights into problems, share work, and add context to process data. Our software supports a culture of continuous improvement which translates into substantial long-term value.



## MORE INFORMATION

Get articles, videos and more on our website:

[www.trendminer.com](http://www.trendminer.com)

