Huntsman's Journey Towards Analytics Maturity & Operational Excellence

Learn how Huntsman used TrendMiner self-service analytics in its digitalization evolution and production optimization to establish 24-hour engineering support. This resulted in greater insight into processes, improved operations and quality control, decreased losses, and more streamlined continuous improvement cycles.

HUNTSMAN
Enriching lives through innovation

Huntsman is a family-led leading global manufacturer and marketer of differentiated and specialty chemicals. In this success story, Jasper Rutten, Advanced Analytics Manager and Global Excellence Team Member for Huntsman Polyurethanes, discusses how TrendMiner's self-service industrial analytics helps their production facility to fully leverage sensor-generated time-series data to gain deeper insight into their operational performance.

Through the adoption and use of TrendMiner's self-service data analytics, Huntsman has gone from experience-driven to data-driven workflows. As Huntsman engineers became "analytics" enabled, they went from pure diagnostics (what has happened and why?) to analyses that explained what was behind the trend. The company has seen significant benefits: data-driven insights leading to data-driven decisions, increased employee and plant efficiency, the breakdown of data silos, and a data-driven "24-hour engineering support" system. Ultimately, Huntsman was able to improve process and asset reliability leading to stabler and therefore safer plants.

THE JOURNEY

GOING FROM EXPERIENCE-DRIVEN TO DATA-DRIVEN WORKFLOWS

Historically, Huntsman process engineers would use their extensive experience and process knowledge to try to understand the sensor-generated data. This approach was experience-driven rather than data-driven. The company wanted to fully leverage the captured time-series data by transforming towards a data-driven work approach. However, first two challenges had to overcome: one related to data skills and one related to workflow.

When solving the data skills challenge, the organization had to take into consideration the different analytic skills of their process experts and data scientists. Process experts know about production processes and think in terms of trends and what these trends mean. Data scientists think in terms of algorithms and statistical models and do not necessarily have

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Jasper is the Manager of the Global Excellence Team, the Advanced Analytics team that sets out the global route on digitalization and advanced analytics for the upstream MDI manufacturing facilities. He joined Huntsman in 2000 after graduating as a chemical engineer from Twente University (The Netherlands). His extensive experience in chemical engineering provides a solid basis to lead the global journey of sustainably bringing Industry 4.0 into practice.

production knowledge. The disconnect between these two central problem-solving groups had to be overcome.

This problem was solved by adopting TrendMiner self-service analytics which allowed process experts to do the data analytics themselves, thus moving their data skills closer to that of the data scientists. TrendMiner democratizes the analytics and the data allowing process experts to analyze, monitor and predict production processes themselves, without the help of data scientists. Therefore, the process experts had a tool that they could use to analyze the data giving them data-driven insights to make data-driven decisions.

Figure 1. Address Mindset, Methods, & Management to adopt a new way of working.

The next step was to capture a way of working so that the personnel would successfully adopt and use self-service analytics. To do this, the following three aspects had to be addressed: 'mindset', 'method,' and 'management' (Figure 1). With any new work approach, personnel need to have the 'mindset' to use the new tool and to want to make it a success. It was decided to solve this challenge by showing quick and important wins. Personnel were willing to adopt self-service analytics once they saw how using it could substantially ease their work and improve operations. Also, with any new work approach to be successful, 'methods' and 'management' have to be in place. Huntsman created a standardized plan for implementing adoption which included proper management support. With these three aspects in place, Huntsman overcame these challenges allowing the organization's workflows to go from an experience-driven to a data-driven work.
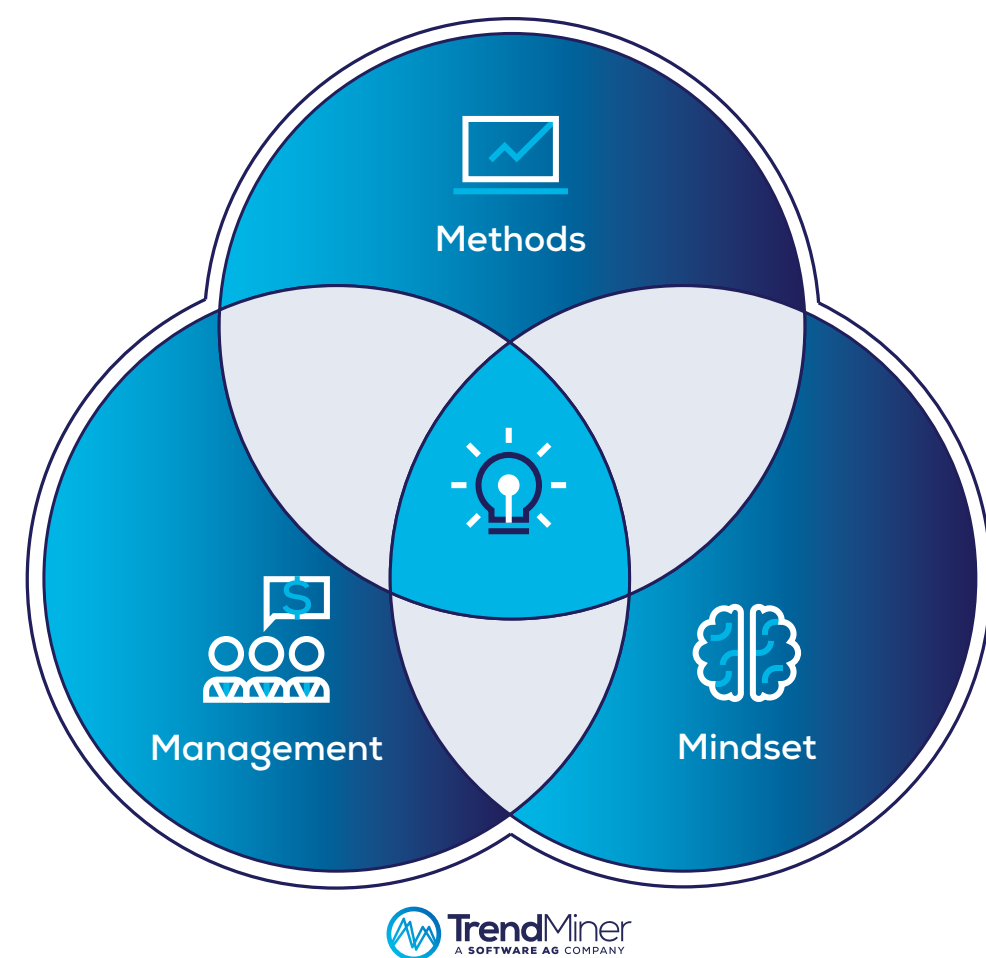
———— USE CASES

HUNTSMAN USE CASES DEMONSTRATE THE VALUE OF TRENDMINER

Use Case 1: Setting Soft Sensors For Product Quality Monitoring

For years, a Huntsman continuous isocyanate plant had been collecting daily process and offline-created lab analysis data, both of which were stored in the historian database. Early in 2016, the company's teams used TrendMiner to build soft sensors on operating conditions to predict product quality for certain Isocyanates. The process experts in turn used these to make micro-adjustments to process setpoints to pro-actively minimize impurity levels. As an example, one of the monitors predicted hydrolysable chloride levels in the final product, and by tweaking vacuum pressure conditions, impact on product quality was mitigated. In addition, monitors were set up to send out early warnings to tell the operators not to load trucks, preventing off-spec material from going to a customer.
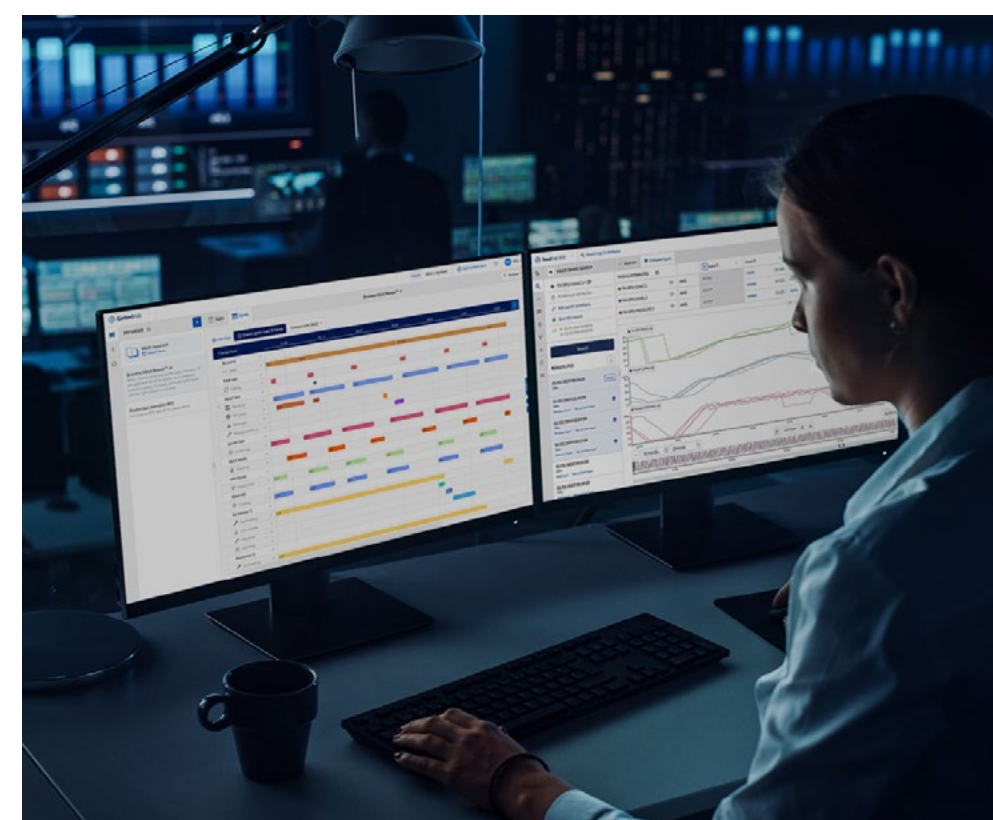

Figure 2. Self-service analytics monitoring capabilities provide "24-hour engineering support".

TrendMiner made it possible to have 24/7 quality control compared to a quality control situation with lab analyses that were only available for regular weekday work hours. With trucks being sent out 7 days per week, the soft sensors eliminated 75% of the expensive off-spec transportation cases which occurred on the weekends. In addition, a significant positive

impact on lead time was achieved as unnecessary wait hours for in-spec product were eliminated, with the average lead time being reduced by several hours. Finally, the extra insights on product quality also reduced the demand on lab resources as the number of uncertain situations for this specific product was reduced by as much as 10%.

Use Case 2: Fingerprinting Batch Processes To Check Product Quality

The common practice of the team was to check batch profiles using Excel. This approach required a lot of work, time, and expertise. Since the end of 2018, process experts used TrendMiner to create fingerprints to check batch quality against specifications. In one of the Polyols processes, distinct pressure and temperature profiles were required to consistently create high-quality material. To ensure this quality, time-series patterns from known good batches were grouped and saved as a "fingerprint." The golden batch fingerprint was then used as a real-time monitor to continuously check the process for deviations.

Subtle disturbances that would be difficult to capture in a numerical model were quickly identified using the fingerprint. Likewise, there was no need to check afterward if there were any abnormalities because the monitors gave early warnings for unexpected heat input which allowed operators to take appropriate action in time. This new approach to batch analysis and monitoring led to a significant reduction in off-spec batches and an increase in product quality.
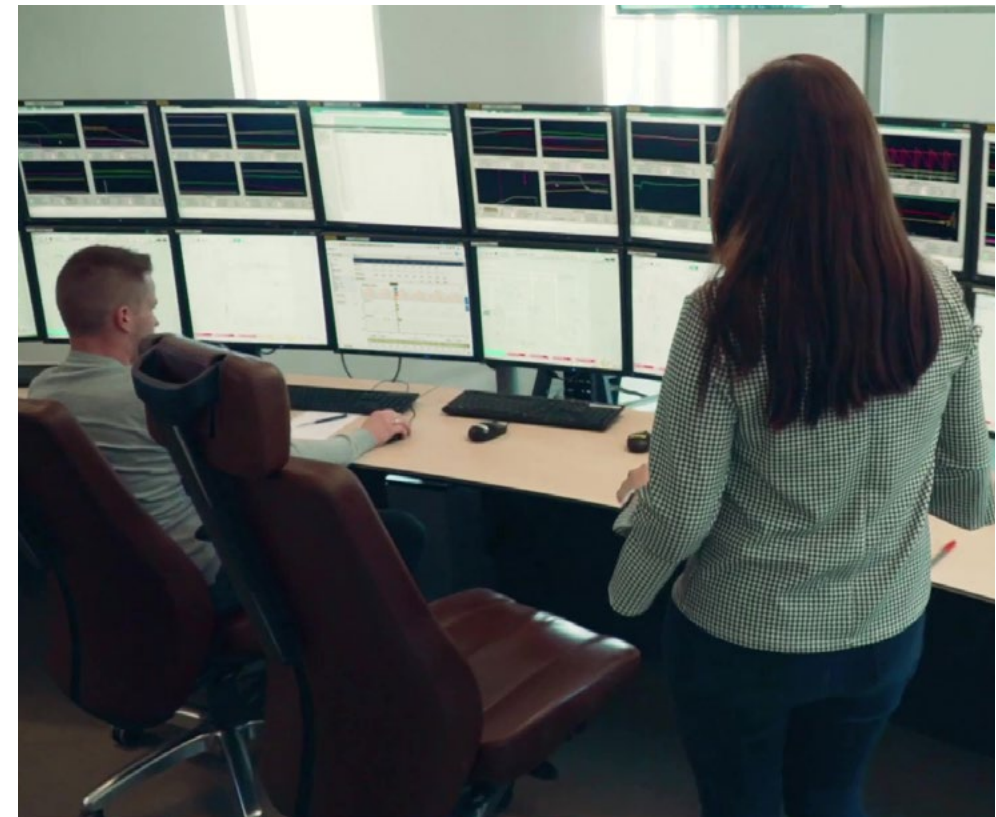
Figure 3. Setting process monitors can give process experts early warnings when batch quality is off-spec.

Use Case 3: Quality Improvement Using TrendMiner Capabilities For DMAIC

In one of the Advanced Materials plants, many batches in a wiped-film evaporator exceeded the solvent specification limit, resulting in off-spec products. Moreover, this same plant had observed a multi-year drift in quality as measured by the QA lab. Process experts suspected that this issue was due to a change in testing methods; however, the frequency of off-spec production demanded a resolution.

A complete Six-Sigma DMAIC analysis was performed using the various capabilities of TrendMiner. The analysis included using value-based searches, layer comparisons, statistical comparison tables, scatterplots, filtering, and the recommendation engine.

> "TrendMiner provides us with 24-hour engineering support, so we are able to optimize processes and asset reliability and run our plants more stably ... a more reliable and stabler site is a safer site."
>
> **Jasper Rutten**
> Advanced Analytics Manager and Global Excellence Team Member for Huntsman Polyurethanes

By observing scatter plots, process experts easily tracked batch performances to see which ones were inside and which ones were outside of the operating zone. Multiple differences between the plant's on-spec and off-spec production campaigns were revealed. The differences were enough to convince subject matter experts that long-term changes were occurring in the process. Through further investigation, the misreading of flowmeters was ruled out, and a non-negligible offset between measured and true pressure was found. TrendMiner allowed the process experts to complete a faster root cause analysis on a much larger data set. They were also able to identify differences in the subtle pressure readings and thus call for more tests to be

done. After making process changes based on these findings, quality improvements were confirmed within a few days. (Learn more about how you can ensure Continuous Improvement 4.0 through the DMAIC cycle with TrendMiner self-service analytics.)

THE BENEFITS HUNTSMAN REALIZED WITH TRENDMINER SELF-SERVICE ANALYTICS

With the use of TrendMiner self-service industrial analytics, Huntsman process experts:

- Became "analytics enabled" so they could fully leverage sensor-generated time-series data. It allowed them to go from pure diagnostics (what has happened and why?) to analyses that explained what was behind the trend.
- Became much more effective in looking at trends, searching back in time, and comparing good and bad behavior in order to come up with solutions for operational problems.
- Compared past patterns looking for good and bad production behavior. Good behaviors were saved as fingerprints, and monitors were set to alert personnel via messages, emails, or dashboards when any deviation from these fingerprints occurred. This monitoring capability created a "24-hour engineering support" system which was extremely helpful as the engineers were not on-site 24/7.
- Performed fast root cause analyzes on much larger data sets.
- Optimized each phase of the classic define-measure-analyze-improve-control (DMAIC) cycle in the Six-Sigma methodology to achieve continuous improvement resulting in operational excellence.
- Eliminated data silos.
- Reduced off-spec batches.
- Improved product quality.
- Contextualized and centralized operational data and saved and shared this data with the entire team thus allowing the company to move towards combined production overviews within the organization for all sites, both locally and globally.
- Improved global collaboration and team efficiency resulting in enhanced resolution of production problems.
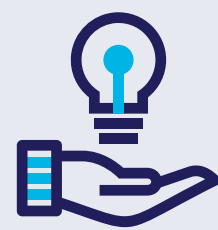
WANT TO INCREASE YOUR KNOWLEDGE ABOUT TRENDMINER SELF-SERVICE ANALYTICS TO CHART YOUR PATH TO SUSTAINABILITY AND SUCCESS?

Gain more understanding about TrendMiner's power and value through our Key Capabilities eBook. Or visualize how you can gain a higher level of operational performance by listening to a Huntsman Customer Presentation. You can also learn how to stabilize operations to increase production through this ammonia production use case.

| eBook | Customer Presentation | Use Case |