

Scalable and Flexible Multivariate Process Monitoring Solution



CAMO

Bring data to life

Unscrambler[®] X
Process Pulse II



"As a contract manufacturer, it is important to be flexible and open to new technologies. The implementation of a PAT data management solution with Process Pulse II from CAMO Software allows us to build process knowledge from the beginning of a new process development and close the gap between R&D and production."

Dr. Tobias Merz, Lonza AG



Software for Every Industry

Unscrambler® X Process Pulse II can be applied across many different industries and research fields to improve product development, manufacturing and quality control by real-time monitoring of processes with powerful multivariate models.

Pharmaceuticals & Biotech	Research & Academia
Chemicals & Petrochemicals	Energy & Renewables
Agriculture	Automotive
Food & Beverage	Medical Devices
Pulp & Paper	Electronics
Mining & Metals	Engineering
Oil & Gas	Semi-conductors
Manufacturing	Aerospace & Defense

Applications for all Roles in the Production Process

Unscrambler® X Process Pulse II can be utilized in many different parts and levels of the organization, and provides users with a tool to solve a variety of challenges from real-time process monitoring to regular reports.



Data analysts often face challenges with the data they want to analyze. The data can be in different formats, coming from different systems, or it can be a mix of historical and live data and contain a large number of variables. Unscrambler® X Process Pulse II handles all of these challenges, and translates the data into what is actually happening in the production process. Unscrambler® X Process Pulse II helps to improve product knowledge and understanding by identifying patterns and relationship between the data, and grouping the data.

In many organizations the access to specialized data analysts is limited and the data owner, e.g. an engineer, has to carry out the daily data analysis. Unscrambler® X Process Pulse II's ease of use makes this situation viable.



One of the main challenges for a production or engineering manager is to keep the process running and deliver the product with the right quality. Additional constraints can include minimizing product waste, energy cost, and process failures. Unscrambler® X Process Pulse II enables real-time process monitoring providing the current state of the processes. If the model describing the normal operating conditions is truly representative, it will provide Early Event Detection allowing the process operator to take corrective action and thus avoid having to scrap a production batch due to quality issues or other errors.



Top level management faces an ever increasing focus on yields and profitability, making control and reduction in costs crucial. The monitoring and reporting capabilities in Unscrambler® X Process Pulse II enable companies to share information more easily and replicate success, which in turn, leads to better decision making. And of course the quality of the decisions has a direct impact on the bottom line.

Multivariate Data Analysis (MVA) in a Production Environment

In any production process, raw materials are mixed and processed to create an end product with some quality requirements. If the process is running to completion and the quality of the product is not meeting the requirements, the product must be scrapped or re-worked. A better solution is to monitor the raw material and the processing to ensure high quality of the end product. MVA is a powerful tool for process monitoring and **Figure 1** shows how this can be implemented in the process.

During the process relevant measurements are taken such as temperature, pressure etc. Some companies are also using advanced sensors such as spectrometers. The models translate the data into executable information which can be presented to the operator via visual displays or sent directly to the control system for automated correction.

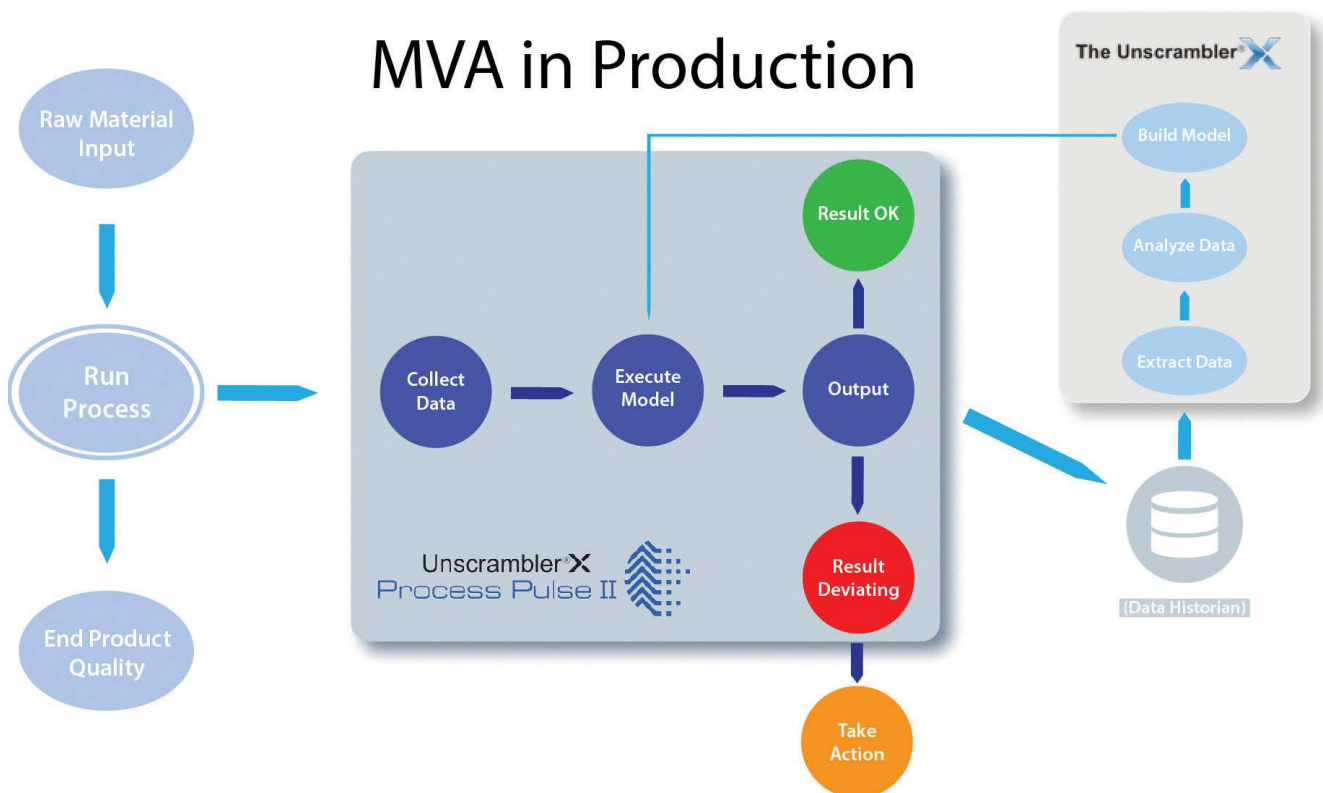


Figure 1

If the results are within the statistical limit, Unscrambler® X Process Pulse II gives assurance that the process is under control and that the end product will be according to the quality requirements. On the other hand, if the results are outside the statistical limits and therefore outside the normal operating region, Unscrambler® X Process Pulse II raises a visual warning for the operator or notifies the control system. At this stage a preventive action might be required to assure that the process will return to the controlled state.

Unscrambler® X Process Pulse II saves all the data and results in a data historian. This means that the data analyst can later import these data to The Unscrambler® X for explorative analysis, troubleshooting or model maintenance. The developed model can also be used in Unscrambler® X Process Pulse II to monitor future process runs. This is relevant if there is a reason to modify the normal operating range, update the models or introduce a new model into the process monitoring scheme.

Unscrambler® X Process Pulse II Continuous Improvement Wheel

Unscrambler® X Process Pulse II provides all the tools required for data driven manufacturing and continuous improvement as shown in **Figure 2**.

The starting point for data driven manufacturing is data (see the upper right corner of the figure). The data can come from a historian documenting earlier process runs, or alternatively generated by experimental design for product transfer or development purposes. The data can be reviewed and analyzed in The Unscrambler® X and models can be developed describing any interesting relationships between the different variables. Subsequently, the models are transferred into the Unscrambler® X Process Pulse II system.

Unscrambler® X Process Pulse II can be connected directly to the data sources generating data such as spectrometers, or to third-party systems holding data, e.g. MES (Manufacturing Execution Systems). In both cases the data is read into Unscrambler® X Process Pulse II where any linked models are executed. The results from the models and the raw data are then presented to the user via screens or sent externally to third-party systems for further handling or use. In parallel, all information is stored in the Unscrambler® X Process Pulse II historian. Users can generate standard or custom reports based on the data in the historian. These reports form the basis for quality assurance or planning of process changes. And of course, as the process is running, new data is stored in the database, which can be used again to develop new models or refine existing models starting a new turn of the continuous improvement wheel.

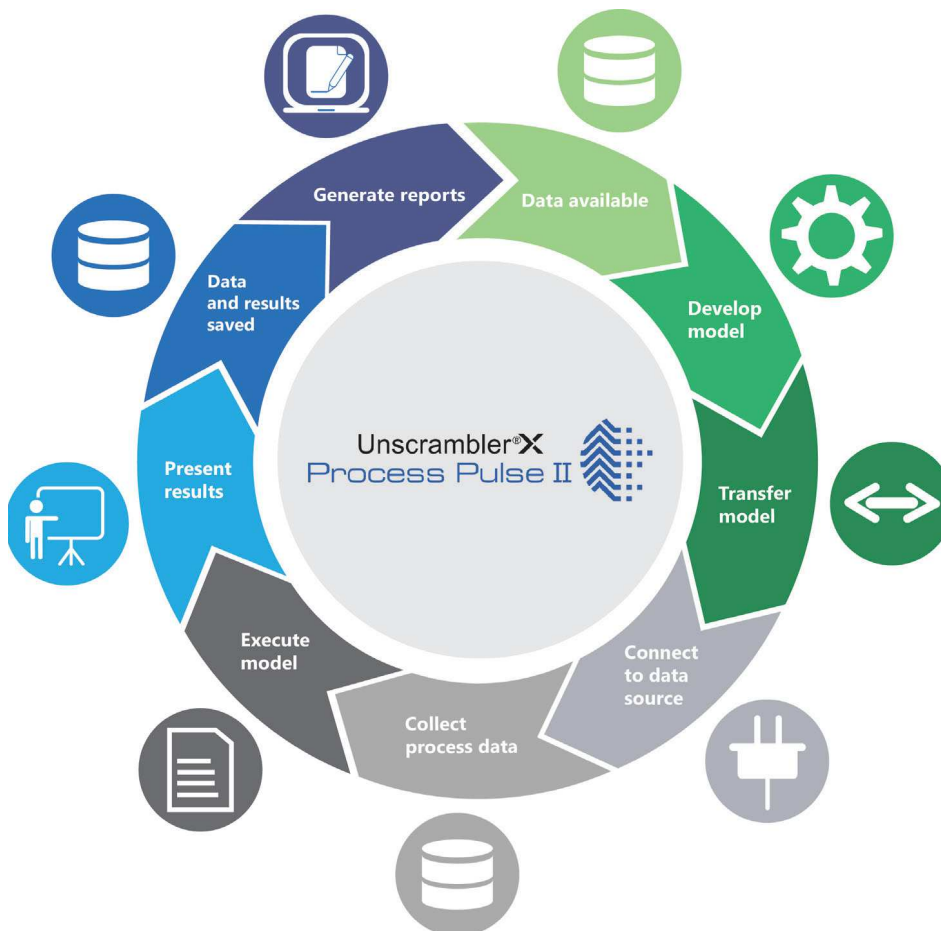


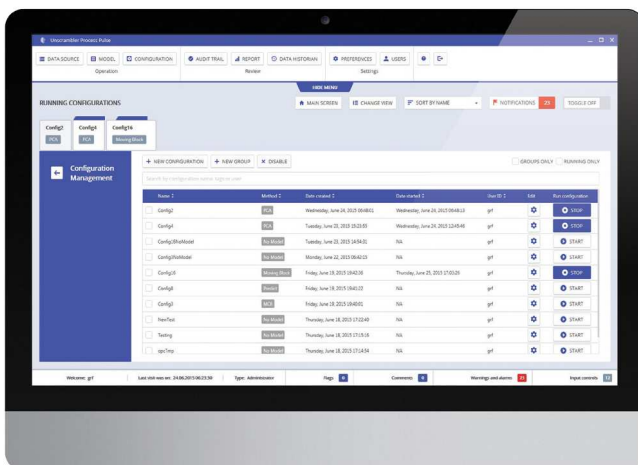
Figure 2

Business Benefits of Unscrambler® X Process Pulse II

Unscrambler® X Process Pulse II is ideal for Laboratory Managers, Engineering, R&D or Production departments, but also has shown to have an impact on the overall performance of the company:

Reduce waste	Increased yield
Improve quality	Reduced cost
Manage capacity	Increased profit
Refine process	Gain competitive edge

Unscrambler® X Process Pulse II is **Affordable, Easy to Set Up and Use**, and **Scalable**. It is independent of instrument vendor software, and can be extended with modules such as **Hierarchical** and **Batch Models**.



Unscrambler® X Process Pulse II provides a customizable view of the configurations and makes it easy to follow processes in real time.

Features of Unscrambler® X Process Pulse II

- User Interface
 - Intuitive
 - Easy to use
 - Web dashboard
- Data Import
 - Folder read outs
 - Direct import from analyzers
 - Standard connections to other systems such as OPC, OSI-PI and ODBC
 - Parallel import from multiple data sources
 - Alignment of multiple data sources in real time
- Data Visualization
 - Visualize data during process
 - Interactive plots – drill down to troubleshoot
 - Switch between data sources or monitor dashboard with multiple real-time data sources
- Model Execution
 - Run models in real time (PCA, PLS, PCR, MLR, SPC, Moving Block, MCR, Batch)
 - Visualize model results in real time
 - Investigate deviations in real time
 - Third-party calculation engines
 - Send results to third-party systems such as control systems via OPC, TCP-IP, ASCII, etc.
- Data Storage
 - Complete secure data storage
 - Compliant PAT database
 - Data historian for data retrieval, simplifies troubleshooting
 - Push data to The Unscrambler® X for detailed analysis
- Model Storage
 - Complete secure model storage
 - Compliant model version control
- Reports
 - Standard reports for quick sharing of results
- Alarms and warnings
 - Real-time flagging of deviations
 - E-mail warnings
- Audit Trail
 - CFR 21 compliant
 - Searchable audit trail
 - Audit trail reports
- Enterprise Solution
 - Access system over the network
 - Share results and specifications effortlessly across groups
 - Scalable integration
- Customize
 - Should you have any special requirements, CAMO Software can provide customized process solutions to fit your process to read and handle your data format or run your existing model formats



About CAMO Software

Founded in 1984, CAMO Software is a leader in Multivariate Data Analysis and Design of Experiments solutions with offices in Norway, USA, Japan, India and Australia. Multivariate analysis is a powerful set of data mining techniques that help identify patterns and understand the relationships between variables in complex data, allowing organizations to:

- Efficiently analyze big data sets
- Efficiently scale up to production
- Reduce final product variability
- Build better predictive models
- Reduce process cycle time
- Improve product quality and safety
- Accelerate R&D timescales
- Reduce process or equipment failures
- Supports PAT and QbD programs

Additional CAMO Software Products & Services

The Unscrambler® X

Leading multivariate data analysis software used by thousands of data analysts around the world every day. Includes powerful regression, classification and exploratory data analysis tools.

Analytical Engines

Software integrated directly into analytical or scientific instruments for on-line predictions, classifications or hierarchical models directly from the instrument.

Training

Our experienced trainers can help you use multivariate data analysis to get more value from your data. Classroom, online or tailored in-house training courses from beginner to expert levels are available.

Enterprise Solutions

Customized solutions which can be integrated into automation and control systems to enhance their analytical capabilities. Available for client-server and web-based architectures.

Consultancy and Data Analysis Services

Do you have a lot of data and information but don't have resources in house or time to analyze it? Our consultants offer world-leading data analysis combined with hands-on industry expertise.

Our Partners

CAMO Software works with a wide range of instrument and system vendors. For more information please contact your regional CAMO Software office or visit www.camo.com/partners

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