Silesian Catalysts

Microsoft Partner

Advanced Process Analytics Suite

Silesian Catalysts

We are a team that combines expert knowledge from the chemical industry and IT. The primary goal of Silesian Catalysts was development and commercialization of innovative methods of advanced organic synthesis. The long-standing experience and observation of the dynamically changing chemical sector market had allowed us to create first in Poland system for validation of analytical methods, based on the Microsoft Azure cloud. Today, we focus our activities around Industry 4.0.

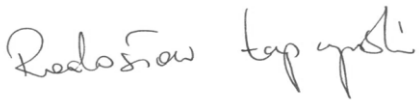
As a Microsoft Partner, we have expanded our services about analysis and processing of BIG DATA. Using artificial intelligence tools, we create predictive systems.

We have developed an advanced data analysis platform - **Advanced Process Analytics Suite**. Our team consists of highly qualified specialists in analytical chemistry, chemical technology, biotechnology and programmers with great experience in conducting complex R & D projects.

We provide services in the following areas:

- BIG DATA processing,
- Predictive analysis,
- Chemical statistics,
- Development and validation of analytical methods,
- Research and development in chemical technology.

We are excited about every challenge you can give us. We are sure that we will become a valuable partner for you.



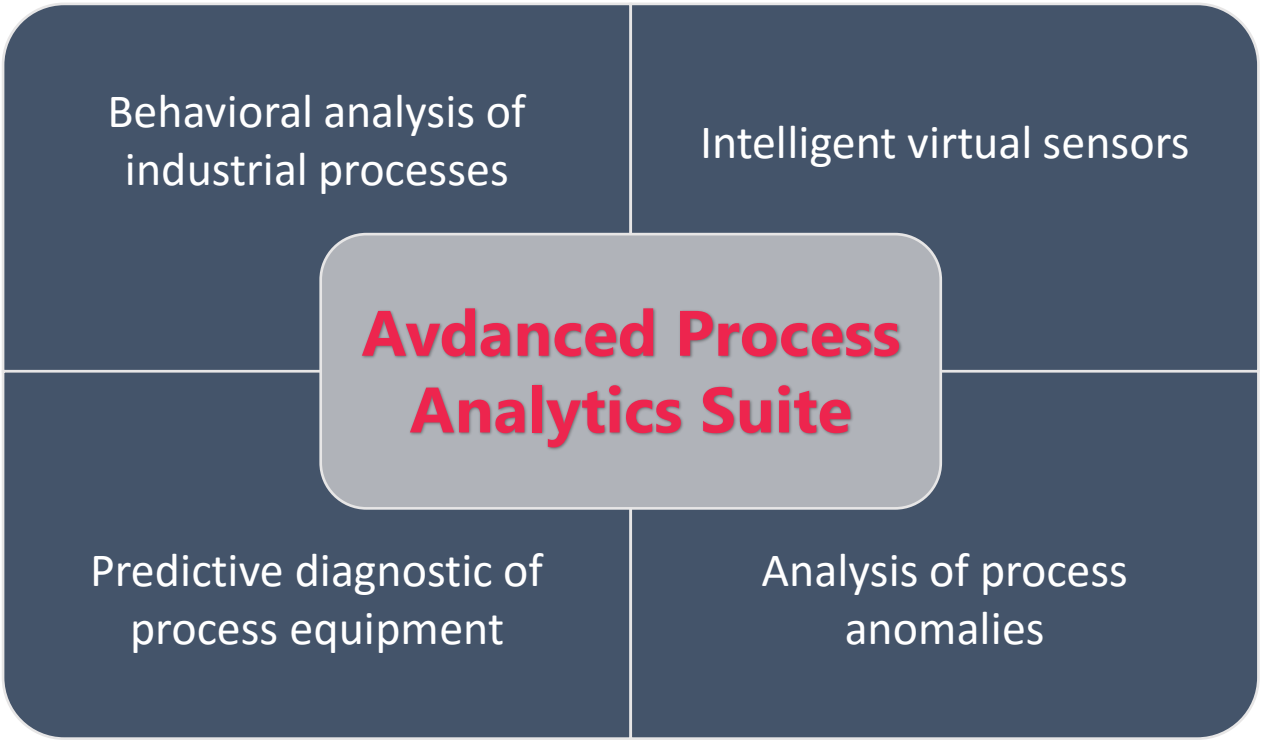
Radosław Łapczyński
CEO Silesian Catalysts

Advanced Process Analytics Suite

Complete Industry 4.0 solution

Silesian Catalysts has developed an advanced platform for analyzing process data from production installations. The new solution combines a rich engineering knowledge of the company's chemistry experts with a modern BIG DATA analysis solutions from Microsoft.

The **Advanced Process Analytics Suite**, based on built-in behavioral sensors, allows you to diagnose a process in its real time. Usage of machine learning algorithms provides predictive diagnostics of process equipment. Thanks to intelligent virtual sensors, it analyzes the reliability of data that comes from control and measurement instruments. It provides advanced analysis to identify causes of process anomalies, using a variety of available data sets in the organization.



Advanced Process Analytics Suite

Behavioral analysis of industrial processes

Most recent achievements in information and communication technology, simplify in a big way the collection and storage of huge amounts of data about technological processes. These data, are collected in a real time from control and measurement instruments. As the industry practice shows, many companies do not use the full potential hidden in their data sets. In the classical approach, the analysis of process data, implemented in SCADA-type systems, comes down to trend and deviations tracking for each process parameter individually. In complex process installations, operators are under high-level attack of a large number of individual process alarms. It happens because the indications of the control and measurement instruments are often undergo to temporary deviations. This leads to the activation of unit alarms. Such a situations increases the risk of the operators resistance to the alarm signals, which, as a result, leads to dangerous process incidents. Currently, many companies in the chemical industry are implementing programs for rationalizing the number of process alerts.

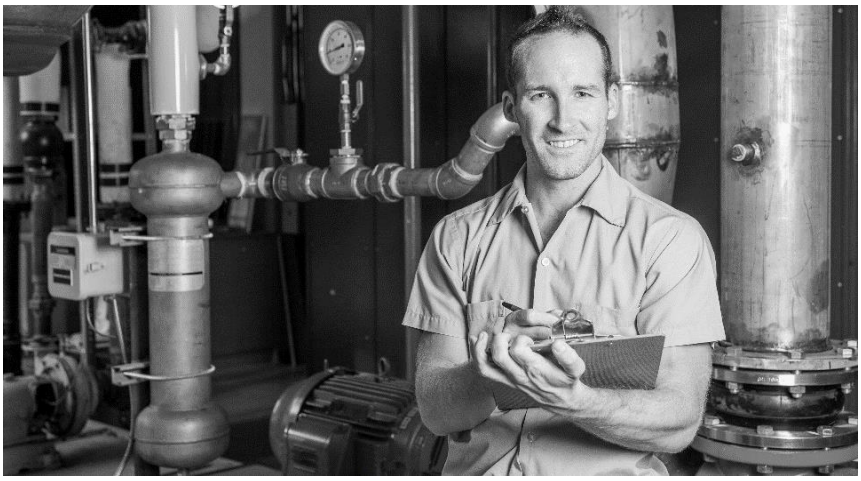
Behavioral analysis allows to change the approach to evaluate the current state of the industrial process in a fundamentally way. The intelligent system for evaluating the current process situation is based on the sum of the impact of all measured parameters on the process status. At the stage of implementation a behavioral analysis, diagnostic system is taught the patterns of the correct trajectory process, using a historical company data sets. It is possible to continually improve the system by teaching it with a new process data. As a result, the system analyzes the process situation on a regular basis and, with respect to the pattern, detects any deviations from the typical state. The system can also be extended with a module for analysis of decisions made by the installation operators.

Benefits

- ✓ improvement reproducibility of processes
- ✓ reduction of production costs,
- ✓ increased process safety,
- ✓ rationalization of the number of process alerts,
- ✓ improvement operators work quality.

Advanced Process Analytics Suite

Predictive diagnostics of process equipment



Predictive maintenance is a maintenance strategy that optimizes the using of machinery and equipment by eliminating the occurrence of failures and optimizes the planning of maintenance work based on the technical condition. To do this, anticipative actions are taken to help evaluate the technical condition of machinery and equipment, and based on this, make decisions about possible replacement of individual parts, regeneration, adjustment, cleaning, etc. Predictive maintenance involves looking for a way to forecast equipment wear and possible failures.

A modern maintenance strategy uses the Risk-Based Inspection RBI to planning the inspection of process equipment. With the RBI methodology, it is possible to make the inspection stops as short as it can be and also to extend the period between inspections, thanks to information from risk analysis and set of researches. Predictive diagnostics of process equipment analyzes the technical condition of machinery and devices, in the direction of probability of failure. It all goes in a real time. As in behavioral analysis, predictive algorithms are taught patterns of approaching device failure, based on historical data. This allows to estimate the risk of impending equipment failure during operation, and also classify their type based on real-time analysis of process parameters.

Benefits:

- ✓ extension of periods between inspections,
- ✓ reduction of inspection costs,
- ✓ improvement of risk management of failures,
- ✓ improvement the management of maintenance services,
- ✓ improvement process safety.

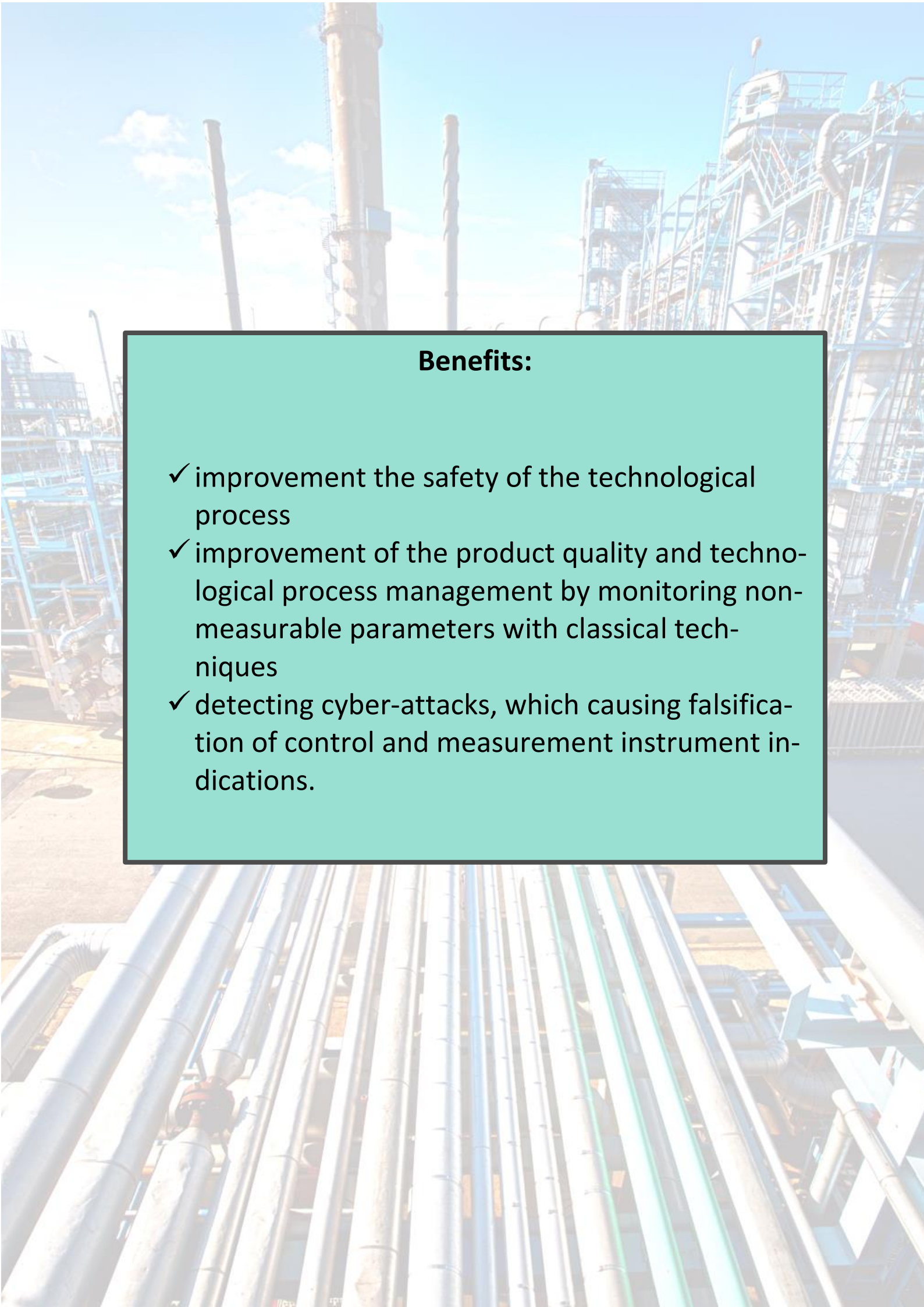
Advanced Process Analytics Suite

Intelligent Virtual Sensors

One of the greatest challenges of industrial installations management is the quality control of measuring sensors. Control and measurement system is a critical area for any industrial installation. The security of the process depends on the proper operations of this system. The data collected through the sensors are fundamental for all operational decisions made by the operators.

Implementation of the Intelligent Virtual Sensors technology allows detecting irregularities in the indications of supervised measuring sensors. The working principle of the virtual sensor is based on the predictive modelling of the correct measurement value. This in turn, is based on the analysis of the indications of other process parameters physically correlated with the parameter being analysed. In addition, for the value predicted by a virtual sensor, in relation to the value measured by the sensor, the time series analysis is performed. This allows to detect small measurement anomalies, which accumulation during time can lead to a process incident.

Another Virtual Sensor application area is prediction of the process parameter value, which, for technical reasons, cannot be monitored, due to lack of control and measurement instruments. For example, there is a lot of product's quality parameters impossible to measure in a real time, due to the unavailability of an appropriate measuring technique.



Benefits:

- ✓ improvement the safety of the technological process
- ✓ improvement of the product quality and technological process management by monitoring non-measurable parameters with classical techniques
- ✓ detecting cyber-attacks, which causing falsification of control and measurement instrument indications.

Advanced Process Analytics Suite

Analysis of process anomalies

One of the principial tasks of safety engineers is identifing the causes of breakdowns and improving the technological process to eliminate them. As part of the investigation of the accitent causes, the records of the installation's operation, the register of operational decisions taken, physicochemical tests of process apparatus elements as well as samples of raw materials and products are analyzed. The complexity of modern process installations makes it necessary to analyze large sets of data describing the course and causes of a process incident.

The **Advanced Process Analytics Suite** significantly improves the data analysis process and allows for quickly identyfing key parameters associated with the occurrence of the investigated incident. Data analysis is based on classification algorithms that automatically analyzes the entire available process data collection to discover the characteristic parameter pattern, describing the occurrence of the analyzed failure. After defining the breakdown pattern, an analysis of the significance of the process parameters, on the occurrence of this incident is conducted. The result of the system operation is a map of parameters, which correlate with a causes of failure together with the indication of the correlation power. The safety engineer will very quickly get a set of suggestions about the possible causes of failure, which can be analyzed to detect the real causes of breakdown.

Benefits:

- ✓ automation of process data analysis,
- ✓ automatic detection of probable causes of failure,
- ✓ automatic detection of non-obvious factors affecting the course of failure,
- ✓ shortening of the analysis time
- ✓ reporting only significant alarms by SCADA systems,
- ✓ limiting the costs of determining the causes of the accident.

Advanced Process Analytics Suite - technical characteristics

1. Compatibility with any SCADA system as a source for process data.
2. Possibility of non-invasive process metering using IoT.
3. Silesian Catalysts Machine Learning Techniques.
4. Predefined, customizable Microsoft Power BI data visualization desktops.
5. Creating an advanced reports in Microsoft Power BI.
6. Reporting analysis results to SCADA system.
7. The highest level of cyber security confirmed by independent audits.
8. Full scalability with Microsoft Azure.

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