

## Using MSPC (Multivariate Statistical Process Control) for industrial process supervision in Chemistry

### ➤ Context / client need

Online process control is becoming essential in many industries. This supervision **improves the product quality** and the manufacturing process efficiency, with a **cost reduction and a defect decrease**, while improving the process understanding.

As part of a semi-continuous production of a silicone polymer, Elkem wished to implement multivariate statistical process monitoring. A Raman spectroscopic database was available. 28 different lots were monitored using the Raman probe. For each lot, two quality criteria were measured on the obtained end product.



### ➤ Ondalys Solution

MSPC (Multivariate Statistical Process Control) is a multivariate method of process monitoring. This method supervises all the measured parameters of a manufacturing process simultaneously. It also makes it possible to take into account the interactions between the various variables. Thanks to a dimension reduction, usually performed using PCA, the MSPC makes it possible to detect potential anomalies or drifts using a few statistical criteria - generally Hotelling's  $T^2$  and F-Residuals.

After preparing the data from Elkem company (spectra preprocessing, dimension reduction, deletion of the non-informative zones), a meticulous identification of the observations constituting the calibration set was carried out by Ondalys.

This calibration set should only include observations from production when it is stable, and corresponding to customer expectations in terms of quality criteria. They are called **NOC - Normal Operating Conditions**.

### ➤ Results / Clients benefits

The MSPC model was developed on the NOC observations, and then applied to those considered as OOS - Out Of Specifications.

The developed model allows an **efficient identification of the different phases of production**. The start and end of lots, during which the process is not stable, are clearly identified. Anomalous events such as production interruptions are also detected.

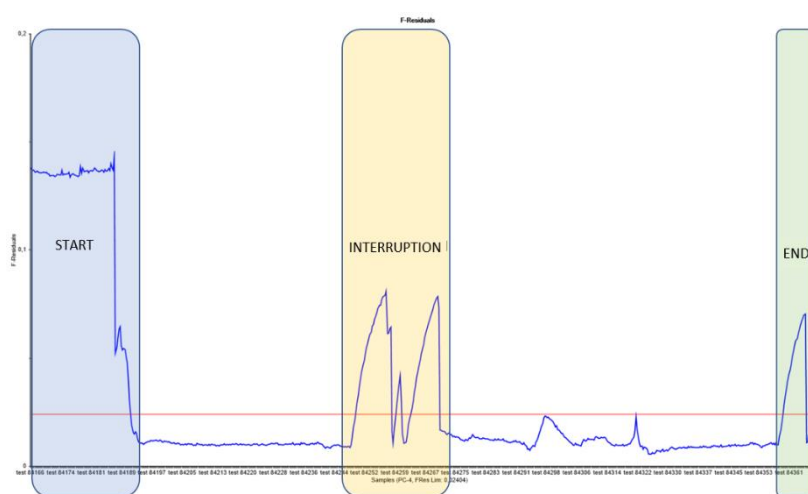


Fig - Results of the model on a complete lot : identification of the start and end phases of the lot, as well as production interruptions

Continuous process monitoring allows rapid reaction and correction of production in real time.



### ➤ Publications / Communications

Sébastien Preys, Alexis Zenner, Florine Gaulier, Magali Davezac. (2020). From complex real-world data to process understanding and monitoring, a use case in the chemical industry. *Chimiométrie 2020 Conference – Liège, Belgium*

### ➤ Contact-us

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