## How the Process Industry Can Use Advanced Analytics to Manage Its Water & Energy Challenges

Water is an integral part of most industrial processes. In some manufacturing industries, like Food & Beverage and Pharmaceutical, for example, it is used as a raw material. For other manufacturing industries, water is used within the production process, possibly as a cooling agent or as an energy source after it is converted into steam. And besides managing water usage, the process industry also produces manufacturing wastewater which must be treated before it is reused or discharged into the environment. Additionally, industrial manufacturing is highly energy intensive and sensitive as consumption and costs can quickly mount up. Improving energy efficiency is a top priority in today's process industry. Therefore, both industrial water and energy must be properly and carefully managed to ensure asset reliability, adherence to energy and environmental regulations, and efficient and economic production processes. A solution for these challenges is to use advanced analytics.

### Process Experts Can Do the Analytics *Themselves*

Many industrial manufacturing plants have their own data scientists to solve complicated process issues while others use external consultancies. The downside to this approach is that it is time-consuming and costly for these data experts to do extensive data modeling and statistics, and most importantly, there just aren't enough data scientists for all the work. A more viable and practical solution would be to let the process experts do the analytics *themselves*. And they can with advanced analytics. These tools allow the process experts to monitor, analyze, and predict industrial processes giving them a holistic overview of what is going on in the plant, and this of course includes what is going on with utility management in the plant. Advanced analytics uses pattern recognition and machine learning to fully leverage process data. With its capabilities, process experts have "eyes into the processes" to obtain data-driven insights which means they will not have to rely on using their experience to tweak operations to solve problems. It analyzes the data letting the process experts know exactly what the problem is, so they can go about solving it. To gain a better understanding of the value of advanced analytics in the process industry, two use cases will be discussed.

### Use Case: Monitoring Pump Operation States

Pumps are critical assets for processes that handle liquids which also means industrial water. Keeping these important assets in operation is necessary to keeping processes running. A breakdown of an important pump can lead to serious problems. In order to avoid unplanned shutdown of pumps, process experts must regularly maintain them. However, not all breakdowns can be avoided since the operation state of a pump is not closely monitored. Moreover, the process and asset experts often do not have the required tooling or the time to follow-up on every important asset within their responsibilities. An answer to this common operational issue would be access to an easy, reproducible, and reliable approach to monitor the operation state of important assets.

Available time series data like pressure difference, vibration, flow rates or shock pulse measurements (SPM) and which are all available for historical analysis can be used for monitoring purposes. Using advanced analytics, an indicator can be created to trigger a monitor as in this recent use case. The pressure difference is a good indicator of the pump operation state and therefore can be used as the basis for further analysis and monitoring. In this case, since the pressure difference (yellow trend in the *Figure 1* below) had a lot of noise, process experts used an aggregation to smooth out the trend visualized in a new tag (red trend, following the yellow pressure difference) (*Figure 1*). The other red tag displays the flow rate, which is roughly constant during operation. The pressure difference rises throughout its lifecycle until the next maintenance cycle, which can be visually seen as the sudden drops in the flow rates and pressure differences. Using advanced analytics, a monitor can be easily and simply created with the purpose of informing the process and/or asset experts in time. By knowing this behavior, they can then take prompt action.

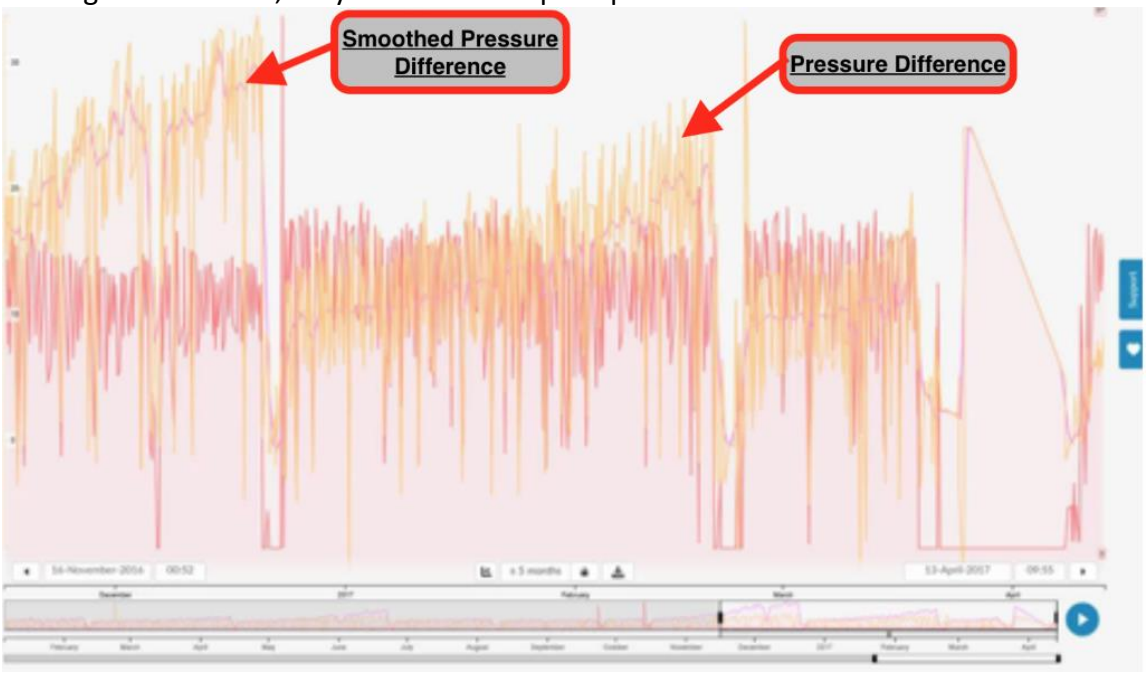


*Figure 1: A display of months of pump operation. The yellow (original) pressure difference was smoothed out to make it easier to analyze the operation state. The shutdowns are clearly visible by the sudden drops.*

The value of advanced analytics is clear as it offers easy and fast access to process data which can be manipulated to create a clear indicator of the pump operation status. The created monitor will enable the process and asset experts to schedule maintenance at the appropriate time before pump failure or before a major process issue occurs. As a result, shutdowns and the over-maintenance of the pumps can be avoided, resulting in an overall operation that is more cost efficient.

**Use Case: How Covestro Reduced Energy Consumption**

Covestro is a leading global chemicals company and supplier of superior polymers. The company initiated three major energy savings projects for its polyether plant in Antwerp Belgium as part of its energy savings goals and ISO50001 directives. Advanced analytics was used to analyze plant data for online detection, logging, and explaining unexpected energy consumption and comparing the results with the 2013 reference year. The comparison of the averages of steam consumptions and production rates for four consecutive years are shown in Figure 2. Using specific formulas and calculated tags, various energy consumers were monitored and controlled. Through monitoring the performance against the reference year, the energy consumption was effectively decreased year after year, meeting corporate goals. More importantly, by fully utilizing process data with the help of advanced analytics, Covestro gained an increased knowledge and insight into the production process and was able to continuously improve their overall performance.


*Figure 2. Comparing results of energy measures to reference year 2013 at Covestro, Antwerp.*

**Concluding Thoughts**

The process industry understands its water and energy management challenges, and thanks to new digital solutions like a self-service advanced analytics platform, they can address them head on. With it, process and operational experts can ensure asset reliability, adhere to energy and environmental regulations, and maintain efficient and economic production processes. As a result of using advanced analytics, continuous improvement will be the way process experts and their plants operate on a day-to-day basis.