



Petrochemical Company Reduces Energy Consumption at its Pyrolysis Furnaces

“Aspen ProMV[®] enables us to quickly understand potential gains, significantly reducing troubleshooting times.”

– Process Engineer, Petrochemical Producer

**50-75
kilogram/hour**
Reduction in fuel/gas
consumption

CHALLENGE

The company wanted to improve the monitoring and efficiency of its pyrolysis furnaces by integrating a predictive vision that would reduce energy consumption.

SOLUTION

Aspen ProMV was applied to the furnaces to identify the parameters most critical to energy consumption and then monitor for deviation from desirable operating levels.

VALUE CREATED

- Realized gains of over \$76K USD in less than one month across four furnaces
- Reduced fuel/gas consumption by 50-75 kg/hr.
- Fully rolled out to 10 furnaces in just over one year



Introduction

A global petrochemical producer specializes in polyethylene (PE), polypropylene (PP) and polyvinyl chloride (PVC) resins, as well as ethylene, propylene, butadiene, chlorine, benzene and toluene. It plays a significant role in other production chains that are essential to economic development. A strong global presence enables the company to develop partnerships and create integrated solutions for customers from 100+ countries across all continents.

How to Improve Monitoring and Avoid Process Deviations

The company wanted to improve monitoring and efficiency, specifically starting with energy consumption, of its pyrolysis furnaces by integrating a predictive vision. With the current process, it was challenging to maintain unit efficiency and stay at a consistent operating level. There were a number of variables and a lot of variations. Even small variations could have major impacts on process efficiency but were difficult to identify on a daily basis.

Adding to the challenge was the non-uniform knowledge of the company's process engineers who had to troubleshoot all of these variables while also monitoring the process. Predictive monitoring would enable it to avoid deviations that were currently resulting in financial losses.

A User-Friendly Solution for Engineers

The company selected AspenTech's solution, Aspen ProMV, because it "is a user friendly tool, created to be used by engineers." Aspen ProMV includes both online and offline analysis capabilities, each serving a different purpose in how the company wanted to address energy consumption in its pyrolysis furnaces.

It implemented Aspen ProMV to model the pyrolysis furnaces in one of its plants. The technology would help define key variables for monitoring the furnaces and provide insights on how to reduce energy consumption.

Implementing the Solution

The first phase of Aspen ProMV's implementation took about four months. As part of this phase, five company engineers received hands on training to be proficient at building offline models and deploying online models.

During the application of Aspen ProMV in the furnace unit, gains of over \$76K USD were realized in just the first month. The engineers discovered that gains would vary for each piece of equipment and were dependent on the availability and quality of the data, but results were still successful.

Once the approach for phase one was complete, phase two began—the rollout and self-sustainment of the remaining furnaces. The second phase took approximately nine months to complete and involved rolling out Aspen ProMV to ten pyrolysis furnaces. The company was hoping to see a proportionate increase in energy consumption reduction as the solution was applied to more equipment.

Throughout the implementation, adherence to processes for how data was extracted and cleansed as well as how objectives for each

model were defined and measured was strictly followed. Executing such a structured methodology was seen as a critical factor in accelerating the construction and deployment of all models.



Methodology for Continuous Improvement

To ensure that results were not only achieved but maintained, the company developed a model for continuous improvement. This included integrating with a multifunctional team to ensure that all analysis accounted for the entire team's expertise. With this collaboration, implemented actions could more readily drive the process to optimal operational levels in order to ensure that goals were met. To further increase operational efficiency, a continual review of existing models is performed on an ongoing basis.

Outcome and Benefits

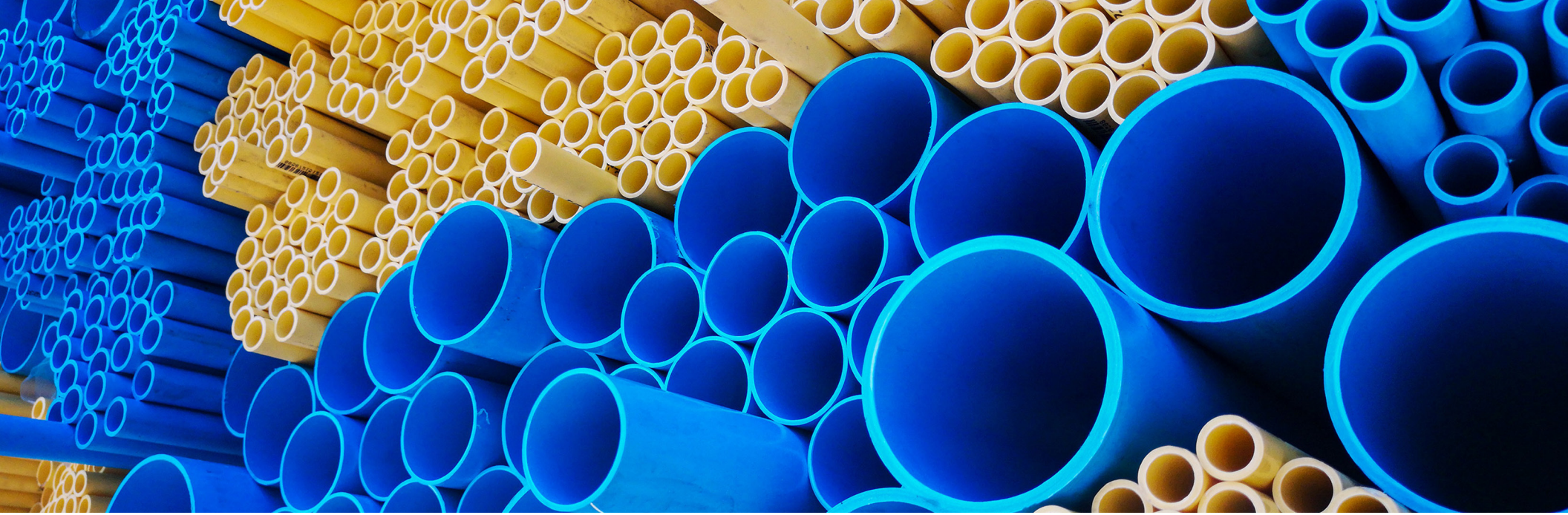
During the initial rollout phase of Aspen ProMV, four furnaces were monitored for roughly one month, each for various lengths of time, driven by production needs. A benefit of approximately \$76K USD was realized with individual furnaces showing varying savings based on availability and data quality. Results ranged between 50-70+ kg/h reduction in FG consumption.

By using Aspen ProMV, the company is able to more quickly and definitively identify the main variables contributing to energy consumption. This allows for focused efforts on optimization and faster identification of appropriate operating ranges. For example, the Aspen ProMV models highlight the influence of the gas distribution between the side wall and the bottom burners of the furnace. Specifically, the higher fuel gas wall/bottom ratios lead to higher energy consumption in the furnace.

These results broke some longstanding paradigms for the company. For example, the belief was that furnace performance would decline, increasing energy consumption, as the feed flow rate reduced. However, using the Aspen ProMV models, they observed opportunities to reduce energy consumption for all range of feed flow rates.

While Aspen ProMV's offline capabilities enable users to understand which operating levels provide reduced energy consumption, operating conditions are very fluid. A range of factors, such as ambient conditions, sensor condition, feedstock and the specific product can potentially result in operating levels outside of the optimal ranges. Aspen ProMV ensures that the furnaces continue to operate within these ranges.





When the energy KPI is outside the desirable energy consumption area, Aspen ProMV issues an alert and highlights the variables that are most contributing to energy consumption not being at the desired level.

Also, Aspen ProMV enables the visualization of a trend graph illustrating the contributing variables for the deviation of the model, showing its real value and predicted value. From the observed deviations, it is possible to propose adjustments to the manipulated variables. Using the insights from the alert, the appropriate adjustments are made and the impact can then be observed.

Aspen ProMV also provides statistical insights to improve equipment operations. The engineers analyze and interpret the insights to see how they can be applied within this one plant.

Best Practices for Continued Success

To achieve the desired results, the following fundamentals are critical:

- An engaged team that is communicative and adaptable. Interaction between the automation, instrumentation and laboratory areas is essential.
- Data availability and quality for modeling.
- Success is strongly associated with the availability and quality of measurements, as well as the choice of variables and the possibility of manipulating existing variables.
- Periodic meetings with the plant local teams to analyze the adjustments in the plants. Alterations in the DCS and APC may be needed.
- Different operational cases and physical changes in the equipment impact the data distribution. More than one model may be required for a single piece of equipment.
- The online system may need to be adjusted after periodically to add more variables and/or to generate more assertive models.



About Aspen Technology

Aspen Technology, Inc. (NASDAQ: AZPN) is a global software leader helping industries at the forefront of the world's dual challenge meet the increasing demand for resources from a rapidly growing population in a profitable and sustainable manner. AspenTech solutions address complex environments where it is critical to optimize the asset design, operation and maintenance lifecycle. Through our unique combination of deep domain expertise and innovation, customers in capital-intensive industries can run their assets safer, greener, longer and faster to improve their operational excellence.

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