

## Saskferco Increases Energy Efficiency and Reduces Greenhouse Gas Emissions with Advanced Process Control



“We needed to improve energy efficiency and thanks to the nitric acid advanced control application on Experion we were able to reduce energy usage and emissions, and provide a much more stable operation. This has allowed us to focus more on other areas including the adjacent urea plant.”

Mark Sax, Controls Engineer, Saskferco Products

### Benefits

Saskferco Products Inc. of Belle Plaine, Saskatchewan was looking to improve the energy efficiency of its nitric acid plant by operating at consistent, stable, high levels of production while at the same time achieving tighter control of greenhouse gas (NOx and CH4) emissions. Saskferco engaged Honeywell to provide engineering services to design and implement an advanced process control (APC) solution on its nitric acid plant.

The primary goal for installing advanced process controls on Saskferco's nitric acid plant was to control the amount of NOx emissions leaving the combustor while minimizing the consumption of fuel gas. Saskferco had recently upgraded its control system to Honeywell's Experion® PKS and wanted to leverage the capability of the new system by applying advanced controls. Over a three-month period Honeywell worked with Saskferco and implemented Profit® Controller across the nitric acid unit. Benefits from the APC implementation include:

- Reduced fuel consumption from previous operations (~5 percent reduction in combustor energy consumption)
- Consistent control of NOx emissions to 200ppm and reduced CH4 emissions by 25 percent
- Increased production capacity (3 percent) by closely maintaining the constraint of back pressure on the inlet to the combustor
- Improved stability of operation around the nitric acid plant that has allowed operators to focus on other parts of the fertilizer complex



Saskferco reduced emissions levels and improved energy efficiency at its Belle Plaine plant using Honeywell's advanced process control solutions.

### Background

Saskferco Products Inc. is one of the largest producers of granular urea, urea ammonium nitrate and anhydrous ammonia in North America. Jointly owned by Mosaic and Investment Saskatchewan, the Belle Plaine fertilizer facility is one of the newest fertilizer plants in the region.

Bound by the high environmental standards set in Canada, Saskferco has chosen to exceed existing minimums, setting even higher industry standards for environmental responsibility.

### Challenge

Saskferco was committed to meeting its environmental goals, but felt that it could achieve them without giving up operational efficiency. The major source of emissions comes from the tail gas leaving the nitric acid plant absorber which contains unconverted NOx gases. The plant operates a catalytic combustor that burns the NOx in the tail gas using a combination of methane and synthesis gas and converts it back to nitrogen. It is important to monitor the combustor outlet for NOx, methane and oxygen.

Greenhouse gas emissions like NOx and methane should be minimized for environmental reasons but the oxygen and methane content must be controlled to prevent the formation of an explosive mixture.

“We needed to maintain NOx emissions below 200ppm while minimizing the use of fuel gas. We also need to maintain the combustor temperature within an appropriate range – hot enough to sufficiently power the expander but not so hot that it damages it or the platinum gauze in the combustor,” explained Mark Sax, Controls Engineer for Saskferco. “We also saw the combustor as a potential bottleneck to increasing nitric acid production.”

### Solution

Saskferco asked Honeywell to provide engineering software and services to design and implement advanced process controls on the nitric acid plant that was recently migrated to Experion. The plant had also recently replaced its old NOx analyzer with a more reliable and accurate analyzer, and felt that it could now take full advantage of Honeywell’s Profit Controller technology.

The scope of the APC project was the design and implementation of a single Profit Controller application in an Experion Application Server (EAS) node that covered the whole nitric acid plant. The controller objectives were to:

- Maintain combustor temperature within limits primarily by adjusting secondary and bleach air flows
- Maintain combustor back pressure
- Maintain combustor NOx outlet at an operational limit of 200ppm by adjusting fuel flow or bleach air flow
- Minimize methane in combustor outlet by adjusting air flows or fuel flows.
- Minimize secondary air/ bleach air ratio to relieve combustor back pressure and improve capacity

The project required close cooperation between Saskferco

engineers and Honeywell, and as a result the controller was online within three months of project kickoff. The new NOx analyzer was very helpful in that it provided faster updates and also highlighted that the old NOx analyzer had been reading lower than reality. This put additional burden on the new controls in controlling a tighter NOx operating specification. Nevertheless, once the new Profit Controller was commissioned the plant was able to quickly see the benefits. Sax commented, “When the operators run the plant in manual they can push the unit pretty well to its limits but they sometimes end up swinging the unit. With the new controller the plant runs in nice flat lines – we now can realize higher sustained production levels because it is so stable.” Conservatively, Saskferco estimates that the increase in nitric acid production due to the APC project is 3 percent.

With tighter control of the combustor outlet NOx, Saskferco has been able to maintain a higher average combustor temperature which allowed it to reduce methane emissions by 25 percent. By closely maintaining combustor back pressure limits, the steam turbine speed has increased to maximize air flow and nitric acid production against multiple constraints.

The biggest impact has come from the much more stable and consistent operation. This has led to significant reduction in the number of plant upsets some of which would require a plant trip.

“The nitric acid advanced control project has exceeded our expectations in the benefits that we have realized,” explained Sax. “Operator focus on the nitric acid unit has been considerably reduced allowing them to be able to focus more closely on the urea plant that they also operate. We are now looking at other APC projects that we can implement with Honeywell to help us further improve our operational efficiency.”

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### More Information

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