



A Responsible Care® Company

## Overview

**Country or Region:** Vancouver,  
British Columbia

**Industry:** Chemical

## Business Situation

As a Responsible Care® company, Methanex needed to monitor and manage operations companywide, ensure consistency, and safely produce the highest quality product to help keep the company in the leadership position of the methanol production world market.

## Solution

The PI System requires extremely low levels of support, allowing users to easily develop and adapt applications from one screen with minimal tools. OSIsoft continuously releases new products, upgrades, and tools dedicated to monitoring and improving business processes. Competitive offerings may provide some of these capabilities but lack the depth and scope of OSIsoft's enterprise platform.

## Benefits

- Increased plant reliability. Since the partnership with OSIsoft, the methanol product has consistently met quality specifications
- Ability to develop models to predict operational behavior
- Significant reduction in laboratory analyses required for all three plants— from 3687 to 600 analyses/year
- Six hours/day saved in laboratory personnel time to analyze samples
- Better use of human resources

## The PI System helps world's largest methanol producer improve quality and performance, stay competitive



"The raw material in Chile is present at high volumes, so from a cost production point of view, we are very competitive. However, there is a risk to our global leadership position in methanol if we do not take advantage of all our systems in operations management. This is where PI really helps us."

Alejandro Sanchez, Chief Process Engineer, Methanex Chile Limited

Since 1997, the Chilean-based operations of Methanex, the world's largest producer and marketer of methanol, have been using the PI System from OSIsoft to improve product quality. With the success of using real-time data to improve operations, the company has recently begun to implement OSIsoft's PI System as a strategic initiative to more fully integrate and distribute operations information throughout the company for better competitive advantages.

By aligning the PI System with its business roadmap, Methanex is ensuring that its processes and people work at peak performance, protecting its leadership position in the world market.

## Methanex

Methanex is the world's largest producer and marketer of methanol. Headquartered in Vancouver, Canada, the company employs more than 800 people worldwide and, in 2003, Methanex sales represented approximately 21% of the total world market for methanol. Methanol is a liquid petrochemical that is composed of four parts hydrogen, one part oxygen and one part carbon. It is used as a basic building block to produce a variety of components that are used in everyday living, from paints to polyester, from windshield washer fluid to plastic bottles. It is an ideal fuel source for computer and cell phone fuel cell applications, and is also used to treat contaminated surface water and municipal wastewater.

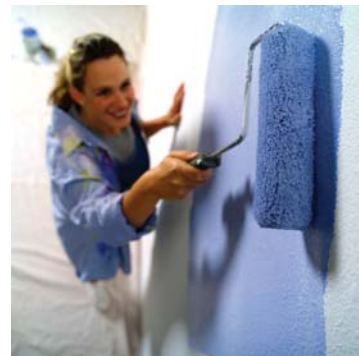
In addition to plants in Canada, New Zealand and Trinidad, Methanex owns three plants in southern Chile in Cabo Negro, 28 kilometers north of Punta Arena, near the southernmost tip of South America. The company has made a substantial investment in these plants, which are its largest and lowest cost hub. The plants have an operating reliability of 97%, outstanding in an industry where 85% is closer to the norm. The region is well situated for methanol production since it is near low cost natural gas and also near the water. Due to its strategic location, it is able to ship methanol to all of the major world markets, including Asia, North America, and Europe.

The three Chilean plants combine to produce 3 million tons of methanol annually, and represent 12% of the world's total methanol production. Since the first installation of a PI System (PI) data engine from OSIsoft in 1997, the plants have been continually expanding and evolving real-time performance management applications, and are moving towards a more comprehensive implementation of OSIsoft's enterprise platform. A fourth Chilean plant is under construction and scheduled to go on-stream in early 2005.

Key to understanding the corporate culture and philosophy of Methanex is knowing that it is a "Responsible Care®" company, which is a designation from the Canadian Chemical Producers' Association. This program guides all designated companies in their actions through the development, manufacture, storage, transportation, distribution and waste management of their product (in this case, methanol) and its end products. It is the global ethic that steers decision-making throughout Methanex, and is the guiding principle in how the company approaches its people, its technology, and its commitment to the community.

## Working with OSIsoft since 1997

In line with the Responsible Care® program, to stay competitive and enable the Clilean plant to expand, Methanex needed a technology partner to deliver a system that would facilitate better more responsible decision making. The IT department studied various software solutions available in the market. The goal was to find a solution that would help them monitor all the variables throughout the operation easily, quickly and thoroughly. With the help of Contact Engineers, the local OSIsoft representative, the plant chose and implemented OSIsoft's real-time data engine in the Chilean plant in 1997. The PI System (PI) replaced the previously used data historian that was part of a distributed control system to collect data. In addition, OSIsoft's DataLink spreadsheet reporting application and ProcessBook graphics package were implemented, which all together, gave the staff the tools necessary to develop the real-time applications to help in reaching the company's goals.



*Latex paint, silicone sealants and clear plastic bottles are just some of the many products containing methanol.*

"Unfortunately, we did not have the ability to analyze different variables with the DCS data historian," says Alejandro Sanchez, chief process engineer for Methanex Chile Limited. "It was not as powerful as the PI System, which provides not only the process variable data, but gives us the ability to integrate the information into DataLink for spreadsheet reporting and produce graphics and trends in ProcessBook. We wanted quality control and performance monitoring capabilities, which requires higher levels of data treatment for further analysis."

## Producing Methanex correctly and safely

The Methanex process for methanol production is fairly straightforward, according to Sanchez. "For the raw material, we use hydrocarbons from natural gas in the region. The natural gas is delivered to the plant and cleaned of poisonous elements for the catalyst used in the methanol process as sulphur. We then reform the gas, i.e. we break the hydrocarbons in the natural gas in combination with steam at high temperatures into H<sub>2</sub>, CO<sub>2</sub>, and CO, which we call the synthesis gas. This is the raw material for making methanol."

"After we reform the natural gas with steam, we compress the synthesis gas and feed it into our converter, or methanol synthesis reactor. We use a copper based specific catalyst for methanol process and produce methanol plus a minor byproduct present at trace levels. Methanol is condensed with water and traces of byproducts and fed to next process step as a Crude Methanol (CH<sub>3</sub>OH + H<sub>2</sub>O + byproducts)."

"The end product is fed to the distillation area, and in this step we refine the methanol further to chemical grade. After we obtain the final product, it is stored in big tanks and then shipped to our customers around the world. There are diversified end uses for the product, including plywood, silicones, clear acrylic panels, latex paints and adhesives, pharmaceuticals, clear plastic bottles, portable power, clean-burning fuels, water de-nitrification and synthetic fibers."

One of the most challenging steps in the process is the handling of the catalysts, which are a significant factor in the methanol synthesis. The performance of the catalyst has to be monitored carefully, and the high volume of hydrogen at very high pressure and temperature also has to be monitored from a safety perspective. This is all part of the Responsible Care approach that Methanex employs in its production process. The company also follows the Canadian environmental regulations regarding emissions, which are tighter than the local Chilean country requirements. Having real-time data available has made a significant difference in the ability to manage processes correctly and carefully.

## Producing a better, more consistent product

The PI data engine is used to collect and store all the raw data from the DCS, and the field including temperatures, pressures, levels, and online analysis, which precipitates the actual monitoring of the process performance. The data is distributed using OSIsoft's DataLink Excel add-in and is also displayed in ProcessBook via monitoring graphs and trends, created by the plant engineers. Statistical Quality Control (SQC) is applied in order to monitor the process variables efficiently, and maintain operational quality through control charts that have upper and lower control limits.

Methanex is able to determine the cause-effect relationships between plant parameters and determine key process variables. The particular cause, such as temperature, pressure, flow, or composition, will have a predictable effect on efficiency, yield, and quality. Knowing the cause and effect enables the staff to maintain better and more consistent product. With higher visibility into occurrences, if data is found outside of the control limits, Methanex is able to determine the assignable cause of the deviation, take corrective action or avoid it altogether.

As the result of the SQC application, the Chilean plants have seen the following results:

- Increased plant reliability since the implementation of SQC, the methanol product has always met quality specifications.

- Significant reduction in the number of laboratory analyses required for all three plants — from 3687 to 600 analyses per year, for a savings of \$270,000 per year.

Reduction in the amount of time spent by laboratory personnel in analyzing the samples, for a time savings of 6 hours/day.

## Benefits

There have been two major benefits to the company since the PI System was implemented at the plant. "One of the biggest differences has been in how we operate," says Sanchez. "Before, we could not take advantage of the historical data to develop models to predict process behavior, and optimizations depended upon the staff's expertise in a particular area. Some of these optimizations were not recorded or documented, and there was nothing left for future employees to use or benefit from. With the PI System, we have a system onsite that continuously captures the advances and methods to monitor and measure operations. So while we have been continually enhancing our PI implementation since the first installation in 1997, all of the activities and analysis that we have performed since then are all captured and can be retrieved quickly for optimization and troubleshooting analysis."

The second major benefit has been that the PI System has enabled the company to make better use of its human resources. Instead of spending all of their time monitoring the activities parameter by parameter, staff can now focus on other areas, and even be physically located in another area or plant. If something is abnormal, the PI System helps advise when and where action needs to be taken. So staff sees only what is necessary, freeing up time for other tasks, like operations support and problem solving, and enabling each person to bring more value to the corporation.

## Future plans include expanding the PI System

The plant is methodically moving toward a more comprehensive PI implementation to take greater advantage the many products OSIsoft offers. The current statistical quality control applications are expanding to include statistical process control (SPC), with an increased focus on process performance. Developments are displayed in ProcessBook for each area of the plant, with optimal control limits for each parameter. The AlarmView component helps rapidly detect process variables that deviate outside the control limits. By implementing SPC, the plants expect to reduce and optimize the time necessary to monitor process variables, respond to deviations, maintain optimal plant operating conditions, and protect equipment from operating conditions that lie outside their design specifications.

According to Sanchez, anything a company wants to accomplish that is related to real-time process management must be aligned with the business roadmap. This alignment is the core value of RtPM. The corporate goal of Methanex is to continue to stay competitive, not only with other regions in the world, such as Venezuela and Saudi Arabia, but also within Methanex itself. Strong cooperation between Methanex plants results in an internal drive for each to achieve higher standards. In addition to a strong commitment to its people and to the community, the company maintains an emphasis on the best use of technology, and the PI System infrastructure approach is a key element to that success.

"Training is also key to enhancing the acceleration and effect of PI," says Sanchez. "To make sure there is not a gap between the availability of the technology and the ability of the workers to learn it and take advantage of it, training and a focus on human resources are important. In the past, the Chilean plants have applied PI primarily to improve product quality. Now, they are moving toward monitoring the whole plant from a process management point of view and providing information throughout the entire company that will help them to maintain their leadership position. The raw material in Chile is present at high volumes, so from a cost production point of view, we are very competitive. However, there is a risk to our global leadership position in methanol if we do not take advantage of all our systems in process management. This is where the PI System really helps us."

The company's forward-looking attitude is what prompted the President of Methanex to note in a December 2003 presentation to the Conference Board of Canada that "our people in Chile are outstanding. They are totally committed to our value system of trust, respect, integrity, professionalism and teamwork. We have one of the best track records in our entire company in Chile — especially in terms of safety and productivity."