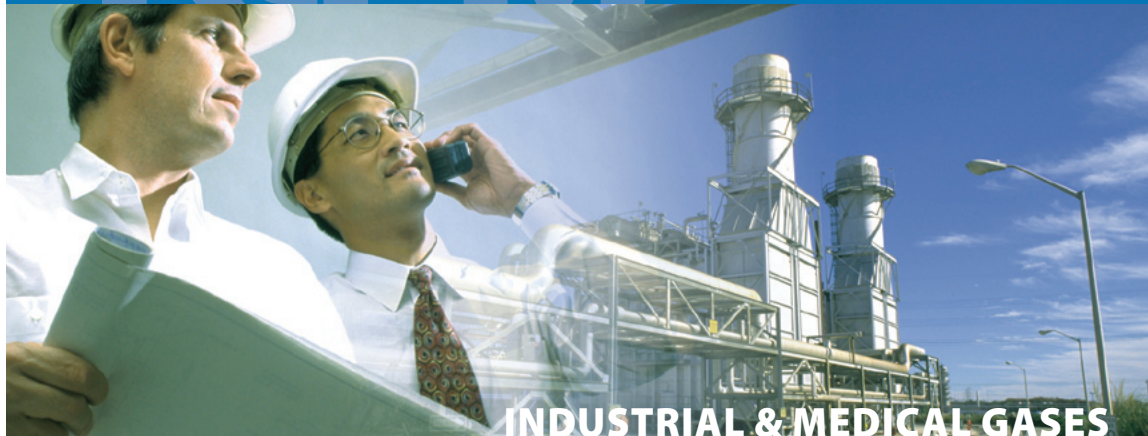




INDUSTRIAL & MEDICAL GASES



Corporate Headquarters: Paris, France

Technical Environment: Intel, Microsoft, SAP, Cisco

Challenge: To create a real-time, enterprise-wide industrial information system that would help people at every level of Air Liquide better monitor operations; to achieve higher levels of business growth, quality, reliability, cost reduction, and opportunities for services.

Why OSIsoft Won: Air Liquide favored OSIsoft not only from a technical standpoint, but also realized that OSIsoft's market strategy fit Air Liquide's market strategy in that both saw the value in building on products, not services. The RtPM infrastructure and PI provided the 'building blocks' that enabled users to create the targeted, high-value applications needed to run the business.

RtPM Applications:

- Baseline Best Practices
- Corporate Data Warehouse
- Downtime Monitoring
- Energy Management System
- Incident Investigations
- Inventory Management
- Key Performance Indicators (KPI)
- LNG Terminal Operating Assistance
- LNG Terminal Operations Reports
- Pipeline Equipment Remote Monitor
- Pipeline Leak Detection Support
- Pipeline Operations Planning
- Production Plan versus Actual Data

Benefits:

- Significant improvement in quality, uptime, and customer satisfaction
- Ability to operate more quickly and effectively in the energy market
- Simultaneously monitor 240 customers including: product consumption, transfers, spotting problems, and automatically bill in real time.
- Managing pipeline operations in real time helped save major costs by increasing pipeline efficiency, uptime, and product availability

Real-time Performance Management helps Air Liquide survive and thrive

According to business visionary Arie de Geus, the average life of a Fortune 500 company is less than 40 years. The average for all others is a mere twelve and a half years. Those that survive past these statistics succeed because these companies find the winning edge, focus on operational excellence, and base actions on knowledge. Air Liquide is one such company. For more than 100 years, Air Liquide has consistently innovated and adapted — and as a result not only survives, but thrives. Research, strategic business ventures, and the initiative to implement technology that enables personnel to drive the company forward have been critical to its long and successful life.

In 2001, the European operations group launched a major IT initiative with the ultimate goal of building a fully integrated, real-time, Web-based global industrial information system for all plant and pipeline operations. Functional requirements included monitoring multinational pipelines, energy management, operational optimization, remote plant monitoring, and machinery analysis. OSIsoft's Real-time Performance Management Platform™ (RtPM™) was selected as the backbone of the new infrastructure that includes various communication technologies (Web, intranet, DSL, phone, messaging, radio). Aside from significant cost savings, improved collaboration, increased uptime, better plant performance, and improved customer satisfaction, RtPM has reengineered the way people work at Air Liquide's European large industries business. It has provided an IT environment where applications are created by users for ongoing innovation and improvement. In addition, Air Liquide has optimized energy consumption and created methods to capitalize on electricity market opportunities, a benefit that has paid off well beyond expectations.

Clay Williams
Asset Manager
Air Liquide

"When you put this type of system in place with reporting that is triggered by KPI deviations, people have to track it. Now, there is no excuse for inefficiencies."



Operating in 65 countries, **Air Liquide** is the world leader in industrial and medical gases and related services. The company offers innovative solutions based on constantly enhanced technologies. These solutions, which are in line with Air Liquide's commitment to sustainable development, help to protect life and enable its customers to manufacture many indispensable everyday products. Founded in 1902, Air Liquide has more than 35,000 employees. The company has successfully developed a long-term relationship with its shareholders built on confidence and transparency and guided by the principles of corporate governance. Since the publication of its first consolidated financial statements in 1971, Air Liquide has posted strong and steady earnings growth. On May 6, 2004, Air Liquide completed its acquisition of Messer Griesheim's industrial gas activities in Germany, the United Kingdom, and the United States.

Turning a dream into reality

For many years, the creation of a real-time industrial information system was a dream of Air Liquide's European executive team. In early 2001, the company undertook a major IT project — the implementation of an advanced industrial enterprise-wide information system. The goals of this project were to achieve higher levels of business growth, quality, reliability, cost reduction, and opportunities for services. This system would need to allow everyone in the company to easily access and share information and be 100 percent user-configurable so as not to overload the IT group with requests.

This initiative was necessary to give Air Liquide a dedicated industrial network. Initially, the company tried to use the intranet as a way to bring data from the local plant servers to a central server. It was soon discovered that this approach did not work very well because process data from a complex industrial operation comes every second, 24 hours a day, every day. Air Liquide needed an industrial data server archiving system and a way to easily utilize information.

The company also faced the challenge of linking 240 of their Large Industries group's customers and metering stations; sometimes located in the middle of nowhere. Telephone, radio, and some IT applications were used, but managing a multinational pipeline requires knowledge about product flowing into and out of the pipeline. Flow to a customer may fluctuate very quickly and without notice. In order to provide better service, more accurate knowledge of these variations was essential.

Lastly, Air Liquide had a multitude of equipment, applications, and systems that needed to be linked together — a task that becomes more complicated with corporate and plant acquisitions that may bring entirely different systems into the mix. To help connect operational systems in the face of constant change, the company sought a common IT base that could interface with many different sources and provide a unified information center.

Air Liquide chose the RtPM Platform and its PI System™ (PI) real-time data engine from OSIsoft® to be the foundation of the company's industrial information system. RtPM gives the company a platform to bring all operational data into a common environment, interfaces to virtually every other source of data, and provides the tools necessary to visualize and optimize operations. What once was a dream is now reality.

For Air Liquide, the RtPM Platform is an infrastructure that brings a quantum leap in operational improvements. The benefits of having a common enterprise-wide RtPM infrastructure were immediate. All data is now available to everyone throughout the field and in central operations for higher visibility and better decision-making. RtPM also enables employees to develop business-specific, generic, and user-defined applications.

The right global IT infrastructure for Real-time Performance Management

"We greatly benefit from using the best standard technology available — Intel for hardware, Microsoft for operating systems, Cisco for networking, and OSIsoft for our operational information platform," says Vincent Bassinet, industrial systems manager for Air Liquide. "We believe all of these technologies are the best choice because we're confident that they are strong companies with plans to evolve their technology and upgrade their products. However, it's the RtPM Platform that brings everything together. It's the sole interface for every Air Liquide user to visualize and work with real-time and historical data — whether it comes from the plant, Maximo, SAP, or any other system."

"Before, we had limited data to enable us to know what was happening in operations and it took a long time, if ever, to retrieve historical data," says Clay Williams, asset manager of energy management and services for Air Liquide. As part of the RtPM initiative, Williams was responsible for promoting best practices, identifying group synergies, justifying the optimization project

and directing the European integration of industrial information systems for all plant operations connected to the pipeline systems. The goal was to optimize plants on a European and eventually a global scale. "Now, real-time and historical data is instantly and easily available to everyone, including managers, operators, engineers, analysts, technology specialists, and even accountants."

An enterprise-level system such as the RtPM Platform requires a focused, multilevel approach for a successful implementation. The high return the company is getting from this very powerful, sophisticated tool requires well-adapted programming tools and strong ongoing support in order to avoid unacceptable response times. It also takes people to make a project of this magnitude successful. In response to this strategy, a dedicated team was formed consisting of five full-time experts from the areas of networking, Microsoft Windows, the RtPM Platform, the internal industrial IT hotline and application development. Results from this team's efforts during the first year were uptime improvements to above 99.9 percent.

OSIsoft offers the ideal operations information platform

"The general idea behind the RtPM installation was to get data to people without placing restrictions on what they are allowed to see," says Williams. "The market changes sometimes very quickly and the real-time information at every level helps us make quick and informed decisions. Now, the CEO is looking at the same information as the operator, so there are no longer questions or doubts about who's looking at what data. Decisions can be made immediately. With OSIsoft's PI System data archive, the entire chain of real-time data delivery is reliable, integrated, and allows for better, quicker business decisions. Data doesn't get translated, changed, manipulated, or crunched. Since PI data can be accessed via the Web, collaboration happens from anywhere at anytime."

"The reason we selected OSIsoft was truly for real-time performance management," says Williams. "We favored OSIsoft from a technical standpoint, and we also realized that OSIsoft's market strategy fit Air Liquide's market strategy in that both saw the value in building on products, not services. It provided a platform from which we could put 'building blocks' into place that would provide the niche applications we need to run our business. Other companies had products but they were service-oriented. If we went that route, we'd be funneled into choosing everything they did all the time. Other products didn't offer a flexible development environment where we could build applications ourselves. This meant that every time we would need to do something,



we would have had to pay extra. In those models, you pay for everything. Above that, OSIsoft's platform sits on standard Microsoft technology, and users can configure displays and applications themselves, which lowers our cost of ownership. The bottom line — it's easier to maintain and it doesn't require outside services to make it do exactly what you want."

"Several companies claim that they can bring multi-site, real-time data to a central location, but nobody could do it reliably while maintaining high data integrity. That's another reason we chose OSIsoft. We wanted the ability to move data anywhere. OSIsoft's platform provides a multi-site, integrated solution which allows us to collaborate and make decisions globally. High-quality data is now ubiquitous throughout our operations."

Air Liquide also chose the RtPM Platform because of OSIsoft's business strategy. "OSIsoft's solutions are more industry-centric," explains Williams. "The company focuses on the needs of specific industries. Its products are focused on what the executives, mid-level managers, and operators can understand, rather than selling return on value to the executives with vaporware underneath. That's very important in our company — we need the end user to adopt and even embrace the technology, otherwise they won't use it. OSIsoft provides such a wide variety of standard, user-friendly solutions that everyone can gravitate towards one tool or another, depending on what they need to do their job."

"We have a lot of confidence in OSIsoft," says Williams. "From talking to Pat Kennedy (OSIsoft's founder/CEO), I could tell that everyone in the company was personally involved in making sure that the solution matched what the customer wanted. When we looked at the product offerings on the market, they were usually made for the big industrials where applications would need to be tailored in order to fit our niche markets. OSIsoft was important for us because Air Liquide is a uniquely complex company. OSIsoft took the time to listen and show us how their platform would fit our business needs."

RtPM permeates multilevel operations

"The RtPM solution is so pervasive within our European subsidiary that it has become part of the culture," says Williams. "PI is a critical component in so many of our solutions. It not only provides the data, but it is the central and critical piece of every project we do. This type of integration was another big reason we chose OSIsoft."

According to Thierry Roba, process optimization manager for Air Liquide, the RtPM Platform affords many degrees of freedom and flexibility that enable people and processes to function optimally. “Each person uses real-time data to decide the best course of action depending on what is happening in the process or marketplace at any point in time,” says Roba. “If there is a shift in supply and demand or a problem that occurs, the decision-maker has all necessary information to bring about the best result.”

Another benefit of RtPM is that some travel time has been eliminated. In the past, Air Liquide could not easily benefit from experts within the company unless they were able to go onsite. Now, any time there is a question or problem that requires a specialist, the right team of people can immediately connect and look at the same data in order to collaborate, without even leaving their desks.

RtPM data and applications help Air Liquide operate better in four main areas:

1. Pipeline management — RtPM helps to optimize modeling, pipeline capacity and pressure, loading and buffering, product consumption, traceability, real-time costing, and billing and troubleshooting.

“With RtPM,” says Roba, “Air Liquide can monitor the consumption of 240 customers and know exactly how much product is being transferred, spot any problems, and automatically bill in real time. Managing our pipeline operations in real time has helped us save major costs in increased pipeline efficiency, uptime, and product availability.”

2. Energy management — Today, Air Liquide has met the challenge of a deregulated Europe by developing an energy management application that enables the company to act in accordance with market opportunities and maximize profits.

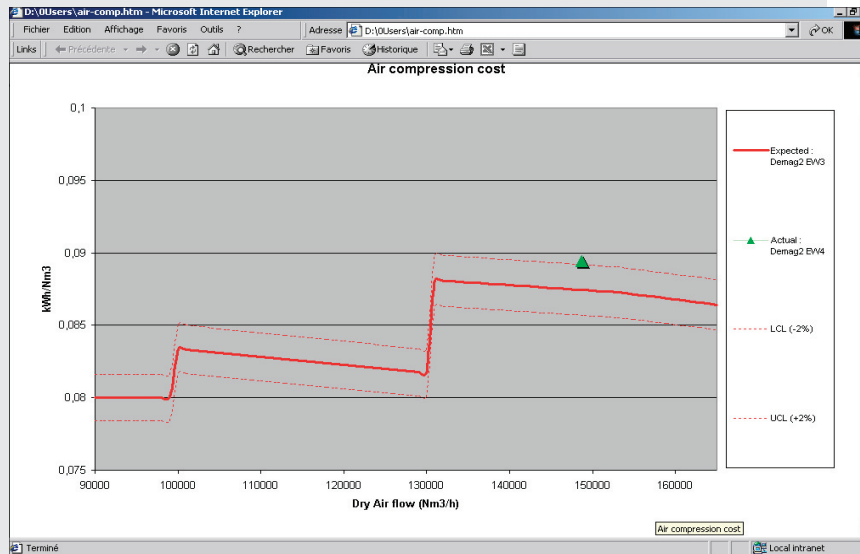
“A real-time tool is necessary to determine when to buy and sell electricity,” says Roba. “With 60 percent of Air Liquide’s costs coming from energy consumption, OSIsoft’s platform provides all of the real-time information related to supplier contracts, prices and the market. We can now better forecast power usage in correlation to target prices and track over- or under-consumption rates, which often causes financial penalties. This helps in making quick decisions in a fluctuating market. We believe that it is impossible to manage the energy market without the RtPM Platform, especially with such extreme market fluctuations, complex energy supplier contracts, and immediate decision-making that operating in the energy market now requires.”

GASES AND SERVICES FOR THE INDUSTRY

Pipeline network: North Europe



Air Liquide’s pipeline network supplies gas to customers in multiple industries. The initial phase of the RtPM rollout spanned the Netherlands, Belgium, France, and parts of Spain and included 24 production plants with 1,600 miles of oxygen, nitrogen, and hydrogen pipelines and 240 remote distribution and metering stations. Using RtPM to connect these plants in Europe, including those in the most remote regions, has resulted in improved operations visibility, real-time operations optimization, and the democratization of data to ensure rapid, solid decision-making.



Operators and managers are able to see whether or not air compression cost is optimized, if the best configuration has been chosen and if a plant or process group is operating in the most efficient way possible. If not, the data helps users take more intelligent action to correct the situation, which was impossible to do before RtPM. Choices were made based on individual experience. Today, these metrics provide a proven way to operate based on fact, not feeling.

X-axis: Air Flow Rate

Y-axis: Dry Air Flow (Nm³/h)

Red line: Optimum cost for different load (air flow)

Red dashed line: Uncertainty limits

Green dot: Actual value (real time) of compression cost

Right Legend: Actual air compressor configuration and expected/optimal configuration

3. Plant optimization — RtPM is used to increase efficiency and reduce the cost of production. It enables users to analyze the actual cost versus the expected cost in order to know the exact daily loss or surplus. To minimize the marginal cost of an operation, users can determine the most optimal configuration of plant processes with targeted applications and real-time PI data.

“The RtPM Platform and PI have been key in spreading best practices,” says Williams. “When an application is identified as a best practice, it becomes a standard and is shared companywide. For example, OSIsoft’s Advanced Computing Engine™ (ACE™) was used to track Key Performance Indicators (KPIs) on compressors. This same model is then shared. Previously, these models were tracked with Microsoft Excel, which in this instance is difficult to maintain. With PI, the process is automated, data is gathered, calculations run, and updates are made in real time. Beyond automating the process, the platform presents the modeling proactively to the user. Prior to using the RtPM Platform, we would see deviations on these compressors and know we were losing efficiencies potentially costing hundreds and thousands of dollars. When you put this type of system in place with reporting that is triggered by KPI deviations, people *have* to track it. Now, there is no excuse for inefficiencies.”

4. Reliability and availability — RtPM enables higher levels of reliability and availability in systems such as interfaces and equipment, and in operational processes. With RtPM, troubleshooting, analysis, and optimization can help maximize reliability, production, and availability for all systems and processes.

Building blocks for optimization

“The RtPM Platform’s flexibility is so valuable because we can configure the ‘building blocks’ to develop applications that fit our business,” says Williams. “A user can choose an application from the library of RtPM templates we’ve built up and basically ‘plug and play’ depending on the optimization project. Or, a user can easily configure an application and then share it with others, which has resulted in a continually-increasing library of RtPM applications. The widespread availability of RtPM applications also helps train new employees and provides general operating documentation.”

"Companywide optimization, establishing a new unit, or adding new devices is more time and cost efficient since we've created standard RtPM templates," says Roba. "Business-specific applications have defined KPIs and structured plant and equipment information. Any user can select a calculation from the company's library to perform the task at hand. Calculations and KPIs are based on OSIsoft's Advanced Computing Engine, Module Database™, and Performance Equations tool for ease and reusability of calculations across multiple areas and hierarchical process data views. There is no need to know Visual Basic or do any additional coding. The calculation is set up for universal access and usability and provides error-free calculation transfer. Really, there is no limit to what you can do with the RtPM Platform and PI."

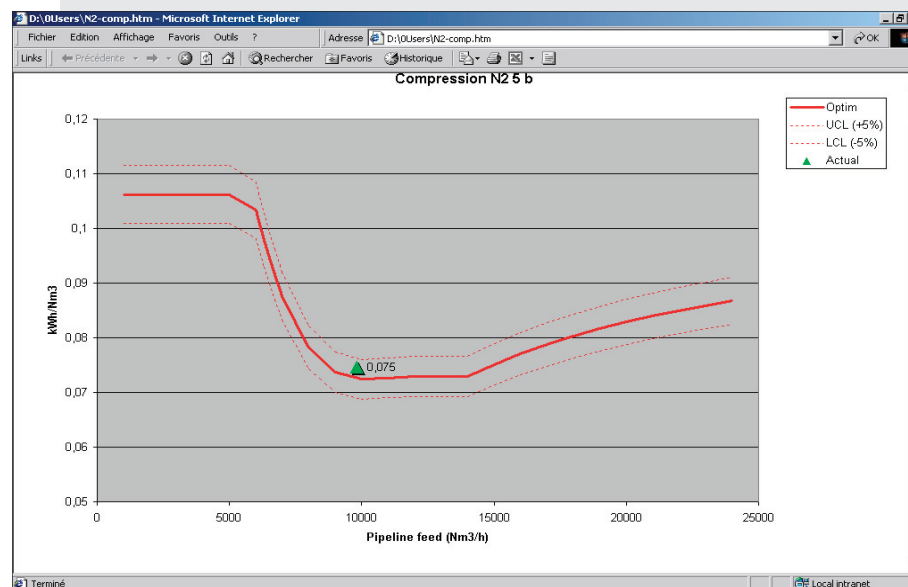
RtPM reengineers the way a company can operate; provides invaluable return

With competing requests for IT capital expenditures, Air Liquide has to justify return on investment, even as the RtPM Platform was successfully spreading throughout the company. This justification is not difficult. Air Liquide has seen benefits well beyond cost reduction. There have been immeasurable returns in changing the way people work and the culture in which everyone operates. Quality and uptime have improved significantly, as has customer satisfaction.

Air Liquide is working so differently than in the past. It's very difficult to put a dollar figure on it. The real value has been in the reengineering of the organization where people now have the ability to see the operations and make the types of decisions that consistently improve operations and profitability.

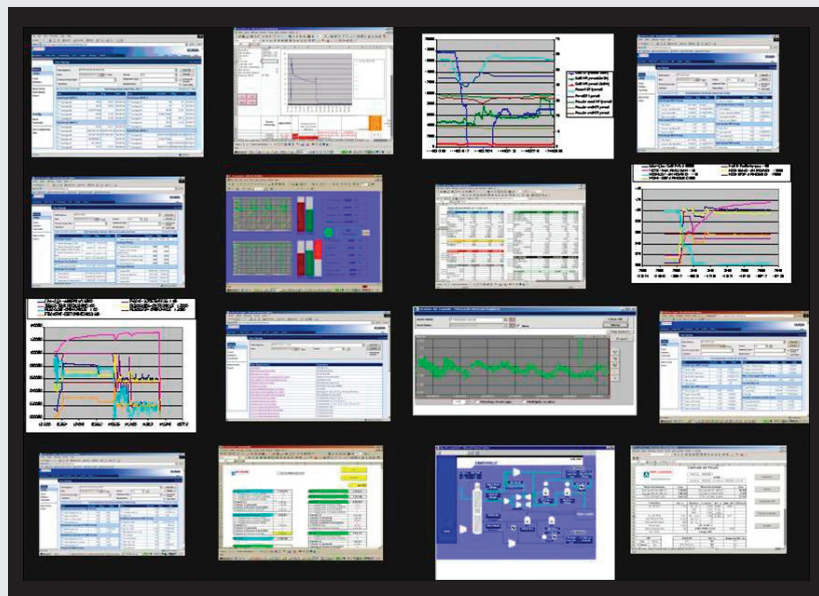
"Before RtPM, Air Liquide went through ten years of efficiency projects which certainly helped to streamline operations," says Williams. "But at a certain point, we had reached diminishing returns on these projects. Today, RtPM has enabled us to attain additional efficiency savings. There are increasing competencies in using data and tools that weren't there before."

"Today, I expect the information to be there and I expect decisions to be based on reality," says Williams. "No one can say that they'll have to get back to me because they need time to see what's happening. Now, I expect people to know immediately. The level of information that we can now access allows us to attain the operational excellence that we have today. And we've only just begun to tap the full potential of RtPM."



Similar to the previous display, this case shows nitrogen compression cost where the X-axis represents the pipeline demand or feed and the Y-axis represents the nitrogen production cost. Now, users know if the production cost is on target for load (pipeline feed/demand).

The red curve is the optimum cost and the green dot is the actual cost. In a glance, users can see if a process group is operating properly, efficiently and most importantly, have many degrees of freedom and tactics to produce the same amount of nitrogen.



Visualization, analysis and the ability for users to configure applications and displays quickly and easily enables real-time decision making.

In all departments, major changes in behavior have resulted from Air Liquide's widespread use of RtPM, including:

- High visibility of events resulting in increased understanding across the organization about how the company operates
- Enhanced vertical and horizontal collaboration and decision-making (e.g., between operations and management); more responsibility and accountability within each group
- Increase in standards, best practices, and higher expectations of decision-makers
- Remote troubleshooting with real-time sharing of company expertise; no travel required
- Ability to determine how one action over another will affect business
- More reliability in quantifying project cost-to-benefits; indicators can be identified in advance
- More accurate risk calculation
- Fast, easy reporting with 100 percent integration and automation

"I wouldn't want to operate without the RtPM Platform," says Roba. "It would be difficult to optimize a plant without RtPM because it enables operation based on visible facts."

Real-world, real-time success

The RtPM benefits and savings presented here, as well as the superiority of OSIsoft products, are actual matters of record at Air Liquide. To find out how your company could become a real-world success story like this, email casestudy@osisoft.com. Explore the power of RtPM at www.osisoft.com/rtpm.

