



## Overview

**Country or Region:** Avon Lake, Ohio  
U.S.A.

**Industry:** Polymer Products and  
Services

## Business Situation

Integrate real-time production data with  
SAP R/3 enterprise systems

## Solution

OSIsoft's RLINK certified interface to R3 offered very robust capabilities and were already tested and approved for use with SAP; they also provided an off-the-shelf solution that meant PolyOne staff would not have to write extensive code or perform extensive testing for SAP version changes.

## Benefits

- Not originally seeking measurable dollar-based ROI but application performance
- Had to meet existing SAP transactional requirements with flexibility to handle recipe downloads and uploads of new custom transactions
- Had to be responsive to future SAP upgrades
- Has vastly improved inventory management, customer order management and customer needs responses
- Has helped create best-of-breed external connectivity to materials suppliers and customers (via the Internet)

## PolyOne deploys OSIsoft's PI System and RLINK interfacing to integrate real-time plant production data with SAP R/3 System.



"The result has been vastly improved inventory management, better customer order management and more timely response to customer needs."

Roger McKinney, Senior Manufacturing Systems Analyst, PolyOne IT Department

PolyOne Corporation is the world's largest polymer services company, manufacturing thermoplastic compounds, specialty resins, specialty polymer formulations, engineered films, color and additive systems, rubber compounding and thermoplastic resins. This broad range of products is used by manufacturers worldwide to make everything from tires to automotive components, building materials, appliances, medical products, packaging, office supplies and more. With such a wide range of products that are used by so many customers around the world, it's critical to the success of this \$2.5 billion company that their production operations be agile and flexible. The goal is to be so efficient in production operations that PolyOne can respond quickly to make exactly the products customers need without building huge inventories of products awaiting orders and shipment.

A critical element in achieving that efficiency has been a corporate program to provide a real-time data link between the company's plant floor control systems and its SAP R/3 enterprise resource planning (ERP) systems. Dubbed projectOne, the program was launched not long after PolyOne was formed through the merger of the Geon Company and M.A. Hanna Company, in September, 2000.

Many of the two companies' plants were already using shop floor control systems, manufacturing execution systems (MES) and SAP's R/3 enterprise resource planning (ERP) systems. There were differences among their implementations, however, and management of the new corporate entity wanted to standardize on company-wide solutions as well as to link the plant floor to the enterprise systems in real time.

## Tested on manual plant

"We had been using Fisher ProVox as our shop floor control systems for several years and we had developed our own custom MES system for tracking production," said Roger McKinney, Senior Manufacturing Systems Analyst in PolyOne's IT department. "In the late 1990s we had replaced our data historians with the PI System Historian from the Real-time Performance Management (RtPM) Platform from OSIsoft, Inc., in San Leandro, Calif. When we began our search for the best way to implement the missing link between the two levels of our operations, we looked at OSIsoft's RLINK certified interface to R/3."

IT management felt that certified interfaces were the solution of choice because it was unlikely that applications other than SAP would require the data, thus there would be no need to provide it in real time to other enterprise applications. Since certified interfaces are "off-the-shelf" solutions that are extensions of the primary application, PolyOne staff would not have to write extensive code or perform extensive testing for SAP version changes. In addition, these interfaces offer very robust capabilities and they have already been tested and approved for use with SAP.

"Although we had also evaluated other methodologies, such as data mapping tools, we felt OSIsoft's off-the-shelf interface would be ideal for our needs because it could plug-and-play at both ends of our system solution," McKinney explained. "That proved to be the case. We had six vinyl plants that we had to change over from custom interfaces within the R/3 conversion schedule. The alternative solutions would have required 300 man/days to test before we could even do the SAP upgrade, but using the RLINK interface between our PI Historians and R/3 we were able to complete all six rollouts within schedule."

The first of the vinyl plants to which the PI Historian and RLINK interface modules were added was in Farmingdale, New Jersey. The projectOne implementation involved a staff of five people from the IT, engineering and shop floor staffs at PolyOne and three consulting engineers from Accenture.

"This was a manually operated plant, with no automation, but we created a Visual Basic application so personnel could enter data into the historian and use the interface to both feed recipes down to the shop floor and provide process data back up to the R/3 system," McKinney says. "This initial setup didn't have all the functionality of what we wanted to have eventually, but it was a good test situation and didn't require a lot of time to configure."

The primary task was to set out the parameters for translating between SAP PP-PI process instructions and messages traveling downstream and the process data moving upstream. The primary R/3 messages include:

AORD – for order data, including start/finish, data/time and PolyOne product version

APHASE – phase data, including external phases

AMAT – for material allocation information and raw material consumption data

AMATP01 – for material allocation information as reflected in finished goods

Process data requests included:

ACRST – control recipe status for started, processed or discarded

ACONS – goods issue information on raw materials consumption

APROD – goods receipt on finished goods production

APHCON – time ticket information to confirm quantity and time

For subsequent installations at the automated Vinyl plants, the team developed new process instructions for reporting unsolicited data upstream to SAP. These included:

PI-CONS – to track unplanned consumption at the shop floor level

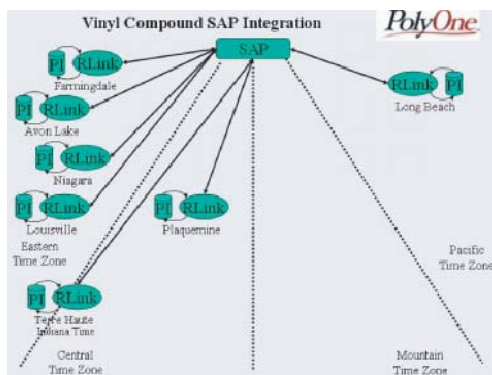
PI\_PROD – to report unplanned production of materials

MATRANS1 – to move products from quality inspection to unrestricted or blocked and to change batch IDs

MATRANS2 – to move product rework from blocked to unrestricted, then consume it

LINEVENT – to populate a custom SAP table with any data on any and all production line events

The initial installation in Farmingdale went well and similar systems were then rolled out during 2001 to the company's six other vinyl plants in Niagara Falls, Ontario; Avon Lake, Ohio; Terre Haute, Indiana; Louisville, Kentucky; Plaquemines, Louisiana; and Long Beach, California. (The manual plant at Farmingdale has since been taken out of service.) These initial systems handled all data transactions for 22 vinyl production lines, generating an average of 182 control recipes each week and an average of 4,120 consumption process message uploads and 555 production message uploads per day.



*Figure 1: The initial configuration for the first vinyl plants linked a PI Historian to each MES server module in each shop floor control system. Data was transferred to and from the RLINK server at each location and passed over a T1 network line to the central SAP center in Cleveland. This involved several steps, however, to pull production data out of the historian for transfer to the MES server and then send it to the interface server and up to SAP.*

## Evolutionary links to SAP R/3

“Our initial use of these new interfaces was configured with a PI Historian linked to the MES server on each vinyl plant’s shop floor control systems, which transferred data to and from the RLINK server at each location,” McKinney explained. (See Figure 1.) “Each plant had its own T1 network line to the central SAP center in Cleveland so this worked. But we first had to pull production data out of the historian for transfer to the MES server and then send it to the interface server and up to SAP. The more we looked at this configuration, the more we thought there must be a more efficient way to interconnect the systems by networking multiple databases to one RLINK server.”

This approach would be critical when rolling out the systems to the six elastomer plants because it would involve a total of 50 production lines. In addition, while the vinyl plants were more continuous process oriented — and finished goods are often built to inventory because many products can be used by multiple customers — the elastomer plants were batch oriented and generally produced goods to fulfill specific customer orders. Because of the nature of the batch production, the volume of data collected from the batch processes involved much higher traffic with SAP: an average of 450 recipe downloads per 12-hour day, an average of 5,200 consumption process message uploads and an average of 1,350 production message uploads per day.

“Our projectOne staff theorized that if we could draw process data directly from a SQL database, we could link multiple MES servers at all our different plants to a single RLINK server that fed the data to the R/3 system,” McKinney said. “We felt this could be a more efficient way of handling data traffic, so we asked OSIsoft if there was a way to draw data directly from a relational database. They were a true partner in this program because there wasn’t an off-the-shelf product to do that, but they volunteered to help find a solution for us. “They devised a tool for us that let us point to different databases so we could extract data from either the PI Historians or from Microsoft SQL Server,” McKinney added. “This was critical to our being able to handle the much higher data volume from the elastomer plants. (See Figure 2.) It also allowed us to redeploy the PI Historians to alternative shop floor applications.” That wasn’t the only technical support issue encountered. All six elastomer plants were to be cut over to the new OSI-SAP configurations in late December, but as often happens with complex solutions, the projectOne staff encountered an unexpected obstacle on New Year’s Eve.

“We discovered that one of our transactional control recipe downloads couldn’t handle a singlequote symbol within a message, which meant we couldn’t download certain recipes,” explained Michael Schaefer, PolyOne SAP Consultant. “We contacted OSIsoft’s technical support and one of their people rewrote the code for us within two hours and e-mailed a patch to us. It worked fine and we were up and running. They responded to our business need at 10:00 p.m. on a major holiday, regardless of the situation. That was amazing.”

The eight North American elastomer plants — in Burton, Ohio; Jonesborough and Dyersburg, Tennessee; DeForest, Wisconsin; Wynne, Arkansas; Kennedale, Texas; Santa Fe Springs, California; and Queretaro, Mexico — were all cut over to the new systems during 2002. The bidirectional data traffic between the shop floor, the MES layer and SAP R/3 has increased consistently ever since. Recent statistics show the following averages for the elastomer and vinyl plants:

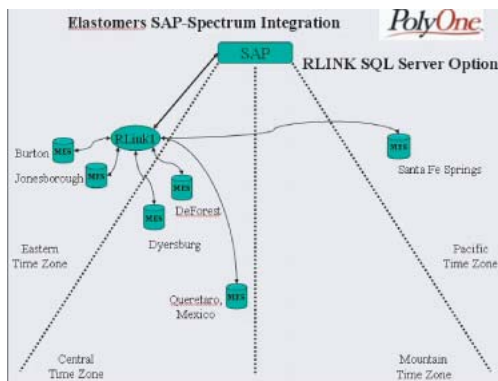
Control recipes downloaded per day: 327 for elastomer lines and 29 for vinyl lines

Consumption messages: 5,160 per day for elastomers and 3,655 per day for vinyl

Production messages: 1,128 per day for elastomers and 616 per day for vinyl

Custom messages: 379 per day for elastomers and 283 per day for vinyl

Plans for the remainder of 2003 call for addition of three other plants in Arizona, Ohio and Pennsylvania to the system.



*Figure 2: When setting up the elastomer plants, the configuration was changed to draw process data directly from a SQL database instead of the PI Historian, which allowed the linking of multiple MES servers at different plants to a single RLINK server that fed the data to the SAP R/3 system. This was a more efficient way of handling data traffic, but it required the custom development by OSIsoft of a tool that could point to different databases to extract data from either the PI Historians or from Microsoft SQL Server. This approach was critical because it permitted much higher data volume from the elastomer plants.*

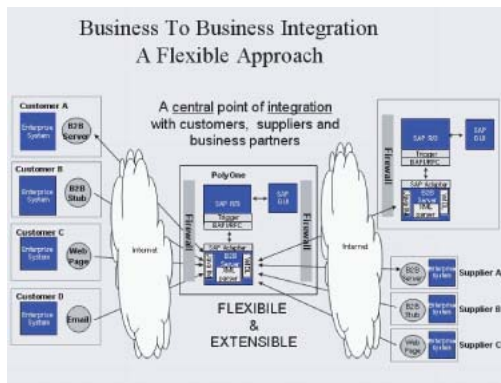
## Multiple system benefits

“When we started projectOne we weren’t necessarily looking for a particular return on investment benchmark from this installation but simply to find a solution that worked for our needs,” McKinney noted. “We were more interested in improving the efficiency of our operations, from top to bottom, so that we could increase our process capacity with existing facilities. To do this, we had to deploy a solution that fit existing SAP transactional requirements while providing the flexibility to handle downloads of our recipes as well as uploads of new custom transactions. At the same time, the solution had to be responsive to future SAP upgrades.

“We’ve achieved all of that with the PI Historian and RLINK modules, because they allow us to upload process data into SAP on a near real-time basis — production data every 20 minutes and consumption data every 60 minutes,” McKinney added. “With our old manual systems, this data was being transferred only once per shift at best, sometimes once per day. The result has been vastly improved inventory management, better customer order management and more timely response to customer needs.”

The system has also helped the company create best-of-breed external connectivity to both its materials suppliers and its customers. (See Figure 3.) Customers can now place orders and check their order fulfillment progress over the Internet via PolyOne web pages, e-mail or business-to-business applications. Suppliers can do the same from their enterprise applications, checking raw material inventories online and preparing replenishment transactions online. All information is gleaned from the SAP R/3 4.6c data warehouse and is up-to-date virtually in real time.

PolyOne also now has two new Internet web sites that provide an online customer “shopping” center. The corporate web site (<http://www.polyone.com>) has comprehensive information about the company’s entire family of products and services. A customer site (<http://www.getpolyone.com>) provides a secure, real-time place where vinyl compound and specialty resin customers can place and manage their orders, and another site (<http://www.polyonedistribution.com>) is the support home page for PolyOne resin products, offering full, interactive troubleshooting from a large knowledge base.



*Figure 3: The OS/soft-based system has also helped the company create best-of-breed external connectivity to both its materials suppliers and its customers. Customers can now place orders and check fulfillment progress over the Internet via PolyOne web pages, e-mail or business-to-business applications. Suppliers can do the same from their enterprise applications, checking raw material inventories online and preparing replenishment transactions online. All information is gleaned from the SAP R/3 4.6c data warehouse and is up-to-date virtually in real time.*