

**Twinsburg Plant Implements Rockwell Software RSSql for**  
**Real-Time Manufacturing Process Control**

The Allen-Bradley manufacturing plant in Twinsburg, Ohio faced the same problem that many production facilities face: How can a bi-directional interface be incorporated between a control system and the enterprise system, to lower rework and scrap cost, and still improve quality and customer satisfaction? By implementing Rockwell Software RSSql, data collection and product tracking software, the Twinsburg facility was able to solve this problem and reduce cost dramatically.

The high mix Twinsburg production facility produces thousands of printed circuit boards (PCB) each year, building everything from Allen-Bradley PLC-5 and ControlLogix processors, to bar code interface and memory modules. Due to the high amount of changeover time, it was necessary for them to implement a sophisticated software package that provides a bi-directional connection from the PLC-based control system networks to their ORACLE® production database. The Twinsburg plant has been in operation since 1979 and depends greatly upon plant floor automation, transporting and buffering of panels, bar code reading, and machine parameter downloads.

Prior to implementing the RSSql solution, Twinsburg used a VMS-based system as an interface between the control process and production database. The old system could not offer up to the minute reporting nor real-time data, something that was crucial to running the production facility. In addition, the VMS operating system running on the MicroVAX platform was not Year 2000 compliant. Upon realizing the limitations of the current system, Twinsburg set out to find a software solution that would match their needs. They needed a solution that would provide real time data with up to the minute analysis that would allow them to decrease down time, scrap, and rework costs. According to Bob Allen, Systems Engineer “There were many failure points with the old system which needed correction, and considering that our manufacturing process thrives on data acquisition, it was essential to implement a reliable, real-time system.” Twinsburg was at a point in which retrieval of the data within the enterprise needed to be cost efficient and fast. Furthermore, they wanted to switch from a hardware-based facility to a software-based facility because the machine hardware has a chance to fail and shut down the whole plant. According to

Bob Allen, “RSSql offered us a secure, Windows NT-based transaction manager between our ORACLE database and our plant-floor conveyor-control system”.

After the decision to implement a new system within the manufacturing plant was made, the next question was, “with what?” According to Bob Allen, “We were looking for a cost-effective solution that provided real-time data collection, and was relatively easy to implement”. Their old system contained the necessary information about build-level and work- order numbers, but not in real time. Lou Duzyk, Project Engineer, states, “We wanted to eliminate a hardware level and provide real-time status and control data utilizing our own products. Rockwell Software’s RSSql was exactly what we needed.”

After testing RSSql in beta format, they knew that it could assist them in the production of the printed circuit boards, data collection and retrieval of data associated with production. Known for its unique capabilities and ability to implement world class solutions, Rockwell Software RSSql has the capability to connect to a wide variety of databases on many operating systems, using ODBC or OCI. This allows the user to transfer important information between the plant floor and the top floor without having to write proprietary code.

The production process of these printed circuit boards begins when the blank PC boards travel through an automated system on stackers and are transferred from one machine to another. Each of these boards may go through different types of placement machines for different types of components including ovens and standard board manufacturing plates. With an Allen Bradley bar code scanner placed before each major piece of equipment in the process, the information (bar code) is sent up through a PLC-5 over the Allen-Bradley Data Highway network. The first board enters a screen printer, which applies solder paste to the board via a stencil. The board is then scanned by another bar code reader and enters the first of many placement machines that place the actual components on the board. This process will continue through different machines until all of the parts are placed on the circuit board. Each board is then electrically tested by an automated in-circuit tester.

Twinsburg first utilized RSSql for Thermal Stress Screening (TSS). The RSSql TSS application diverts printed circuit boards to one of two magazine loaders, depending upon whether or not the PCB has been “flagged” for TSS sampling. Each eight-digit bar code gets scanned by a fixed-mounted Allen-Bradley bar code reader, which triggers a RSSql transaction.

RSSql then enables an ORACLE procedure to test the barcode for the TSS flag bit. In this particular process, RSSql, in essence, is verifying the bar code. The application accepts bar codes up from the bar code readers on the plant floor and logs those into the database. This also provides data for real time error reporting as well as the possibility to track out of control processes. For instance, if the production has slowed down considerably they could be notified of the out of control process.

“When you’re doing database design, solid, real-time communication between computer systems is essential. Previously this is what was happening, data was not getting logged, the network would go down, and other failures would occur, thus making the whole process come to a halt.” Explained Paul Hartman, Project Engineer.

The implementation of RSSql alleviated many of the data acquisition problems at the Twinsburg facility. The old system stored the data in the ORACLE database on an hourly basis. This is where RSSql’s real-time data capabilities influenced the plant. In the past, the managers would be notified of boards that were failing tests on an hourly basis and at the end of a shift. Whereas with RSSql, they could see the failures as soon as they happened, in real time. Lou Duzyk states, “ This was an after-the-fact analysis of why some of the boards failed 5 times in one day, without anyone noticing until the end of that shift.” Because data is in one centralized location within the system and eliminates “hunting” down the necessary information needed, data points are ‘bound’ directly to the PLC data table using standard ORACLE procedures.

The Oracle database, which contains information about every board that is produced, is native to RSSql thus making the transition easier. According to Paul Hartman, “RSSql now offers us what our old system could not, a systematic and organized way of retrieving the data we need. Now, I can tell you what any of the machines on the floor is building right now and how long it’s processing each board.”

Since RSSql resides on Microsoft Windows NT and incorporates NT securities, with three levels of protection, Twinsburg did not have to worry about data being lost or misused. On the ORACLE side, two separate accounts were created. The first was a librarian account, which owned access to database objects (tables, procedures, etc.). The second was a user account (used by RSSql) that only had execute privilege on a single procedure owned by the librarian account.

With this configuration, any unauthorized personnel logging into the user account could only execute that procedure.

With the amount of production that Twinsburg does each day, they became concerned about the amount of message packets on the Data Highway. Since RSSql can be configured for DDE or Advanced DDE links to the PLC via Rockwell Software RSLinx, communication software and RSView32, Human Machine Interface (HMI), this reduces traffic of message instructions on their data highway and communication failures. “The RSSql DDE (Dynamic Data Exchange) links are easily configured and are more efficient than the PLC messages that we were using. Upon implementing RSSql, we eliminated approximately 4000 lines of code that was previously needed to run the old system.” stated Bob Allen.

Because of RSSql’s flexibility, the Twinsburg plant has the capabilities to initiate transactions based on a set of event triggers. These event triggers can be used to launch specific Oracle procedures, return information to a PLC, or simply log data to Oracle. These “events” are an Oracle application, but are initiated through RSSql in real time. For instance, if a machine was out of parts or down for some reason, the system has the capability to notify the appropriate people, either by pager and/or by e-mail. And instead of the people being notified an hour or so after the event has occurred, they are notified as soon as this event happens. “ The name of the game in this industry is real time, not five minutes ago, an hour ago, but now.” States Paul Hartman.

The interoperability of RSSql can be seen when it communicates with RSView32 within the Twinsburg plant. RSSql transactions can utilize tags created with RSView32, and these tag values are displayed through the HMI. As outputs from RSSql, these tags can contain the module information, instead of sending the information to the PLC. This can be done if there is too much traffic on the Data-Highway. By displaying this through the RSView32 Active Display Server, all of the module information can be available at every node, and to all clients on the RSView32 Active Display server. The RSView32 Active Display extends the functionality and the reach of the standard HMI software. This allows the users to access a project from remote client sites, such as the plant floor, control room, the managers office, the presidents suite, or anywhere in the world.

The Rockwell Software solution has given the Twinsburg plant a simpler more cost effective way in which to operate their plant. RSSql's robust, end-to-end link establishes a level of integration that provides support to an Enterprise-wide system.

Allen concluded, " RSSql provided us with an intuitive software solution to a vital link between our plant-floor and our data-base system. Our application is now logging transactions from over sixty barcode nodes on our factory floor. The support staff at Rockwell Software was extremely helpful and quick to respond to our needs. This enabled us to replace our outdated hardware-based system with a dynamic real-time data-collection system that is year 2000 compliant."