Topeka, KS — There are an estimated 35 million dogs in the United States and probably at least as many cats. Like their owners, each of these pets is of different age and size and has different nutritional needs. This means that for a major pet food supplier such as Hill’s Pet Nutrition, Inc. (a division of Colgate-Palmolive Company), it’s a large and complex business to produce canned, dry and specialty pet foods to meet a wide range of nutritional needs.

Hill’s operates four plants around the country that produce nearly 50 different dry, canned and specialty products, each of which involves a different recipe of ingredients and production sequences. Dry foods typically are combinations of grains, special additives such as vitamins and minerals, and other minor ingredients that must be mixed with water or steam in order to be processed properly in giant extruders to make the familiar kibble shapes customers feed their pets.

Once the food products are manufactured they must be packaged in a variety of container sizes and types before shipment to distributors and retailers. Canned food production is even more complex since it involves the grinding and mixing of meat products, canning in a variety of containers, cooking within the can according to specific recipes, and finally custom labeling for specific geographic markets prior to shipment.

Process monitoring, quality control, and data acquisition are paramount concerns. “This company has always tried to be progressive with its use of technology. The commitment to information and quality has been a Hill’s philosophy for a number of years,” said Scott Davids, IMS Coordinator at Hill’s Pet Nutrition.
the Topeka Plant. “About five years ago, we put in TCP SmartScreens so the operators could see what was happening on the plant floor. But they were expensive, slow, and tough to read. Looking at the SmartScreen was like looking at a spreadsheet. Plus these monitors didn’t have the supervisory control capabilities we needed.”

The engineering staff at the Topeka plant began looking for a better way to manage production. They had already installed programmable logic controllers (PLCs) to automate machine sequencing but it had not fully resolved major issues. They still needed a better way to provide feedback to operators and team leaders so that they could make more efficient use of existing equipment. The solution they found was simple and cost-effective.

In early 1993, Hill’s installed a personal computer-based workstation on the specialty line running Wonderware® InTouch™ man-machine interface (MMI) software from Wonderware Corporation in Irvine, California. This software is an object-oriented, graphical system that provides supervisory control and data acquisition (SCADA) functionality, including process graphics, real-time viewing and data analysis, trending, recipe management, and alarm monitoring. The resulting improvements in efficiency, productivity, and data access were so impressive that within six months the plant was on its way to complete Wonderware conversion.

“The Topeka plant’s goal is to get rid of all SmartScreens,” Davids said. “Everything will be Wonderware for control and data acquisition. And this will be true at our other plants as well.

**Connecting Diverse Control Elements**

The Topeka plant is run by a collection of about 30 TI/Siemens PLCs that have been installed at various times on different lines. About 20 of the PLCs are linked on TIWay networks. The main backbone network in the Topeka plant is a Novell token ring architecture.

The plant presently has eight MMI workstations: two for grain, one for specialty or “treats,” and five for the canned line. “The two in the grain room do data acquisition, process monitoring, recipe management, SQL — the whole gamut except statistical process control (SPC),” Davids explained. “The five in the can processing area are purely for data acquisition, but the one in Treats does both SPC and data acquisition.”

The systems used in the grain room and on the canned food lines were set up with assistance from systems integrators Advanced Automation Associates, of Philadelphia, Logic Control Sales, Wonderware’s distributor in nearby Olathe, Kansas, helped set up the specialty system. All of the units are tied into the Novell network. Six of the workstations are interfaced to the TIWay network, with backup serial connections; the other two units are on a LAN. The entire system can share data plant-wide using Wonderware’s NetDDE connectivity software.

“We’re building everything around Wonderware,” explained Ken Berry, manufacturing systems analyst in Hill’s Science & Technology Center in Topeka. “There are almost no systems enhancement decisions made at the corporate level or at the plants that don’t take Wonderware’s capabilities into account. Eventually, we’ll offload the tasks from the workstations to a Wonderware SQL server talking to an Oracle database running on our IBM AS/400 here at headquarters. One of our justifications for using Wonderware was its compatibility. Since Information Systems at corporate runs Windows, it made sense for the plant to run Windows, too.”

**Recipe Management**

Despite the large number of different Hill’s products, the Topeka plant has just two primary production lines: the dry products line and the canned line, for meat products. “The trick is to be able to make quick and efficient changeovers from one product recipe to another so that required volumes of each product can be produced while making optimal use of the line,” Davids noted. “The new
MMI’s Recipe Manager maintains current records of different recipes, so it’s easy to switch because you can just select, load, and run different batches. And the chance of misformulations has been greatly reduced because of the tighter control.”

Hill’s has found that their new system’s capabilities have improved plant performance in ways they didn’t even anticipate until they started to use it and realized what it could do. “We originally installed Wonderware just to track downtime,” Davids recalled, “but now we use it to monitor operations and diagnose problems. It’s a great troubleshooting tool. That’s important, because there are all kinds of things that can go wrong — clutch failures, limit switch sticking, temperature fluctuations — in an operation of this size.

The MMI’s alarm monitoring and alarm history functions help the operators keep tabs on the different production lines. “We simply put in a setpoint for every variable we need to track and the operators can instantly pinpoint any problem, trace its cause, fix it, and get the line running again,” Davids explained. “In the past three to four months we’ve reduced our downtime by a third, from 17 per cent down to about 13 per cent, just because of this new supervisory control capability.”

The data acquisition capabilities also help monitor longer term trends as well. For example, all downtime information goes into a Microsoft Access database where it can be archived and analyzed to spot trends. This same database is used for a running inventory system. Ingredients are logged in when received and the weigh scales automatically deduct materials usage as each batch is prepared. This inventory and batch record database can then be used by the Materials Resources Planning (MRP) system, running on the AS/400, for company-wide planning and corporate inventory control.

The MMI also enhances schedule attainment. “We run a lot of different SKUs for specific geographic orders,” Davids observed. “Say the kitchen makes 100,000 cans of Canine R/D but it needs to go into seven or eight different packages for different markets in different countries. The contents are the same but the labels may have to be in Korean or Japanese or French. The MMI keeps track of exact production numbers in real-time so the operators know when to switch over to different packaging and labeling. It’s really simple, but it’s a big help and it was easy to implement.”

All these improvements add up to big bottom-line results. “We’ve seen efficiency increase significantly since we’ve been using Wonderware,” Davids noted. “We’ve increased productivity by 25 per cent with pretty much the same manpower and all it cost was the capital expenditures involved in upgrading the software. That’s pretty impressive when you consider that this is by far the oldest plant we have, and a lot of our equipment is old equipment. But Wonderware interfaces with all the existing equipment so we didn’t have to replace it. Instead, we’re just using it better, pushing more product through our existing machinery. It all revolves around Hill’s working smarter. If you know exactly what’s happening, you can make the process consistent and run the plant continuously, 24 hours a day.”

To facilitate high product quality, the Topeka plant now uses Wonderware InTouch to log process variables in a database used specifically for quality troubleshooting. “For example, the plant used to have problems with product consistency following short downtimes,” Davids recalled. “By looking at the downtime information and the process variables, we were able to finally identify one of our biggest product quality headaches — a problem with coagulation of ingredients when they sat in a mixing vat for longer than necessary while we were resolving other problems.”

Real-Time Information

Hill’s not only gets more out of their machinery now, but they can use their human assets “smarter” as well. “Here at the Topeka plant, we’re trying to go towards a team-based, high commitment work system (HCWS),” Davids explained. “That means that the technicians out on the floor...
who make the product every day take more ownership of the business, make better decisions. And they have to have good, real-time information to make good decisions.

“This access to information helps the technicians learn to make better decisions because they get instant feedback on the results,” he added. “If you make a decision today and don’t see the result of it until your report comes out at the end of the month, it’s pretty tough to know if you made a good decision or not. The MMI lets us see the results right away, right on screen.”

The real-time data they get from the MMI helps technicians improve efficiency as well. “They know what their downtime is, for example, in the middle of the shift, or any time they need it,” Davids said. “We’re working on giving them access to all those things we measure ourselves with, like real-time yield information and real-time schedule attainment numbers. Without the MMI, there’s no way we could get that information out there.”

Ease of Use

Wonderware’s graphical user interface (GUI) helps technicians on the floor take advantage of all that information, because the screens are intuitive to use. Operators can view an animated “picture” of the plant floor operations on screen, so they can “see” inside the machinery and “watch” the process unfold inside places and equipment where they can’t literally see.

“The guys really love the touchscreens,” Davids enthused. “They’re so much easier to use than the old pushbutton mimic panel back in the old grain room, with lights and buttons all over the place. It used to be like setting a combination on a safe to set up the grain room to run.”

And since the software is networked throughout the facility, operators can access information from any of the nodes. “People shift around quite a bit in the plant,” Davids noted. “The beauty of this new system is that operators can go from station to station and still have familiar screens.”

The GUI has simplified operations in the Experimental Food Lab, too. The EFL is located at the Science & Technology Center and serves as the plant’s research center, where new recipes and processes are developed and tested. The new SCADA functionality has radically improved efficiency of data collection and analysis in EFL experimental runs. “The EFL is a perfectly scaled down version of our regular plant,” explained Berry. “The process engineers used to manually dial in control all of this equipment and then had to document everything manually, so they were constantly sitting here writing information. Now they can get a ‘snapshot’ of their whole process from the screen and create a detailed audit trail simply by printing the screen every time they make a process change. If they decide they want to go into production with a new recipe, they have all the data they need and can easily scale it up to the plant.

“We’re also logging data to a historical data file so they can look at real-time and historical trends, and can offload data into Excel spreadsheets to do complex manipulations and what-if scenarios,” Berry said. “We also log equipment runtime information in a database to analyze it for improving maintenance procedures.”

Berry is particularly excited by the newfound ability to share real-time data with remote sites. Since Hill’s runs Wonderware at all four of its plants, a Science & Technology Center process engineer with the right security clearance can access real-time operator screens from plants in Los Angeles, CA, Bowling Green, KY, and Richmond, IN, over an AT&T 56 kbps wide area network.

“In effect, we’re right there in California, viewing live data,” Berry explained. “It’s saved us a lot of travel.”

“Our old system was pretty much slower than dirt. We really pushed its capabilities way too far,” Davids concluded. “We’ll never have that problem with Wonderware, because it’s designed to grow with us, as we’ve seen by our gradual implementation of nodes throughout our system. Our plan is to migrate all control and data acquisition applications to InTouch as soon as possible.”