

Smart Distributed System Works “As Advertised” For Orange Engineering & Machine

Ron West, engineering manager for Orange Engineering & Machine (OEM) Company, Anaheim, CA, recalls distinctly his first thoughts regarding the Smart Distributed System developed by Honeywell’s MICRO SWITCH Division —“When I first saw the advertising on the product, I realized that this was going to be a time-saving device on the shop floor, as well as a time-saving device when we start up the machines...”

OEM designs, manufactures, and supports large lamination presses and equipment that goes primarily to the electronics industry for printed circuit board fabrication. The systems, notes West, can be quite intricate: “Some of our systems—especially the material handling portion of them—get pretty complex. We have done systems with tens of thousands of feet of conveyors, section transfer device robotics systems, automated copper lay up and break down stations, and automated tooling de-pinning stations—all of which integrate into the presses. On the press side, we may have six or seven vacuum laminating (i.e., hot) presses, three or four cooling presses, several stacking stations, and a loading system that automatically loads and unloads the presses.”

The bottom line is a manufacturing process that is custom-designed (each board fabricator has different process and installation needs that the systems must be built to fit) and labor-intensive. For each of its customers, OEM designs a system, builds it, troubleshoots it, tears it down, ships it, then reassembles it on the customer site. The ability of the Smart Distributed System to simplify the process and reduce both labor and technical costs has made it an important tool for manufacturers like OEM.

A Simple Attraction

The Smart Distributed System converts sensors and actuators from change-of-state devices to intelligent control devices through an open, robust network. A bus system that enables communications at the device level on the factory floor, it empowers both inputs and outputs with distributed intelligence capabilities. The simplified wiring enabled with Smart Distributed System was a key benefit for OEM. The presses OEM makes are very large—up to two stories tall. The material handling devices are integrated over the expanse of the fabrication system, and they incorporate numerous sensors, pneumatic actuators, and hydraulic actuators to ensure that product is where it is supposed to be in the system.

Several issues are associated with the size of the machine—

- Where do you put control cabinets?
- Where do you put operator interfaces?
- How do you minimize the amount of point-to-point wiring?

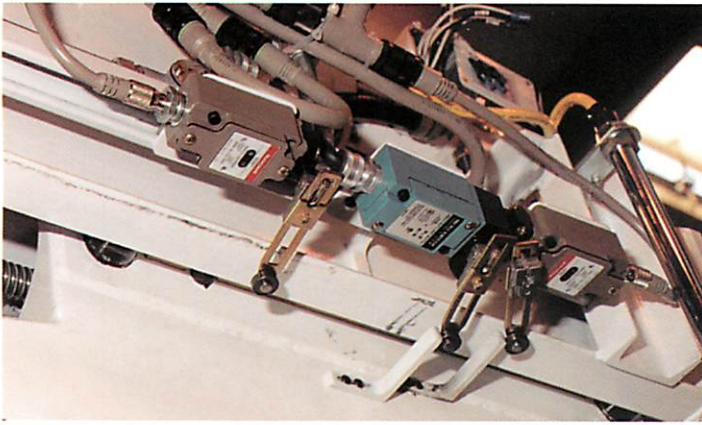
The Smart Distributed System directly addresses all of these issues. By allowing the user to run a single, four-wire cable throughout the system, it significantly reduces the “spaghetti wire” often associated with systems incorporating manifold sensing and I/O devices.

Destination: Singapore

It was just such an installation that Ron West chose to try out the Smart Distributed System technology on: “We had a medium sized material handling and press system going to Singapore, and we decided that this was a good application to use the Smart Distributed System.”



The equipment used in the installation was fully automatic, including the gantry system which loads and unloads the presses.



“Smart” limit switches track the position of the automated gantry system. Plug-and-play capability enhances the ability of the user to easily locate devices as appropriate.

The OEM system consisted of:

- Three automatic lay up stations
- A fully automated conveyor system to bring trays in and out of the lay up room
- Two storage units to store material and track it before it went into the presses
- Two vacuum lamination presses
- One cooling press
- Two stacking units—an entrance stacker and exit stacker
- A fully automated gantry system to load and unload the presses
- An automated de-pinning system

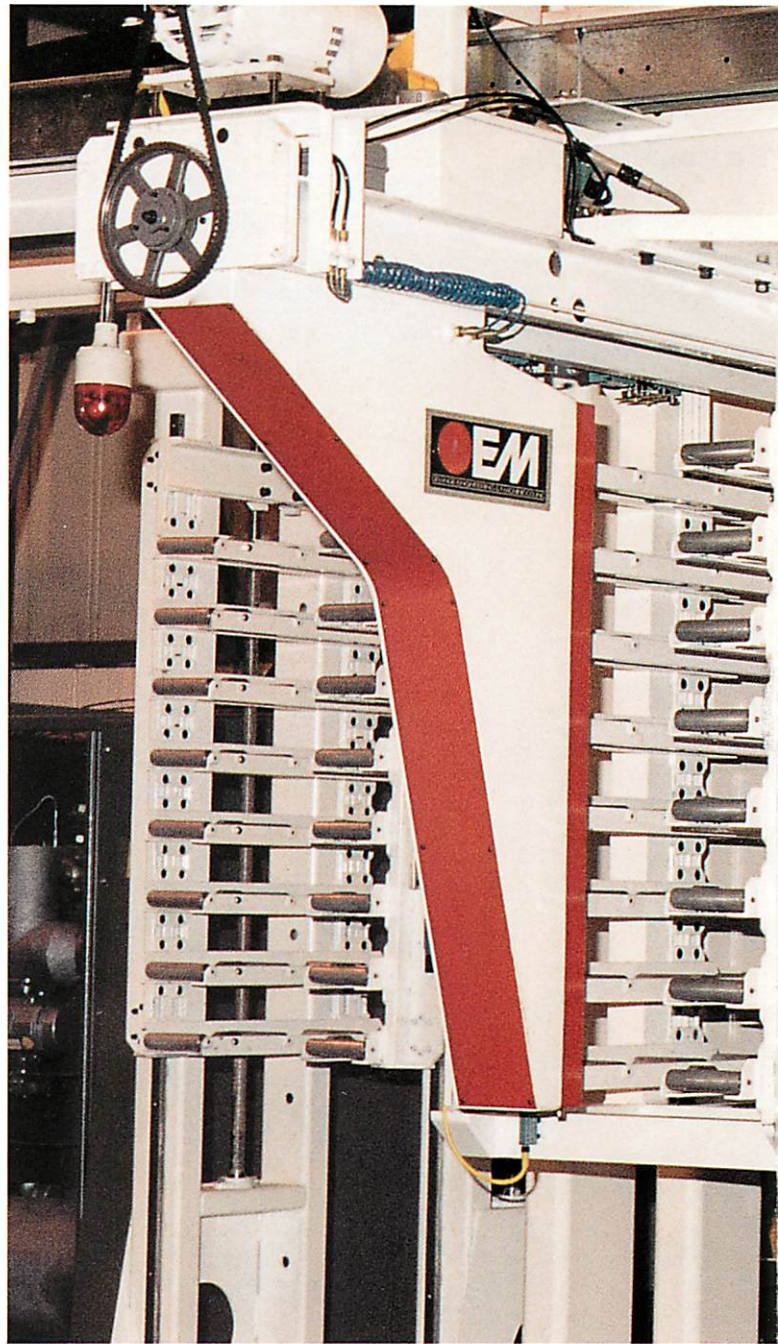
The equipment was fully automatic, except at the point of breakdown and at the lay up room. It was a complex system with numerous parts. In the material handling system, approximately 30 different pieces of machinery had to be assembled and wired. In the press area, approximately 10 different items had to be controlled. The total system contained over 200 sensors, and the Smart Distributed System was used to control all of the outputs, pneumatic, and hydraulic actuators.

The Power of Plug-and-Play

With such a large device and sensor population, this system was ideally suited to the Smart Distributed System’s plug-and-play cabling configuration—and according to Bill Arnold, GE/MICRO SWITCH Control Inc. sales engineer, this was a central feature in OEM’s perspective.

“I believe,” says Arnold, “the primary motivation for OEM when they first took a look at the Smart Distributed System was its plug-and-play design.”

In contrast to traditional hard wiring where sensors, wires, and leads have to be stripped back, and where hardware must be committed to handle complex wiring schemes, Smart Distributed System components come with twistable plugs on each end that fit simply into a system module. All you have to do is plug and twist.



The effective results of this technique were impressive for OEM. Again, Ron West: “The Smart Distributed System gave me exactly what I thought it was going to give me. First of all, as far as the set up time, on a press system like this one, we usually take three weeks wiring it up, and maybe a week or two to debug. With this system, the press wiring was done in four days, and debugged in less than a week. This was a big, big positive change.”

An additional benefit came when the system was sent into the field.

“Plug-and-play,” notes Bill Arnold, “successfully addresses problems in the commissioning process—and this was very important to OEM. After they build their system and test it on site,



Smart Distributed System photoelectric sensors and limit switches were used on the equipment to determine if the doors to the presses were open or closed. Proximity sensors were used to detect the presence or absence of parts in the mold.

they have to take it apart and ship it to England, Taiwan—who knows where? The point is they have a group of people who install the equipment and get it up and running, and they'd prefer not to send higher-paid engineering personnel to do this if technicians or local labor can accomplish the task. By simplifying installation, the Smart Distributed System helps OEM meet this objective."

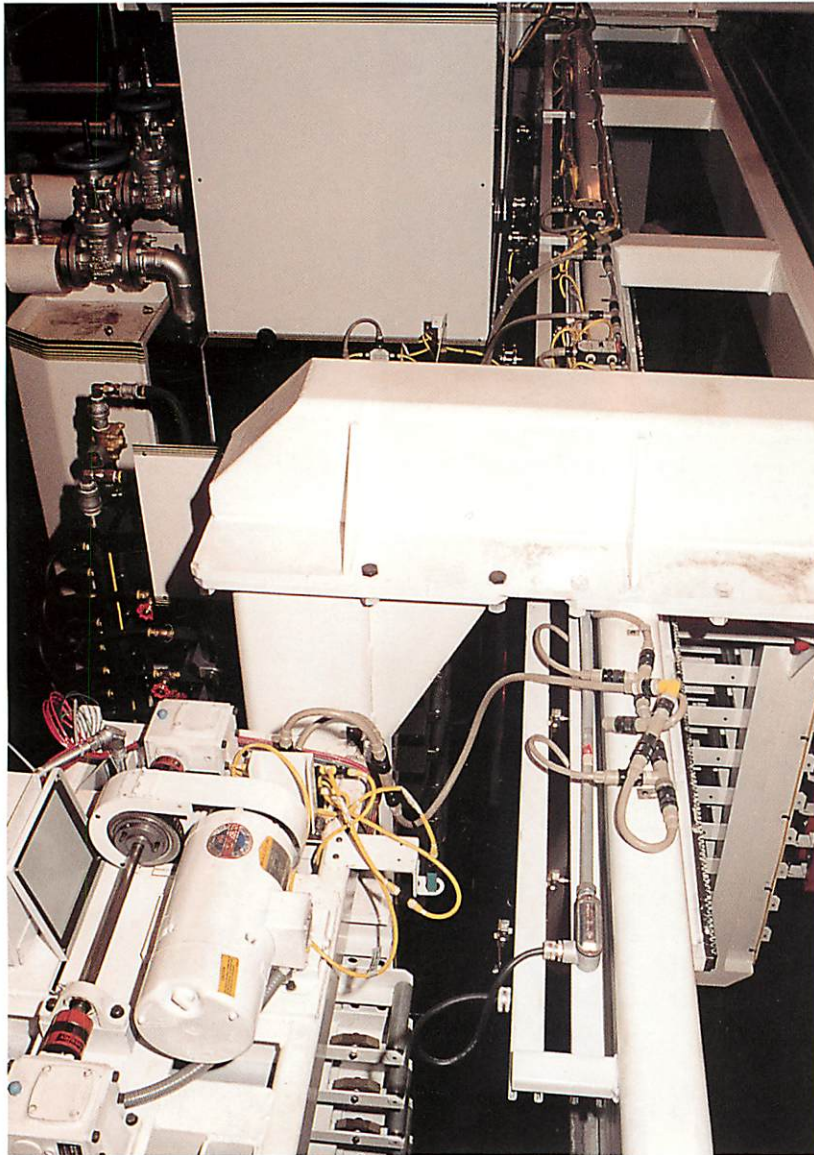
Ron West verifies that the Singapore project confirmed these beliefs: "One of the problems I have is that I have to send support engineers out into the field to help the technicians put the equipment together. On this project I did not have to send an engineer out—our technicians handled it themselves. It's kind of amazing, because this was our first project with the Smart Distributed

System technology, and I assumed I would have to send an engineer on the first one. But I didn't have to, and I thought that was very impressive."

"As far as the wiring portion of the project," West continues, "I can say the installation time was cut in half."

Bottom line, OEM cut in-house installation time by more than 50 percent, field installation time by 75 percent—and with Smart Distributed System technology, the PCB fabrication system didn't have to be debugged after re-assembly. "When it was put back together," West succinctly notes, "it ran."

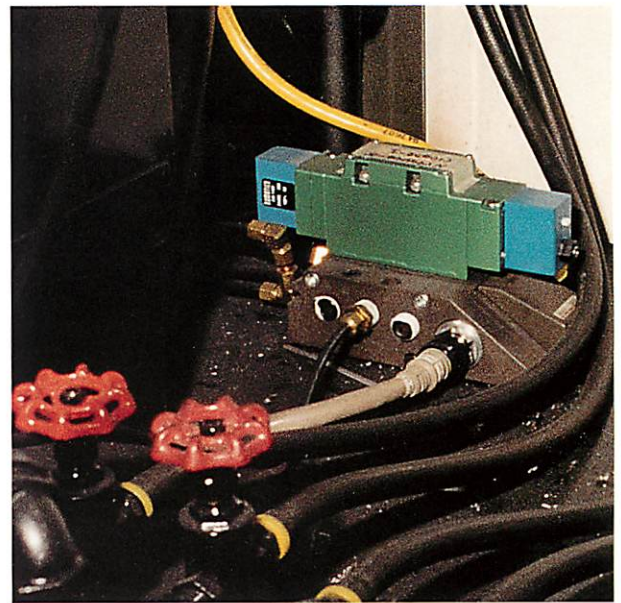
The system built for the Singapore operation offered the ease of plug-and-play, making reassembly quick and simple.



Adding Value for the Customer

Smart Distributed System's communications, control, and diagnostic functions—originally thought of as a secondary benefit by OEM—are now considered increasingly important as the company looks to the future.

In this system, the link between the components and the PLC was made through a Honeywell Intelligent Terminal Strip (ITS), which converts data on the four-wire bus from serial data into parallel I/O points.



Pneumatic valves incorporated on the bus provided increased flexibility for OEM while building the equipment.

“On this particular system,” says Ron West, “the customer required us to use an Allen-Bradley PLC, but on future units we’ll be using PLCs that have specific interfaces for Smart Distributed System components.”

West continues, “We want to get to sensor-level diagnostic capabilities. Our customers are demanding it.”

OEM provides sophisticated man-machine interface (MMI) systems that do data acquisition, statistical process control (SPC), recipe capabilities, and so on—but, according to West, “having sensor-level diagnostics really enhances the capabilities of the system.”

“By tying sensor diagnostics into an on-line help manual that brings up troubleshooting guides and procedures, we can provide an important benefit for our users. The fact that Smart Distributed System has that capability is a real strong point of the product.”

For more information on
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