Using CompactRIO for a Laser Profilometric Method to Save Resources

Figure 1: Beams Routed Out of Blasting Directed to Conveyor and Paint Booth

"In addition to the operational aspects of the system, the statistics display compares the opening time of the old and the new systems and shows a 30 percent paint savings."

- Aurélien COTELLE, ARDPI

The Challenge:

Reducing the amount of raw material wasted when depositing paint on metal beams and centralizing data acquisition related to metallurgy station operation.

The Solution:

Using NI CompactRIO hardware to manage the profilometric method of beams upstream and precisely control the amount of paint deposited by spray guns to eliminate waste.

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The old automation system that managed the paint booth deposited paint in a vacuum. This wasted significant raw materials and operators lost critical time by regularly stopping production to clean the booth. The painting carriage, in a continuous back and forth motion, was equipped with a simple inductive sensor to detect the presence of beams on the conveyor. The automaton activated the spray guns across the whole width, regardless of the number of beams and their dimensions.

Controlling the Quantity of Paint

To overcome this problem, we decided on a system that scans the beams upstream to precisely determine their profiles and more finely trigger the opening of spray guns to only deposit a useful quantity of paint. Our system, based on the NI cRIO-9074, acquires the profile in real time and controls the paint nozzles by taking into account the different position encodes integrated in the existing system.

We chose a Micro-Epsilon OptoNCDT-1700 laser range finder because it measures up to 2 m with a resolution of 10 µm regardless of the state of the object's surface. Users can set the laser range finder to choose the paint finish—from simple matte to glossy—as a blasting output.

We mounted the laser range finder on a bracket above the conveyor to sweep the back and front of the beam profile. We acquire the profiles with an 8-channel NI 9201 C Series analog input module that puts the field-programmable gate array (FPGA) at the forefront because execution velocity is one of the required criteria for this task. The real-time CompactRIO layer processes the signal and restores the profile so the touch screen NI PC panel human machine interface (HMI) displays a clean vector profile to the operator.

Transitioning to the New System

The real-time layer offered direct integration of the client's painting algorithms and methods on its products. The compact form factor and extensibility of the CompactRIO greatly assisted us in this application. Another important criterion was integrating our system without interrupting the almost continuous production. To accomplish this, we placed the CompactRIO between the old automation system and the booth. We used two digital input and output C Series modules (NI 9425, NI 9476) that gave the operator the choice to use the old system (a digital copy of the orders from the controller to output pistols) or switch to the new system. This offered a seamless installation without negatively impacting production in a continuous flow or disrupting the existing architecture.

Displayed on the 17-in. touch screen PC panel HMI developed in NI LabVIEW software, the operator can view the incoming profiles being painted as well as pistol activation areas. This helps the user diagnose any possible adjustments or algorithm parameters to edit. In addition to the operational aspects of the system, the statistics display compares the opening time of the old and the new systems and shows a 30 percent paint savings.

System Extensions

The reliability of National Instruments technologies implemented during this project was so convincing that we have already added the products to the system. We added a remote EtherCAT chassis to the CompactRIO system to measure multiple environmental parameters, such as multipoint temperature and hygrometry, related to the paint deposition station. We added a second EtherCAT to monitor the eight turbines in the blasting station. These extension possibilities attract both integrators and customers.

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Figure 2 : The Micro-Epsilon Laser Range Finder Acquires a Beams' Profile

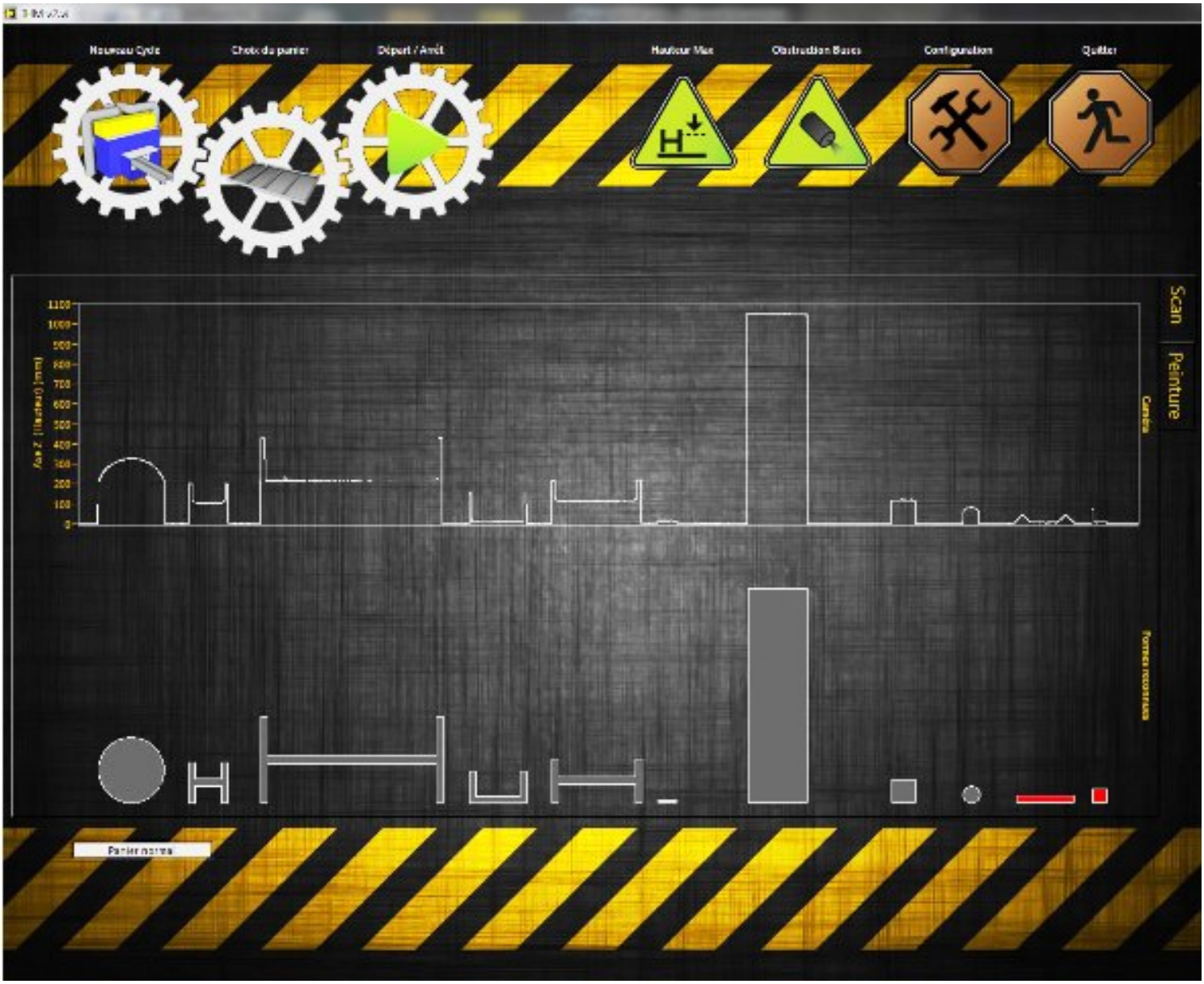

Figure 3 : The HMI Centralizes all the Information for the Operator

Figure 4 : The CompactRIO at the Core of the System is Seamlessly Embedded in the Booth (Bottom Left Corner)