

# **Pro-face**

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May 2011

White Paper

## **The Role of the Human Machine Interface in OEE Initiatives**

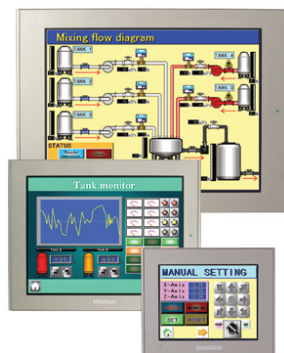
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In order to drive continuous improvement and increase productivity, manufacturers are implementing Real Time Performance Management (RtPM) Systems into their processes. The recording of machine downtime events was once the role of an industrial engineer with a clipboard and stop watch. Today, technology in PLCs and network connectivity on the plant floor has automated this process allowing for faster, more efficient data collection. This goldmine of data is fueling the engine for production metrics such as OEE and TEEP and allowing for the real time display of plant floor performance.

A cornerstone in the building of a successful RtPM system is a Human Machine Interface (HMI). HMIs are used to capture operator input, display real time metrics, consolidate data from PLCs, and bridge production machine information to office databases.

*Figure 1: Human Machine Interface Examples*



## Engaging the Operator

One of the keys to a successful RtPM is operator involvement and engagement. When operators feel that their suggestions are being acted on and are encouraged to participate, they can provide valuable insight. One way to capture the operator feedback is through the use of a Human Machine Interface (HMI). This 'front line' input can help give depth to the downtime reason codes that are automatically generated from the PLC. For example, if a packaging machine stops for ten minutes due to PLC reason code: "Door Open", it is critical to know the reason why the operator had to stop the process and open the door. An HMI can be prompted to display a menu of common reasons when triggered by the PLC 'Door Open' tag. Through experience, production managers have learned that the menus should only be displayed after the machine has started again; should only list a few (3-5) reasons; and the prompt should be removed after a period of a few minutes, or when the next downtime event happens. Some users also report that free form text is helpful for downtime cause analysis (5 Why Methodology) and can help facilitate Kaizen conversations and determine the root cause. Inviting the operator

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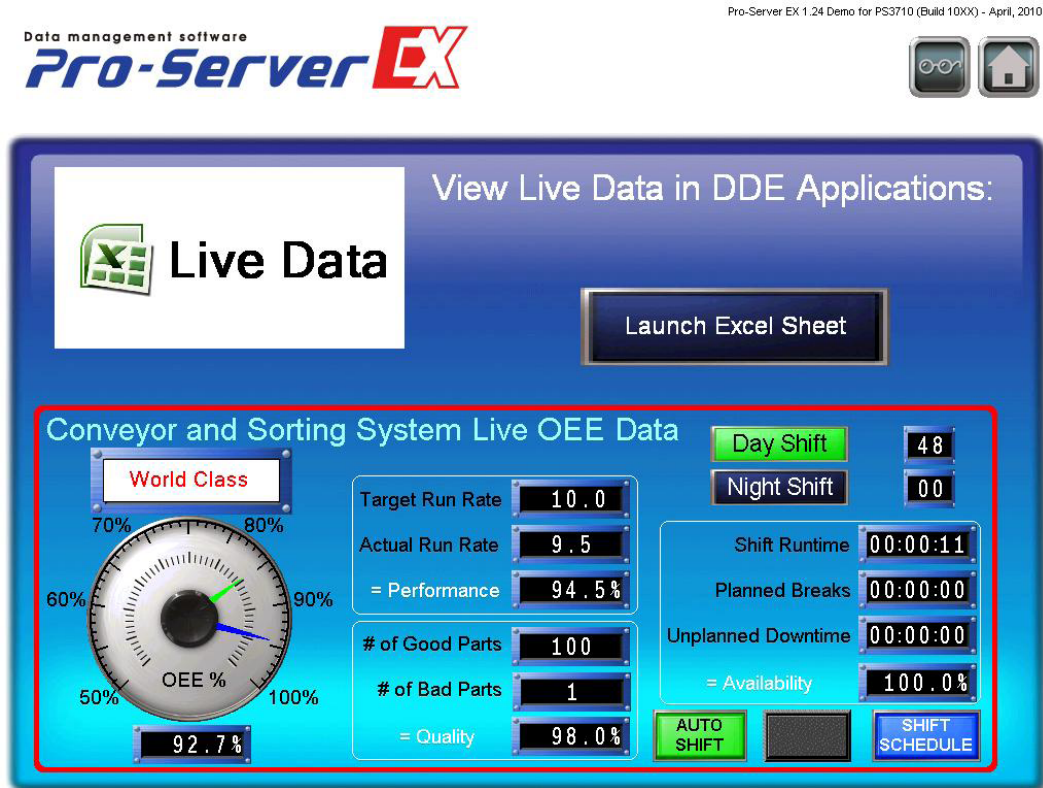
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to enter more information at the time of the event will help insure that real cause is identified rather than relying on memory at a production meeting days later. The security levels built into HMI's, anything from a simple password, RFID / Barcode Badge, or biometric sensor, can help match production performance to individual operators.

In addition to collecting information, HMI's are utilized on the plant floor to give visibility to production data. When machine, supply, or maintenance issues can be displayed for personnel, they can be used to initiate corrective actions to improve the performance. For example, if a supervisor notices a below-goal production rate displayed on an HMI, a maintenance resource or additional operators could be allocated to assist in the problem area for the remainder of the shift. Intuitive objects such as dials, dashboards, and stop lights can be integrated into the HMI display. This will insure that the data is visible, accurate, and real time. Some HMIs incorporate 'out of box' dashboard capability with calculations and displays.

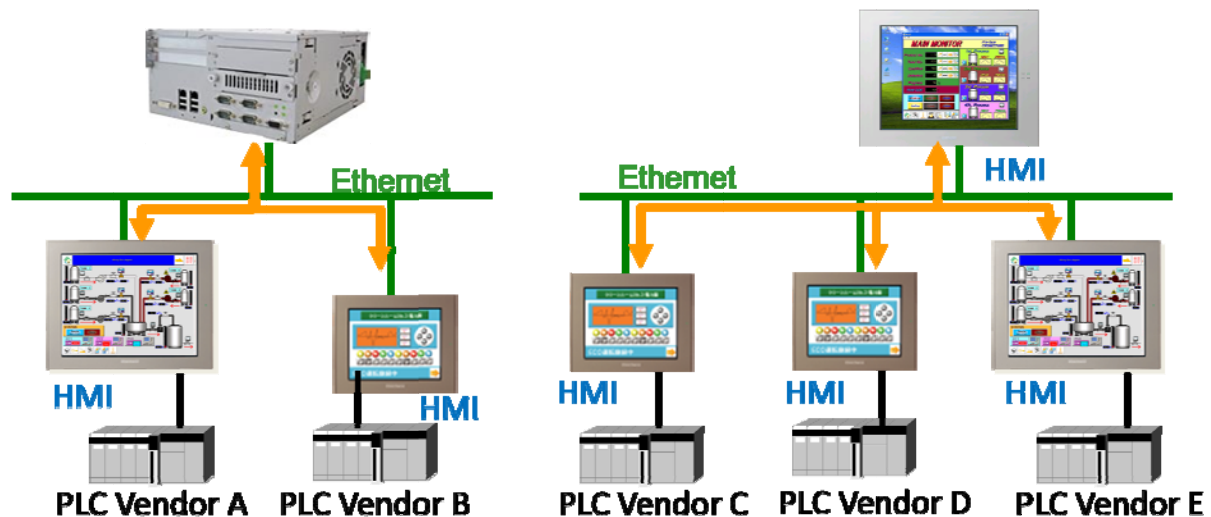
Figure 2: HMI Screen showing 'out of the box' dashboards, database connections, and reporting.



## Connecting Islands of Automation

HMI's are also a critical key to success when implementing RtPM. This software's function is to consolidate and calculate OEE and RtPM values by connecting different automation protocols on the plant floor. If a manufacturer is unable to specify a particular automation vendor for all new machines or does not have the capital to retrofit legacy systems with one protocol it can prohibit an RtPM implementation. An HMI can help bridge the different machines, lines, and processes by communicating simultaneously with diverse communications protocols. A manufacturer that uses an HMI with 'native' drivers (protocols that are part of the HMI operating system and not a third party add on) can find noninvasive connections to consolidate data for reporting. This practice can also significantly decrease hardware purchase costs, integration complexity, and implementation time of any OEE project.

Figure 3: Connecting "Islands of Automation" (multiple PLC vendors with one HMI vendor)



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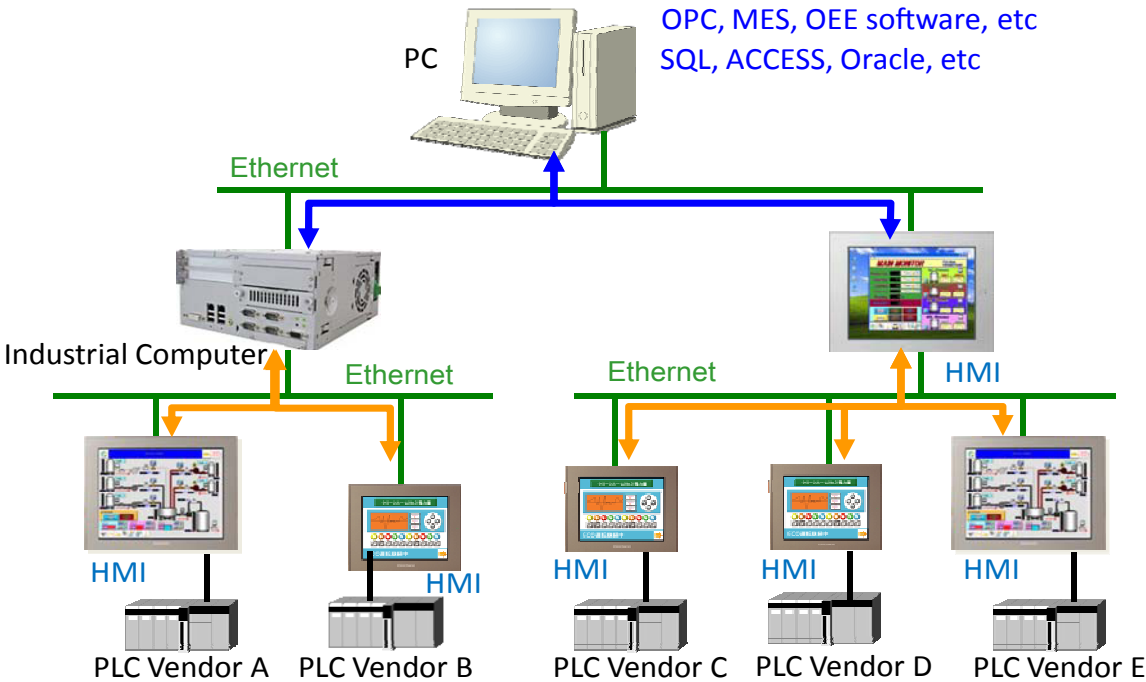
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## Going the Last Mile – From plant floor to office

Data collected from the plant floor and the vertical integration of this information to management systems such as RtPM , QA, or MES can be accomplished with an HMI's powered with database transfer tools, such as Pro-face America's Pro-Server. Today's technology enables the transfer of data from one repository to another in real time via the HMI. Silos of information can be connected, and complex third party tools are not required. "Going the last mile" from the plant floor to the office desk is a reality with HMIs.

Figure 4: Connecting the office to the plant floor with HMI's



## Pilot, Prove, and Progress

Going from clipboards, to spreadsheets, and finally launching an enterprise-wide RtPM can be an intimidating initiative with no obvious low cost entry. Justifying the ROI on a significant system purchase can be difficult, time consuming, and discourage project managers from making a decision with no real tangible return. Pilot projects can be stalled when access and coordination is required to the PLC programming. This obstacle can be overcome by using an HMI with integrated controls and real time clocks. Many HMI's, such as the Pro-face LT Series, have the ability to directly connect to sensor inputs and use logic to calculate OEE. When this is coupled with 'out of the box' software solutions for production calculations and dashboards, a project engineer can start data collection on a machine very quickly and inexpensively. By using a photo-eye sensor for part entry count, reject stations, and part exit count, the variables for OEE (run rate and quality) can be collected by the HMI and stored in memory. If the machine is not running, the HMI can trigger a screen to be shown with downtime reasons displayed on text buttons. When the operator enters the reason by pushing the appropriate button, it is collected in real time. This information (production rates, reject parts, and time based downtime reasons) can be exported by shift to a USB stick for easy import into an Excel or similar spreadsheet tool. Once the reports are published, managers can gain insight into the process and begin the continuous improvement process. By proving the value of OEE and downtime data collection on one machine, it can be expanded to a cell, a line, or several lines in a plant. When a solution has been selected to implement plant or enterprise wide, the existing HMI solutions can be utilized in the new system. This practice can greatly reduce the time of justification, cost, and implementation of an RtPM.

*Figure 5: HMI with integrated I/O, expandable I/O cards, logic, and control for OEE pilot projects*



## Summary

Manufacturers who want RtPM Systems for OEE reporting and automated collection of downtime events will find that Human Machine Interfaces (HMIs) can be a valuable tool to pilot new initiatives, connect different islands of automation, bridge the plant floor to the office, and engage operators in the continuous improvement process.