Digital Retrofit on the Production Line - The Current Landscape

Central machine monitoring and process optimisation is the best way to ensure that production lines and their associated constituent part machinery operates more effectively and economically. Many machines in well-established production lines, which may be between 15 and 30 years old, can still perform their main functional tasks successfully, however they do so less efficiently than their modern day counterparts.

For example, they don’t have the same level of computing power, enough memory capacity to record and store the relevant data, they lack the ability to communicate with their modern equivalents, or other language protocols. In many cases, these machines also use data formats and protocols from the 80s and 90s, which are no longer used by today’s PLCs and industrial PCs.

Industry 4.0 Demands in a Smart Factory

The key to a successful Smart Factory is the ability for machines to communicate to one another at field level, in real time and with an intelligent functionality that gathers all the data together, analyses it and produces meaningful insights that are then delivered to a management system.

With a unified language, there is communication between machines, enabling full interaction and integration across the whole factory. This communication functionality doesn’t need to be built into the machine. Instead flexible modular devices can be added on to capture, process and transfer this data throughout all levels of the factory.

What is a Digital Retrofit?

A digital retrofit is where you add digitalisation capabilities to an existing machine that is without them or that these capabilities are not up to date. One such way of doing this is with the addition of a modular industrial computer.

Digitalisation capabilities can include:

- Enabling ICT Infrastructure of Machinery
- Processing data in the production environment
- Using smart data such as predictive analytics
- Creating human and machine interaction
- Enabling the use of mobile devices - dashboards
- Creating Auto ID opportunites with RFID solutions
Why Digital Retrofit?

Undertaking a digital retrofit project such as integrating a “smart” industrial computer to existing machinery, offers many benefits for end users including:

- **Create a Smarter Business**
  A digital retrofit project opens up a whole world of live production data that can be used to improve processes, increase efficiency, quality and throughput. The ability to think smartly about predictive maintenance and condition monitoring contributes towards increasing efficiencies and saving costs while reducing downtime.

- **Extend the life of existing and old machinery**
  By integrating a “smart” digital platform such as a modular industrial computer to existing machinery, end users are able to create a way in which all machinery within the factory can easily communicate across different protocol languages and across different aged machinery. The modular industrial computer provides a protocol-converting gateway to the central operating software controls of the machinery, meaning that existing machinery can be given the power to speak, thus extending the life of existing machinery.

- **Program in a language you know**
  Reduce time to adoption and get up and running quickly with the ability to choose an industrial computing system that enables you to program in a language and environment that your organisation is familiar with.

- **Huge cost savings**
  Often the cost of undertaking a digital retrofit project is far less expensive than purchasing new machinery that has modern communication capabilities built in. There are indirect cost savings also, long down times for new machinery installation and old machinery decommissioning can be prevented by opting for a digital retrofit. Disruption to working environment and production schedule can be minimised, training costs can be reduced due to the ability to use a familiar programming language.

- **Communication with legacy machines**
  A digital retrofit project enables modern interfaces for devices whose communications are outdated. Using a modular industrial computer based solution you can convert old machine protocols into OPC-UA or MQTT in order to connect legacy machines to Industry 4.0 based systems or MES systems.
Introducing MICA

HARTING’s new MICA (Modular Industrial Computing Architecture) edge computing device can directly address the Industry 4.0 roadblocks that older machines create. The path to Industry 4.0 success can be cleared by using the MICA to provide a digital retrofit solution for older machinery. The MICA provides a protocol converting gateway to the central operating software controls of newer machinery, opening up communication pathways between old and new machinery, at a fraction of the investment cost of purchasing a new machine.

This is due to the fact that with MICA’s modular open platform, the HARTING IIC MICA permits the user to choose the programming language and development environment according to what they are more familiar with. It can create a virtual image of a device or a machine in the digital world. It enables modern interfaces for devices whose communications are outdated. This means that you can convert old machine protocols into OPC-UA or MQTT, in order to connect legacy machines to the developed MES and Industry 4.0 based Smart Factory.

MICA fits anywhere

With dimensions of 13 x 8 x 3.5 cm, it is extremely compact and can be fitted directly at the machine or on the DIN rail in the electrical cabinet. MICA is robust, has no fan and is maintenance-free. The system is designed for harsh industrial and railway environments. It can be used in metallic environments and is resistant to dust, moisture and temperature fluctuations (IP67). Remote servicing for the MICA can be performed with a web browser.

MICA has a modular design architecture made from open hardware and software components. Unlike single-board computers – such as the Raspberry Pi – this device is divided into three control boards. A power and network, CPU and an end-user customisable function I/O board. For this function board RFID, WLAN, BLE, SSD storage or fieldbus functionality can be integrated with suitable I/O connectivity, without changing the form factor or degree of protection of the MICA unit.
Linux Based Containers

MICA is easy to use, with the touch-optimised interface for end-users and administrators, implemented entirely in HTML5 and JavaScript. It provides an open system software environment that allows developers from both the production and IT worlds to quickly implement projects and customise without any special tools. Applications are executed in their own Linux based containers which contain all the necessary libraries and drivers. This means package dependencies and incompatibilities are a thing of the past. In addition, such containers run in individual ‘Sandboxes’ which isolate and secure different applications from each other with their own separate log-in and IP Address. As a result, there should be no concerns over data security when MICA is allowed access to a higher-level production operating network.

MICA is already offered with a number of containers such as Java, Python C/C++, OPC-UA, databases and web toolkits. The modularity and the use of an intermediate JSON format allows other legacy systems to be integrated in the future with minimal effort, only the log-input container is replaced. In addition, other protocols can be easily supported by replacement of a container on the server side, e.g. MQTT.