UNIQO CONNECTS THE MACHINES

Röchling

The Röchling Group, pioneer in the production of customized products in plastic material, relied on ASEM technology for the realization of a new motorcycle tank.

The challenge

The constant investment in research and development, the basis of the success of Röchling Automotive, brought the company to study an innovative solution for the interoperability of machines with business management systems that could be applied effectively and uniformly both to the existing leet and to the new machinery.

The case under consideration is the new development of a motorcycle fuel tank that meets the permeability requirements set by the U.S. Protection Agency environmental (EPA), equal to 1.5 g/m²d (grams per square meter of surface area per day). The tank is made with an injection molding machine with

DIMENSION
11.000 employees

SECTOR
Plastics, Automotive

COMPANY
Customized products in plastic materials for vehicles in the Aerodynamics, Propulsion, and Structural Lightweight areas that help customers to best manage the main challenges: to respect the environment and improve the driving experience.

PRODUCTS
• Functional groups in the SCR tanks sector
• Active Grill Shutter and engine cooling management
• Molded or pressed components in reinforced plastic material with aerodynamic, thermodynamics, and structural functions
• Standard components as air ducts, engine air manifolds, window washing tanks, air suction/filtration systems, conditioning cockpit ducts, etc.

a double injection system with which the two shells of the tank are made. The shells are then assembled by other robotized stations.

To achieve the required objectives, it is necessary to be able to connect the machines contributing to the realization of the piece with the Smart Factory System and provide a bidirectional communication mechanism.

Once the ERP receives the order of the product, it communicates with the Smart Factory System which in turn, according to information received from machines involved in the process, manages the machines to realize the required product.

1 **Automatic adaptation to different PLC protocols**

The machines and equipment that provide the information of the various processes to the Smart Factory system come from external suppliers or are made internally. This implies that to acquire the data is necessary to communicate through proprietary communication protocols based on the PLC used that can typically be a Beckhoff, Siemens, or Rockwell Automation system, according to the design choices of the various supplier companies.

To do this you would need to write communication libraries directly on the PLC that can read monitored process variables and make them available for example through an OPC UA server. The procedure, apparently simple, implies however a revision of PLC programs - many of which also dated - and a critical downtime related to the software update of the controller.

Besides, it is not to be overlooked the aspect linked to the actual availability of the necessary libraries and their license cost.

2 **Two-way communication with the Cloud**

Data acquired by the Smart Factory system are used to orchestrate the production depending on the state of the machines, providing to the machines the necessary information to proceed in the realization of the piece.

Besides, the data acquired by the Smart Factory system are saved to be analyzed in order to optimize the production process.

It is, therefore, necessary for an application to communicate the machine data, acquired from the PLC via proprietary Fieldbus, to the Smart Factory server through MQTT, protocol chosen by the company for general compatibility and efficiency.

3 **Strict connectivity requirements**

The complete cycle time, from the moment in which the data is read from the PLC up to the reception of process information by the MES, must be under a specific time threshold.

Besides, to overcome potential data loss caused by unpredictable connection problems when sending data to the server, a local database is required to function as a communication buffer.

4 **Secure remote assistance**

The security of the machine must be guaranteed through separation between machine network and IT network and remote connection with the machine must be possible for monitoring and diagnostics.

Solution with UNIQO

ASEM's IIoT Gateway RM20 system allows you to face successfully the challenges through the implementation of a complete IIoT solution that connects the machines with the Smart Factory system.

RM20 is an IIoT gateway that combines the remote assistance functionalities of the UBIQUITY platform with the programming potential of UNIQO making it it an ideal system for the realization of IIoT gateway solutions. Thanks to the integration of UNIQO software is possible in fact to create an intelligent and totally dynamic application that can perform all the required operations.

The application acquires the basic settings for the communication with the PLC (IP address and port, type of PLC used) through a configuration file provided to the system; once started, the application can establish communication with the defined PLC and start the acquisition at Runtime of the list of the variables defined in the PLC program.

The variables are in fact not known at design time and must therefore be acquired and evaluated at application execution time.

The variables of interest are therefore acquired based on the name and type of structure that characterizes them every time a machine cycle is executed, or a particular process is completed, i.e. a piece has been produced/processed.

At that point, the application imports data from the PLC of the machine according to the configured protocol and makes it available into appropriate data structures through the OPC UA server to offer a universal and effective interface for diagnostic and monitoring.

Besides, by integrating into the application an open-source C# library, a publication mechanism has been developed to publish the pre-processed data to the Smart Factory system through the MQTT protocol.

The possibility to integrate existing code has allowed total customization and optimization of the application that therefore adapts perfectly to specific needs, including the necessary local data buffering, so as not to lose information in case network connectivity is not available (store function). Once the connection is re-established, the data is sent to the server (forward function) which in turn communicates with the connected machines. For this particular situation it was decided to use a NoSQL database as an alternative to the storage functions offered by UNIQO on SQLite databases, allowing complete reusability of the existing logic, tested and satisfactory in functionality.
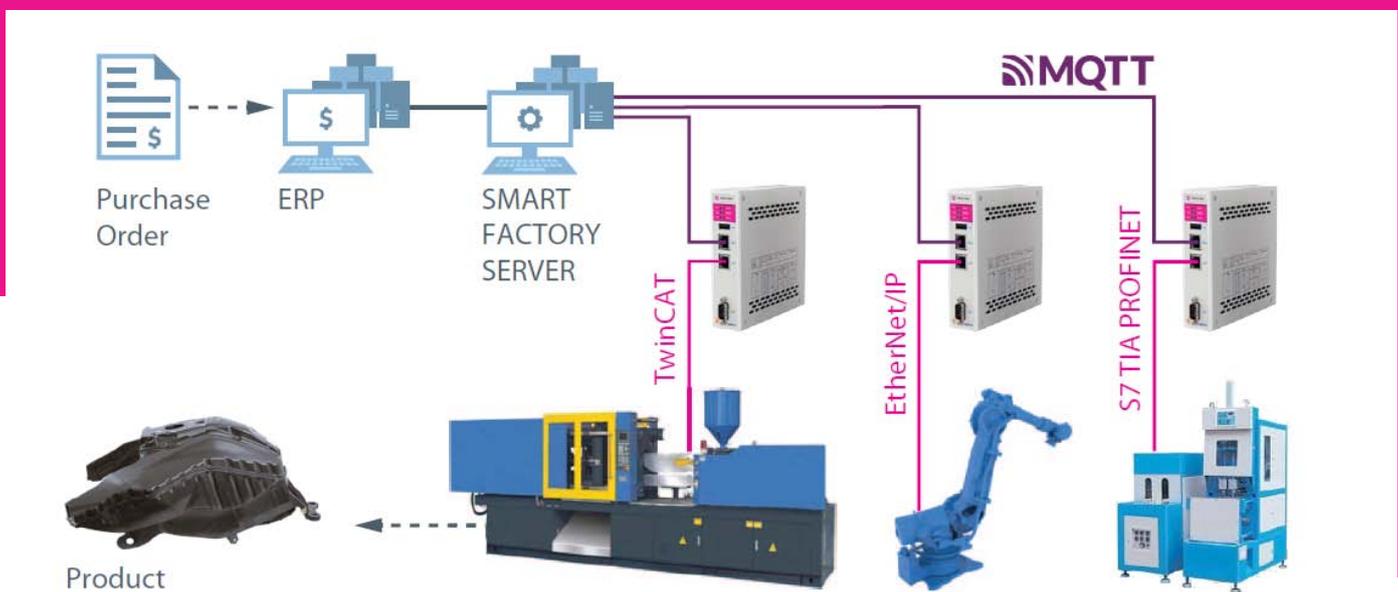
UNIQO connects the machines

The data acquired by the Smart Factory system are used to orchestrate the production depending on the state of the machines, providing the information necessary providing them to proceed in the realization of the piece.
Once the data are sent to the broker of the Smart Factory server, the application is on hold for an answer on the subscribed topic to close then the loop and transfer to the PLC program the information needed to execute the machine cycle. Thanks to the remote assistance functionality of

UBIQUITY integrated into the RM20 product, it is also possible to connect to the gateway and to remotely reach the automation devices connected to the machine subnet to perform monitoring, diagnostics and provide assistance through a VPN tunnel, thus meeting the remote control and security requirements defined by IEC 62443-3-3. UBIQUITY also ensures the security of the machine allowing the separation between the automation subnet and the IT network.

UNIQO ENABLING FEATURES	VALUE IN TOKEN
Beckhoff TwinCAT Communication protocol with importation of PLC memory variables at runtime	2
Rockwell EtherNet/IP Communication protocol with importation of PLC memory variables at runtime	2
Siemens S7 TIA PROFINET (1) Communication protocol with importation of PLC memory variables at runtime	2
Integration of existing applications in C# language compatible with .Net standard 2.0	-
OPC UA Server - single client	1
ODBC Database - single connection	1

(1) Supports the variable import from TIA Portal and communication S7-1200 / S7-1500 controllers via symbolic addressing

Used Tokens
The flexibility of UNIQO's business model is evident: for the same license (XS) the customer can best choose how to use the 5 tokens available.
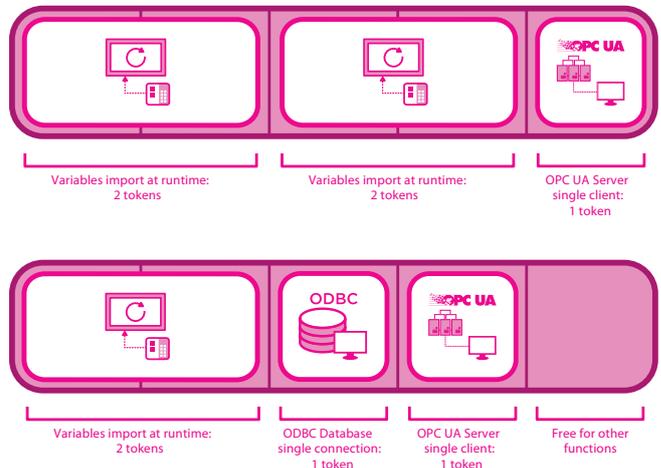
Case 1:
The RM20 device can support 2 different communication protocols on the same device and the OPC UA server, a universal interface for communication with other systems.

Case 2:
Otherwise, it is possible to connect connect one RM20 device per machine and add other UNIQO features such as MySQL depending on the needs of the application, and the OPC UA server, universal communication interface with other systems.

Licence XS in Embedded ARM systems: 5 tokens

Variables import at runtime: 2 tokens

Variables import at runtime: 2 tokens

OPC UA Server single client: 1 token

Variables import at runtime: 2 tokens

ODBC Database single connection: 1 token

OPC UA Server single client: 1 token

Free for other functions