From the sales office right through to the dispatch depot: Ware-house Automation with Scada

The circulation and storing system of merchandise manufactured by Rik-Fer of Pordenone (Italy) automated by Co.Mar Automation.

Rik-Fer is an important company operating in the manufacturing of iron products for the furniture sector. Founded in 1960, Rik-Fer through the years has developed its own original design and become one of the top companies for its artistic expression in cast iron. This accomplishment has gained it a strong hold on the international market where its products are exported all over the world. These products are manufactured by fusing hi-level automation together with a sector dominated by artistic expression. This company, located near Pordenone (Italy), employs around 120 people in an area of 11,000 square meters.

The increasing mass production of semi-finished cast iron parts destined for manufacturing railings, stairs, gates and similar, gave Rik-Fer the incentive to invest in installing robotized production systems in both the casting and welding assembling sections.

Co.mar Automation have been partners with Rik-Fer for many years to provide them with the right automation for this particular production area as specialists in designing, building and installing NC and PLC automation systems.

Another Rik-Fer need emerged, in response to its mass industrial production, to automate its

logistics and storage of finished and semi-finished products.

Their warehouse was managed manually and could not keep up with logistics demands, especially when exclusively working on a 'just-in-time' basis. Therefore Co.mar Automation was entrusted the task to analysis the feasibility in keeping a warehouse with 1500 storage spaces automated to manage the requirements deriving from company information systems (Sales and Order management) to packing goods onto pallets or in containers ready to be dispatched and delivered by road, sea or air.

They came up with a automated logistics system which manages storage and withdrawal procedures of semi-finished and finished goods, in different weights and sizes, for both internal use or for external supplier use. Apart from being very user-friendly it has also been designed with great emphasis on safety of all the personnel involved.

System information integration allowed the logistics process to be managed directly from receiving the order right through to delivering the goods to the customer.

The project, which was completed within six months by gradually activating the loading/unloading aisles without effecting the normal running of the client product activity: the shuttles of the two central aisles were automated first then those of the two outside aisles which were then all integrated into the company information system working in an Ethernet network.

A demanding task

Rik-Fer had two clear and precise goals: to make market headway and to get orders dispatched on time. Their warehouse had become a bottleneck. The manual management of 1500 pallet posts, where getting the right

products in the right place at the right time, was not always easy and, naturally evitable errors caused delays and production line inefficiency. They assigned Co.mar the mission to:

- Concentrate all warehouse management data on one single workstation based on a Personal Computer linked to the managerial information system connected to the company network.
- Create simple processes for loading/unloading goods that do not need workers with particular qualifications to handle them.
- Contain costs in realizing this project
- Use equipment resistant to the environment in which they work.
- Ensure the maximum safety for workers while loading and unloading goods.
- Ensure maximum safety in handling automated machinery.

The patrimony of experience gained in years of working in highly flexible automation and its versatile organization has allowed Co.mar Automations to present itself as the ideal

Rik-Fer revamped the warehouse by applying Movicon Supervision to manage it completely in automatic.

interlocutor for designing and realizing warehouse automation, by planning and coordinating all the modifications needed to the existing structure involving mechanics, electrics and electronics. The mission was accomplished successfully and within a few months the whole system was working completely in automatic.

Architecture and running of warehouse:
The warehouse has four aisles, with shelving on each side, where freight elevator shuttles run to and fro on a monorail. Each aisle has two loading/unloading bays, one on the right and one on the left, which are equipped with a weighing device.
The shuttles take out or store the goods according to the orders received from the central administration management system through the Ethernet network, which connects the supervisor workstation (based on the Movicon Scada) to the management. The Movicon supervisor manages the warehouse components and mapping, and creates the extracting and depositing missions to be carried out by the four shuttles based on the orders to be dispatched. The missions are executed by operating a Master Simatic S7 PLC and other independent peripherals aboard the shuttles, linked up in MPI by infrared wireless support.
The warehouse management and control is today entrusted to one operator only, with the task of sorting out orders and dispatching them with the right delivery transport means.
Based on the managerial system requests, the Scada system verifies with its database and, by communicating with the shuttles, starts the necessary missions to withdraw the metal crates or containers containing the goods required from the storage cells and deposits them in the right unloading/loading bay. An intelligent system for automatically

calculating the number of articles in each container without requiring operator intervention was tested and trial-ran successfully. This system is programmed to carry out continuous stock counts of realtime product availability in the warehouse, by calculating the number of articles based on their actual weight and that of the container's while being withdrawn and deposited. The test turned out to be exact guaranteeing a high level of autonomy and reliability. Thanks to the control checks, carried out for each mission, on the number of articles kept in the containers, (value obtained by dividing the container's weight with that of the articles', recorded on database), the system verifies and gives confirmation to the operator to extract them. Once this operation has terminated the system carries out another check by confronting the data, contained in the order being executed, with that of the goods which were effectively extracted and, if correct, transfers the container to its destination cell. The shuttle missions can be executed to carry out parallel extraction of goods from different aisles simultaneously along with a succession of extraction

The operator used to manually extract the goods while onboard a shuttle. Now everything has been automated by a system that receives purchase orders from the company management and executes the necessary dispatch procedures all in automatic.

processes of goods in the same aisle. This software has also been designed for managing warehouse loading operations, where the central PC operator has to control various items while the operation is underway, such as: codes, article type, quantity and so on.

Revamping:

The main objective of the project was to revamp the existing manual day-to-day running of the warehouse where the operator had to move around on a shuttle and physically searched for the items to be dispatched according to order printouts from the sales office. The initial idea was install automation to command and control shuttles from a computerized system capable of automatically running order dispatch missions.

To achieve this, special extractor/depositor procedure, elevators were built and placed at the head of each aisle, to take the weight of heavy containers deposited by shuttles while loading and unloading products. This involves two operations: transfer containers to a level that can easily be   accessed by operators and activate the mechanism for raising heavy cells (mechanism needed to prevent storage cells from being knocked out of place while containers are being loaded by the dispatcher forklift trucks).

All the necessary modifications have been studied and applied to include a shuttle management which didn't exist before: installing PLCs, installing Encoders for managing controlled movements, as well as replacing motors with ones to drive the controlled axles which move the shuttles and the freight elevator vertically along the aisle. Control devices, supervisor PCs, managerial PLC systems for wireless data transmission to shuttles, system and command panels have been designed and installed.

The supervision system:

The supervision system is the warehouse's heart. All the 1500 posts are controlled and mapped on the PC so that the operators keep the warehouse running constantly and goods supply under complete control.

The supervision system is connected to a managerial system in an Ethernet network and is capable of receiving lists of goods to be dispatched due to its data sharing ability.

The managerial system can verify which orders can be fulfilled, according to realtime warehouse stock data, and organize the production of those goods on orders not currently in stock.

The orders to be dispatched are sent directly to the warehouse due to the exchanging of order lists stored on shared SQL Server database tables.

The supervision system is therefore able to automatically verify whether the goods, on the order lists to be dispatched, are available in the warehouse and start the necessary extracting and depositing missions for the operators, whose job it is to shunt the goods off on delivery.

Movicon Scada, produced by Progea, was chosen for its potentiality in SQL database interfacing management and capability with SQL databases and for its particular transparency in exchanging data with the management system.

The graphical interface, created by Co.mar, is extremely user-friendly and designed expressively for the non-expert personnel use.

Thanks to the Scada platform's characteristics, Co.mar was able to create a powerful and complete system in a short space of time, dedicated with the delicate task of managing the warehouse data and generating the appropriate missions.

The platform's hi-reliability ensures safe data storage (data backups are done automatically for security reasons), which is vital for any application dealing with "critical missions".

Remote Assistance Service

Even though Co.mar came up tops with optimal and reliable solutions they also needed to install a remote management and control system to give prompt long distance client assistance in the event of any anomaly or software updating. In order to achieve this, the decided to connect the PLC of the Master

frame (by using a Siemens card) directly to the company's network, which was

One of the loading/unloading bays. A weighing system makes an exact and precise calculation on goods available.

connected by a router to the internet. This created a hardware support that was capable of connecting from remote PCs directly to the warehouse PLC. This system, one of the first to be used in Italy, without the aid of analogic modems and purposely-dedicated telephone lines, permits fast connections with ADSL 640Kb lines with total security when transmitting data and accessing the company network by filtering the entry of logged on users using connections with static IP.

Conclusion:
A versatile organization, combining heterogeneous competences into one

reality, (mechanics, electronics and software) and acquired know-how developing new technologies in various sectors, Co.mar has proved itself in planning and realizing a tailor-made application based on the customer's needs.

The automatic warehouse now allows the company to be updated, in realtime, on the quantity of finished or semi-finished stock, to be quicker in dispatching client orders, to have an integrated data management between the various company office divisions and warehouse functions and to manage products to cohere with their life-cycle in realtime (index rotation management) with consequent reductions in warehouse immobilization.

All these operations are managed with simple procedures where the only manual involvement of the worker is to load or unload goods from the containers and confirm the completion of each operation. The automation system updates all data and supplies it to the company's information system. This automation also ensures complete safety in the working environment by reducing manual operator intervention and by managing the unmanned transportation of heavy loads, lessening exposure of accident risks.

Movicon is the scada system used and has proven successful in this delicate task by demonstrating to the satisfied Rik-Fer company that it is very flexible, powerful, and reliable.

Thanks to:
Marco Colombini
Andrea Acquafresca
Co.mar Automation Italy