Productivity Supervision and efficiency in the lubricating oil production line

A multinational oil company uses Movicon.NExT to manage the production line of lubricating oil for motor vehicles in its Italian plant in Cornaredo, Milan.

Softec Srl from Parma develops software that manages automated systems in the palletizing and manufacturing plant supervision field as well as software for machine automation. Based on experience that expands over twenty years, the company offers specific manufacturing plant supervision applications, barcode recognition, product labelling and traceability systems. In addition, they also develop systems for calculating productivity performance indexes, Alarm analysis and statistics, which are productivity efficiency improvement-oriented. Furthermore, they also specialize in replacing and converting obsolete automated systems with the latest technology. The clients, who assigned Softec the project described in this article, are leading manufacturers, distributors and suppliers of oil lubricants for a famous multinational oil company in the automobile, maritime and aeronautic sectors.

The project's automation solution

Oil lubricants for motor vehicles are produced at the Cornaredo manufacturing plant in the region of Milan for a well-known oil trademark.

Movicon.NExT 3.1 has been installed in the assembly line that handles 4 and 5 litre oil containers. The filling line consists of different machines, each one managed by a PLC.

1. Movicon.NExT screen representing the Container Filling Line graphically

The depalletizer is the first machine used in the filling line. It picks up the empty containers from cartons stacked on pallets and places them onto the conveyor belt. Each container is then marked with a printed batch code and verified by a camera.

At this point, another machine sticks product labels on both sides of the container before continuing on to the filling machine where it is filled with oil. Once filled it continues on to the capper machine, which screws a cap onto the container and attaches a warranty seal. While this is being done the container is given a final weigh in. A second camera checks that is it has been labelled correctly and that the cap has been screwed securely. Once approved the sealer machine fastens the warranty seal on with glue. The correctly assembled containers are then placed into cartons that are distributed by the carton machine and labelled before placed on pallets by the palletizer machine. The wrapper machine wraps the pallets with a protective plastic film. The process is completed when another machine sticks on a label containing the transport data and destination details.

2. Labelling Machine Status dashboard created with Movicon.NExT

System Description

The Movicon.NExT platform is connected to all the assembly line machines with the objective to collect the information needed to monitor operating status, active alarms, instantaneous speed rates, counters and other items in real-time. 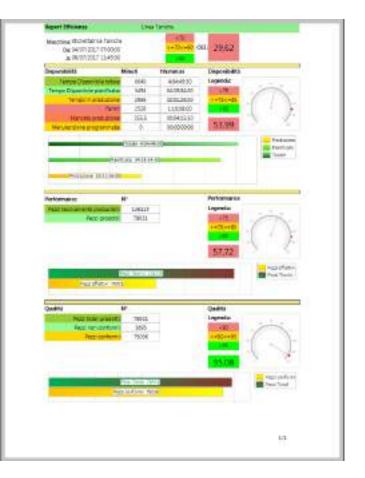This system has been designed to receive big data containing key information from each machine. These data are used by Movicon.NExT to calculate the availability, performance and quality indexes (OEE, KPI and DOWNTIME) as well as performing downtime statistics for the time ranged specified. Collected data are stored on a PLC data concentrator that communicates with all partner devices participating in the plant system. Devices interconnected throughout the plant where possible with Ethernet or existing bus connections. Movicon.NExT displays the real-time operating status of each machine, durations of various states on histograms and productivity flow trends using charts. In addition, the status and levels of silos in the product supply department are also displayed and logged. The SCADA is in continuous communication with the PLC data concentrator and historically logs a major part of the data on a SQL Database using data loggers.

3. OEE display and KPI – Key Performance Indicator Dashboard

The recorded data are:

- Produced container count
- Machine status (stockpile, rejects, downtimes, etc.)
- List of alarms causing machine downtimes

All this information is processed in real-time and displayed in reports created on request by the operator using predefined filters. These reports reconstruct production batch trends and identify any time or containers lost during the filling process. Reports are available for each production batch to show all the previously recorded parameters: quantity of containers produced, production trends, alarm statistics, assembly line efficiency and OEE measurements. Some of the key Movicon.NExT tools were used to develop this system and include the I/O Data Server module to manage real-time information and the Historian module to ensure efficient data recording. These modules are crucial for accurate data analysis

to obtain the vital information needed to improve productivity. The Hstoricals are managed by the Historian module and can be displayed by using the powerful analysis tools from the Movicon.NexT toolbox. VB.NET script has been used in the application to execute normal routines or those encapsulated in the Progea Platform objects. The Server module and the event/command scheduler provide easy and simple configurations of objects designated to execute specific functions according to precise scheduled times or durations. Whereas powerful analysis reports are created and displayed using the Report Manager. An intuitive and object-oriented interface is used to create reports within a few simple steps. This is facilitated by using wizards that are provided by the platform along with report templates. The operator can display, print and export the reports in any one of the most commonly used formats, that include PDF, HTML, RTF, XPS, XLS and XLSX, as required. The I/O Data Server uses the OPC UA specified communication data model to ensure that data exchanging is open and safe. A data controller and processor terminal resides in the Production Manager's office.   Managers have been provided with a data analysis feature that allows them to quickly identify critical areas of the productivity process that need improving to obtain better system efficiency and productivity. This feature comes with the aid of the Movicon.NExT Alarm Manager. This powerful tool is used to perform event and downtime diagnostics with results shown in reports according to total and partial times. These reports provide a detailed summary of each individual alarm analysed and can be displayed or printed on command or event.

4. Labelling Machine's OEE Report

Conclusion

The system is based on slim architecture designed for simplicity to facilitate usability and sustainability. The fact that it can be centralized and connect to all machines makes it easy to control the whole production process from one individual workstation. Therefore, there is no need to operate each production line individually on the spot. The Client's explicit demands for a simple and effective tool that could ensure data collection, aggregation and analysis in line with Industry 4.0 that was also cost effective, were fulfilled with great satisfaction. The reality of productivity, in today's ever increasingly competitive world, necessitates the application of the industry 4.0 concepts and guidelines to sustain

efficiency, quality and continuous improvement in all processes within the productivity chain globally.   The mission of the solution providers assigned this project, was to develop one unique tool that was simple and efficient to use. One that was Industry 4.0-ready to ensure data collection, aggregation and analysis at a low investment with rapid returns. Productivity is becoming more competitive in today's fast digital world. The pressure to keep up

5.   Container Filling Line KPI summary report

with the times and be future proof has never been so felt. More emphasis is now placed on the Industry 4.0 guidelines to achieve efficiency and quality through a continuous process of improvement making. Within just a few months of using Movicon.NExT, the end user was able to know which were the major problems causing production losses on the assembly line and during which production phases downtimes occurred most frequently. The system also made it possible to detect and analyse those parts of the assembly line that diminished in performance during prolonged production runs. In addition, the operator is saved the tiresome task of paperwork that was previously needed to document the problems encountered and the total count of pieces produced at the end of each shift. According

to Mr Pappani, Engineer and General Manager of Softec, "From a development perspective, Movicon.NExT has proved to be easy to configure and use". He also commented that, 'Furthermore, the VB.net scripts allowed Softec to save more time by being able to recover and use parts of previously written code for other applications. Movicon.NExT has a lot of ready-to-use tools that have helped us save time in writing code as well. From a graphical perspective, Movicon.NExT offers a new user interface concept that deploys the accelerated graphics features of the latest generation of DirectX systems. This has enabled us to make good use of the exceptional WPF/XAML vector graphics technology that also support graphics in 2D and 3D." He concludes by saying that, "The training courses and highly qualified technical

support services make Progea a strong point of reference that has helped contribute to reducing installation and setting up costs." Greatly satisfied with the results, the company decided to expand the project which is now already in the realization phase.

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