

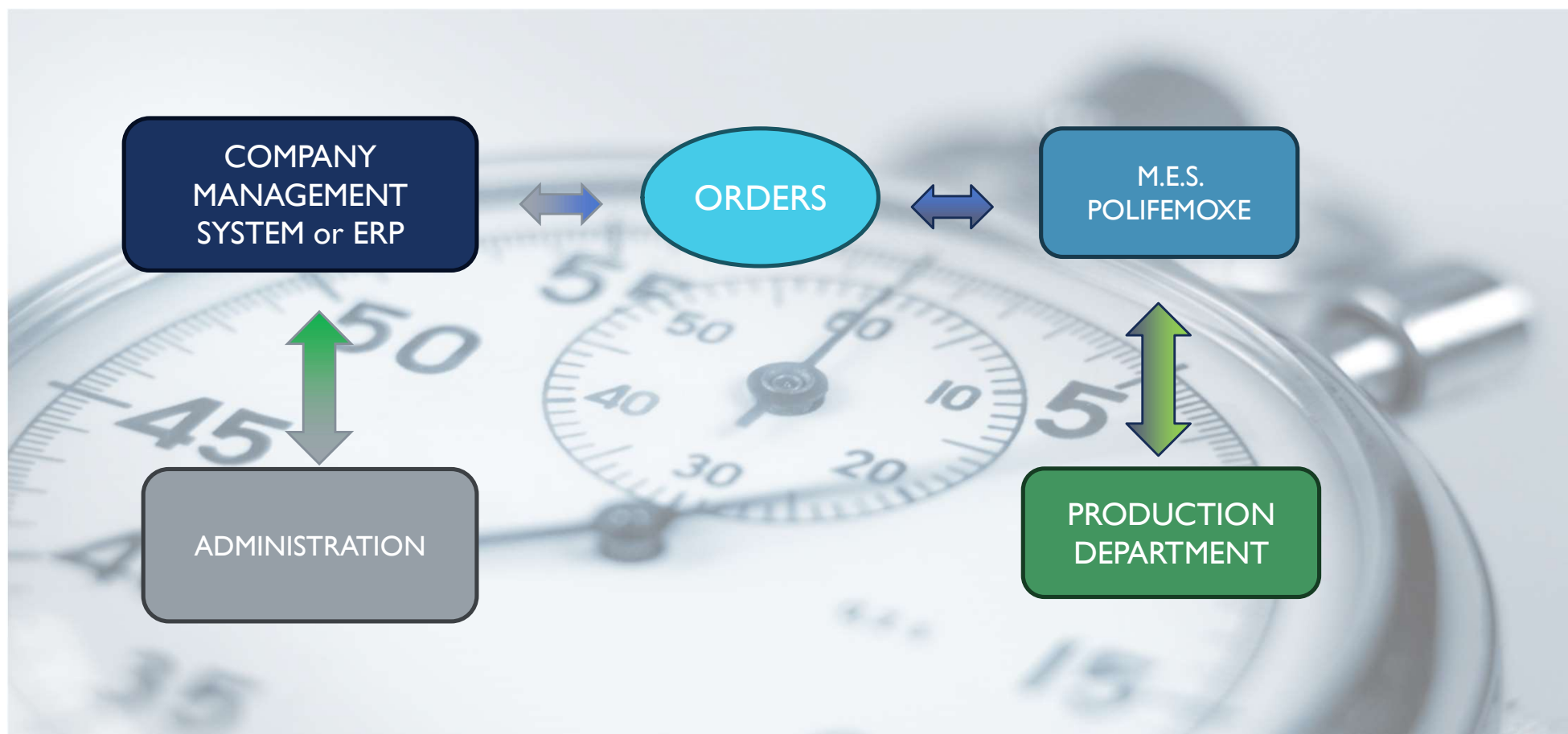


INTERCONNECTION WITH THE PRODUCTION MANAGEMENT SYSTEM

POLIFEMOXE



THE DATA EXCHANGE INTERFACE BETWEEN THE MACHINE AND THE COMPANY'S INFORMATION SYSTEM IS MANAGED THROUGH THE POLIFEMO APPLICATION, A PRODUCTION MANAGEMENT SOFTWARE DEVELOPED BY ITACA SRL



EXPLORING THE SYSTEM: INTRODUCTION TO DESCRIPTION AND HARDWARE CONNECTIONS

System Description

- Itaca's Polifemo Xe supervisory software enables the monitoring of production machines, as well as the management of their records and scheduling. Through appropriate connections to the machines, it is also possible to collect data for production progress and set parameters for machine programming. The system is based on a production server that acts as a data hub and one or more clients within the network, which can perform management activities in full or in part, depending on the access rights assigned to each workstation.

Hardware Connection

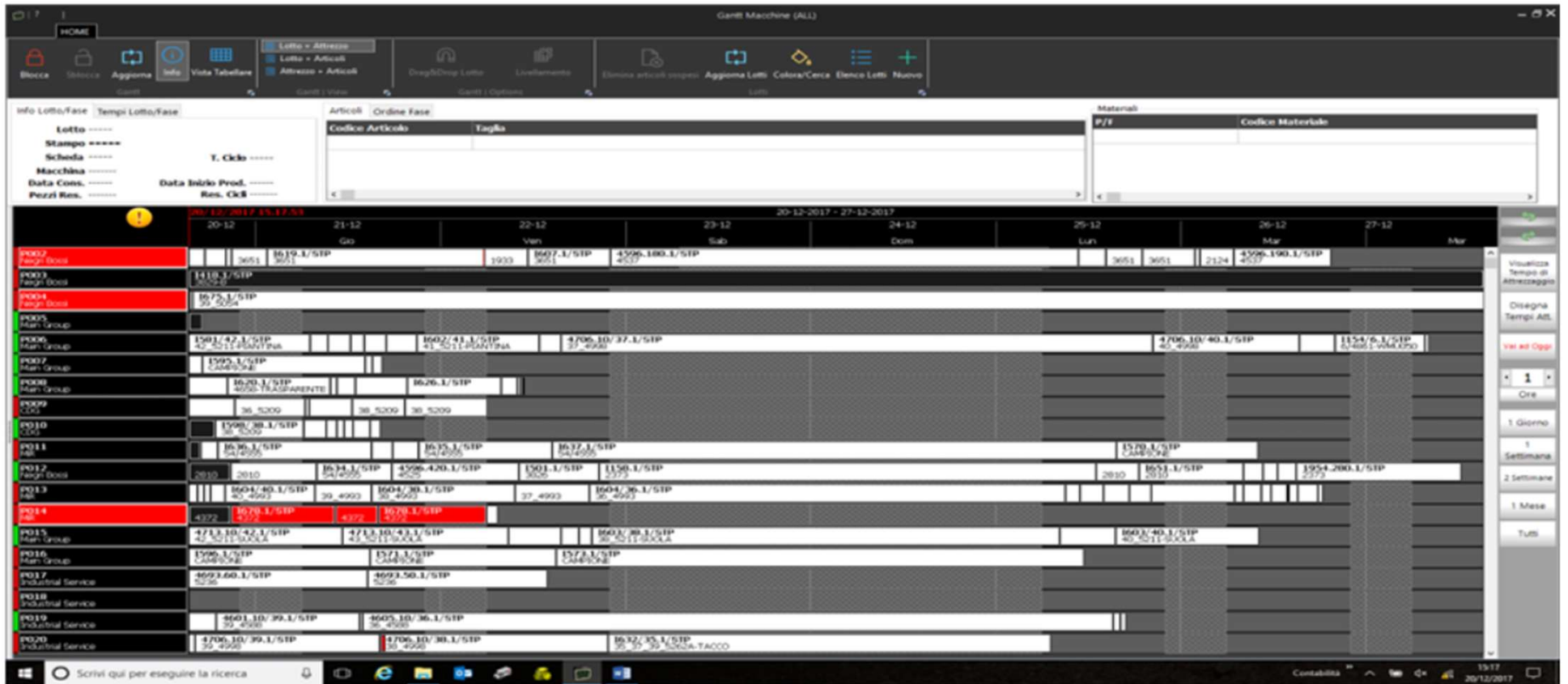
- The interface management for the machines and the corresponding connection is handled through an Ethernet network between the machine's supervisor (a PLC of various models depending on the type) and the data acquisition PC, located within the same company network. Through specific ad-hoc processes, it reads production data and writes programming data.

DATA EXCHANGE

The screenshot displays the Polifemo Xe software interface. On the left, a table lists various production records with columns for ID, Code, Description, Tagline, Editing, Macrologica, Estaglio, Status, and Price. The record with ID 827 and Code '0000280AC-GZ' is highlighted. On the right, a detailed view of this record is shown, including a 'Control Quality' section with a tree structure of production steps and parameters.

ID	Code	Descrizione	Tagline	Editing	Macrologica	Estaglio	Status	Prezzo
829	00001881	TRASPARENTE VARIO	NO	[SET0000]	Settore Default	[COMPR0000]	OK	0,000 G
827	0000280AC-GZ	FAST TRACK +	NO	[SET0000]	Settore Default	[COMPR0000]	OK	0,000
827	0000280AB-GZ	TAPPO FAST TRACK	NO	[SET0000]	Settore Default	[COMPR0000]	OK	0,034 KG
827	0000280AC-GZ	FAST TRACK -	NO	[SET0000]	Settore Default	[COMPR0000]	OK	1,300 KG
832	0000430AA-GG	CARTER DA VARIO NUOVO LOG-GA	NO	[SET0000]	Settore Default	[COMPR0000]	OK	0,000
832	0000430AA-GG	CARTER DA VARIO NUOVO LOG-GA	NO	[SET0000]	Settore Default	[COMPR0000]	No Fase	0,000
827	0000430AA-GG	MANGIOLONE DA NUOVO LOG-G	NO	[SET0000]	Settore Default	[COMPR0000]	No	0,234 KG
827	0000430AA-GG	MANGIOLONE DA NUOVO LOG-G	NO	[SET0000]	Settore Default	[COMPR0000]	OK	0,000
814	0000122-GG	DISTANZIUNGO POGGIASALLE	NO	[SET0000]	Settore Default	[COMPR0000]	OK	0,000
814	0000350AC	MANGIOLONE	NO	[SET0000]	Settore Default	[COMPR0000]	OK	0,000 G
828	0000287AA-GG	MANGIOLONE BIKE 2HG	NO	[SET0000]	Settore Default	[COMPR0000]	OK	0,000
827	00002424	DADO M4	NO	[SET0000]	Settore Default	[COMPR0000]	OK	350,000 G
842	00004307L	TACCO 6430/5262A LILLA	NO	[SET0000]	Settore Default	[COMPR0000]	OK	23,000 G
842	00004307N	TACCO 6430/5262A NERO	NO	[SET0000]	Settore Default	[COMPR0000]	OK	0,000
842	00004307P	TACCO 6430/5262A PAVINA	NO	[SET0000]	Settore Default	[COMPR0000]	OK	0,000

- In Polifemo Xe, after defining the required records within the system (or acquiring them from a remote management system), the user can schedule the activity of each machine connected to the system. Specifically, the user will program a series of production batches for each item/quantity.
- At the time of the production change, the remote user, from one of the Polifemo Xe system clients, will confirm the change. This operation will trigger the writing of the current article, the number of pieces to be produced, and, if previously stored, all the recipe parameters already used for this article on the specific machine.
- At this point, the operator will verify any parameters that have been written and will give the go-ahead for the production to start by accepting the change on the operator's keyboard at the machine.



PARAMETERS SAVING

Once production has started, the remote system remains in constant connection with the machine, reading the number of pieces produced and any ongoing alarms. The operator can change the working parameters for the current article and, once these parameters are deemed valid, can request their saving to the central system.

INTEGRATION AND COMMUNICATION: IMPLEMENTATION FOR CONNECTION BETWEEN MACHINE AND INFORMATION SYSTEM

Communication between the machine and the information system occurs using international data exchange standards, keeping in mind that the rules of the protocols are based on three different aspects:

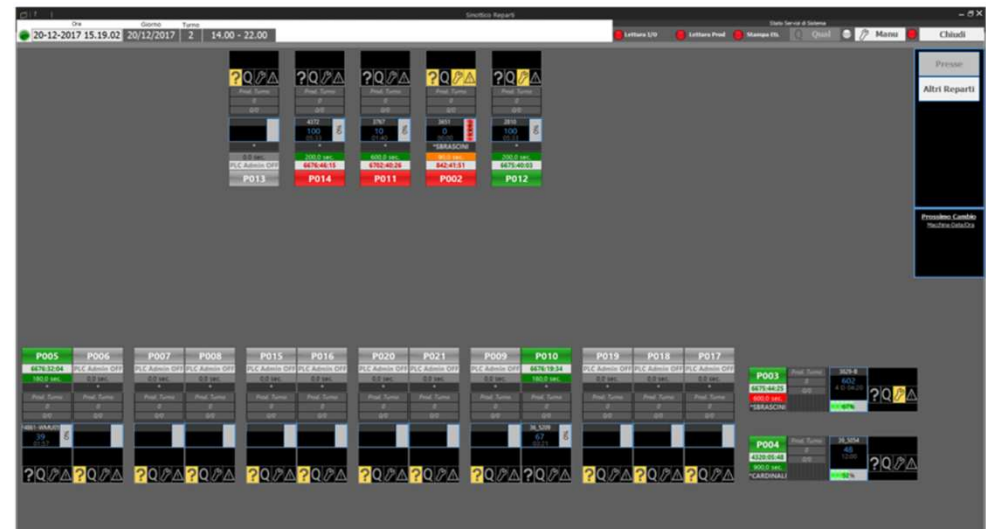
- The hardware support used, specifically which "hardware communication line is utilized," includes Ethernet TCP/IP (which is further divided into wired and Wi-Fi), Profibus, Profinet, ModBus, etc.
- The basic communication protocol used, that is, 'the communication mode that follows a basic standard,' including the use of network sockets, data exchange on databases, file exchange via FTP, OPC-UA, OPC-DA, etc.
- Lastly, but certainly the most important, is the so-called Handshake, which refers to 'the mode in which data exchange occurs.' There are certified international standards for this, such as the Euromap 77 for presses, or freely established methods agreed upon from time to time among different machine manufacturers. It is also necessary to have a list of 'exposed tags' to write the code for the 'Part-program' and to monitor the production progress (these are essential conditions for compliance with Industry 4.0, including the associated tax benefits).



OPERATIONAL OPTIMIZATION

The instructions exchanged between the machine and the factory information system are related:

- to planning,
- to scheduling,
- to process control.



INFORMATION FLOW FROM PRODUCTION ORDER ENTRY TO MACHINES

As for the information transferred from the factory management system to the machine, these can be summarized as follows:

Production order table (production jobs)

Production batch table

Machine setup table

The screenshot displays the 'Stampaggio' (Molding) control interface. Key data points include:

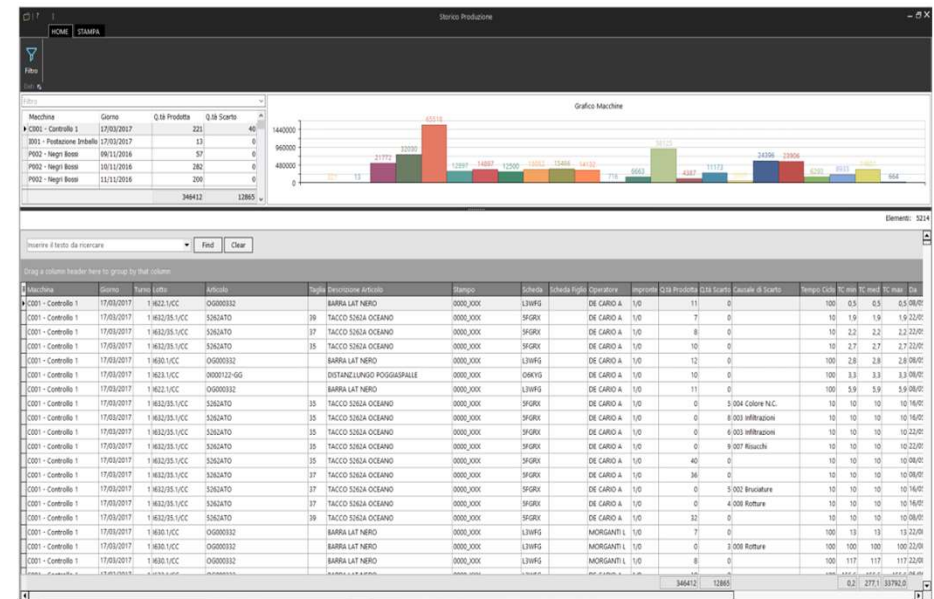
- Stampo:** 453-TRASPARENTE, Pos. TERSA 1, Pallet
- Machina:** (P005) Man Group, Ubicazione 8, Matricola 0000
- Ciclo:** 31.00 SEC, Num Stampate 1, Ciclo/Ora 70, Pz/Ora Tot. 140
- Articoli:** OC 1809/1811, TRASPARENTE ETICHETTA CLIFRICOTTI VARIO, Nuts. 2, Peso 1 8.00, Pz/% 140
- Materiali:** TCX, In Stampaggio 0.00, In Officina 0.00
- Funzionamento:** AUTOMATICO, GIORNO, NOTTE, SEMIAUTOMATICO
- Quota Apertura:** Lento 0.00, Lento quota 2.00, Velocità 0.00, Freno 0.00, Freno - Quota 0.00, Quota effettiva apertura \ ricoda per consenso robot 0.00
- Quota Chiusura:** Velocità 0.00, Freno 0.00, Freno - Quota 0.00, Vel. finale 0.00, Vel. finale quota 0.00, Basso pressione 0.00, Basso pressione quota 0.00, Alta pressione quota 0.00, Forza chiusura

In Polifemo Xe, the user can define the necessary master data from the system or, alternatively, acquire it from a remote management system.

PROGRAMMING AND CONTROL OF PRODUCTION ACTIVITIES:

ORDER MANAGEMENT PRODUCTION CHANGE, AND PROCESS PARAMETERS

- The user can schedule activities for each of the machines connected to the system.
- At the time of the production change, the remote user, from one of the clients of the Polifemo Xe system, will confirm the production change.
- If the necessary setup fields for the machine have not already been defined for that item, the user can enter them into the Polifemo Xe system and send them to the machine. This way, they are saved for future use if the condition arises again.
- At this point, the operator at the machine will verify any parameters written on the platform, check their accuracy, and give the go-ahead for production to start by confirming the change on the operator's keyboard at the machine.
- Always through the communication protocol, once production has started, by accepting the Part-program, the system remains in constant connection with the machine, monitoring the produced pieces and any ongoing alarms.



ARCHIVING AND MANAGEMENT OF PRODUCTION DATA: OPTIMIZATION OF THE PRODUCTION CYCLE AND PERFORMANCE ANALYSIS WITHIN THE CONTEXT OF THE MACHINE CONTROL SYSTEM

- Any changes made at the machine regarding process parameters can be archived and used to modify the production cycle/recipe. This data can be dynamically associated with the item code. The saved production data can then always be accessed by viewing the product bill of materials.
- All produced batches are archived and stored to provide productivity analysis and efficiency statistics.

CRUCIAL COMMUNICATIONS: DATA TRANSMITTED FROM THE MACHINE TO THE PRODUCTION SOFTWARE TO MONITOR AND OPTIMIZE THE PROCESSING WORKFLOW

The machine can communicate the following data to the production software:

Start of processing, including the identifying data of the piece, the batch, the production order, and the process settings

Real values and states of the main machine functions (Times, Speed, Pressures, Temperatures, Positions, total machine operating hours counter, number of cycles performed, press status, instantaneous powers, etc.)

End of processing, including the identifying data of the piece, the batch, the production order, and the process report.

Alarm status; Configuration variables (Times, Speeds, Pressures, Temperatures, Positions, machine cycles).

Machine operating status (start of machine downtime with time and date; end of machine downtime with time, date, downtime code, and operator)

Production variables (pieces produced, batch, type of material, theoretical production time).



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