Interconnection to the POLIFEMO production management system

The data exchange interface between the machine and the company information system occurs through the application software POLIFEMO, a production management software produced by ITACA SRL.

System description

The supervisory software 'Polifemo' by ITACA SRL allows better supervision of the moulding machines, as well as master data management and their programming. Through appropriate connections to the machines, it is also possible to acquire data from them in order to track production progress and to write the parameters necessary for programming the machines themselves. The system is based on a production server that collects data and one or more clients within the network that can perform some or all of the management activities, depending on the access rights provided to each workstation.

Hardware connection

In the specific case of an interface to the moulding presses, the connection is established through an Ethernet network between the PLC management of the presses (there are different PLC models depending on the type of press) and the PC-based data acquisition located within the same company network, which, through specific processes, read the production data and write the programming data.

Data Exchange

Within our software “Polifemo”, the user, after having defined by default the necessary master data set (or having acquired it from a remote management system), can program the activity of each press connected to the system. Specifically, for each press it will program a series of production lots per item/quantity. At the time of the mould change, the remote user shall confirm the procedure from one of the Polifemo system’s clients and then it will record on the machine the current article, the pieces to be done and possibly, if previously archived, all the Recipe Parameters already used for this item/size on the press in question. Obviously, this activity will reset on the press the number of pieces that
had already been made. At this point the machine operator will check any written parameters and give the green light to start the production by allowing the change on the machine keyboard operator.

Once the production has started, the remote system remains in constant connection with the press, reading the pieces already made and the alarms in progress. Moreover, the machine operator will also be able to change the working parameters for the current article and, once their validity had been checked, the operator could at any time press the 'Save data' button on the press keypad and this will order the 'Polifemo' remote system to store the production data per article/press.

The communication between the machine and the information system takes place using the international OPC DA standard (OPC in Euromap 63 emulation for some machines). In the information system, is inserted an OPC DA client that communicates with an OPC DA server located on a PC-based data acquisition from which you can access the press.
PLC, uniquely identified by an IP address, through the customer’s company network. The data are situated in the PLC, but they are made available to the production information system by the OPC server, which reads the production data and writes the programming data. The data format depends on the type of variable to be accessed, that is: binary, integer, real, etc. according on how it was created within the programme in the PLC.

The instructions that are exchanged between the press and the factory information system are linked to the process planning, scheduling and control.
As to the data transferred from the factory information system to the press, these can be summarized as follows:

- Production order table;
- Production lot table;
- Machine set-up per unit table (order feature).

Indeed, within our software “Polifemo”, the user can define by default the necessary master data set or acquire it from a remote management system through the “Import/Export” function that connects the software directly to the SQL database of the business management system.

After that, the user can program the activity of each press connected to the system. Specifically, for each press it will program a series of production lots per item/quantity.

At the time of the mould change, the remote user shall confirm the procedure from one of the Polifemo system’s clients and then it will record on the machine the current article, the pieces to be done and possibly, if previously archived, all the Recipe Parameters already used for this item on the press in question.

Obviously this activity will reset on the press the number of pieces that had already been made.

Whether the fields for the machine set-up of that unit had not been defined yet, the user can enter them in the “Polifemo” system and send them to the machine. In this way they will be stored in order to be reused whenever the moulding condition of the same article is repeated.

At this point the machine operator will check any written parameters and give the green light to start the production by allowing the change on the machine keyboard operator.

Following the OPC protocol described in the previous section and through the acceptance of the part-program and of the machine start-up, once the production has begun, the system remains in constant connection with the press by reading the pieces already made and the alarms in progress.
Any changes made on the on-board machine to the process parameters may be stored and used to modify the mould cycle/recipe through the "save data" command. These data may be associated with the item code. The saved production data can then always be accessed by viewing the item list.

The system will proceed in this way until the next mould change in which a new item/size will be recorded on the machine along with the pieces to be done and, possibly, its machine data, saved on previous occasions.

All the finished lots are archived and stored in order to carry out productivity analysis and efficiency statistics.

The machine, in particular, can submit the following data to the production software:

- Start of processing, including the identification data of the item, lot, production order and process settings;
- End processing, including the identification data of the item, lot, production order and process report;
- Machine’s operating status (start of the machine downtime with time and date, stop of the machine downtime with time, date, stop code and operator);
- Alarm Status
- Actual values and status of the main machine functions (Timeline, Speed, Pressure, Temperature, Position, total hour calculator of the press functioning and number of cycles made during processing and status of the press, instantaneous power);
- Configuration variables (Timeline, Speed, Pressure, Temperature, Position, Machine cycles);
- Production variables (finished items, lot, type of material, theoretical production time).

In addition, for each press you can view a dashboard with all the stored parameters related to the press and the efficiency indexes.