

THE ERA OF REALTIME AND DETERMINISTIC CONTROL **HAS BEGUN**

WE ARE IN AN ERA WHERE CONTROL SYSTEMS ARE DESIGNED TO RESPOND TO EVENTS OR STIMULI WITHIN SPECIFIC AND PREDICTABLE TIMES, ENSURING THAT THE SYSTEM'S ACTIONS OCCUR ACCORDING TO A PREDEFINED AND DETERMINISTIC PLAN. DETERMINISTIC BEHAVIOUR MEANS THAT, GIVEN THE SAME INITIAL CONDITIONS AND INPUTS, THE SYSTEM WILL ALWAYS PRODUCE THE SAME OUTPUT AND THE SAME BEHAVIOUR WITHIN THE REQUIRED TIMINGS. IN OTHER WORDS, THERE ARE NO RANDOM OR UNFORESEEN ELEMENTS THAT INFLUENCE THE OUTCOME. REAL-TIME AND DETERMINISTIC CONTROL IS CRUCIAL IN APPLICATIONS WHERE TIMING AND PRECISION ARE FUNDAMENTAL, SUCH AS IN ADVANCED AND HIGH-PERFORMANCE INDUSTRIAL AUTOMATION SYSTEMS.



VLSPRO ETHERCAT

HOW DOES THE AUTOMATION AND SUPERVISION OF CONVEYOR BELTS CHANGE?

SMITEC inaugurates the era of real-time and deterministic control for logistics automation and the management of conveyor lines dedicated to bottling and packaging in the systems proposed by SMI.

The automation and supervision solution for SMI conveyor belts through the VLS (VaryLine System) PRO maintains the strengths that have characterised this solution until today.

In particular, the flexibility and openness ensured by a PC-based and distributed architecture, the use of a softPLC solution, and the HMI capable of offering extensive parametrisation; all elements that have



characterised the generation based on the PROFIBUS-DP serial fieldbus and that now give way to the more modern, high-performance, fast, and deterministic VLSPRO ETHERCAT solution (Ethernet for Control Automation Technology).



VLSPRO ETHERCAT

THE PAST, PRESENT AND FUTURE OF AUTOMATION

The important evolutions are those that maintain continuity with what has been validly applied in the past and know how to integrate the new, more efficient, open and real-time solutions. The key innovations in the transition from PROFIBUS-DP to ETHERCAT are:

1) PROFIBUS-DP is replaced by ETHERCAT (EC), a next-generation automation fieldbus based on Ethernet, which allows for superior performance and reliability in communication with inverters and other devices distributed along the production line, increasing the potential for integration with other present and future systems.

Main advantages:

- update of field I/O in the order of milliseconds
- ensures continuity of product in the future, no longer assured by PROFIBUS-DP, which has now reached the final stage of its lifecycle.

VLSPRO
EtherCAT
simpler,
more performance
& control



2) With the use of ETHERCAT, complex “add-on” fieldbus interface cards are eliminated, as this task can be managed directly from the ethernet port of the automation PC-PLC.

Main advantages:

- simplification of hardware configuration, eliminating the presence of an important component (the fieldbus interface card)
- increases the overall reliability of the system.

3) ETHERCAT overcomes the limitations of the delicate connection system of PROFIBUS-DP, moving to Ethernet connectors.

Main advantages:

- greater reliability and ease of installation.

4) Use of a state-of-the-art ‘softPLC’ (DIAGOS) for executing the control logic of the line.

Main advantages:

- real-time and deterministic execution cycle with millisecond timing, compared to the hundred milliseconds ensured by the previous VLSPRO PROFIBUS-DP solution
- control one hundred times faster and more accurate of the lines, with the ability to manage very high production speeds with maximum precision
- direct management of product flow manipulation systems, such as unloading and accumulation pallets without pressure, simplifying the configuration of the line itself, improving its overall reliability and reducing overall management and maintenance costs
- simplification of commissioning and maintenance operations, with reduced times and improved quality of interventions. The use of the new “softPLC” ensures, for example, a more accessible and high-performing development and debugging environment (TOOL IDE) in terms of compilation times (cut in half) and downloads to the PLC (reduced by 90%).



THE NEW SMITEC SOLUTION IN SUMMARY

VLSPRO ETHERCAT offers the ability to control with millisecond precision in a real-time and deterministic manner:

- up to 98 conveyor belts (driven by ETHERCAT slave inverters NORD)
- up to 3 unloading pallets, signal exchange (via MODBUS/TCP or through wired signals) for up to 10 machines in line
- up to 10 ethercat “slave” I/O modules.

Additionally, the new version of the system allows direct Industry 4.0 connection to supervisory systems (MES/ERP) with MODBUS/TCP protocol (client or server) and OPC UA (server).

VLSPRO ETHERCAT ARCHITECTURE

From an architectural point of view, VLSPRO ETHERCAT features a simple and classic configuration composed of a panel-PC (POSYC®), where the HMI for line control is executed, which connects via ethernet to a PC-PLC (CPC), that runs the line control program via the ‘softPLC’ DIAGOS.

The PC-PLC, through its second internet port, connects to the ETHERCAT network and thus to the line systems to be controlled (inverters and I/O modules), typically through at least one ‘switch’ in order to divide them into at least two sections (depending on the line layout).

Features	VLS PRO ETHERCAT	VLS PRO PROFIBUS
Fieldbus	standard, next generation	serial end of life cycle
Timing of fieldbus data acquisition	1 millisecond	50 milliseconds
Need for fieldbus interface card	NO (uses ethernet port)	YES (add-on card on PC bus)
Robustness of electrical connection fieldbus	High	Low
Type of control	deterministic real-time	not strictly deterministic
Control timing	1 millisecond	50 milliseconds
Soft PLC	next generation (DIAGOS)	end of life cycle
Soft PLC development environment	next generation and easily accessible	end of life cycle
PLC program compilation timing	several seconds	several minutes
PLC program download timing	several seconds	tens of minutes
Direct control capacity of fast systems	✓	✗
Product counting capability	✓	✗
Possibility of controlling high-speed lines	✓	✗
Availability of I4.0 OPC UA connection	✓	✗