# Parts of the future

CONTROL SYSTEMS AND MACHINE COMPONENTS ON VIEW AT THE PPMA SHOW HELPED GIVE A PICTURE OF FUTURE PACKAGING MACHINE DESIGN. REPORT BY SIMON MARSDEN.

Developments in control systems and components at this year's PPMA Show continued to give machinery users a look into the not so distant future, illustrating the technologies now available for machine builders to create an improving breed of packaging equipment.

Examples could be found in motion control systems, communications, inspection sensors, safety devices and servo system components.

However, to put all this in context, it is useful to go back a few years and consider, for example, the servo controlled machine and some of the issues manufacturers have had to overcome.

Until fairly recently, machine builders generally treated the elements of motion control and machine control logic as two separate functions when designing and developing a new machine.

Perhaps this was largely due to motion control being seen as a mechanically biased discipline, while machine control logic was seen as electrical or software biased. So any attempt at developing a coherent machine control strategy by standardising on one set of equipment for these different disciplines, may not always have been possible.

Apart from differing personal preferences and possible limitations in technology, a "best of breed" approach may have been taken during equipment selection. Certain suppliers were recognised as experienced in one discipline but not necessarily in the other. Hence, motion control equipment may have come largely from one supplier, while the PLC, sensors and actuators for the machine logic came from others.

This mixed approach to equipment selection limited overall integration of the various functions of machine control, either because of hardware incompatibility issues or because the programming methods and techniques were completely different.

Additionally, in the past, when communications standards were still being established, any integration between various systems and equipment was largely the responsibility of the machine builder. This raised the issue of support and co-operation between different suppliers, which may not necessarily have been consistent. So there are a number of issues to consider and overcome when adding functionality to a new machine.

Clearly, for machine builders to reap the commercial benefits of adopting new and improved technology, they have to invest heavily in a range of skills and experience before seeing any return.

However, many of these past pressures and problems have now been overcome. Significant advances by control equipment suppliers over the past few years have led to a more integrated control solution, with greater emphasis being placed on ease of set-up, operating, fault diagnostics, communications and support. In turn this has reduced the development effort and improved machine availability, significantly improving the return on investment.

Looking at some of the advances in motion control equipment, we now see controllers that can be configured, programmed and monitored through Windows based software. Additionally, they provide improved built-in PLC functions, automatic recognition, configuration and auto tuning of the drive to optimise its control loops, while there are also improved communications to external devices.

With the trend towards decentralised control systems and the availability of industry standard communications, control devices from different suppliers such as drives, sensors and actuators are now easily networked and distributed around the machine. This can significantly reduce the amount of time and cost during machine build, installation and commissioning, and when carrying out fault diagnostics during normal machine operations.

## Better decision making

With more communications to the machine providing more production information, better decision making can be achieved, be it at local operator level, at manager level over factory wide networks, or possibly globally over the world-wide web. Furthermore, these improved functions and facilities on the machine are increasingly easy to adopt.

For example, Elau's PacDrive range – handled in the UK by Intelligent Motion Control – integrates the motion control functions with an IEC 61131 PLC for the machine logic in one central controller. PC architecture is used running VxWorks, which is a real-time operating system running outside Windows.

For applications requiring intensive visualisation, image and data processing there is the PacPC, described as an "open" system which includes an HMI display running Windows as a task under VxWorks.

Elau provides Ethernet or OPC as the communications link to factory systems or the world-wide web. Its drives are connected using a high speed SERCOS bus, with Profibus, DeviceNet or CANopen being used to communicate to machine mounted sensors and actuators. The company says its use of PC architecture allows the user to employ the latest PC trends.

## Supervisory role

Quin Systems' approach is its central Machine Manager which performs a supervisory role, controlling the various motion tasks and taking care of the communications to any external devices. Quin's PTS software is used to program and run the Machine Manager and can also control the machine logic using an event driven method.

However, for more advanced or larger I/O systems there are options to communicate to third party PLCs using Ethernet, Profibus or DeviceNet. Quin distributes the servo drives over a high-speed bus, SERVOne, and provide a CANopen option for connecting to machine sensors and actuators.

Control Techniques has its MC Motion controller series, a multi-tasking processor which controls the various motion axes. One of these tasks can perform machine logic control running under Motion basic. However, as with Quin, larger or more complex I/O systems can be handled using a dedicated PLC, so to this end Profibus and DeviceNet communications options are available. The M'Ax and MultiAx drives are connected to the controller over the company's high speed SLM communications link while there is also a USB port on the controller to connect to external devices such as PCs.

However, traditional PLC suppliers may

approach this integration issue using various dedicated PLC mounted and distributed co-processor modules.

For example, Omron Electronics uses its C200H-MC402 or MCW151 motion control modules which are multi-tasking processors running independently of the PLC CPU and handle the various motion tasks. Programmed and run under Motion basic, with high speed interrupts being handled directly by the modules, they also have access to all remaining PLC I/Os.

The principal advantages of a traditional PLC approach are the improved integration of motion control with the rest of the machine logic, for example temperature control, and that the programming language is widely recognised by industry, and so easy to maintain and modify. Additionally, any machine mounted sensors and actuators can be connected over all the standard fieldbus systems and communication to factory networks or the world-wide web is possible.

While on the subject of communications, there are many industry standards now available and selecting control equipment that is compatible to them all can prove difficult at times. However, this is where the Unigate modules, shown by GDL Automation, could prove invaluable.

## Gateway to networks

The Unigate range is designed to provide gateways to and from just about any fieldbus network on the market today, which is achieved by "translating" information into their relevant packets such that they can be read across different networks. These modules are available as DIN mounting units or as PCBs designed for OEM applications.

Health and safety at work legislation is on the increase and there is a wide range of safety components available to meet the requirements.

Erwin Sick has a safety bus range that can co-exist on standard Profibus networks. Its latest UE4150 is an intelligent Profibus node that allows various safety devices such as light guards and emergency stop buttons to be integrated on to a Profibus network, with configuration and monitoring of these devices being achieved centrally to improve maintenance.

Further safety devices shown, such as the C2000, C4000 and M2000 safety light curtains are manufactured to IP67 and use materials that can withstand harsh environments, such as washdown, and can therefore be fitted directly to the machine.

Meanwhile, demand for more inspection and continuous monitoring on the production line is being met with a wide range of "smart" sensors, which are designed to be low cost and easy to configure with push-to-teach set-up routines.

Products such as "smart vision sensors" are ideally suited to general-purpose inspection applications where higher cost, more complex PC based vision systems would prove prohibitively expensive. For example, the DVT Legend range of vision sensors can provide solutions to a variety of applications: from simple low cost general purpose inspection, through to high precision, high speed colour recognition vision sensors for more demanding applications.

These units feature a number of configurable inputs and outputs for logic control while configuration and programming is carried out using their PC set-up software via its built-in Ethernet port. Switching between pre-stored inspection tasks is done either manually by the operator, or remotely using a PC or PLC. There are also options for linking multiple sensors over a common bus for total integration and for a built-in light source.

Likewise, Erwin Sick demonstrated its ICS 100 intelligent camera sensor for shape, pattern recognition and dimension checking applications. The ICS 100 is configured using the company's VSC hand held device and is a multi-mode sensor with a built-in light source for jobs such as inspecting label overprint.

Other sensors shown by Erwin Sick included contrast scanners to detect objects regardless of surface material or contrast, and luminescence scanners in which the sensor's UV light source picks up luminescent pigments on the target.

From Synatel came ATEX approved intrinsically safe sensors for hazardous areas, along with the company's general purpose control and instrumentation range which includes the new Whirligig sensor, designed to mount easily onto rotating shafts and detect stoppage or slippage during normal running conditions.

New servo equipment and components were present from Festo, Lenze and Quin.

Festo's latest servo-pneumatic system is aimed at volumetric filling applications. The SPC 200 controller provides actuators with multi-positional information and is designed to eliminate aeration, splashing and foaming during filling by precisely controlling the drawing and dispensing of fluids. In addition, the SPC 200 can be controlled by a PLC or PC so that any feedback from the process, such as in-line checkweighers, can be considered and adjustments made on-line to correct any errors.

The CPX, Festo's new modular electrical and pneumatic terminal, is compatible with all the leading fieldbus systems, allowing integration to the remaining control system. These terminals can be supplied pre-assembled and tested with a range of digital and analogue I/O modules.

Lenze has launched a new range of servo drives and motors, the Panasonic A series, said to provide high performance with fast response to dynamic signals, particularly for high-speed applications. Improvements to the smooth running of the motor are provided by a frequency analysis function in the drive, which is said to minimise motor shaft vibration.

## Windows based software

The A series motor range is physically compact and rated to continuous operating speeds of 3000rpm, maximum short duration of 5000rpm, with rated torque up to 2.4Nm. Windows based software is used to set up the drive.

Quin's new R-Theta product-handling system, consisting of a motor, arm and controller, is aimed at pick-and-place applications where over 100 cycles/min with repeatability better than 0.5mm are required. R-Theta is configured using a graphical touch screen interface to set up its motion paths. Integration into a production line requires minimal disturbance due to its small footprint, while the system can be stand-alone or networked into an existing control system, with diagnostics shown on-line or remotely.

In addition, Quin's LinMot linear servo motors are designed for long life in severe industrial environments, suiting dynamic applications demanding high speed, and high accuracy with variable positioning. They are capable of accelerating loads up to 250m/s$^2$, with repeatability up to 0.01mm and peak forces of up to 200N. The controller can be programmed to provide various functions such as cam actions, and can be further integrated into an existing control system using either Profibus or DeviceNet interfaces. Typical applications include pushing stacked products onto a moving conveyor. ■

## For further information:

| | |
|---|---|
| Control Techniques | **enter 150** |
| DVT Sensors | **enter 151** |
| Festo | **enter 152** |
| GDL Automation | **enter 153** |
| Intelligent Motion Control | **enter 154** |
| Lenze | **enter 155** |
| Omron Electronics | **enter 156** |
| Quin Systems | **enter 157** |
| Erwin Sick | **enter 158** |
| Synatel Instrumentation | **enter 159** |