

# Networks in the air

THE MAIN AIM OF PNEUMATICS SUPPLIERS IS CURRENTLY TO REDUCE THE TOTAL COST OF SUPPLYING COMPONENTS AND SYSTEMS TO MACHINE BUILDERS AND END USERS. BUT AT THE SAME TIME THEY ARE BATTLING AGAINST A RELUCTANCE BY MACHINERY USERS IN THE UK TO ACCEPT MORE NETWORKING WITHIN THEIR PRODUCTION SYSTEMS.

Machine builders in the UK spent about £236 million on pneumatics in 2005, approximately the same as five years previous and representing a recovery from the 6 per cent dip of the intervening years. But while continued growth depends largely on the performance of UK industry as a whole, there is a booster effect coming from the trend to repatriate production to the UK from the Far East.

Some manufacturers have found that management costs associated with production half a world away are difficult to control, so now prefer domestic production with automation to reduce the labour content.

Even so, industry watchers see a very black cloud on the horizon in the shape of UK machinery users' reluctance to network their production systems. "For a decade or more the UK has dragged its heels over fieldbus," says Jacqui Reid of Festo. "Already our machinery is 3-5 years behind that produced in Germany, Europe's industrial engine room. And now there is a paradigm shift from fieldbus to Ethernet, which will allow total shop floor to top floor integration. If the UK falters with this change, we could be kissing goodbye to virtually all volume or multiple machine building activities.

"Control and systems suppliers such as Festo and the other pneumatics players are all geared up for Ethernet and fieldbus. But our customers [machine builders] blame their customers [end users] for not being prepared to adopt and adapt to new technologies!"

It seems that end users' focus is so much on cost control that they are unwilling to 'risk' innovation. But networks offer lower cost through easier reconfiguration, faster commis-

sioning, improved diagnostics and better human-machine interfaces. So networks are a technology for reducing costs, but there is a reluctance to take them up. Where networks have been installed, definite and immediate business benefits have been realised.

## Technology trends

In terms of technology, the overriding design trend in pneumatics is for virtually all pneumatics components to offer increased features and functionality combined with cost reduction.



**Air or electricity:** Pneumatic and electric actuators are now often virtually indistinguishable, sharing common external components and being operated via the same controllers

In pneumatic cylinders or actuators, costs have been steadily reduced by improvements in materials – such as a shift from steel barrels and die-cast end caps to extruded aluminium – and the introduction of advanced moulded polymer materials for the internal piston and bearings. The next steps for these components will be continued integration of electronic sensors for improved diagnostics, and/or faster cycle times – possibly using low cost sensor arrays or more exotic laser or ultrasonic sensors.

In the other major pneumatic component category of valves, solenoid valves represent the

majority of the market and the last big advance was the introduction of valve terminals a decade ago. Generations two and three are now on the market, with the latest versions offering features such as improved modularity and better connectivity – including of course fieldbus communications. A major technological drive in this area has been to decrease the overall size of the valve modules to reduce machine/automation footprints, and modular valve widths of around 10mm are now commonplace.

Today, traditional direct-acting solenoid coils are approaching their miniaturisation limit. The likely evolution is towards piezo or other solid-state actuation devices, which will support the introduction of valve modules as narrow as, say, 6mm.

Although piezo-actuated valves have now been available for some time, they have yet to be seen as a mass commercial solution and some optimisation for reliable volume manufacturing remains to be carried out. These next generation valve pilot actuators will expand out from their specialist niches in sectors such as medical devices in the next year or two.

Underpinning all these trends is the general move by pneumatics manufacturers to design products for low cost, small batch production – to keep up with the continual pressure for lower costs (many component prices have remained virtually static for several years). It's now typical that component families are made from a modular kit of parts, with as much commonality as possible.

## Software selection

In the general pneumatics business arena, a key advance of recent years is the integration of sophisticated computer-aided engineering (CAE) software selection and configuration programs to allow automation systems to be designed quickly, and right first time.

This helps reduce component and operating

costs by simplifying the selection of optimally sized parts. But it is also part of a bigger shift in the market: to meet the rising demand from OEMs and users for not just components, but guaranteed-performance sub-system solutions from their automation suppliers – so reducing demands on their own in-house engineering resources.

Perhaps the most significant impact of the CAE packages though, is the way they integrate with automation suppliers' manufacturing systems. For example, the output from on-line CAE tools and purchasing systems can feed directly into the manufacturing process. This reduces costs and improves efficiency, but also makes it possible to put the automated flexibility of the manufacturing lines to the service of individual customers across the globe.

### User driven developments

Developments in pneumatics often result from specific user requirements. "Different user sectors appear to have differing needs," observes Hoerbiger-Origa's Ray Barnes, "but when you analyse all the requests there is a lot of commonality. For instance machine speed is a critical parameter for many mass producers, so faster-switching valves with higher flow rates are a key development focus."

He also cites a common drive for improved productivity and reduced energy consumption. "We are mounting valves ever-closer to the pneumatic actuators they control to reduce air tube lengths and cycle times. This has resulted in new valves designed to withstand the rigours of the operating environment, which are also easier to install and reconfigure.

"Modular valve mounting systems make machine design and build times much faster, mounted on the machine rather than in the control cabinet to give the required rapid cycle capabilities, so have to be corrosion proof and able to withstand cleaning in place with aggressive chemicals."

The trend towards higher protection valves is being driven by the need to adhere to ever-increasing safety compliance requirements.

Ray Barnes also notes an inexorable trend to mixing pneumatic and electric actuation technologies. "In some cases, we need simply to supply the best solution of each axis; but in other cases, we are building in the flexibility that is required for easy reconfiguration of machinery. Some industries, such as food manufacturing, have always needed easily reconfigurable machinery, but the requirement is now

spreading to almost all sectors.

"The interface between pneumatic and electric technologies is already almost invisible, with both using identical mechanical connections and the same electronic controllers. We are almost to the point where the user neither knows nor cares to know which axes are electric and which are pneumatic."

Festo's Jacqui Reid concurs, emphasising that servo-pneumatic technology provides highly cost effective and dynamic movements and that servo electric systems, although more expensive, enable high precision control. "The technology shouldn't be important to the user – it's the role of the automation supplier to make the right selection for the application."

### Pre-engineered systems

Today many products are designed around common 'platforms' with modular sub-systems. The automotive industry pioneered pre-engineered assemblies, and pneumatics suppliers are learning from their experience.

Cost savings can be significant, but manufacturers are finding that pre-assembled modular systems give them quicker design turnaround, and reduce time-to-market. Pre-engineered systems also demand less effort by the end-user, reducing the need for expensive design personnel.

A case that highlights the safety benefits of pre-assembly is ASCO Joucomatic's provision of pre-assembled tank/valve systems for dust collection. In the past, OEMs have assembled their own systems from discrete parts, but new Directives have made this more onerous and costly and led to the adoption of pre-assembled, fully tested and certified tank systems from a single source supplier.

Steve Meadows of ASCO Joucomatic says that the growth in pre-engineered systems is not surprising considering the complexity of modern machines. "The requirements for machine designs are becoming ever more demanding, and to meet these demands specialised products are often required. This could involve producing a totally individual design or, more simply, modifying an existing product."

Companies such as ASCO Joucomatic offer a specialised product service, with a special team of engineers and technicians to produce these designs: the objective being to provide the most cost effective solution, and the closest correlation between market demands and equipment performance.

To achieve this requires pneumatics suppliers to go beyond simple assembly of components and include metal cutting, software writing, testing, certification and so forth. ■

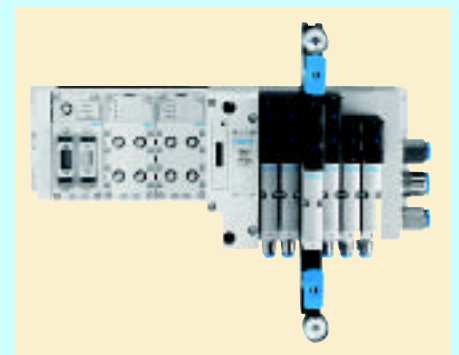
## Valve terminal simplifies automation

Festo has launched an electro-pneumatic valve family that allows fully-featured automation systems to be built around a configurable manifold, replacing the functions of a control cabinet with a standalone, point-of-use system.

Ease of configuration and access are said to be fundamental to the design of the new VTSA valve family, with industry-standard dimension valves – compliant with ISO 15407-2 – and a modular approach that allows systems to be built with different pressure zones, gas zones, and electrical power isolation.

Features include support for 'hot swap' valve changeovers, enabling valve bodies to be exchanged without turning off the air supply to the manifold, for reduced downtime and disruption. All air connections can also face in the same direction, to suit the space available or to offer an improved controls layout.

The VTSA terminal family includes over 150 new components, ranging from solenoid valves in all standard configurations, through sub-bases, supply-plates, end-plates and gaskets, to a choice of vertically stackable compo-



**New Festo VTSA valves:** Allow automation systems to be built around a configurable manifold

nents and accessories, such as pressure and flow regulators and hot-swap adapter plates.

As standard, integrated diagnostics allow incorrect valve allocations, coil short-circuits or lack of a load supply to be detected directly via LEDs. If systems are fitted with the CPX I/O system, additional diagnostics are available via a plug-in display or via the fieldbus system, helping minimise downtime.

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