

Integrated technologies give Boost to pneumatics

PNEUMATICS TECHNOLOGY IS CONTINUING TO DEVELOP ON SEVERAL FRONTS, SOME FOLLOWING WIDER INDUSTRY TRENDS, OTHERS MORE SPECIFIC TO COMPRESSED AIR ACTUATION AND INTEGRATION WITH OTHER TECHNOLOGIES. BOB DOBSON REPORTS.

To paraphrase John Donne: 'No technology is an island.' This is becoming more and more clear with pneumatics, which are integrating with complementary technologies to form mechatronic machine elements that are easily installed yet carry out sophisticated multifaceted functions.

Previously, pneumatic actuators were designed to provide linear motion or thrust. For this to be converted into useful work, such as operating a flow diverter on a conveyor belt, opening a gate or driving a hammer, one or more further mechanisms had to be added. This usually entailed the end-user – or a contract engineer – designing and making a bespoke element.

Increasingly, pneumatics manufacturers are relieving their customers of either some or all of this burden by providing actuators that incorporate guides, sensors, controls, cranks, levers, rack and pinions or other elements in plug-and-play units.

It also means that there is an increasing emphasis on product quality: a machine component or subsystem that breaks down in the field can quickly become a very expensive liability.

"This adds tremendous value for the suppliers, but that is not the real reason for going down this path," says Ray Barnes, managing director of Hoerbiger-Origa.

"Most manufacturing companies had no choice but to steadily reduce their in-house engineering capabilities through the 1990s and into this decade. So now they rely more and more on bought-in expertise. This allows them to concentrate on their core business and reduce their overheads. Where previously a pneumatics company could be just a product supplier, now there is a far greater need for technical support."

An example of the change is that electronics is now an integral part of practically all pneumatic systems, so that the once humble 'bang-bang' pneumatic cylinder has developed into a sophisticated actuator with positioning capability, speed control and so forth driven by a PLC, PC or fieldbus network. Many actuators now have either on-board controllers or plug-in interfaces so that they can be integrated into the machine control system in moments.

Similar developments are seen with on-board sensors that can detect many different types of

our designers decided to make the actuators so strong that they could be used as structural elements with machine designs. This was really radical thinking and as a young sales engineer I often felt like a magician, solving two or three problems for a machine designer with a single product."

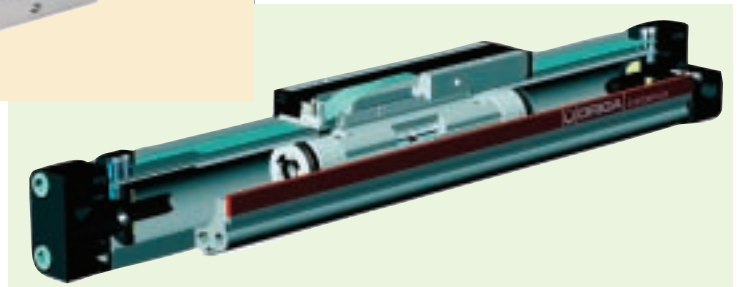
Another trail that Hoerbiger has blazed is in the development of electric actuators, as opposed to pneumatic ones. While the company can probably not claim to have invented the technology, its major contribution has been to make them completely interchangeable with their pneumatic equivalents.

It is unlikely, though not unheard of, that a machine requires such a changeover. The gain is that machine designers can develop a range of



Above: Fetso's new DGSL mini slide features an integrated design and is easier to install.

Right: Hoerbiger-Origa rodless cylinder can now be supplied with integral guides, bearings, sensors and other subsystems



operating and process variables. This information can be communicated back through the control system so that the actuator becomes an intelligent element within the machine, perhaps monitoring production processes or protecting itself from excessive loads and temperatures.

Integrated with guides

Mechanically, actuators are now often integrated with the load bearing guides, which were previously separate items needing to be engineered into the machine. This is an area where Hoerbiger-Origa set the lead 20 years ago, as Ray Barnes explains:

"It was we who invented the rodless pneumatic cylinder and it is this sort of actuator that really benefits from integral guides. Early on

near identical machines offering different powers, speeds and accuracy by fitting pneumatic, electric belt or electric ballscrew actuators as necessary.

"This reduces the initial design effort, but the real saving comes in spares and stock holding," explains Ray Barnes.

The interchangeability is achieved by using the same extruded aluminium profile for the main housing of the actuator, the same mounting and same options for both pneumatic and electric variants. This can be particularly advantageous to machine builders who supply to customers around the world, where local stockholding can become a significant cost unless carefully managed.

While most of Hoerbiger-Origa's products

COMPONENT MATTERS: PNEUMATICS

are of industrial scale, Festo is applying many of the same principles to miniature components. It has just launched a new generation of pneumatic mini slides that it feels are set to redefine the market for guided actuators.

The DGSL unit is based on a design in which the guide unit forms the actual body of the actuator and incorporates a high performance pneumatic drive. This fully integrated approach offers numerous advantages over conventional mini slides, including greater smoothness, higher end-position accuracy and inherent robustness, says Festo.

"A completely new body profile simplifies installation and commissioning by enabling all sensors to be mounted, adjusted and seen from just one position," explains the company's Steve Sands. "Thinking through how a product is installed and used, rather than just how it operates, is quite a discipline for the designers but the dividends in the field are enormous.

"They are suitable for a wide range of precision moving, pick-up, insertion and placement tasks, and integrate easily with other Festo automation components."

DGSL mini slides are available with stroke lengths up to 200mm. Each unit offers a wide range of

stroke adjustment which, combined with its exceptional rigidity and linearity, means that multiple slides can simply be 'piggy-backed' to create the desired motion characteristics. There is also a choice of eight actuator piston diameters – from 4 mm to 25 mm – and three types of damping option.

In all, the DGSL series offers 145 different models, making it very easy for system designers and machine builders to select an exact match for their application.

All DGSL series mini slides feature an extruded aluminium body, which mounts the guide unit and houses the bore of the pneumatic actuator cylinder. A precision stainless steel guide is coupled to the housing via ball cage bearings running along the guide rails, and is pre-tensioned to ensure smooth and reliable operation. The guide and the slide are pre-mounted and then ground in-situ, obviating any dimensional errors caused by the aluminium extrusion.

Thanks to the rigidity of the slide and yoke plate the new slide is said to realise a repetition accuracy of 0.01mm and offers linearity and parallelism within the 0.01mm range – even at maximum stroke. Furthermore, cage control is implemented using a patented rack-and-pinion arrangement which prevents any slip due to friction.

Air preparation

While actuation is the more immediately exciting end of pneumatics, air preparation has not been forgotten either. Many manufacturers have introduced improvements to their filtering, regulating and lubricating technologies in recent months.

For example, Hoerbiger-Origina has announced a major expansion of its Airfit Tecno range

and convenience of the FRL system to applications that involve large air volumes.

Well suited for use in factory pneumatic ring-main installations, the Moduflex 80 range includes filters, lubricators and regulators, as well as a comprehensive series of accessories. Individual components can be quickly assembled in almost any combination, which is said to produce efficient, economical and easy-to-maintain air preparation systems, exactly matched to their users' needs.

A key feature of the Moduflex 80 range, in common with other products which make up the FRL system, is the use of Parker's novel Cliplok fasteners. These allow combinations of components to be assembled without the use of tools, in less than half the time needed with conventional systems.

The Cliplok system also eliminates the need for extra items such as pipe connectors and, since the individual components mount directly face-to-face without intermediate blocks, it produces exceptionally compact assemblies. Further, the Cliplok system allows individual components to be easily removed or exchanged, greatly facilitating maintenance.

These technical developments are often reflections of greater trends in wider industry. For instance pneumatics is doing its bit to reduce carbon generation and energy consumption, with simplification and ergonomic designs driven by users needs for greater productivity and flexibility.

Ray Barnes at Hoerbiger-Origina, has one final thought for the future of pneumatics users:

"For ten years or more we have seen machine building moving to the new low wage economies of the East. But their wages are now catching up, while we are developing automation and machine systems that reduce labour content. Also consumers are increasingly concerned to buy locally produced goods, thus reducing transport miles and increasing the need for production machinery." ■



Air preparation: Parker is evolving the design of the once humble FRL – filter/regulator/lubricator – with the Moduflex 80 range

of intelligent proportional press control valves.

Airfit Tecno combines piezoelectric technology and precision miniature component engineering which is said to completely redefine user expectations for speed and precision of air pressure control.

The piezoelectric control means the range is able to offer high dynamic performance, with such small power consumption that sparking generation is physically impossible allowing it to be used in Zone 1 rated explosive environments. Similarly there is no heat generation.

Full range pressure regulation is achievable for 0 bar to full flow, which coupled with its quiet operation makes it ideal for medical applications. Rapid cycling, ease of installation and compact size are further characteristics of Airfit Tecno.

At the other end of the scale the latest addition to Parker Hannifin's innovative Moduflex modular air preparation system is the new Moduflex 80 range. This extends the versatility

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