Machine building & Automation

Control & Automation

The challenges of today's machine building industry

The ramping up of the low wage economies in the machine building sector means that OEMs often feel they are working under the shadow of the threat of cheap imports. In the first of a series of articles, Robert Brooks looks at the 'must-have' features that will keep UK machine builders ahead of the pack, and the opportunities to add even greater value.

In the last 20 years, machine building in the UK has changed beyond recognition. Of course some of this is driven by new technology, but much more is about meeting today's vastly different user requirements whilst also fending off competition from low cost entrants to the market.

Naturally price is a pressure, but end users tend to be more focused on speed, reliability, flexibility and lifetime costs. At the same time, the requirement to differentiate themselves from the competition means that machine builders are building a lot more one-off machines and special purpose machines, ideally without impacting on either development time or cost. These two sets of criteria would appear to be in contradiction but it doesn't have to be so, as the latest automation technologies give machine builders all the tools they need to develop vastly superior machine designs, more quickly and more cost-effectively.

The issue of speed is interesting because it means different things to different industries, and certainly overall speed is less of an issue in particular sectors. But no machine builder is ever asked to develop a machine that is slower than the previous generation. And of course machine builders themselves all have a determination to constantly improve machine performance.

Speed goes hand in hand with productivity – absolute cycle time means nothing if half the products coming off the end of the line are scrap, or if it impacts negatively on availability. So speed is also tied to reliability, and end users have become adept at monitoring uptime, availability and productivity to produce overall equipment effectiveness (OEE) scores that benchmark the performance of different product lines, in different plants, in different regions of the world. Flexibility, too, is a key issue. Much has been written over the years of the need for pushbutton changeover between product variants coming onto the production line, but today flexibility goes far beyond that. End users are looking for machines that can enable production line capability to be modified quickly and easily, perhaps by adding a robot based pick and place station when required or adding a specific machine module. Just as OEMs talk about 'plug and play' with regard to integrating automation technologies, so end users are developing a plug and play mindset with regard to adding functionality to production lines.

Finally there is the issue of the lifetime cost of the machine. Yes the purchase price is important, but end users also want easy upgrade paths to extend the working life the machine, will tie in lifetime cost with reliability, will factor in the cost of support, and will also monitor cost per product as part of benchmarking the effectiveness of the machine. The question arises, then, of how machine builders can offer all of this – developing advanced machines cost-effectively that tick all the boxes for performance and flexibility whilst being easy to support. And what are the opportunities to build in even greater differentiation to develop a real competitive advantage

Control and automation technologies

The key lies in today's automation technologies and control solutions, with machine controllers at the heart but embracing open communications and technologies such as servos, vision, robotics and safety, and exploiting the ever growing capability and diagnostics functionality of drives, sensors and HMIs, and tying this all together through open standard programming and development software.

Some machine builders will have the luxury of being able to impose their own automation platform standards, or to select best of breed components. Others will have a control platform requirement imposed on the specification. Happily, with open communications

standards and open standard programming structures such as IEC 61131-3, no design effort is ever wasted. Function blocks developed in software for one job can be easily ported to another. Hardware systems implemented on one machine on a given platform can be readily scaled up or even changed to an entirely different platform on another. There is no 'one size fits all' solution for machine control, but open standards mean that this represents an opportunity rather than a limitation.

At the same time, open communications standards based on industrial Ethernet structures not only simplify machine component integration at the local level, but also the integration of the machine within the production line and the higher level enterprise. And industrial Ethernet also opens up the possibility of remote access into the machine, bringing advantages to end users as they look to monitor and control different plants in different areas of the world, but also to machine builders as they look to add value by offering ever better support, whilst reducing the cost implications of that support.

There can be very few machine builders who can afford to be sending out members of the development team on service and support operations. But remote access and advanced diagnostics capability mean that many seemingly complex machine problems can be potentially fixed in minutes remotely.

There are many opportunities to add value in terms of machine performance, too. A recent report from PLCopen looked at the benefits of servo technology. The report highlighted how servos not only significantly boost machine performance, but importantly – and perhaps unexpectedly – also reduce machine cost and complexity. It examined the case of a specific food packaging machine, with the traditional mechanical design elements replaced by multi axis servos. In the new design, the number of pulleys was reduced from 45 to 0, the number of belts from 15 to 0, drive sprockets from 15 to 0, spline shafts from 2 to 0, bearings from 18 to 3 and line shafts from 6 to 0, while the motor count increased from 1 to 10. The result was an 81% overall reduction in parts from 118 down to 23. The end result was a faster, better, lower cost and significantly more compact machine.

Servo technology can today be regarded as plug and play – simple to integrate and program. The same can be said of vision technology, too, which can play a huge role on production lines in quality assurance, minimising rejects, traceability and more.

In subsequent articles in this series we'll look at specific automation technologies in detail, and how machine builders can best exploit them to develop machines that offer greater performance without impacting on cost or development time.

Robert Brooks is an automation product specialist at Omron