

## Drives&Controls' 25th Anniversary

# Learning lessons from nature

Gary Wyles, General Manager, Festo

The automation market has just gone through one of the most volatile periods I have known. Predictions that looked accurate have consistently been more than 25% out, only three months later. Without doubt, this has brought into question our ability to predict, with any degree of certainty, what is going to happen to turnover next year – let alone over the next quarter of a century.

However, some trends are considerably clearer. The role of high-volume manufacturing in Britain and, more recently, Europe has undergone rapid changes. Future opportunities in higher labour-cost markets exist, where flexible automation can help to achieve rapid upgrades and a continuous stream of new products to stimulate consumer demand.

Alternatively, manufacturers can choose to take the higher-value route of highly-customised production – the so-called “batch size of one” model. Either way, we see a role for flexible automation that is easily adaptable and able to work closely alongside people to utilise the advantages of both. Automation can deliver the product safety, reliability and quality we demand; people the input, flair and flexibility. Most

importantly, automation drives business competitiveness, which helps to ensure job security and future growth.

Teamworking and collaboration are fundamental to success. Of course, this is mainly thought of in terms of management, leadership, communication and engagement. However, because of the environment I work in, I also think of teamwork and collaboration between man and machine – and not merely in terms of existing interfaces such as touchscreens and panels.

One of the biggest opportunities for automation is with ever-closer human-machine and machine-machine interaction. This will develop as automation systems start operating semi-autonomously as human assistants, not just in factories but in healthcare, workshops, retail, agriculture – and, not least, in the home.

While Festo is not involved actively in the military sector, this field will be a key driver for some of these systems with, for example, exo-skeleton robots and specialised devices for arduous or dangerous tasks. In all cases, the bottom line is that successful automation depends on harnessing the knowledge of the people

involved in the process. If it does not, when the automation arrives, its interaction with people will be severely limited.

Closer interaction between humans and machines will require us to develop machines that can operate safely side-by-side with humans. We have been exploring some of the options through our Bionic Learning Network, looking at solutions that have evolved in nature.

For example, our research into the elephant-trunk-inspired Bionic Handling Assistant has shown how the latest additive production processes can be used to produce extremely flexible devices that can lift more than their own weight and yet provide unprecedented flexibility.

Developments in the control technology behind such potentially complex systems also hint at the way forward. These entirely new forms of automation, which have 11 degrees of freedom and use a compliant medium such as air, require new approaches to control – again working like the natural world, with the control co-ordinating mechanical changes via visual feedback loops, managing systems with multiple inputs and outputs.



The ultra-lightweight bionic handling assistant is modeled on an elephant's trunk



The human user-interface clearly has to be intuitive and accessible. Communication between machines still has plenty of scope for development. Ultimately, at the application level, the machine will need to speak the language of the people – not the other way around.

The past quarter-century has seen the commercial introduction and development of fieldbus protocols, with networking technologies such as Ethernet rapidly gaining acceptance, and wireless communications surely not far behind. In the future, machines could relieve people of more of the planning load. The ability to adapt to fluctuating demands, product types and configurations, will require very flexible modules, cells, lines, plants and factories.

Rather than complex centralised control systems, we can already see MEMS (micro electromechanical systems) or nano-sensors being embedded within individual devices, along with localised control functions and software. Again, to handle the potential complexity we can look to nature and at using "swarm intelligence" to organise relatively simple independent systems into entities that exhibit collective behaviour and responses to a given demand. It sounds complicated, but we are surrounded by examples – from termites to jellyfish – of simple organisms that behave in an organised and effective way. We can learn how to make our systems self-adapting to optimise throughput, and self-recovering to survive breakdowns or failures within individual devices.

At the end of the day, it's people that can and will make this technology work. The critical and hardest-to-change elements aren't the technological leaps, but developing our people to engage and embrace automation. More than anything, this will depend on the way we lead and coach them.



The swarming behaviour exhibited by Festo's "bionic jellyfish" could lead to self-adapting automation systems

## Slow fans cut cost of fast-food



Blaise Ford of IDS explains: "McDonald's are keen to offer their customers maximum value, which means keeping costs under tight control. When they wanted to improve energy efficiency in their kitchens, they called us. We are Inverter Drives Systems, an ABB Drives Alliance member. We installed low voltage AC drives in their extraction fans, slowing their speed to match less busy times and cutting energy use by 50 percent."

The ABB Drives Alliance is a national network of independent companies supported by ABB, a global company. Together, we offer all the solutions, support and services you need to benefit from using drives and motors in your business.

To find out more

email: [energy@gb.abb.com](mailto:energy@gb.abb.com)

call: **07000 DRIVES** (that's 07000 374837)

or visit: [www.abb.co.uk/energy](http://www.abb.co.uk/energy)

