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BIOMANUFACTURING INDUSTRY SHIFTING TO SINGLE-USE APPLICATIONS

With the rise of biologics and personalised medicine, the biopharmaceutical industry is moving away from large-scale production processes to a single-use manufacturing style. Manufacturers are realising the benefits of being agile, and many are adopting single-use technologies to turn over new products and batches quickly and efficiently. Single-use technologies utilise disposable bioprocessing equipment instead of traditional stainless steel. By eliminating the time-consuming clean-in-place (CIP) and steam-in-place (SIP) processes between batches, single-use technologies reduce the costs of labour, materials and utilities and accelerate time to market.

These technologies are integral to today's biomanufacturing landscape. Fluid control and automation systems and solutions can help processors leverage the benefits of single-use products, such as reducing product development time, enhancing operator safety and increasing productivity.

Single-Use Technologies Are Key to Minimising Downtime

Single-use technologies overcome one of the biggest challenges faced by biomanufacturers — downtime. Typically made from platinum-cured silicone or biopharmaceutical-grade plastic, these products are disposed of after each use.

As a result, single-use products eliminate the need for cleaning between batches and offer a shorter changeover period than stainless-steel equipment. For example, a line changeover for a stainless-steel bioreactor can take up to 10 hours for the same product and up to three weeks for a full product changeover. By comparison, a single-use bioreactor only requires a few hours between batches. Because of the quick changeovers, single-use products lead to significantly higher throughput and enable smaller, more efficient batches. They can also help manufacturers decrease their facility manufacturing footprints, thereby reducing the costs for ventilation, heating and other utilities.

Biomanufacturers making the leap from large-scale to single-use production should work with fluidic system suppliers that offer fluid-automation products. These offerings can include valve automation solutions, air preparation equipment, instrumentation and integrated solutions. Fluidic system suppliers combine their products with industry expertise to provide customers with reliable service.

Single-Use Pneumatic Pinch Valve Reduces Install Time and Costs

From valve automation solutions to advanced control systems, a variety of solutions can help get a single-use biomanufacturing operation up and running.

Single-use pneumatic pinch valves, for example, achieve process control automation in areas like bioreactor and fermentation tanks, chromatography, tangential flow filter (TFF) skids and other drug discovery lab applications. Look for valves with innovative designs, in which the pinch mechanism holds the soft tubing in place, minimising any disturbances to process media and preventing tube damage from repeated use.

Your supplier should always keep user safety at the forefront of product design. Pinch valves, for example, should include a protection guard that allows operators to safely work around the pinching mechanism, as well as a manual override function that lets operators insert or remove tubing without actuating the valve. In addition to keeping operators safer, this enhanced valve design accelerates setup, reduces costs and makes unscheduled maintenance easy — all of which are critical to maximising uptime in single-use applications.

In addition, the right pinch valve makes no contact with process media, features a long life cycle and provides a reliable pinching force without the need for an electrical connection. It should also resist corrosion due to tube breakage or washdown.

A One-Stop Shop for Process Control Automation

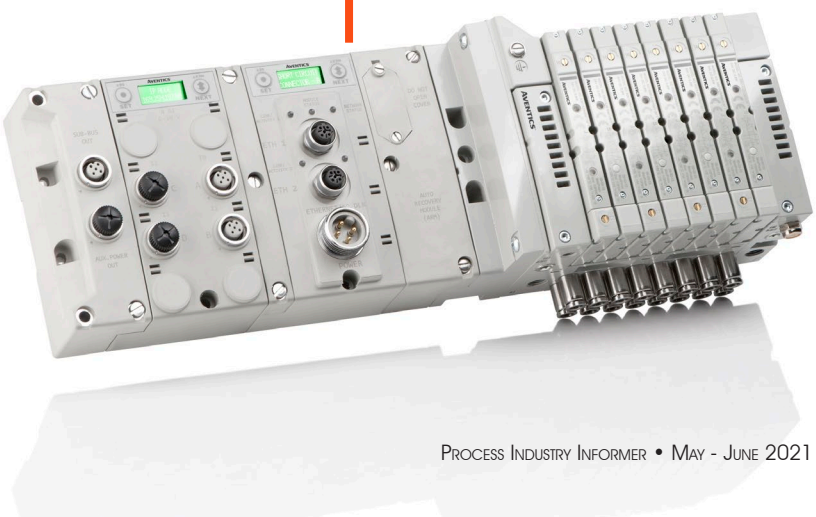
As the single-use market continues to expand globally, it pays to use a single, global supplier that can deliver a comprehensive fluid-control solution. To that end, many suppliers offer a wide range of systems and solutions that enhance product quality, improve reliability and reduce operating costs in the biomanufacturing sector.

In addition to pinch valves, which overcome many of the issues related to downtime and operator safety in single-use applications, many suppliers offer directional valves, communication protocols, air preparation units and other technologies — all of which work together seamlessly so you can focus on what really matters: optimising your biomanufacturing operation. From design and implementation to startup and ongoing technical support, your supplier can help your single-use operation stay competitive in a global economy, enabling you to:

- **Control aggressive fluids with durable valves.** Angle body valves handle aggressive fluids, such as steam, hot water, solvents and light slurries, in CIP and SIP applications. Air- or water-pressure-operated with a straight-through design, these valves come with advanced accessories, including a signaling box,

G3 Electronic Fieldbus Platform

The G3 Electronic Fieldbus Platform complements Emerson's AVENTICS™ Series 501 Pneumatic Valve Manifold for easy commissioning and highly distributable I/O. The graphic display for configuration and diagnostics is compatible with various industry-leading communication protocols like Ethernet IP, ProfiNet, DeviceNet and others. Photo courtesy of Emerson.



AVENTICS 580 CHARM node

AVENTICS™ 580 CHARM node integrates seamlessly into the DeltaV DCS S-series via Electronic Marshalling — a tightly integrated remote I/O solution for pneumatic valve manifolds. The 580 CHARM electronic is also available with other industrial fieldbuses. Photo courtesy of Emerson.

compact positioner for proportional control and stroke limiter for even greater precision.

- **Speed time to market with high-performing valve manifolds.** Valve manifolds with modular, flexible designs simplify installation, commissioning and system integration in single-use applications — reducing engineering costs and speeding time to market. These plug-and-play systems include high flow rates, input/output (I/O) capabilities, compatibility with popular industry protocols and a pressure shutoff function, which allows individual valves to be replaced without halting the production process — further reducing line downtime and maintenance in single-use applications.
- **Improve valve efficiency with next-generation electronics.** Electronic fieldbus platforms provide pneumatic valve manifolds with fieldbus and Ethernet connectivity, as well as a graphic display for configuration, commissioning and diagnostics. They allow programmable logic controllers in single-use systems to more efficiently turn valves on and off. They also channel I/O data from sensors, lights, relays, valves and other I/O devices via various industrial networks.

> Fluid control and automation systems and solutions can help processors leverage the benefits of single-use products

- **Minimise downtime with quality air-preparation equipment.** Air-preparation devices treat the air quality and pressure in a plant's pneumatic system. Modular filter regulator lubricator (FRL) assemblies with body-to-body clamps facilitate assembly during installation and service, while optional end plates allow the manifold assembly to be quickly removed by loosening screws — keeping downtime to a minimum in single-use systems.
- **Optimise plant performance with advanced control systems.** Distributed control systems (DCS) can improve manufacturing agility in single-use applications by helping to meet demands in real time. These easy-to-use automation systems often include a suite of services geared toward simplifying operational complexity and reducing project risk. They also adapt to meet specific biomanufacturing needs — scaling easily without adding complexity.

ASCO Series 273 Pneumatic Pinch Valve

For single-use batch production, the ASCO™ Series 273 Pneumatic Pinch Valve features an innovative design that enables better tube retention and prevents breakage or damage to the soft tubing from repeated use — virtually eliminating any disturbance from valve motion to process media, unlike other products on the market. Photo courtesy of Emerson.

- **Utilise IIoT solutions** for more informed data driven decision making: Digitalisation of components and systems is empowering production staff and managers with the real-time actionable information. All stakeholders in the complete value-added chain are able to exchange information thanks to the advanced technologies used for networking and sensor-based intelligent components. These solutions support and enhance areas such as production efficiency, energy management and integration of the single-use solution.

A Robust, Customised Control Cabinet

In cleanrooms or environments subject to washdown, you'll need a quick, easy and space-saving way to protect your sensitive electrical and pneumatic components. Already assembled, tested and ready to install, integrated enclosure solutions ensure corrosion and damage resistance in sensitive installations. These turnkey packages also withstand regular exposure to aggressive cleaning fluids. In addition to biomanufacturing applications, these enclosures are ideal for the life sciences, food and beverage, chemical, and packaging industries. The valve systems are equipped with an innovative display that clearly depicts default settings for faster installation and commissioning. An Individual shutoff makes the valve system suitable for continuous processes that allow the valve to change while the valve manifold is under pressure.

ASCO Series 290 Angle Body Valves

ASCO™ Series 290 Angle Body Valves handle various types of fluids in CIP and SIP applications. Photo courtesy of Emerson.

About the author

Audrey Richard is the product marketing manager for Life Sciences, Europe, at Emerson. During her 9 years at Emerson, she has served as a marketing specialist and strategic planning analyst. Richard holds a masters degree in marketing from the ICN Business School of Nancy, France