

The XACT-FIL machine from ProMach achieves 5,000 weight measurements per second and an accuracy of $\pm 0.5\%$ for non-contact filling of liquid products into containers with capacities as small as 1 ounce and as large as 5 gallons.



Highly efficient filling systems for liquid food and non-food products with reduced footprint

PC-based control quadruples weight measurement capabilities

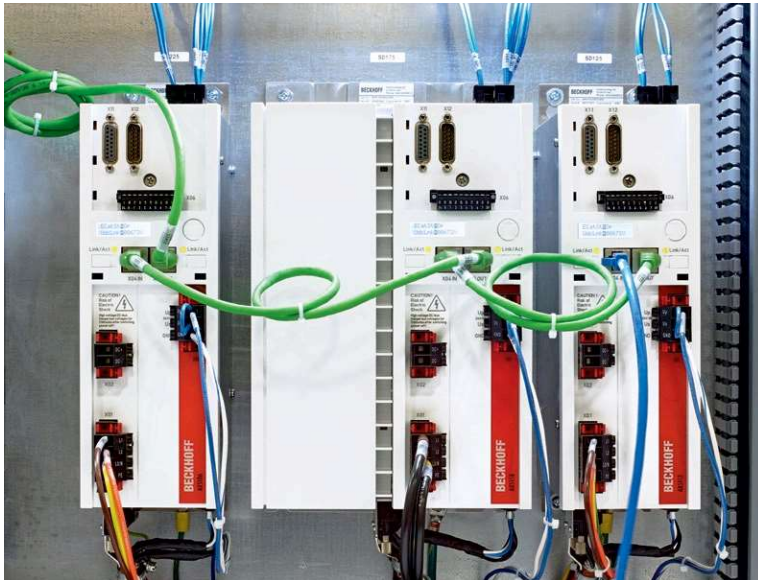
ProMach Filling Systems has extended its tried-and-tested range of filling and capping systems with a particularly space-saving machine generation that offers great model variety and added functionality. With PC-based control and EtherCAT, the XACT-FIL™ weight filler meets the high requirements that apply to primary packaging of food and other liquid products, combining reduced footprint, increased throughput, improved accuracy and hygiene.

ProMach encompasses a family of more than 30 packaging machine brands for the food, beverage, pharmaceutical, personal care, household and industrial goods industries. In 2017 ProMach Filling Systems, based in Waukesha, Wisconsin, introduced the XACT-FIL™ machine line for filling and capping systems under the Federal brand name to meet customer requirements for high-precision and hygienic filling with significantly reduced machine footprint.

ProMach Filling Systems worked extensively with Beckhoff USA to develop the XACT-FIL using PC-based control technology within a tight timeframe. The new gravimetric filling machine needed to premier at Pack Expo 2017, but at the beginning of that year, they still had not finalized the design. The modular machine design is highly flexible for a wide range of uses. The application spectrum covers containers made of polyethylene, metal and glass with capacities as small as 1 ounce and as large as 5 gallons for liquid food products such as sauces, milk and olive oil, and non-food products such as paints, chemicals and lubricants for the automotive industry. In addition to filling liquids at ambient temperature, the machine can also handle cold or hot liquids. Various capping units to complete the lines are available from ProMach.



A Beckhoff CP3918 Control Panel with an 18.5-inch multi-touch screen serves as an advanced and intuitive user interface.



The compact AX5000 Servo Drives for the three-axis motion system easily fit into a smaller control cabinet.

PC-based control ensures accuracy and increases efficiency

The special feature of these systems is non-contact filling, which prevents contamination of the containers as well as the transport and filling units of the machine and enables sterile packaging to meet demanding quality and food hygiene standards. "During non-contact filling, the nozzle floats above the container opening, usually at a distance of around a quarter of an inch," explains Cesary Mroz, Vice President of Engineering at ProMach Filling Systems. A prerequisite for contactless filling, however, is precise positioning of the containers under the filling nozzles and control of the fill weight in real-time. The XACT-FIL machines use a feed screw to load the empty containers onto a carousel, where a rotating filling turret dispenses liquid products into the containers. Load cells under the individual filling stations check the weight of each container up to 5,000 times per second until the desired filling level is reached. The containers are then moved to the capping turret.

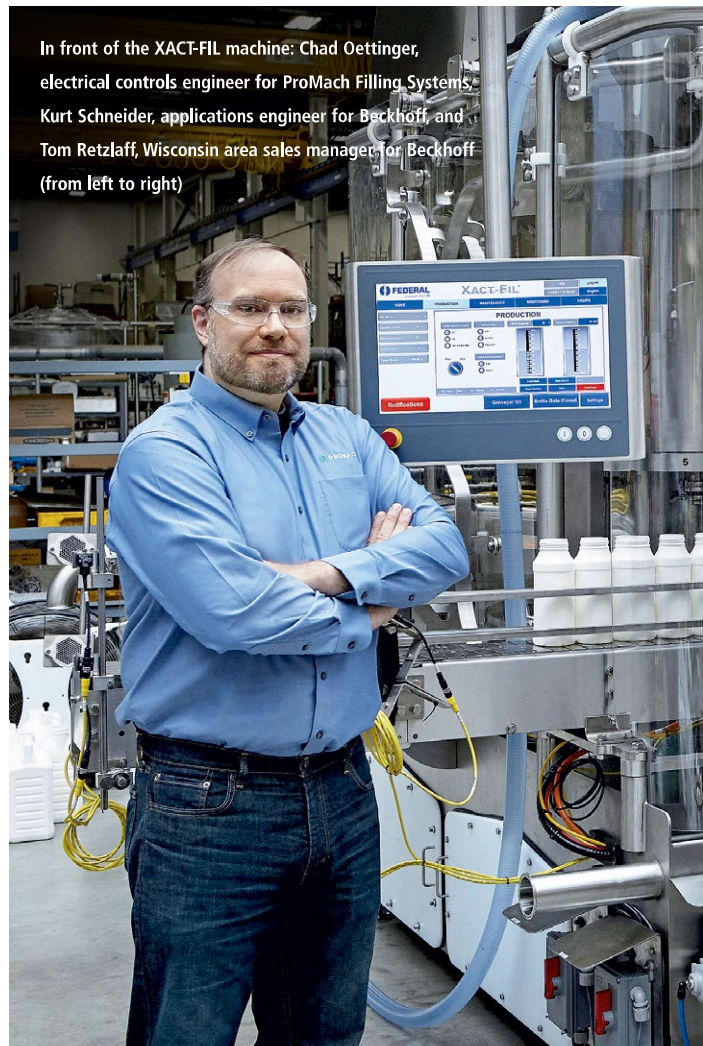
Coordinating the machine's rapid yet precise loading, filling and capping sequences requires powerful automation, motion control and I/O systems. Synchronization with PC-based control and the EtherCAT high-speed fieldbus not only fulfills all given requirements, but also guarantees a fill-weight accuracy of $\pm 0.5\%$ or better. "EtherCAT and TwinCAT allow the valve outputs and the load cell measurements to be synchronously scanned with the PLC code cycle time of 200 μs ," says Kurt Schneider, applications engineer for Beckhoff. "This provides tighter overall valve response and accuracy." The new XACT-FIL system roughly quadrupled the number of weight measurements per second, increasing it from 1,200 to 5,000.

Reduced footprint and increased cleanliness

All control tasks are performed by a CX5140 Embedded PC with TwinCAT 3 automation software for PLC, motion control and HMI functions. Cesary Mroz explains that the DIN-rail mounted controller significantly reduced the size of the control cabinet while still providing plenty of processing power to increase reliability and



In front of the XACT-FIL machine: Chad Oettinger, electrical controls engineer for ProMach Filling Systems, Kurt Schneider, applications engineer for Beckhoff, and Tom Retzlaff, Wisconsin area sales manager for Beckhoff (from left to right)




throughput. As a backup, a CFast card loaded with all PLC and motion control functions for the XACT-FIL ensures availability in the unlikely event of a failure.

A CP3918 Control Panel boasts an 18.5-inch touchscreen and multi-touch functionality for advanced, user-friendly HMI. "Beckhoff offers multiple multi-touch panel form factors that work with the scalable HMI software options to provide solutions for any screen size and the varied customer requirements we need to implement," says Cesary Mroz.

Stainless steel AM8841 servomotors operate the filling and capping turret via timing screws and support IP69K wash-down environments. AX5000 Servo Drives with built-in mains filter provide a compact basis for the three-axis motion system, which easily fits into the smaller control cabinet. One Cable Technology (OCT) provides power and feedback signals to the motors through a single standard cable, further reducing the footprint. Having fewer cables also means reduced cleaning effort and simplified hygiene. Serving as drive bus and I/O system, EtherCAT facilitates real-time communication while further minimizing the form factor, says Tom Retzlaff, Wisconsin area sales manager for Beckhoff: "Rotary fillers have considerable space constrictions, so the incredibly compact HD EtherCAT Terminals are perfect for this application."

Conclusions

With the open and flexible PC-based control technology from Beckhoff, the new modular generation of gravimetric filling machines can cater to a wide variety of requirements. XACT-FIL reduced its required part count by 25% and overall machine footprint by 30%. With EtherCAT, the compact and easy-to-clean system boosts throughput due to the significant increase in measurement speed and high accuracy.



Stainless steel AM8841 servomotors support IP69K wash-down environments involving regular high-pressure steam jet cleaning required when packaging food and non-food liquids.



A high-performance CX5140 Embedded PC with attached EtherCAT and TwinSAFE Terminals saves installation space in the control cabinet and ensures fast control with highly precise synchronization.

Further information:

www.federalmfg.com

www.promachbuilt.com

www.beckhoffautomation.com

