

How Electric Actuation Saved Switzerland's Leading Milk Processor 60% in Power Consumption

Customer

Mittelland Molkerei AG (Emmi) is one of the leading milk processors in Switzerland. Dairy products including butter are produced at the company's facility in Suhr. Butter portions are produced in the weights of 1, 5, and 10 kilograms, with annual production totaling around 5,500 tonnes.

Application and Challenge

To press butter in the desired quantity and shape, a hydraulic system with a maximum of 180 bar (approximately 17 tons feed force) was necessary.

However, the company's hydraulic system had to be replaced because hydraulic oil is no longer desirable in the processing area due to potential product contamination. Additionally, more precise dosing, shorter changeover time, and less equipment maintenance was desired.

Solution

Electromechanical actuators are ideally suited to meet the requirements governing food processing, while eliminating the need for hydraulic oil, pumps, hoses, filters, etc. Electromechanical actuators are the very best when accuracy and repeatability are required, so exact butter portion control can be met. Also, portion changes can be done quickly, as mechanical conversion, or recalibration, of the system are eliminated. The user simply selects

the desired product via a recipe table and the electronic system does the rest. Further, production can be resumed with minimal downtime when portion changes are necessary. It quickly became clear to Mittelland Molkerei AG that an electromechanical solution presented many advantages.

The hydraulic system previously in place was monitored on-site, which captured cycle and load data. Hydraulic systems are usually oversized to handle instances of peak force, which are typically only needed for short periods of production time. Electric systems do not typically have to be designed to handle force this way, as hydraulics do. A design for the average production force is sufficient, as servo drives can apply two to three times the nominal force for short periods of time. The mechanical load of the system is also calculated to size the planetary roller screw necessary to achieve the required service life.



Using only the data provided from the previous hydraulic system, a new electrical system was designed for Mittelland Molkerei AG; by analyzing how often the system would need above-average force they were able to design a system that was perfectly sufficient to handle normal production without being overbuilt.

Results

The butter press was retrofitted with the Exlar FTX215 electric cylinder, which has a feed force of 17.8 tons. This electric cylinder is based on the more robust and stronger planetary roller technology compared to the ball screw. To generate the linear force via the roller screw, it is driven by a servo motor with 60Nm torque. The intermediate planetary gearbox with a reduction ratio of 5:1 increases the torque to 300Nm. A 90 KVA servo controller powers the motor. After commissioning on site with minor calibration, the butter press has successfully resumed production. The dosing quantity can now be kept more accurately and consistently, and waste has been reduced by 50%. With the electrical system, an infinite number of defined motion profiles can now be utilized. The production speed can be variably adjusted, which has increased quality. The changeover time has been massively reduced, and the complexity of reconfiguring to another format has also decreased significantly. With the electrical solution, neither a mechanical adjustment nor several readjustments are necessary to achieve the exact portion weight. Only the desired recipe needs to be selected in the controller; the weight (volume) is automatically tracked by means of the newly integrated trend control of the downstream continuous scale.

The production staff were pleasantly surprised when the new electrical system operated so much more quietly than the hydraulic system. The noise impacts caused at machine start-up and on mechanical end stops do not occur with the electrical system. The vibrations produced by the hydraulic hum of the machines are also gone. The noise reduction is very much appreciated by the production staff, which has created a more comfortable working environment.

Perhaps the most significant result Mittelland Molkerei AG realized upon switching from hydraulic to electric was a 60% savings in power consumption! This guarantees significant and ongoing cost savings over the entire service life of the butter press, in addition to conserved resources. Mittelland Molkerei AG's goals - eliminating hydraulic oil, reducing waste and changeover time, and energy optimization were achieved upon replacing their hydraulic system with an electrical one.

The Future of Food Production

With increasing concerns surrounding food safety, hydraulic systems are no longer desirable in food-producing companies due to the potential risks of food contamination from oil leakage. Thanks to electrical solutions, oil can be eliminated from production. Maintenance can also be kept to a minimum, eliminating the need for frequent oil and filter changes. Although the initial component acquisition costs of an electromechanical system are usually higher than for hydraulics, the total life cycle benefits make the investment worth it. Profitability increases thanks to higher productivity and significantly lower operating and maintenance costs.