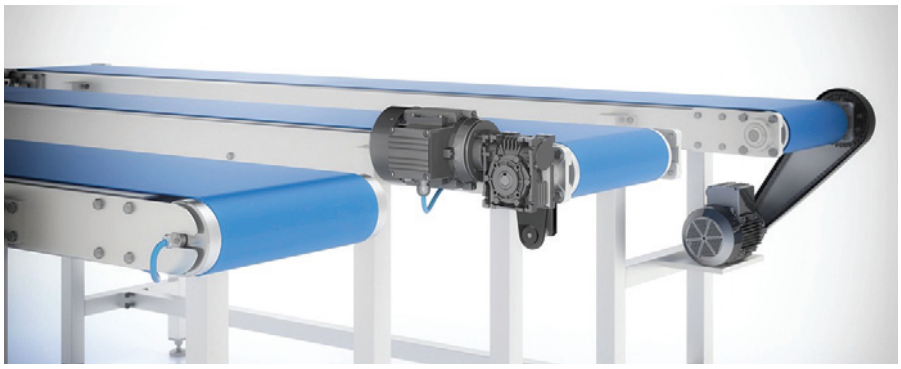
Synchronous drum motors significantly increase food safety

Drum motors are widely used for food conveying. As a completely enclosed single-component solution, they offer particularly high standards of hygiene.

Whereas asynchronous drum motor designs used to predominate, synchronous drum motors are now becoming more and more popular. Their advantages: they run oil-free and significantly cooler.

by Gerhard Froebus, Momentum Technologies (part of NGI A/S). www.momentum-tec.de



When it comes to the functionality of drive components, the demands of the food industry are essentially the same as those of any other industrial application. Here as well as there, the conveying and transport tasks range from simple to demanding.

Demanding tasks can only be solved with intelligent drive solutions that work with servo control logic and that can deliver high-precision transport and positioning within dynamic processes.

Production processes are becoming increasingly dynamic

Similarly, there are no real differences compared to other industrial applications in terms of drive speed, torque and power. These three key criteria for movement in production processes in general are also becoming increasingly dynamic in the food industry.

The motors are expected to accelerate faster and faster; start up and slow down more accurately; and maintain precise speeds.

This puts greater emphasis on peaks and lows as well as good drive control, with the interaction between motors and controllers playing an increasingly important role. Current topics relating to energy efficiency and digitalisation also need addressing.

Here, too, the demands on drive technology for the food industry are no different from those in general mechanical engineering.

Hygiene is the top priority

However, there is one extremely important requirement of the food industry that makes the deployed drive technology unique: hygiene. Drive systems for use in the food industry must be designed in such a way that they cannot contaminate food.

This is why drum motors have long been deployed as integrated drive components in

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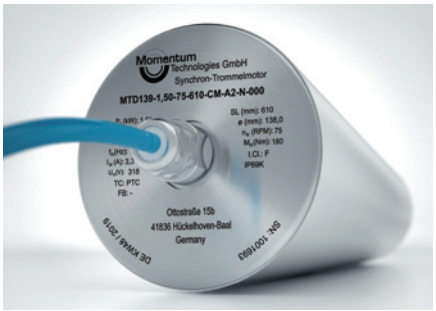
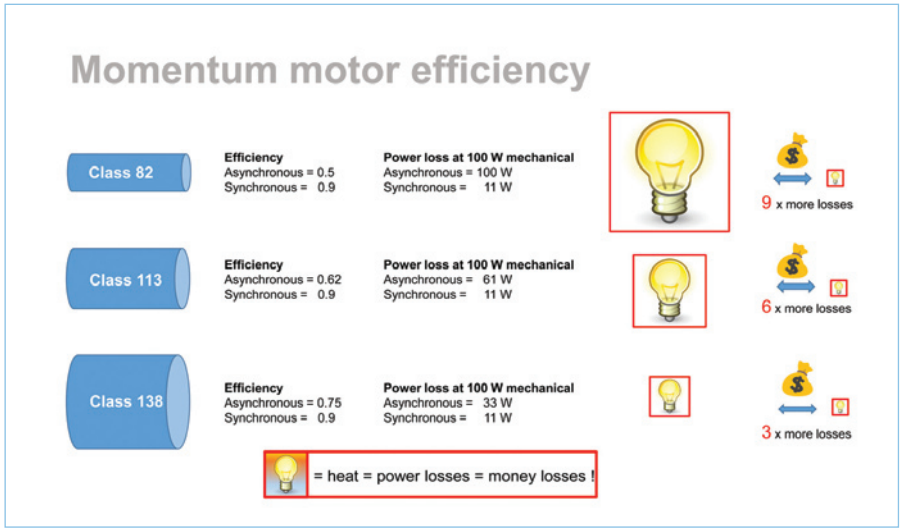
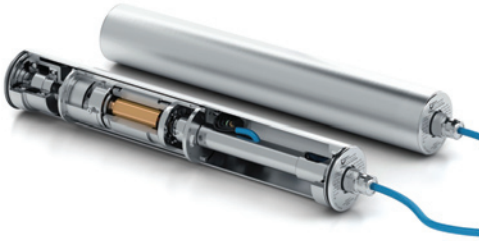
Synchronous drum motors like those from Momentum Technologies increase food safety because these single-component drive units run oil-free, stay cool and are easy to clean.

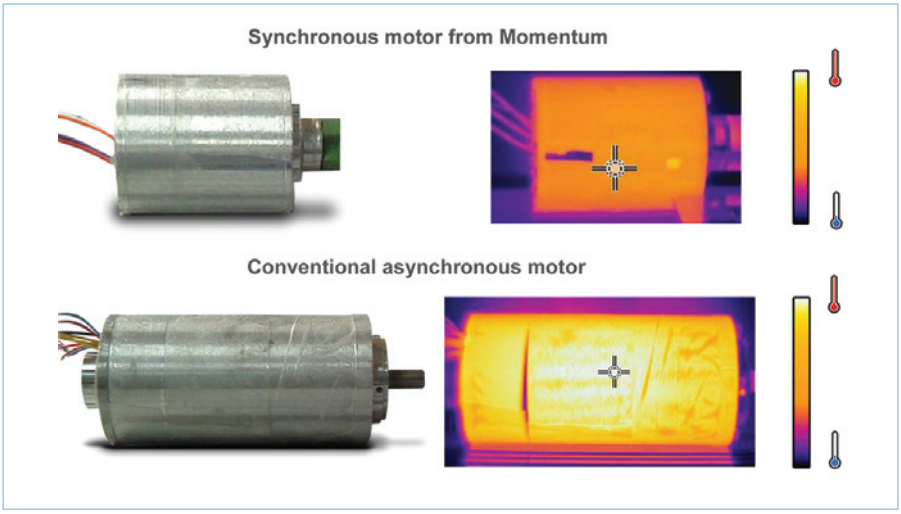


Synchronous motors that sit inside a drum unit have an efficiency of 90% to 95%. The calculations here are based on a cautious 90%. By comparison, the efficiency of asynchronous motors of a comparable size ranges between 49% to 75%.





The two shafts of Momentum's synchronous drum motors have no oil filling and come with IP69k sealing to ensure reliable performance even during the most demanding cleaning cycles.



Temperature tests have shown that a 380 watt drum motor with IE2 efficiency rating gets around twice as hot as a synchronous drum motor with the same power rating and IE4 efficiency.

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the food industry. They have largely replaced motors that are flanged to the outside of the system. Admittedly, such external motors are now standardised worldwide, which has the advantage that if a motor fails anywhere in the world, it is usually easy to obtain a replacement.

However, the use of external motors essentially contradicts the idea of hygiene.

Eliminate bacterial pockets

All motors must be isolated from the food production process. Yet this cannot be fully guaranteed with external motors, as any experienced practitioner is likely to confirm. Pockets of bacteria, even after thorough cleaning, are one of the consequences. As drum motors are significantly more hygienic, they are increasingly being deployed in food processing.

The design of drum motors allows quick, safe and thorough cleaning, leaving no pockets of bacteria behind. When using external motors, it is also necessary to build protective hoods around them, which is costly. A second plus that speaks for drum motors. However, when it comes to drum motors, it is important to take a closer look at which technology is used.

Oil-free is best

Asynchronous drum motors, which have been dominating the market so far, come with three fundamental disadvantages. They are usually filled with oil to dissipate motor power loss. This oil can leak out. These motors also cause the surface of the drum to get quite hot – regardless of loads up to 1kW. However, heat is not something you want in food processing.

Quite apart from it also adversely affecting belt tracking performance, there is also the fact that asynchronous technology requires users to deploy a large number of drum motor variants in order to achieve the required belt speed, tensile force, starting torque, or other needed functionalities.

Synchronous drum motors do not have the above disadvantages.

As they are not filled with oil, there is no chance of it leaking out and contaminating the conveyed materials. The motors also run cool.

That is a good thing, too, because heat can exponentially increase the proliferation of bacteria. In this respect, every degree saved increases the food safety – not to mention the cost savings in primary energy for running the motors, and secondary energy for cooling in production.

And the power density is so high that the many variants previously used can be standardised to just a few. Which makes design and engineering easier. The same applies to spare part logistics and safety stocks. Ultimately, all this frees up capital – both for the OEM and the operator.

The most efficient solution: synchronous drum motors

But what makes synchronous motors so much more efficient than asynchronous motors?

It boils down to technological differences, and is mainly due to the slip of asynchronous motors, a problem that simply does not exist with synchronous motors.

In asynchronous motors, a rotating magnetic field must first be induced, whereas it is already present in synchronous motors thanks to permanent magnets.

Hence such motors can achieve a rotor efficiency of 100%. In comparison, the rotors of asynchronous motors are about 1.2% to 10% less efficient. And the smaller they are, the greater the slip and the poorer the efficiency.

Together with other inefficiencies – such as higher current heat losses in the windings and rotor cage, as well as core magnetisation and eddy current losses (also referred to collectively as iron losses) – the power losses of asynchronous technology quickly add up to 3-9 times more than those of synchronous technology.

With increasing pressure to reduce energy consumption and rising CO_2 taxes, there is no way around synchronous motor technology. ■