PRECISELY THE RIGHT TORQUE

A new capping head for PET bottles with constant torque

It is often the smallest and most inconspicuous part that can make or break the whole. This is also true of Chr. Mayr Power Transmissions products. This company from Mauerstetten in Allgäu, specializing in power transmissions, manufactures torque limiters, safety brakes and shaft couplings for machinery. These are all parts that must be reliable and fail-safe and are essential to the smooth running of the machinery in which they are used. BREWING AND BEVERAGE INDUSTRY INTERNATIONAL spoke to Hans Eberle, Director of Sales and Marketing at Chr. Mayr, about the company's safety philosophy and in particular about the newly developed capping head for bottling systems.

BREWING AND BEVERAGE INDUSTRY INTERNATIONAL: *Your company specializes in drive technology. Could you give us a quick summary of the company's fields of activity?*

Hans Eberle: We specialize in machine components, in particular components for power transmissions. Specifically, these are safety couplings for torque limitation, backlash-free shaft couplings and safety brakes based on the fail-safe principle.

BBII: *Your company has a long history – more than 100 years.*

Eberle: That's right. The firm of Chr. Mayr dates back to 1897. Right from the start the company produced drive systems with so-called transmissions for mills, which were initially made as one-offs. As demand grew, the company soon moved into serial production, initially of belt pulleys.

These were followed a short while later by torque limiters, clutches and brakes, which have remained an important part of our production up to the present day.

BBII: *What connections do you have to the beverage industry?*

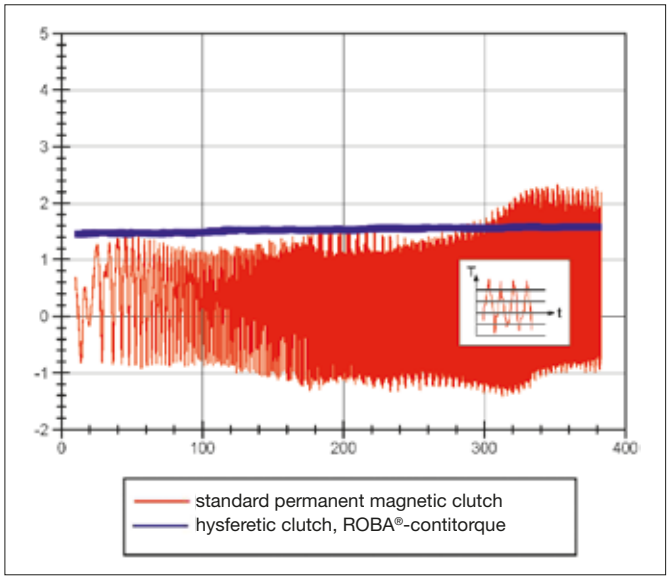
Hans Eberle (r.), Director of Sales and Marketing at Chr. Mayr, talking to Dominik Weikl, Editor BREWING AND BEVERAGE INDUSTRY INTERNATIONAL

Eberle: Machines for packaging and foodstuffs have been an important market for us for a long time. Take, for example, a beverage bottling line: around 80 percent of the components that we produce can be used there. These include brake systems for filler carousels, which make it possible to stop machinery quickly and safely in case of emergency. We also supply capping heads for screw caps. We work with many well-known mechanical engineering companies in the beverage industry and we always have an open ear if a bottler comes to us with problems. In many cases we've already been able to help out with innovative solutions that have subsequently influenced our serial production.

BBII: *Is this how the idea for your new capping clutch came about?*

Eberle: Yes. Imagine the following scenario: You're on a mountain bike trip and you're struggling uphill. You get to the top, worn out, and you really need something to drink but the bottle you have with you won't open because it was closed too tightly on the bottling line. This kind of negative experience mainly has repercussions for the beverage brand. This means that the exact functionality of the capping clutch is extremely important, even though it's such a small and seemingly insignificant component.

BBII: *How can problems like this arise?*



Torque speed characteristics of a permanent magnetic clutch and a hysteretic clutch in the event of overload (Fig.: mayr® Antriebstechnik)

A filling line for drinking yoghurt: the hysteretic clutch, with its constant and shock-less capping torque, is particularly suitable for applying plastic screw caps with a preformed thread. (Picture: mayr® Antriebstechnik)

Eberle: Clutches commonly used in capping heads are often conceived as permanent magnetic clutches. If a clutch like this releases due to overload, it causes extreme fluctuations in the torque, resulting in vibration on closure. With cappers for glass bottles this was a desirable feature that ensured that the bottles were closed tightly. With the PET bottles used today, this is counterproductive: it often results in bottles being closed too tightly. Nonetheless these traditional clutches are still used quite often.

BBII: *How could this problem be solved?*

Eberle: The ideal way to close PET bottles is with constant torque. This makes over-tightening impossible. This is exactly the reason we developed our capping clutch Roba®-contitorque: to provide constant torque.

BBII: *How, exactly, does the clutch work?*

Eberle: Basically, it's a magnetic clutch that works on the hysteretic principle. Torque transmission takes place without contact,

The Roba® capping head's hysteresis technology ensures contactless and therefore wear-free torque transmission: no contamination is caused by abrasion. The clutch works precisely and is characterized by high torque-repeat accuracy. (Picture: mayr® Antriebstechnik)

by magnetic power, which is produced by permanent magnets and magnetizes a hysteresis material.

The maximum torque can be set on the clutch by adjusting the overlap of the two sides.

If the operational torque exceeds the preset torque, the clutch slips. In practice, this takes place for each capping procedure: when the cap is firmly screwed to the bottle, the clutch slips, preventing it from being screwed too tightly.

Technically this means that the two parts of the clutch rotate at different speeds. The drive side continues to turn, while the capper side slows down and eventually stops. The energy still being transmitted from the drive train has to go somewhere so it's converted into heat.

BBII: *Which limits the clutch's range of application?*

Eberle: Right. The clutch can only be allowed to heat up within an established temperature range,

Production at the mayr® Antriebstechnik headquarters in Mauerstetten (Picture: mayr® Antriebstechnik)

or it could be damaged. This means that it's important to use expert knowledge in choosing the correct size of clutch for each specific application. Naturally we support our customers with advice at all times. Clutches are available in various sizes with torque ranges of up to 12 Nm that can be exactly preset. If they have the correct dimensions, Roba-contitorque clutches in bottling lines do not reach critical temperatures.

BBII: *What are the advantages compared to conventional clutches?*

mayr® Antriebstechnik relies on qualified employees and therefore attaches great importance to well-founded training. The company has, on average, 60 apprentices in training, which represents around ten percent of the total workforce. (Picture: mayr® Antriebstechnik)

Eberle: The main advantage of the Roba-contitorque is the constant torque transmission. Unlike permanent magnetic clutches, even when overloaded, i.e. when the clutch slips, the preset torque remains constant. The troublesome vibration is eliminated; the torque varies by 2 percent at the most.

And as I mentioned, the clutch is contact-free. This means that there is almost no wear so it has a long life and requires almost no maintenance.

BBII: *In practice, what is the service life of the clutch?*

Eberle: The clutch basically has the same service life as the machine it's used in, as long as it's not overworked or subjected to mechanical damage from an outside source. Only the mounting can be limiting.

BBII: *The capper head in a bottling line is of course a sensitive area regarding hygiene. How does the clutch design meet these requirements?*

Eberle: For a start, smooth surfaces are part of the design, guaranteeing that fluid runs off quickly. This means that the clutch is made without slots or indentations. This also rules out any infiltration of product remnants or cleaning agents into the drive side. Then the clutch is made of nonrusting materials, mainly stainless steel. The bearings are also made of stainless steel and the magnets are covered, ensuring corrosion resistance here, too. These design features make the whole construction safe to clean, even with the cleaning agents usually used in the beverage industry.

BBII: *Are the components already being used in practice?*

Eberle: Yes. They've already proved their worth in many applications. As you might expect with a company from the Southern-German region Allgäu, the first application was in dairy production. In the meantime, these clutches are used widely in the beverage industry, mainly for PET bottles but also for beverage cartons with screw caps.

BBII: *What are some of your current new developments for the beverage industry?*

Eberle: For some time we have also been looking at Industry 4.0. This is mainly about making it possible to track the condition of the components. For example, giving feedback to the control system on the state of wear in order to make preventive maintenance possible, or indicating error conditions. Developments in this area are already well advanced, particularly in brake systems for filling carousels.

BBII: *Would feedback signals like this also be feasible for torque limiters and similar parts?*

Eberle: It is technically possible. The question is, would it be economical? Usually, it's better to monitor the power consumption of the servomotor. Although the data obtained in this way are an indirect signal, this is precise enough for condition assessment.

BBII: *What are your company's plans for the future?*

Eberle: We have a long history based on trust and cooperation with our customers and business partners, which is very important to us. We have maintained connections with some of our customers for several decades and that is exactly how we wish to conduct business in the future.

BBII: *Mr. Eberle, thank you for the interview. (dw)* □

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