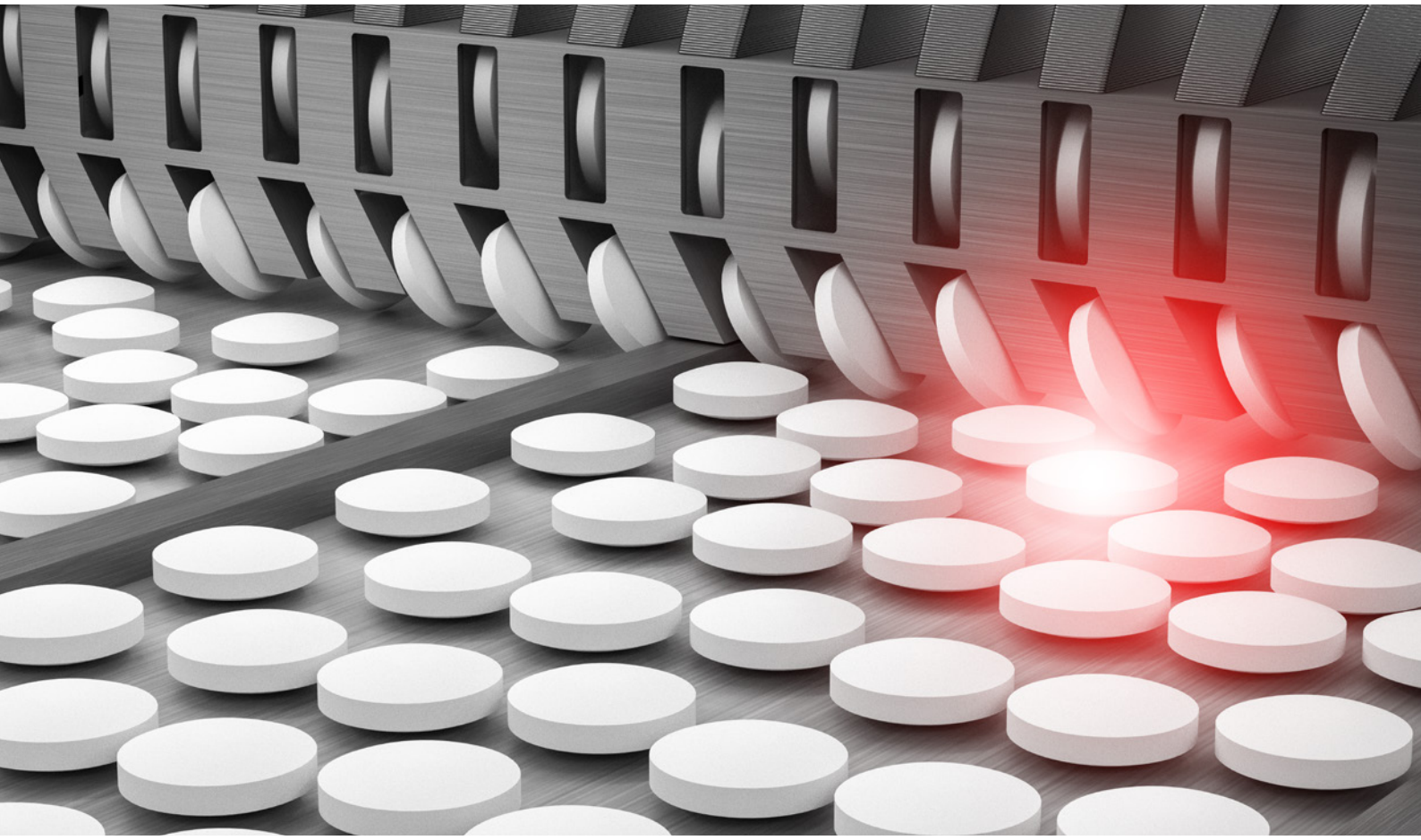

Romaco Kilian
Tablet production

Ensuring consistent efficency: individual gear unit solution for tablet presses.

In the production of medicines, the very highest level of precision is essential. The formula has to be 100 per cent right – and the production process likewise requires precision down to the last detail. So in order to perfect its tablet production, the Cologne-based tablet press manufacturer Romaco Kilian opts for customised worm gear units made by ZAE. Their smooth running, low temperature emissions and durability make them highly desirable.

Compact info

Company: Romaco Kilian **Industry:** Tablet production **Project years:** 2018 to 2020

Medicines are key topic of debate in society.

Hardly a day goes by without medical research hitting the news ticker. Add to this our increasingly ageing society with its growing dependence on medicines as people live longer and longer, and we come to realise: the demand for medical drugs – especially tablets as the most common dosage form – is a key challenge that we as a society are called upon to tackle.

This cost-efficient machine produces up to 1.02 million tablets/hour, developing pressing forces of up to 100 kN.

The S710 Prime double-sided rotary tablet press made by Romaco Kilian produces up to 1.02 million tablets/hour, developing pressing forces of up to 100 kN.

The key factors in tablet production.

Tablets are produced using tablet presses, which heavily compress the powder or granulate containing the active ingredient. One of the leading manufacturers of such presses is Romaco Kilian, based in Cologne. A tradition-steeped company, Kilian was founded as long ago as 1875 and has been part of the Romaco process and packaging technology group since 2013. The company now offers the full range of tableting technology – from single-stroke laboratory tablet presses to high-speed tablet presses for large-scale producers. The latter also include the S710 Prime double-sided rotary tablet press. This cost-efficient machine produces up to 1.02 million tablets/hour, developing pressing forces of up to 100 kN.

“For our customers, the most important thing is the consistent quality of the tablets.”

If high-performance tablet presses break down or have production problems, the tablet manufacturer suffers a major economic loss within a very short time. This is why Romaco Kilian attaches importance not just to performance but in particular system availability and process consistency when developing tablet presses, Romaco Kilian design manager Bernhard Kock explains: “For our customers, the most important thing is the consistent quality of the tablets. The weights have to be uniform. And the tablet powder content mustn’t differ from one tablet to the next: this ensures that the efficacy in medical terms is identical. Accordingly, the quality of our machines and that of the components used has to be excellent – especially that of the gear units.”

Temperature and running smoothness as success criteria.

In order to prevent malfunction and rejects in tablet production, the tablet presses must not run too hot. Too high a temperature might impact negatively on the effectiveness of the formula. What is more, excess heat input could affect the longevity of the machine components. Here, the gear unit has an essential role to play as the centrepiece of the machine.

The gear unit drives the rotor of the tablet press. The press tools and the die plate are located on the rotor, which has a major influence on the performance and process quality of the tablet press. The active ingredient mixture of the tablet flows into the holes of the die discs before pressing: this means the rotor has to run absolutely smoothly so that the tablet powder is discharged evenly. For this reason, Romaco Kilian's requirement was that the gear unit driving the rotor of the S710 Prime must not heat up excessively during operation and that perfect running smoothness was to be guaranteed. If this is not the case, noise levels can be disruptive as well.

ZAE: Specialist for sophisticated solutions.

In search of a reliable partner able to produce customised gear units of the very highest quality, Romaco Kilian turned to ZAE-AntriebsSysteme based in Hamburg Altona. "ZAE stands for stability and competence. We've worked with this Hamburg-based company for a long time on other types of machine. Since day one we've been able to rely on the fact that the quality of the ZAE gear units is consistently high, with parts availability always guaranteed – both in purchasing and in spare parts management. That's something we greatly appreciate," says Romaco Kilian Managing Director Jens Carstens, explaining the background to the collaboration between the two companies.

- Design of highly individualised drive solutions
- Individual gear units of the very highest quality
- Stability and competence

ZAE-AntriebsSysteme can justifiably call itself a tradition-steeped company. For more than 100 years, it has produced innovative, highly efficient drive technology that has an outstanding track record in numerous industries. In particular, the design of highly individualised drive solutions is a speciality of the industrial gear unit manufacturer. "We build excellent standard gear units too, of course. But we're unbeatable when it comes to the customised engineering of bespoke solutions. So we were delighted when Romaco Kilian approached us with this challenging task. On the one hand, gear units for tablet presses must not generate too much heat, but at the same time they have to run smoothly and be particularly robust in standing up to incoming torque and impact," says Folke Hedder, sales manager at ZAE, explaining the requirements that apply to the gear unit for the S710 Prime.

ZAE's E160F flange-type worm gear unit was customised to meet Romaco Kilian's requirements.

Extreme precision required.

So ZAE's flange-type worm gear unit E160F was customised to meet Romaco Kilian's requirements. The E160F is a low-backlash gear unit. This is particularly important for tablet presses: when the press stamps are applied and released, any repelling force would impact negatively on the running and the service life of the gear unit. Worm gear units are predestined to meet this type of requirement, as they are well able to absorb or compensate for such impacts due to their interlocking geometry.

Nevertheless, it was far from enough simply to choose any random worm gear unit with suitable capacity. In particular, the adjustment and selection of the tapered roller bearings required the very highest precision so as to ensure that the axial clearance of the worm was at its optimum during operation and that the desired smooth running was achieved. The clearance was only allowed to be 0.02 mm at the defined operating conditions, thereby ensuring a perfect compromise between stiffness, energy efficiency and friction. If the installed tapered roller bearings are preloaded at the operating point, there is naturally an increase in the temperature of the gear unit, and therefore of the entire system. In addition, a high gear unit temperature reduces the service life of the gear unit oil, the radial shaft seals and the bearings.

- ZAE E160F in a low-backlash version
- Axial clearance of the worm shaft at the operating point only 0.02 mm
- Compromise between stiffness and energy efficiency

Impressive proven quality.

A fair amount of engineering was required on the part of the ZAE specialists to be able to guarantee this accuracy. By means of an extensive testing and development process, ZAE was able to find the perfect solution for the Romaco Kilian S710 Prime. ZAE operates a large-scale test facility at its plant in Hamburg-Altona in order to be able to offer customers products which are not just perfectly assembled but which have demonstrated in practical testing that they meet customer requirements.

- Worm gear unit E160F
- ZAE with large-scale test facility
- Proven in practical testing
- Temperature far below the limit
- Efficient operation of the transmission system
- Protection of the tapered roller bearing
- and the gear oil used

In order to measure the axial clearance with repeatable accuracy, ZAE designed a specially made automatic measuring machine, since manual measurement was not sufficiently precise in this case. Further proof that ZAE-AntriebsSysteme spares no effort in ensuring a perfect result for its customers.

Perfectly matched to the S710 Prime by ZAE, the E160F worm gear unit more than meets the benchmarks set by Romaco Kilian. At the defined operating point, the gear unit reaches a temperature that is far below the limit set by the Cologne-based tablet press manufacturer. This is established in an acceptance report that is issued for every ZAE gear unit on delivery that contains the values from the test run. Most gear units complete this test run with temperatures that are generally 10K (or 10°C) below the customer's limit.

The gear unit ensures the tablet press rotor runs smoothly. This is essential in order to ensure consistent tablet quality.

The optimised operating temperature ensures efficient operation of the transmission system, while at the same time protecting the tapered roller bearings and transmission oil used. As such, Romaco Kilian benefits from a gear unit solution that provides optimum support for the S710 Prime in tablet production and requires very little maintenance over the lifetime of the machine. This in turn increases the service life of the entire tablet press. And ultimately, the tablet press manufacturer can rely on the gear units. ZAE is committed to ensuring that the gear units it supplies run smoothly and reliably. No readjustment is necessary during assembly. For Romaco Kilian, this means: order, install, start up – job done.

Collaboration on an equal footing.

ZAE and Romaco Kilian are well-matched partners – not only technologically, as Folke Hedder comments: "It's simply a lot of fun working together. We collaborate with Romaco Kilian in a spirit of partnership and trust. And last but not least, there's a good personal match, too. When the chemistry is right, I believe the work itself usually ends up being more productive and successful, too."

Jens Carstens agrees: "We value ZAE as a sparring partner on an equal footing. Our suggestions and requirements are taken on board and we get creative and competent feedback on how to tackle our challenges. The quality of discussion and response time are excellent. You simply notice that with ZAE you're talking to experts who understand our needs as machine manufacturers and are able to translate these into excellent gear technology. We're already looking forward to taking on joint projects in the future."

"ZAE and Romaco Kilian are well-matched partners. We're already looking forward to taking on joint projects in the future."