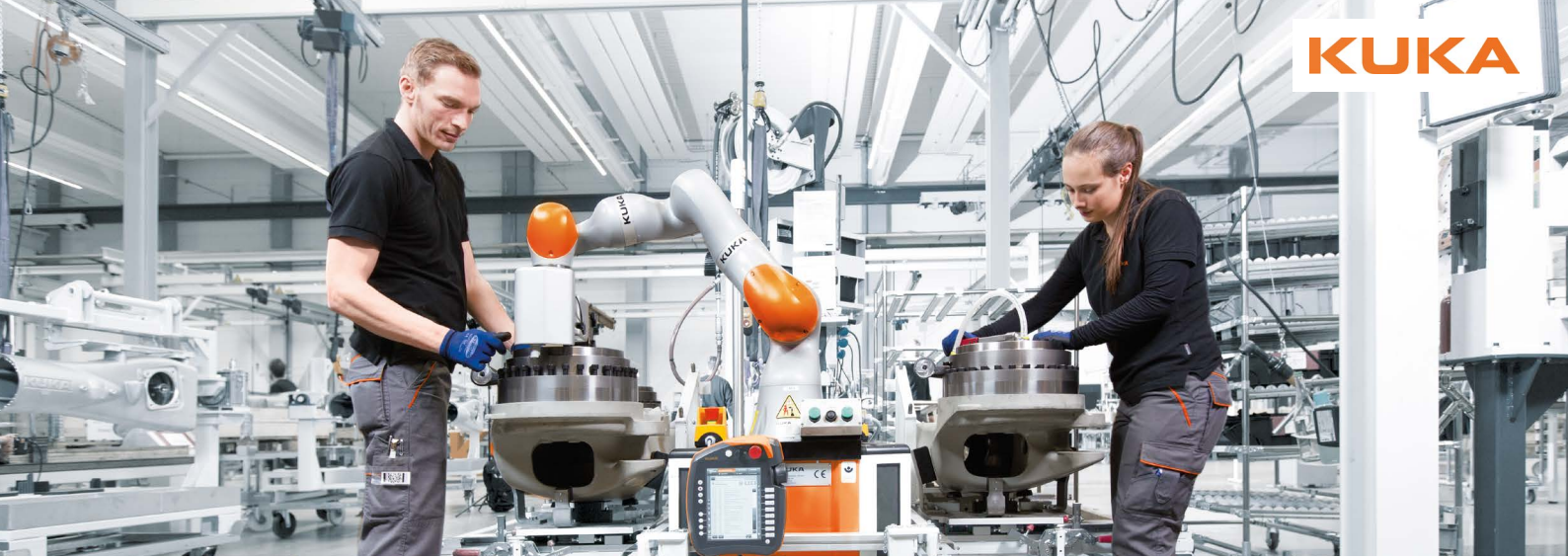


Whitepaper

OPTIMIZING ROBOTICS, MAXIMIZING UPTIME



IT'S MORE THAN JUST OIL. IT'S LIQUID ENGINEERING.® 



HOW YOU CAN IMPROVE THE QUALITY AND EFFICIENCY OF YOUR AUTOMATED PRODUCTION FACILITY AND REDUCE DOWNTIME

Fully automated assembly lines with industrial robots are highly efficient, fast and precise – as long as they are in operation. When unplanned downtimes occur, the economic damage can be immense within just a matter of minutes. Prevention, as the sayings have it, is better than repair. Using high-performance lubricants during regular maintenance of industrial robots prevents unscheduled downtimes, optimizes the robotics and maximizes the uptime of the assembly line. In this white paper, you will learn more about the right lubrication for your industrial robots.

INDUSTRIAL ROBOTICS: PROGRESS AND CHALLENGES

With Industry 4.0, the automation of manufacturing processes continues to advance at pace. Industrial robots work together seamlessly on fully automated production lines. Replacing human labour in monotonous manufacturing processes with robots increases production, improves product quality and lowers production costs. So it is no wonder that the number of industrial robots worldwide increased by 83% between 2013 and 2018. If one of them comes to a standstill, however, the production chain is interrupted and the moment that every company dreads becomes a reality: unscheduled downtime due to robot failures. Downtime is the challenge of automated manufacturing processes. A single minute of manufacturing downtime can

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Lubricants must be completely replaced every five years or **20 000** operating hours at the latest

cost a carmaker roughly USD 22,000[A1]. It is therefore extremely important to plan necessary downtimes in advance rather than being taken by surprise. If the production line is optimally configured, maintained and lubricated, it performs its work smoothly, with minimal wear and without breakdowns. Regular, generally annual, maintenance is therefore indispensable. It is essential to check all moving parts and replace them as necessary, as well as to check the lubrication. Lubricants on average should be replaced every three to five years or 20,000 operating hours (subject to robot manufacturers recommendations). Depending on the field of application, they are subjected to extreme stresses and should therefore not be left in the gearboxes for longer than recommended by the manufacturer. Continuous operation, start-stop movements and heavy

loads generate high temperatures and shock loads in the gearboxes. The right lubricant under these circumstances improves the efficiency of the machine and can even extend the oil change interval.

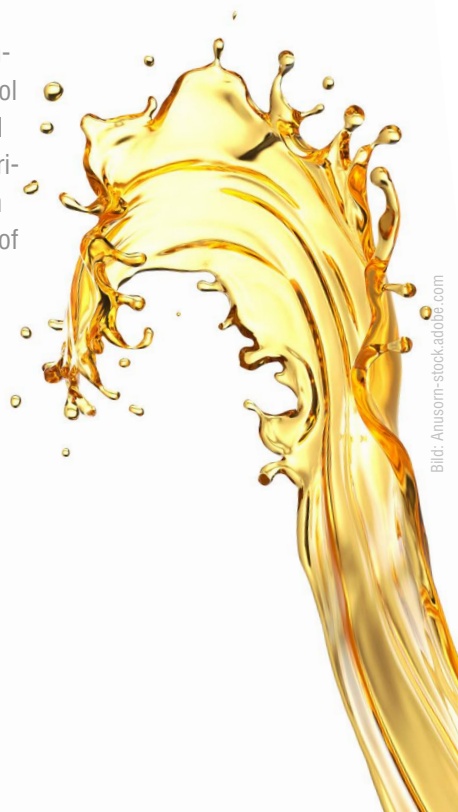
Tip: go all the way with automation, not just halfway. Continuous data collection and analysis of your robots can help to develop a software-based and predictive maintenance routine. This data allows system-specific maintenance management that identifies wear and need for action before unscheduled downtime occurs.



ACHIEVE SMOOTH MANUFACTURING PROCESSES WITH HIGH-PERFORMANCE LUBRICANTS

Robots require the right lubrication in every moving joint, which provides wear protection for joints, bearings, sliders, chains and gears and improves the performance of industrial robots. The choice of lubricant has a major impact on production efficiency. If it is suitable for the robot model and its area of application, it also prevents leaks. This advantage should not be neglected, because whenever oil or grease leak and foreign matter such as dust, dirt, water and chemicals enter the lubrication system, the result is increased wear. Material abrasion and scratching of moving parts occur, resulting in increased wear, fatigue and corrosion. Leaks or

chips can also damage or contaminate the products. Recalls, downtime and increased overall operating costs are then inevitable. But which lubricant is the right one? There are manufacturer's recommendations for this, including state-of-the-art lubricants from Castrol. These ensure faster start-up times and can lead to lower energy consumption. The impact is felt not only in important industries around the world. Castrol high-performance lubricants are also used on Mars. With these Castrol high-tech lubricants, you can achieve smooth production processes and influence the performance of any system, be it in space, wind turbines, on the road or in industrial production.



CASTROL ADVANCED LUBRICANTS FOR ROBOTICS (ALR)

- Castrol advanced lubricants for robotics (ALR) are based on the latest lubricant technology. They have been developed to reduce downtime and costs and increase quality and efficiency in production.
- Castrol ALR is the result of intensive research and development. The program offers greases and gear oils for all axes, helping you increase efficiency in the individual production stages.

The Castrol ALR robotics range includes both greases and oils. The main difference lies in the consistency and thus also in the areas of application. In addition, special lubricating greases are used for cables, which are constantly in motion due to the numerous possible movements of the robot. The lubricating grease ensures that the cables glide smoothly and protects the insulation from breakage and wear. Use the correct lubricant for your robots and the respective part to be lubricated.

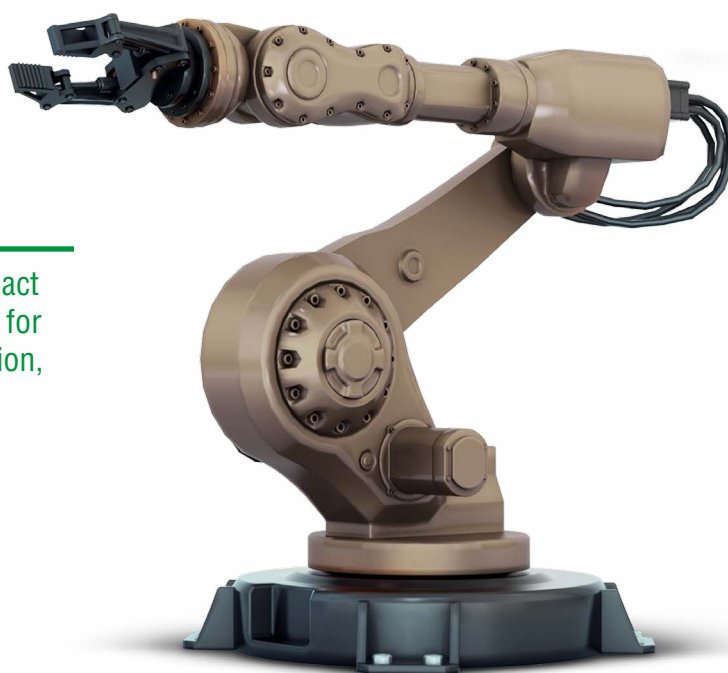
The benefits to you include:

- Reduces friction and wear of moving parts;
- Cools the system and dampens vibrations;
- Protects seals, rubbers and plastics from drying out;
- Protects surfaces and material;
- Prevents leakage;
- Potential to optimize to 1 lubricant for all axes.

You also have the choice between synthetic and mineral lubricants. Most robot manufacturers recommend synthetic based lubricants for complicated mechanisms and approve the use of mineral based lubricants for simple and heavy-duty mechanisms. For example, the manufacturer of your industrial robot may recommend synthetic lubricants in principle, but specify mineral lubricants for a particular axis.



The choice of lubricant has a major impact on production efficiency. If it is suitable for the robot model and its area of application, it also prevents leaks.





LUBRICATING OILS

- **Castrol Optigear ALR X1** is a synthetic gear oil specifically designed for oil-lubricated robots. It is notable for its good elastomer compatibility, low leakage and long life. It is versatile and can be used on all axes of an industrial robot.
- **Castrol Optigear Synthetic RO 150** is used where things get heavy. The high load-carrying capacity of this synthetic gear oil guarantees high reliability and endurance for oil-lubricated robots working with heavy loads. It is suitable for use on all axes of the robot. Long-term tests with this oil have shown excellent gearbox performance. This oil proved its high load-carrying capacity in the FZG GL5 “Sprungtest”.
- **Castrol Optigear EP 320** is a mineral gear oil that is particularly low-friction and suitable for heavy loads.

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Long-term tests
with this oil have
shown excellent
gearbox
performance

It is therefore often used on axis 1 of a robot. Melior Motion recommends this PD high-performance lubricant for its backlash-free precision planetary gearboxes.

- **Castrol Optigear BM 100** is the specialist for precision work and is therefore used on the upper axes of the robot. This mineral oil ensures particularly low friction and thus supports the precise work of axes that allow many different movements.
- **Castrol Optileb GT 1800/220** is Castrol's dedicated solution for robots in the food industry. This synthetic oil was developed for the lubrication of worm gears, but has also proven effective in other types of gears. It complies with NSF-H1, exceeds the requirements of DIN 51517-3 as well as ISO 12925-1 and is physiologically harmless.

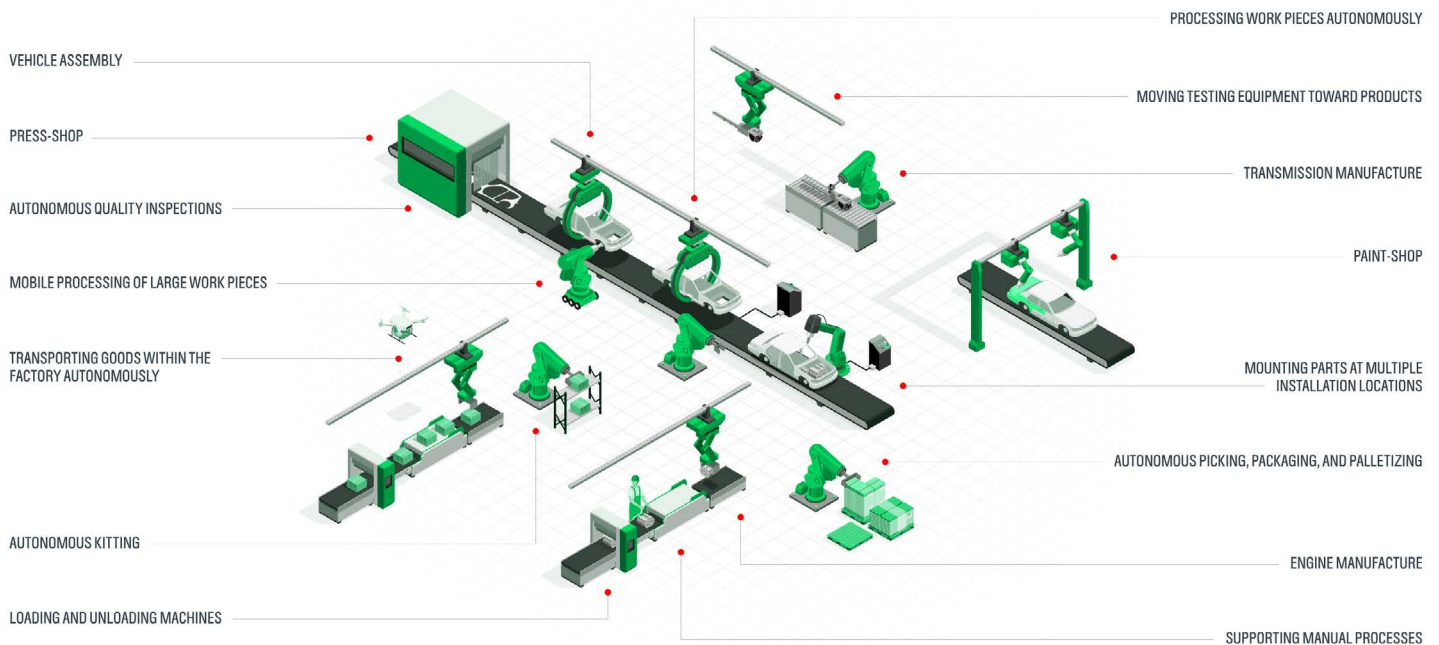
GREASES

- **Castrol Tribol GR ALR 100-00 PD** is a synthetic all-rounder grease. It is suitable for all axes of a grease-lubricated robot. It is very stable and has a low oil separation. The grease boasts low friction and has impressively low torque values.
- **Castrol Tribol GR 100-00, -0, -1, -2 PD** is the mineral version of the all-rounder grease. It is particularly low-friction and offers high wear protection on all axes of a grease-lubricated robot. This makes it the ideal lubricant for cycloidal robot gearboxes.

The US automotive industry relies on this high-performance grease not least because of its global availability.

Castrol Optileb GR 823-2 is the special solution for automated food production. This grease protects the cables of grease-lubricated robots and keeps them both pliable and flexible.

- **Castrol Optitemp RB 2** is the synthetic grease for all cables on robots outside the food industry. It was specially developed for the lubrication of robot cables and offers both high wear protection and good adhesion.



INDIVIDUAL LUBRICANT SOLUTIONS FOR KUKA ROBOTS

Every robot manufacturer is keen to ensure the smooth running of all work steps for their products, because the more successfully and consistently a robot works, the more the purchase pays for itself. It is therefore not uncommon for manufacturers of industrial robots to approach lubricant experts in order to jointly develop the ideal lubricants for the respective application. One such collaboration was established between the experienced lubricant producer of the BP Group, Castrol, and the first manufacturer of industrial robots with PC-based control, KUKA, for their six-axes industrial robots which is now widely used worldwide. These lubricants are available exclusively from KUKA.

- **Castrol Optigear Synthetic ALR 150** has a unique additive system and has been specifically developed for the lubrication of KUKA robot gearboxes. It offers a three-pronged combination: sludge-free, low-wear and excellent elastomer compatibility. It is designed for 20,000 hours of leak-free performance with reduced maintenance. This synthetic gear oil is suitable for all axes of KUKA robots.
- **Castrol Optigear ALR 320** is a mineral gear oil that is particularly low-friction and suitable for heavy loads. It is recommended by KUKA for all robot axes of a particular robot type. It is also used in larger robots on axis 1.





Find out which lubricant is ideal for
your industrial robots and how
Castrol ALR can maximize your
equipment availability.

Contact your Castrol representative now!

www.Castrol.co.uk/industrial

