

A thirst for automation

Intelligent filling machine lubrication for the beverage industry

You need only stroll down the beverage aisle of your local store to know that bottled drinks have become a consumer staple, and that the range of products is overwhelming. The growing demand for drinks at convenient locations – work, school, gym, transport, leisure – is being driven by the global trend towards urbanization, fueled in turn by inexorable population growth. Inevitably, snowballing consumption increases the pressure on manufacturers, and also on the machines upon which they rely.

Small wonder that the beverage industry is becoming increasingly competitive. It is common for manufacturers to demand 24-hour production, leaving little time for maintenance and requiring upkeep be performed while equipment is still in operation. Machine failures have a dramatic impact on availability – the goal of overall equipment effectiveness (OEE)

at 80% or higher often clashes with a reality of around 60%. One of the most critical applications determining overall OEE in beverage manufacture is the filling machine itself. Faced with filling a glass bottle, can, Tetra Pak, pouch, tube, PET and more with anything from water or tea to smoothies and yoghurt, the market expects filling equipment that is accurate, versatile, hygienic and reliable, even when operating continuously, at high speeds, and without planned maintenance breaks.

This paper explores a new approach and considers the potential of automated lubrication systems and food-grade lubricants in beverage filling machines.



Poor lubrication accounts for more than 36% of all premature bearing failures. If you include contamination, this figure rises above 50%.





Filling machines and lubrication

These characteristics of beverage production demand efficient lubrication of moving parts. SKF customers in the sector often list the following aspects of lubrication as critical to the performance of filling machines:

- **Too little grease:** Lack of lubricant shortens the lifetime of the bearing and that of the machine as a whole. Both under- and over-lubrication can be due to imprecise metering, but also because some lubricating points are simply forgotten, especially those that are difficult to reach or cannot be accessed while the machine is in motion.
- **Too much grease:** The paramount risk here is costly contamination of the product. But even more critical in cost terms is that grease can enter the water used to clean the machine, requiring water treatment processes to meet environmental regulations.
- **Complexity:** A filling machine may have up to 80 lubrication points, many of which are located inside rotating mechanical parts and therefore impossible to access while machinery is running. Manual access might be complicated by safety concerns. Components vary and their efficient lubrication can be complex. An example is gear wheels, lubrication of which is fundamental to the machine's performance.
- **Corrosion:** Lubrication systems may not be designed to operate under the aggressive conditions of the beverage industry, such as high humidity, leading to corroded metering devices, grease nipples and piping. Frequent high-pressure washing is mandatory on bottling lines and poses a real challenge to the integrity of bottling mechanisms and their lubrication. It goes without saying that corrosion is damaging for beverage manufacturing sites.



Automated solutions

Centralized, automatic lubrication systems (ALS) have the potential to increase machine availability while reducing reliance on scarce talent. These systems provide the appropriate quantity of lubrication at the correct intervals, minimizing friction and wear and optimizing bearing and machinery service life. Designed to lubricate individual machines or entire plants, ALS provide proper, precise lubricant replenishment to all required points, enabling a range of benefits in the process.



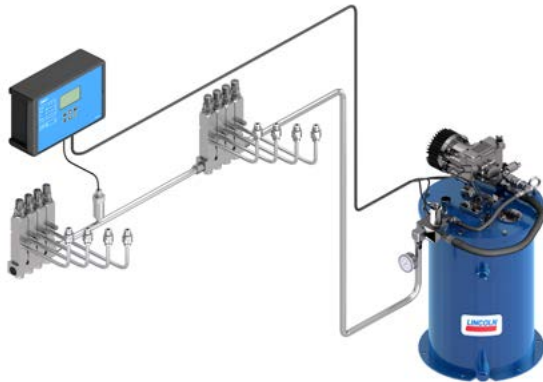
An intelligent machine, made from non-corrosive materials, therefore has the potential to eliminate the common problems listed above. By delivering the correct lubricant, in the right quantity, at the right time to the correct lubrication point, automation removes human error, hugely simplifies lubrication management, reduces lubricant consumption and thereby enhances the overall efficiency of the bottling process.

Before we describe the different types of automated systems for filling machines, let's examine the main factors that determine the correct choice of solution:

- **Dimensions:** The size of the filling machine determines the number of lubrication points, and thus total lubricant consumption.
- **Variation:** The chosen system must have the capacity to deliver an exact quantity of grease or oil to each lubrication point, which may vary according to the part of the machine to be lubricated.
- **Technical parameters:** The system must take into account back pressures at the lubrication points, operating temperature range, the choice of lubricant itself, the feed pump's drive energy, control and monitoring.
- **Type of mechanisms to be lubricated:** Bearings, gears, selection screws etc.
- **Factory environment:** In most circumstances, stainless steel components are essential to avoid corrosion. However, not all automated lubrication systems use corrosion-free materials.



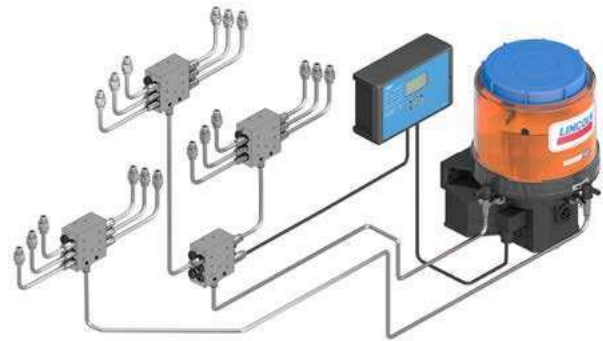
Types of automated lubrication systems



Single-line automatic lubrication systems



A pump delivers lubricant to an (adjustable) metering device that services the lubrication points, delivering a precise amount of grease or oil. Single-line lubrication systems can be used to service one machine, different zones on one machine, or several separate machines. Monitoring is done by sensors that monitor system pressures and send signals to the control unit at preadjusted critical values. The control unit enables lubrication to be triggered automatically at predetermined intervals. Single-line lubrication systems can serve up to 900 lubrication points in machines over distances of up to 100 m (300 ft). Smaller systems are fed by compact pump units incl. lubricant reservoirs, bigger systems are fed by barrel pumps. Installation is easier than with a progressive grease lubrication system, but the initial investment in a single-line grease lubrication system may be higher.

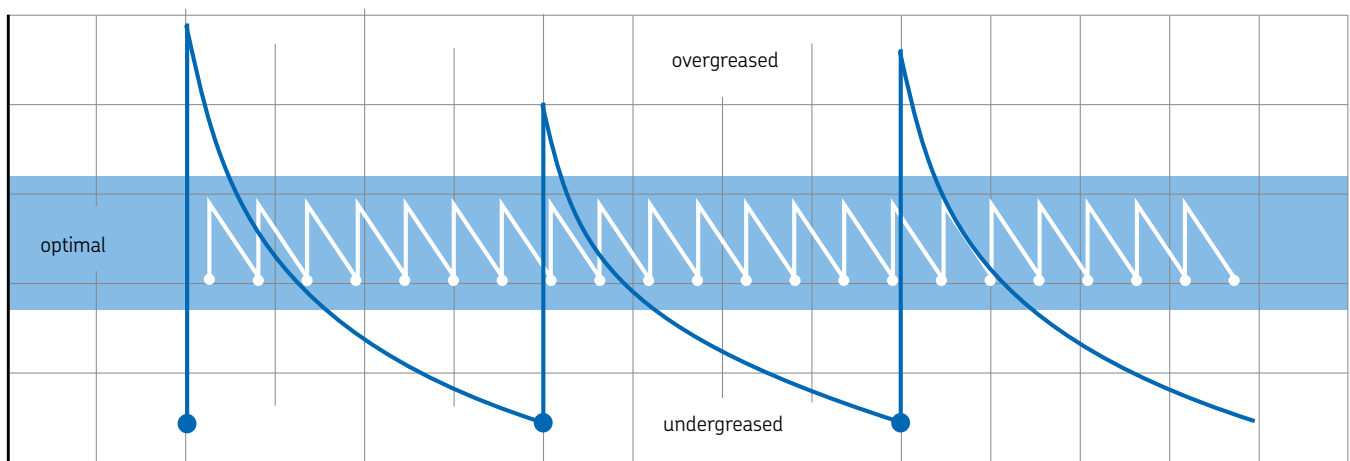


Progressive automatic lubrication systems



This is the most common lubrication system in food and beverage industry. It can be used on small to medium sized machines with dispersed lubrication points that require varying quantities of grease or oil. Progressive lubrication systems consist of a pump connected to a primary metering device, outlets from which are connected via pipes or high-pressure hoses to the lubrication points of the filling machine. The pump supplies lubricant to the meter, which splits the lubricant into predefined amounts, which in turn are pumped to the lubrication points or – alternatively – to the inlet of a secondary metering device, thereby enabling more points to be lubricated. Progressive lubrication systems can dispense a precise, metered amount of lubricant to up to 150 lubrication points over distances of approximately 15 m (16 yd).

Grease level



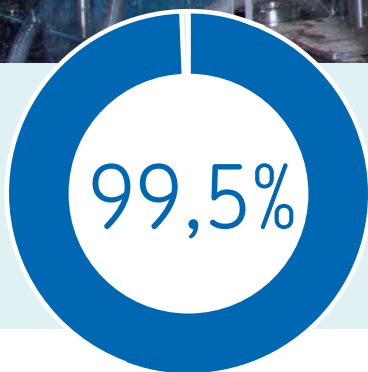
Automatic lubrication systems help ensure that the right amount of lubricant is applied in the right place at the right time.

Time

“

Production managers tell us, that the investment in an automatic lubrication system pays off in short time.

”



of today's operated beverage filling machines are still manually lubricated.

Return on invest

Although there is an initial cost to installing an ALS, the return on investment can come faster than might be assumed. Firstly, labor costs are significantly reduced. But there are also considerable savings from reduced downtime and extended component life. There is no need to stop the machine for lubrication, only to keep the system filled and maintained, so efficiency is enhanced.

Lubrication that takes place while the bearings are rotating also improves the distribution of lubricant. A small amount of grease remains flowing, keeping out contamination even when the machine is operating in a harsh environment.

Smart sensors and digital measuring devices also make it possible to constantly monitor the entire lubrication process. Monitoring and control are essential to the efficient operation of lubrication systems. Installed in conjunction with intelligent monitoring devices, automatic lubrication systems can facilitate economical and optimal lubrication. The resulting data can give operators advanced warning of lubrication or machine failure, enabling preventive action to be taken.

Benefits of automatic lubrication systems

The potential of automatic lubrication systems for filling machines can be measured in economic terms:

- **Increased asset availability:** With the reliability that comes with automated lubrication, the frequency and duration of downtime as a result of mechanical failures is sharply reduced. SKF has experience of applications in which downtime reduction has been up to 80%.
- **Lower consumption of spare parts:** With lubrication failures eliminated, annual consumption of spare parts such as bearings, chains and gear wheels is reduced on average by around 50%, according to SKF's experience.
- **Reduced maintenance costs:** accurate and appropriate lubrication removes one of the main causes of machine failure.
- **Higher speed:** A bottling plant can as much as double the speed of a spiral conveyor, because automatically lubricated transmission chains can run faster without damaging the bottles.
- **Higher productivity:** Apart from the increase in machine uptime, the reduction in labor necessary to carry out routine lubrication makes automation an obvious route to increased efficiency.
- **Improved health and safety:** Workers are no longer exposed to potential hazards during manual lubrication of machines during operation.
- **Lower risk of product contamination:** automation eliminates the danger of contaminating beverages through over-lubrication.
- **Rapid return on investment:** All the above factors combine to deliver a swift return on investment in automated lubrication systems for beverage filling machines.

Food grade lubricants

The food and beverage industry is a challenging market where production efficiencies need to improve while maintaining safety and cleanliness. Health concerns are rising concerning the usage of inappropriate lubricants in the manufacturing of various food-type products. It is very important to use food grade lubricants in food production facilities to avoid potential product pollution and unnecessary costs related to it.

SKF food grade lubricants are NSF H1 ¹⁾ registered, and Kosher ²⁾ and Halal ³⁾ certified. Additionally, they rely on the ISO 21469 standard which helps ensure that they are produced and delivered according to the highest hygienic requirements.

- Improved food safety
- Reliable machine lubrication
- Reduced cross contamination risks
- Reduced maintenance costs
- Improved processing efficiency



1) NSF: U.S. National Sanitation Foundation, H1: Incidental contact with food
2) Kosher: Food prepared in accordance with Jewish dietary laws
3) Halal: Food prepared in accordance with Islamic dietary laws

Compliance with food safety regulations

Regulation is increasingly affecting global food and beverage production, with stricter rules forcing manufacturers to change their processes or modify their machines. In some countries, stainless steel is already obligatory for critical machine parts. Components for use in damp areas must be corrosion-free and amenable to high-pressure cleaning.

Health concerns are also rising with regard to the use of inappropriate lubricants in the manufacture of food and beverage products. Lubricants themselves must therefore be certified safe for incidental contact with items to be consumed by humans, and compliant with the dietary specifications of the world's major religions.

Upgrading to automated lubrication can bring the additional benefit of compliance with existing or anticipated regulations.

Components must be coated in stainless steel or housed in a stainless steel cabinet, ensuring that migration of contaminants takes place, if at all, in completely harmless amounts.



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For more information,
please visit



[SKF.com/fb/lubrication](https://www.skf.com/fb/lubrication)

Conclusion

SKF and Lincoln lubrication products, systems and services are available through a global network of distributors, supported by a unified sales organization around the world to offer turnkey solutions and extensive aftermarket support, including food-grade lubricants tailored to the beverage sector. We are committed to your success through optimizing your lubrication management.

[skf.com](https://www.skf.com) | [skf.com/lubrication](https://www.skf.com/lubrication)

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PUB LS/S2 19568 EN • June 2023
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