



*THE IMPORTANCE
OF QUALITY
H1 FOOD GRADE LUBRICANTS IN
TODAY'S FOOD PROCESSING EQUIPMENT*

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In spite of electronics, automated equipment, computers and other modern technology, people are still responsible for lubrication and maintenance in the Food Processing Industry. They are constantly beset with plaguing problems of the operating environment, as well as problems inherent in complex equipment. Lubrication of equipment in food industry applications requires high quality, high performance lubricants that stand up to some of the harshest environmental conditions found anywhere. A few of these difficult conditions are listed below.

Moisture is an ever present destroyer of lubrication and is detrimental to good maintenance. The water or steam present is due to the necessity for constant cleanliness of the machinery and surrounding areas. It may also be a part of the process itself. This moisture can wash out lubricants, cause emulsions of greases and oil, cause rust and corrosion as well as increasing the deterioration of lubricants.

Heat is often one of the more serious problems. High temperatures can come from drying and sterilizing processes, or from steam and hot water used in cleaning. Higher temperatures can cause greases to melt and run out of bearings and will speed up oxidation of both greases and oils; thereby shortening their life.

Conversely, in some plants there may be refrigerated areas, coolers, etc., which require **low temperature** mobility in greases and low pour points in oils. Wear can result from channelling of the lubricant. These areas may also create moisture problems because of excessive condensation.

Shock loading or impact may be a factor in many areas. The lubricant may be pounded out of an area leaving metal-to-metal contact with consequent damage to surfaces; an increase in friction leads to heat & wear. Grease may lack cohesion or adhesion; oil may be light or won't penetrate to critical areas.

Long life of both the equipment and the lubricant is another challenge. Some operations run around the clock twenty-four hours a day. Again, these operations may be hot, wet, cold, subject to contamination etc., and therefore creating doubly severe conditions. Grease may "shear down" or become very soft or liquid, oils oxidize rapidly and both may become contaminated. Both greases and oils may harden or thicken in service, creating increased power demands.

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One of the most severe requirements imposed on lubricants in the food processing industry is the demand for purity and the necessity for non-toxicity. Several agencies, such as the NSF and United States Department of Agriculture (USDA), concern themselves with controlling the possible effects of lubricants on beverage and food processing and packaging. There are stringent and very restrictive regulations in effect, which often limit a lubricant's ability to perform well. For years, the NSF & USDA ratings of H-1 and H-2 have been important features in the food processing industry and they are becoming increasingly vital ratings for lubrication in this industry. The following is the definition of the ratings given by the NSF & USDA:

H1 Lubricants with incidental contact

These compounds may be used as a lubricant or anti-rust film on equipment and machine parts in locations in which there is potential exposure of the lubricated part to edible products. They may also be used as a release agent on gaskets or seals of tank closures.

H2 Lubricants with no contact

These compounds may be used as a lubricant, release agent, or anti-rust film on equipment and machine parts in locations in which there is no possibility of the lubricant or lubricated part contacting the edible products.

An often ignored problem in the built-in environment of a particular plant is the effect of chemicals in the process – mild acids and alkalis in juices, syrups and other components, citrus acid, carbonic acid, various salts, sugars, malts and alcohol often have their own peculiar deteriorating effect on lubricants. These are usually falsely recognized as a fact of life and not something that better maintenance and/or lubrication might be able to overcome or at least alleviate. In other words, food processing companies feel problems associated with these ingredients are “normal” or expected.

Other chemicals are involved in the cleaning process. Again, acids and alkalis, but also some severe materials such as cleaner lubricants (generally, soaps of some type) for conveyors, sodium hypo chlorite polyphosphates, silicates, acid detergents, sanitizing solutions, iodine sanitizers, spray insecticides, anti-foaming additives, and conditioners for algae, slime and bacteria. Often the interactions of these products are unknown or unrecognized, to the severe detriment of lubrication and maintenance.

So what are the solutions for these lubrication & machinery maintenance problems that plague food processing equipment engineers & mechanics the world over? Three specific types of specialised, high quality H1 lubricants and their possible food industry applications are now covered to demonstrate how effective a solution the market's leading H1 lubricants can really be for the food processing industry.

H1 Waterproof Grease

Most H-1 greases are easily removed by water washdown in food plants. This results in frequent bearing failures and a large consumption of grease (most of which gets washed down the drain). Highly water resistant H-1 grease saves money in both bearings and reduced grease usage.

Standard tests, which measure Resistance to Water Washout (ASTM D1264) and Resistance to Water Spray Off (ASTM D-4049), are useful for selecting a high performance grease. The water spray off test result is the more relevant test for environments with water washdown. A result of less than 10% should be aimed for (which means that over 90% of the grease remains in place).

This extra resistance to water washout is the most significant as it eliminates corrosion related failures of the bearings which is usually the most common cause of failure in food plants. The increased adhesiveness will also result in much less grease being used as it will stay where it is put, reducing the amount that is needed to be added. You will find that the greasing intervals will be able to be increased to weekly and longer in many cases, once the waterproof grease is in the bearings. Many plants find that they only use a quarter of

the amount of grease that they did before. This means that more grease is staying in the bearings and that less grease is leaking out and contaminating the food.

Case Studies

At Lion Breweries in New Zealand, Steinecke malt mills feed the mash tun. Lubrication Engineers 4024 QUINPLEX® Food Machinery Lubricant was found to provide better resistance to water wash out, less grease was used and there was a significant improvement in vibration analysis.

Maple Leaf Pork in Brandon, Manitoba documented that they are now using less than half the amount of grease than before using LE's 4024 and that they are saving a substantial amount in labor as they don't have to grease as often. They have also saved a significant amount per week on repairs in parts alone, especially on their Jarvis Brisket Saws. When the saws are opened up for inspection, they no longer contain metal filings.

William Hill Winery in Napa, California, was able to increase greasing interval from once a day to once every 3 days; therefore decreasing labor and grease costs by two thirds.

Borden Company, Inc. is located in Sulphur Springs, Texas. They process specialty food such as cottage cheese, dips, and sour cream, for the dairy industry. Grease consumption was reduced from 150 lbs. per year with the specialty grade lubricant to 50 lbs. per year with LE's 4023 QUINPLEX®. This is a savings of 67%. The true savings came in the elimination of repair man hours, parts and lost production.

Whitehall Specialties, Inc., Whitehall, WI is a producer of dairy products distributed both in the USA and internationally. Marty Hess, Maintenance Supervisor, was looking for a lubricant that would perform in bearing and seal applications throughout the plant. The plant operates 10 hours a day, five days a week, and because of the food processing nature, they have extensive wash-downs to meet cleanliness regulations. With the food grade lubricant they had been using previously, excessive grease consumption was experienced, and the grease would wash out of the applications. Since switching to LE's 4025 QUINPLEX®, bearing problems have been reduced, resulting in more production time. The plant's wash down crew have also reported that LE's 4025 QUINPLEX® does not wash out of the applications. Lubricant consumption has been reduced by 50%.

H1 Low Temperature Oil

When discussing a lot of the food industry applications and their lubrication problems, it is generally dealing with steam, heat, constant cleaning and contaminants. But when processing frozen fruits, vegetables and frozen specialties, another consideration must come into play: low temperatures. Much of the food productions that are included in SIC 2037 & 2038 takes place in large freezers that have chains, slides, conveyors and hydraulics that must function in extremely cold temperatures. These temperatures cause problems for many lubricants; most will stiffen or even freeze solid in the sub-zero temperatures. This is therefore obviously a major issue for the equipment and machinery that they run in.

There is a product though that is particularly suited for many applications in sub-zero environments – a synthetic food grade oil called LE 4046 QUINPLEX® Synthetic Food Grade Oil, that has a pour point of -65° F (-54°C). It is able to perform in most low temperature applications such as chains, slides and hydraulics. But many plants also require a H1 air compressor oil for rotary screw air compressors and LE's 4046 QUINPLEX® is also an ideal recommendation for this application as well. Frozen food plants can therefore consolidate their H1 sub-zero lubricant products into just one product for all applications.

For example, at Maple Leaf Pork in Brandon, Manitoba, the 3280 feet quick chill chain was causing major problems. This chain carries pigs through a freezer at -49°F (-45°C). Once a week during the weekend, the freezer is warmed up and washed down, and then started again. On Monday morning at start-up, the chain would repeatedly jam due to water being frozen in the links of the chain, causing 4 hours of downtime at the start of every week. A three-step process was introduced in order to dissolve the ice and lubricate the chain. A chain spray system with 6 nozzles was installed to spray a combination of air and liquid into the pin area of the chain. First, food grade alcohol is applied to dissolve the ice, then LE's 4058 QUINPLEX[®] H1 Penetrating Oil & Lubricant is applied to displace the water, finally LE's 4046[®] QUINPLEX Synthetic Food Grade Oil is applied to lubricate the chain effectively even at -49°F (-45°C). The chain problems have been eliminated, saving 4 hours of downtime per week, a significant amount for a plant of this size.

H1 Penetrating Oils

The majority of chains in food processing plants that are exposed to washdown are suffering unnecessarily short lives. This is leading many companies to do away with the chains all together and replace them with belts. But in most cases, the problem is not at all the fault of the chains but rather the method in which they are lubricated.

Often, the current chain lubrication practice is to apply a heavy oil or grease to the outside of the chain. While this does a nice job of lubricating the sprockets and the outside of the chain, it does very little to protect the most vulnerable area of the chain: the contacting surfaces inside the pin and bushing/plate/roller/hook.

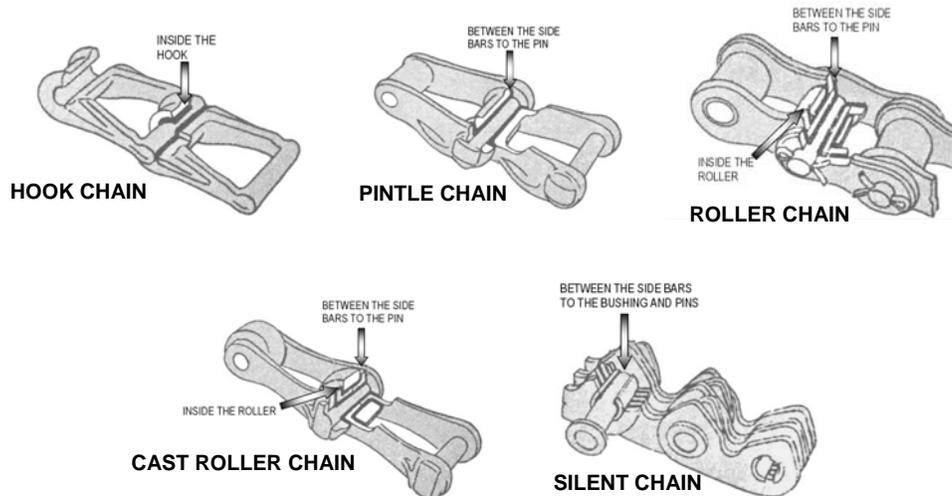
The fact is that most chains fail from the inside. They stretch or kink up due to wear and corrosion wear inside the pin and bushing area. To lubricate them properly, the lubricant needs to be engineered to penetrate into the inside of the chain, clean the inside of the chain (to remove contaminants and to displace any trapped water that it encounters) and leave behind a heavy film of oil, grease or solid lubricant.

A penetrating-type chain lubricant not only displaces water, but it also cleans dirt and wear metals out of the pins of the chain and off the sprockets. It is essentially an oil change for your chain.

The operating conditions (including load, environment, temperature, and speed) need to be taken into account too. Maximizing chain life requires attention to these details and the selection of a suitable lubricant.

Of equal importance is the method of lubrication. Regardless of whether the application of the lubricant is accomplished manually or by use of an automatic system, the lubricant needs to be aimed into the pin and bushing area. Figure 1 illustrates where the lubricant should be applied to several types of chain.

Figure 1:



When chains are subject to water wash down in food plants and there is incidental food contact, it is imperative to displace water from the chain on a regular basis by using a H1 penetrating type of chain lubricant. Regular oil and grease are non-polar and therefore unable to grab onto the water and remove it. A polar organic solvent included in the formulation of the lubricant works best.

If the chain is running through water and/or immersed in water, a combination of penetrating oil and tacky grease works best. This forces the water out initially, and then seals the inside of the chain to prevent water from getting in.

Case Studies

Federal Beef Processors in Rapid City, SD had to lubricate their drive chains on a daily basis. They needed a USDA H1 food grade lubricant that would last longer and resist the high moisture in the plant. By switching to LE's 4058 QUINPLEX® H1 Penetrating Oil & Lubricant, they are now able to lubricate the chains only once a week.

In a similar chain application at Atwater Foods in Lyonville, NY, great success has been achieved throughout the plant using the very same food grade penetrating oil and lubricant. Oscar Cotton, the lead mechanic stated "I have been working with equipment for about 62 years, and this is the best lubricant that I've ever seen. It penetrates faster than any other penetrating oil I've used."

Conclusion

This article has sought to illustrate to those involved with maintenance & lubrication in the food processing industry that by utilising premium quality H1 Food Grade lubricants in their machinery an increase in profitability will always be achieved by:

- Longer equipment life – fewer capital expenditures
- Extended service intervals – reduced lubricant consumption
- No contamination of food products
- Energy reductions
- Improved plant reliability – less downtime & lost production
- Fewer repairs – fewer parts & less labour
- Less inventory – multi-purpose products

The investment in these high quality H1 Food Grade lubricants will then more than pay for itself many, many times over.