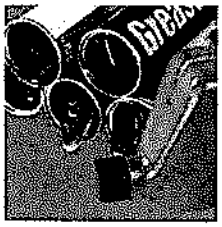

Optimizing Food Plant Efficiency and Safety

Opportunities for Synthetic Food-grade Lubricants

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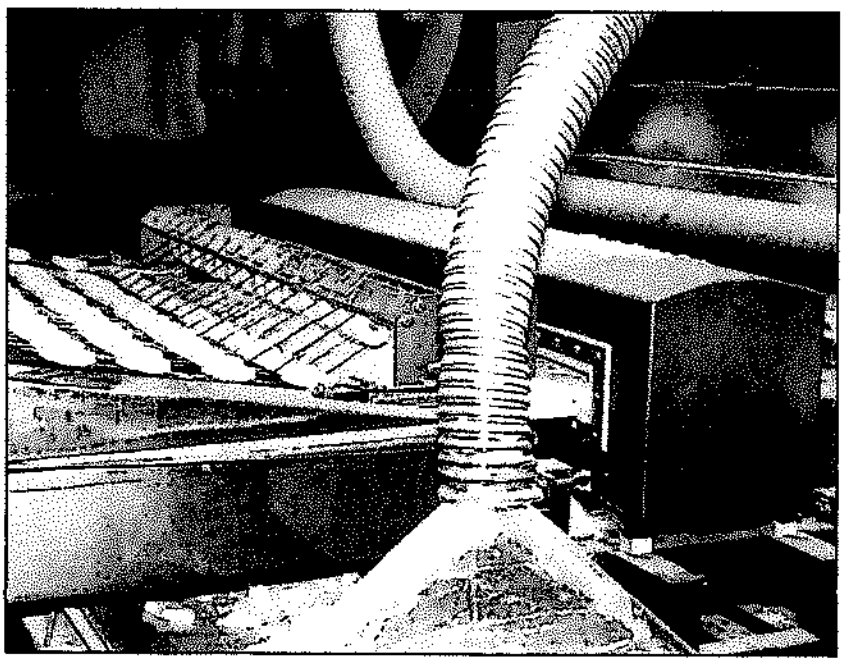
To improve safety initiatives and optimize plant efficiency, food processors need to focus on two main areas: processing equipment and lubricants. Original equipment manufacturers (OEMs) are helping food processors meet demands for better processing throughput and reduced risk to food safety. As a result, lubricant manufacturers are reformulating products to enhance operating speeds and raise sanitation levels. H-1 "incidental contact" synthetic food-grade lubricants are at the forefront of these advancements. These lubricants offer food processors the solutions for stronger overall brand insurance through cleaner and safer formulations, improved antiwear properties throughout a wide range of temperatures and extended service life for production equipment.



Meeting Regulatory and Equipment Needs

The U.S. Center for Disease Control and Prevention (CDC) estimates 76 million people suffer from food-borne illnesses each year in the United States. Contaminated food is harmful not only to the consumer, but also to brand integrity and profits for food processors. To promote safe processing protocol, organizations such as Hazard Analysis and Critical Control Point (HACCP), Pan American Health Organization (PAHO) and religious groups have established strict operating guidelines for the food-processing industry. Third-party certifiers such as NSF International have also established approval programs to ensure products used in food-processing are safe. While compliance for these programs is not mandatory, a proactive food safety program can increase profitability for processors by streamlining cleaning procedures and strengthening the brand integrity and quality of their products.

During processing, food has the potential to get caught in the equipment, enabling the growth of bacteria. In response to evolving safety standards, OEMs have examined these breeding grounds of bacteria and redesigned

Continued on Page 38

Continued from Page 36

equipment. The new designs minimize or eliminate the potential for bacterial contamination. At the same time, OEMs are designing for higher speeds, improved energy efficiency and increased production capacity.

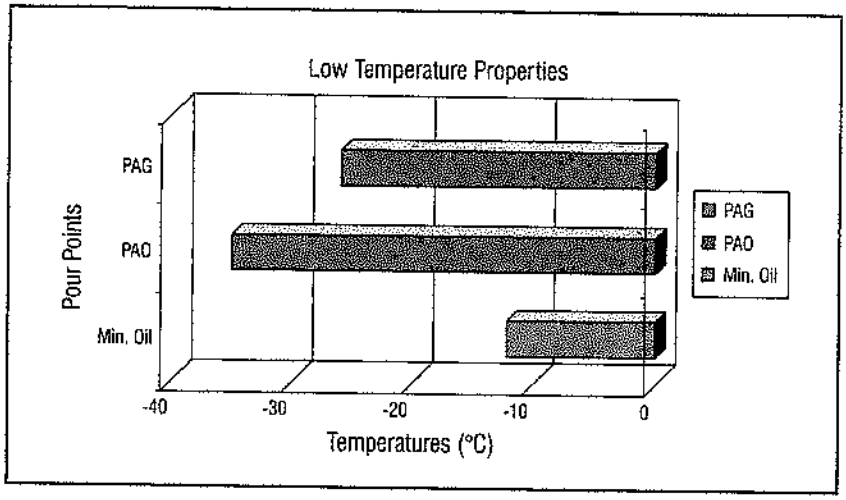


Figure 1

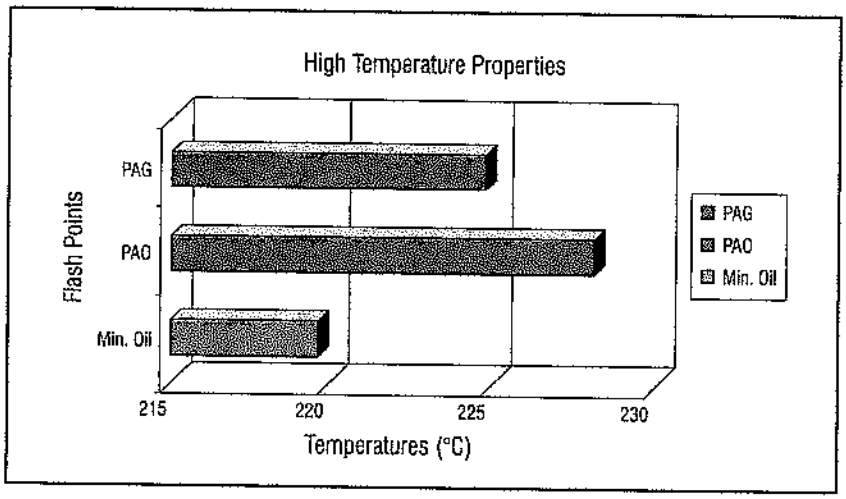


Figure 2

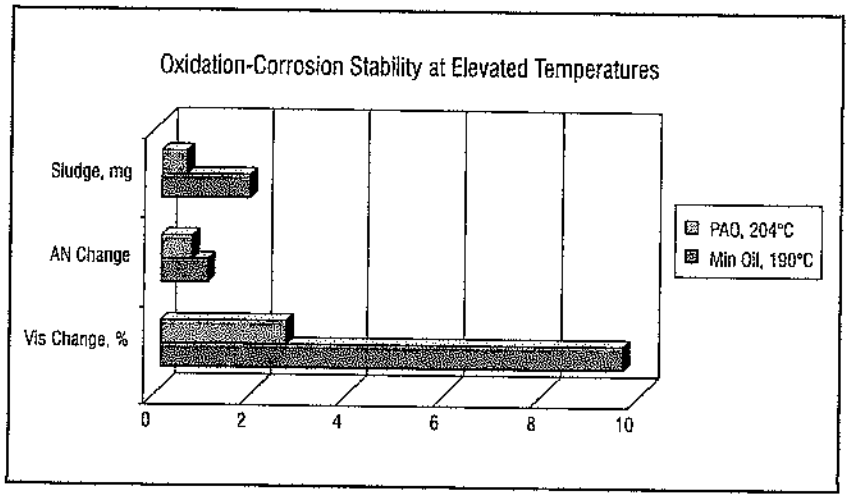


Figure 3

Lubricant manufacturers have been challenged to engineer new formulations to meet the safety and operating guidelines for the new equipment. These new chemistries provide enhanced antiwear properties to increase equipment performance and minimize maintenance for equipment used in extreme temperature applications. Mineral oil-based lubricants for food-processing applications are a fading trend. As new technologies increase productivity and enhance food safety, processors are seeing better results with synthetic lubricants.

Why Synthetics?

H-1 "incidental contact" synthetics are formulated to be FDA 21, CFR 178.3570 and HACCP compliant, registered by NSF International, and meet kosher and halal requirements (allowed to be eaten as determined by different religious groups) to ensure processing safety. They are virtually nontoxic, colorless, odorless and tasteless lubricants engineered with customized additive technology to increase food plant productivity. The enhanced chemical makeup of these lubricants maximizes equipment life, reduces maintenance expenditures and minimizes the frequency of lubrication for bearing and gear components. Synthetic lubricants are comparable to nonfood-grade premium lubricants and synthetic formulations are manufactured with a variety of base stocks, including mineral oils, polyalphaolefins (PAO) and linear, random polyalkalene glycols (PAG). When compared to mineral oil-based lubricants, synthetics exhibit superior characteristics such as lower pour points, higher flash points and more stable viscosity.

Pour Point

Refrigerated and frozen food processors (as well as processors operating equipment in extreme ambient conditions) need to evaluate pour points when selecting a lubricant. The pour point indicates the lowest temperature at which a lubricant will continue to flow freely.

The closer operating temperatures are to the pour point, the more the protective qualities of the lubricant are compromised.

Figure 1 evaluates the pour point properties of ISO 320 H-1 designated gear oils made from mineral oil, PAO synthetic hydrocarbon and a PAG. Given their extremely low pour points, the synthetic products exhibit properties that optimize equipment performance, extend lubricant life and extend the temperature range for reliable operation of gears and bearings used in freezers, compressors, mixers and transportation belts.

Volatility and Flash Point

Similarly, food processors operating equipment in extremely high-temperature environments need to evaluate the lubricant's evaporative losses and flash point during the selection process. The flash point indicates the temperature at which it will vaporize and momentarily ignite when exposed to an open flame. The rate of vaporization dictates the speed with which the lubricant evaporates and must be replaced. High evaporation rates drive high lubricant consumption and increased risk of food contact.

Figure 2 contrasts the flash points of PAG, PAO and mineral oil-based lubricants. The molecular structure of the PAO synthetic products makes them ideal for hot applications.

The oxidative stability of a lubricant reveals how well the lubricant will withstand degradation effects of oxidation. Heat, moisture and wear metals all accelerate the chemical degradation of the lubricant. As the lubricant degrades through oxidation, it generates sludge and varnish deposits, becomes more acidic and loses film strength. The stability characteristics of the PAO-based lubricant demonstrated in Figure 3 suggest better lubricant life cycles and improved protection across the life cycle between the PAO synthetic and the mineral oil-based ISO 46 compressor oil. Choosing a high-performance lubricant with an extended life may also minimize the amount of space needed for product storage.

Continued on Page 40

Continued from Page 39

Real-world Applications

Incorporating a synthetic lubricant into a food safety and brand insurance program has provided food processors with substantial cost-savings due to reduced equipment failures and increased production.

A leading baking processing facility was experiencing six gear failures every year on a set of oven-drive worm gears that were operating under severe load and temperature stress. The failures combined with excessive product loss amounting to more than $300,000 in losses associated with product contamination, labor and parts. The company resolved the problem by switching from a semisynthetic to a fully synthetic H1 gear oil following a complete lubrication audit. Following the change, the plant has not experienced a failure for more than 12 months of operation.

In another instance, a sugar processing facility was utilizing a mineral oil-based ISO 220 gear bearing oil and NLGI 2 grease on its rotary blower, operating at temperatures ranging from 210°C to 285°C (410°F to 545°F). Despite daily grease relubrication, the facility was experiencing gear and bearing overheating and grease leakage, which resulted in maintenance costs that exceeded $5,000 per month. Following a switch to a PAO-based aluminum complex grease, the equipment has not experienced a bearing failure in 18 months. Daily lubrication is no longer necessary, resulting in a cost-savings of $40,000 per year.

Several areas of the food-processing industry are evolving to ensure a high level of food safety protocol and operational efficiency. Synthetic lubricants are being used as effective tools to help food processors meet their safety and production business goals. Partnering with an experienced and capable synthetic lubricant manufacturer can help ensure compliance to food safety guidelines, extend equipment life and substantially reduce maintenance costs. ML

Related Reading

Lesinski, D. and Raab, M. "*Brand Insurance:* Using the Right Food Lubricant to Protect Your Company." *Machinery Lubrication*, May-June 2003.