Centralized Grease Lubrication Systems

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Tags: automatic lubrication, greases, bearing lubrication
Machinery Lubrication (1/2005)

Centralized grease lubrication systems are widely used in industrial and heavy-duty mobile equipment applications to lubricate multiple points on a machine. These systems range from a simple single-port lubricator to complex dual-line, reversing units employing timers and alarms to deliver grease reliably to hundreds of grease points.

The design parameters of centralized grease systems include the volume and frequency of grease required at each point, the number of points requiring grease, operating conditions, pump pressure, line diameter and distance to the grease points. When used and maintained properly, centralized grease systems can help enhance technician productivity and simplify equipment maintenance processes. The following is a comprehensive overview of centralized grease systems and the benefits they offer, the various types, concerns to watch out for and tips on how to maintain them properly.

Advantages of Centralized Grease Lubrication Systems

Centralized grease systems are designed principally to make the work environment safer for maintenance personnel by simplifying the process of accessing remote grease points, especially in confined spaces, when equipment is in operation. However, the primary benefit is derived from the continuous application of small amounts of grease resulting in improved equipment life, due to the uniform supply of grease.

Hand application is typically performed infrequently and may result in uneven amounts of grease being applied, which can lead to over-greasing resulting in damaged seals and elevated bearing temperatures caused by grease churn.
It is important for maintenance professionals to realize that many centralized grease systems have long lines, precise metering valves, fittings and numerous connections that can malfunction due to vibration, air entrainment and other environmental impacts. Thus, carefully monitoring and maintaining the systems on a consistent basis is critical.

Types of Centralized Grease Systems

Centralized grease lubrication systems are designed to lubricate the broadest range of stationary and mobile equipment. As the lubrication application becomes more complex, the design of the system also becomes more complex as additional features are added.

Most centralized grease systems fall into two categories. The first is a direct system in which a pump is used to pressurize the grease and meter it out to the application point. The second and more complex type is an indirect system in which a pump pressurizes the grease. Valves built into the distribution line are then utilized to meter the grease into the bearings.

Indirect systems are further broken down into two basic types, parallel and nonparallel. In parallel systems, also known as non-progressive, the system is pressurized and the metering valves operate simultaneously. The disadvantage of a parallel system is that it can be difficult to identify a failed (blocked) valve, as grease will continue to be dispensed through the remaining valves. Pump pressure will not increase and there will be no outward sign of a valve failure (Figure 2).

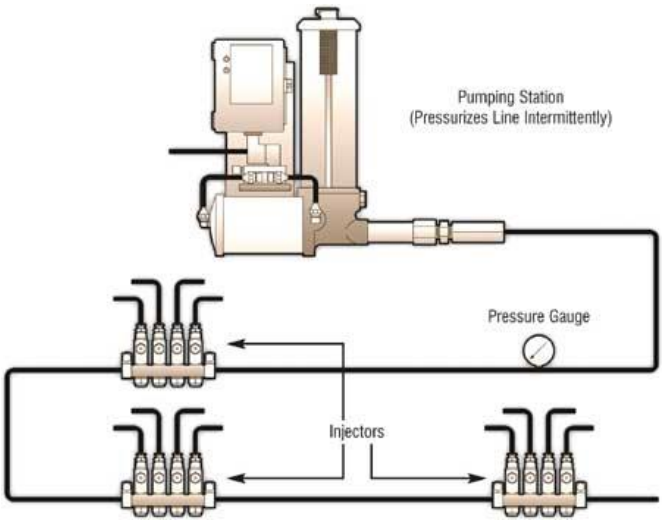

Figure 2. Single-line Parallel System
Courtesy of Lincoln Industrial

In nonparallel systems, also known as progressive, the metering valves are installed in-line. After the system is brought up to pressure, the first valve operates. Grease then flows through it to the next valve in line. In this setup, if one valve fails, the entire system fails resulting in increased pressure at the pump and no grease consumption. No other obvious problems can be used to quickly identify the exact point of failure (Figure 3).

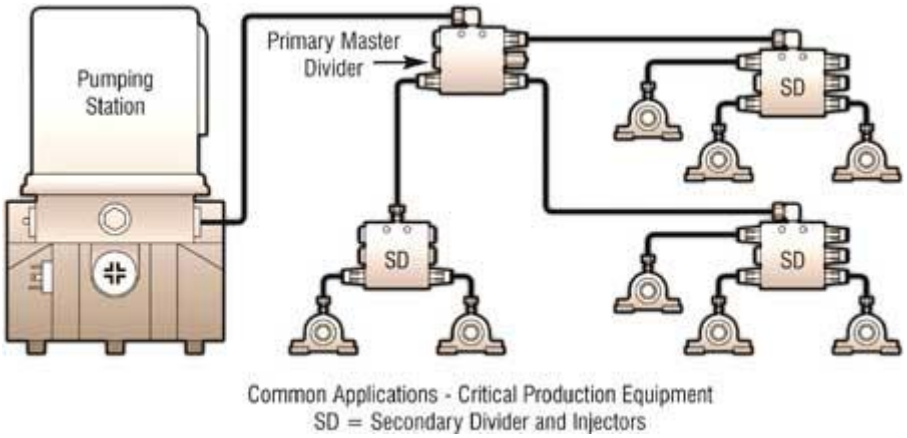

Figure 3. Single-line Progressive System
Courtesy of Lincoln Industrial

Parallel and nonparallel systems can be further broken down into single- and dual-line systems. Today, the most common type of centralized grease system is the indirect single-line system, accounting for more than 50 percent of the market. For single-line machines, injectors represent the key to quality performance. In single-line systems, injectors are responsible for metering the correct amount of grease to the bearing or other surfaces requiring grease lubrication. When advancing to a new cycle, one must always vent the injectors.

The other type of system, the dual- or two-line system, uses two supply lines to provide grease to the injectors. A four-way valve is used to direct grease alternately to each of the grease lines while relieving pressure on the other line. The second line provides a safety margin but involves additional cost and complexity related to installation.

There are a number of ways to control both the single- and dual-line systems. The valves can be operated manually, cycled by a timer or controlled by a counter that measures grease flow.

Various strainers, filters, alarms and monitoring devices may also be included in the system. These systems are set up in one, two or three stages, depending on the number of lubrication points.

Besides injector valves, all centralized grease lubrication systems incorporate a reservoir of grease, pump, controller, lines and metering blocks as shown in Figure 1.
Click Here to See Figure 1

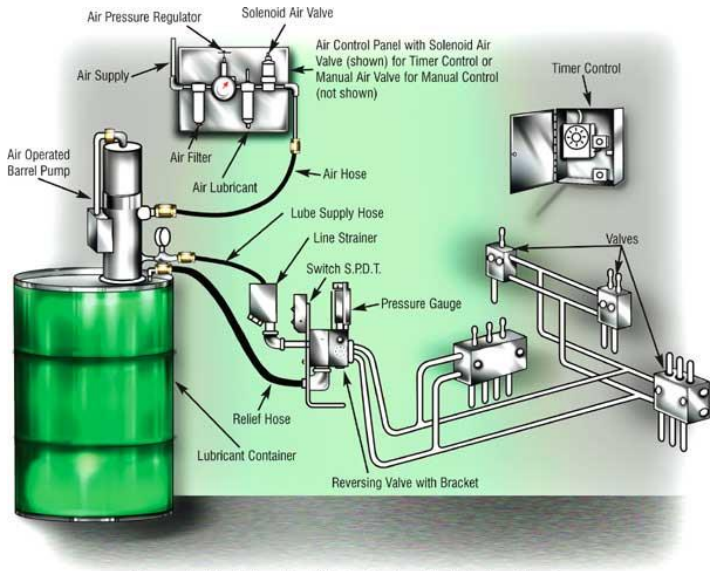

Figure 1. Dual-line Parallel Centralized Lubrication System

Each part functions as follows:

- Reservoir: Provides a bulk quantity of grease that can be kept clean and readily available to the system.
- Pump: Produces the flow of grease and builds up pressure in the line(s). Pump size will vary depending on the distance between the pump and the farthest injector.
- Controller: Manages the pressure on the system by turning pressure supply valves on and off on the basis of either time or cycle. It can also receive signals indicating restricted or failed grease flow to the bearing.

Pump and reservoir capacities vary depending on the number of application points to be serviced and the length of lines.

Who Makes Centralized Grease Systems?

Manufacturers of centralized grease systems include, but are not limited to, Lincoln Industrial, Alemite, Farval, Graco, Ingersoll-Rand, Trabon, Lubriquip, Safematic and Vogel (SKF). Each manufacturer has its own guidelines for maintenance and proper use of its particular systems. Therefore, it is important to contact the original equipment manufacturer for precise instructions on what works best for its particular machines. In addition, it is essential to know what type of grease should be used for a particular system.

Grease Selection

The bearings or other grease points that must be lubricated will determine the base oil type and viscosity of the grease to be used in the system. Factors that play a role in this decision include speed, load characteristics, ambient and operating temperatures, and other environmental concerns.

If the grease is applied by means of a centralized grease system, the National Lubricating Grease Institute (NLGI) grade and other physical properties must also be considered to achieve trouble-free delivery of grease to the lubrication point. Greases that function best in centralized grease systems are typically ones that demonstrate the following properties:

- NLGI 1 Grade or softer
- Good shear and mechanical stability (ASTM D217, ASTM D1831)
- Good resistance to separation of oil and soap (ASTM D4425)
- Good pumpability and flow properties (Lincoln Ventmeter; USS Mobility, ASTM D1092)
- Good seal and elastomer compatibility (ASTM D4289)

Evaluating the flow properties of grease is essential when the application engineer designs the system. Pressure from the pump moves grease through the lines and is needed to activate the metering blocks, valves and injectors precisely and at the right time. The grease must be able to relieve this pressure in time for the next lubrication cycle in order to reload the injector.

To ensure the efficiency and long-term life of a centralized grease system, it is important to consider not only proper maintenance throughout the life of the system, but also the pre-lubrication of the system during initial activation of the system.

System Design

Several decisions and calculations should be made prior to identifying the final system type and setup. The size of the system, frequency of lubrication and cost should be considered and will direct your decision to install either a manual or automatic system. An automatic system requires a pneumatic, hydraulic, mechanical or electrical power source. Grease volumes required at each lube point will need to be determined via various calculations, which can be provided by your lubricant supplier or centralized grease system manufacturer. The location of bearings, bearing size and line size should also be considered. The lube volume and type, pressure capacity and cost should all be considered for pump selection. The control system that will run the system should be identified; variations include visual, machine PLC, timer and count monitor. Finally, a low-level monitor should be considered for the reservoir.

System Installation

While all operating aspects of either a new system or a recently serviced system must be verified against the manufacturer's instructions, it is also essential to prelubricate all application points to ensure a sufficient supply of grease at start-up. Before connecting feeder lines to the lubrication point, the pump should be operated until grease appears at the end of all lines - unless prefilled lines are used.

Sufficient grease should be expelled to clean the lines of any debris that could potentially present future wear problems on the bearing surface. Grease should be at room temperature before being charged into the system. Purging the system of air is also essential to the operation of metering blocks and injectors.

Centralized grease systems are complex units that require a strict regimen of maintenance procedures. By following these guidelines, one can help to ensure that their centralized grease system operates at peak performance, thus simplifying equipment maintenance procedures and saving time and money.

Today's costly industrial and mobile equipment requires regular and accurate lubrication. To prevent contamination, potential equipment damage, unplanned downtime and to improve safety the right lubricant must be provided at the lube point in the right amount and interval. Centralized grease systems, if properly installed and operated, can and will ensure the correct application of grease in a multitude of applications.

Sidebar:

Best Practices

While each system design will have some special operating and maintenance requirements, lubrication technician responsibilities should include:

- Keeping the grease clean - Dirt will interfere with metering blocks and injector operation and damage bearings. Clean all fittings before pumping grease into the reservoir. Install and maintain a filter, typically 140-micron for grease, between the pump and the injectors and monitor its condition.
- Inspecting screen, if any, at the reservoir fill connection.
- Filling reservoirs - Operate the pump (if manual) and make sure that the system is operating properly.
- Scheduling reservoir filling or drum replacement - Prevent having an empty reservoir of grease.
- Reporting signs of under- or overlubrication - Ensure proper lubrication amounts are being applied. In general, centralized systems deliver small amounts of grease more frequently than when serviced manually. Overgreasing wastes grease, requires clean up and, more importantly, is detrimental to the bearing's operation and life expectancy.

Maintenance Practices

General maintenance personnel will ensure the operating efficiency and reliability of centralized grease lubrication systems by performing the following tasks:

- Learning how the system operates, including all monitoring systems.
- Testing the system and monitoring equipment on a regular basis to verify performance.
- Inspecting for crushed or damaged lines and fittings.
- Inspecting for grease leakage at connections, valves, injectors and grease points.
- Seeking input from oiler personnel and equipment operators.
- Checking operation during a complete lubrication cycle, including maximum pump pressure and cycle time. Record and report any changes.
- Consulting with system manufacturer and lubrication engineer, as needed.
- Using safe practices when inspecting, moving or shutting down equipment.

Please reference this article as:
Brad Jeffries, ExxonMobil Lubricants and Specialties, "Centralized Grease Lubrication Systems". *Machinery Lubrication* Magazine. January 2005