

Capabilities

INFORMATION FROM THE LEADER IN THE LUBRICATION INDUSTRY

Automated Lubrication Systems for Industrial Applications



- Bearing, Chain and Gear Lubrication Systems
- Specialty Application Systems
- Return-on-Investment Calculator

Manual Lubrication Pitfalls

The Cost Of A Bearing Failure Is Much More Than The Replacement Cost Of The Bearing:

- Loss of production due to downtime
- Labor for repair
- Replacement bearings and related materials
- Production labor cost
- Missed customer deliveries
- Increased safety issues when repairing machinery



Issues With Manual Lubrication

- Many machines are dangerous to lubricate while running
- Safety is an issue when lubricating hard-to-reach bearings
- Lock Out/Tag Out procedures are time consuming and lost production occurs
- Over lubrication can cause product spoilage, bearing seal damage and cleanup issues
- Under lubrication will cause bearing damage and premature failure

Labor Cost For Manual Lubrication Can Be Significant

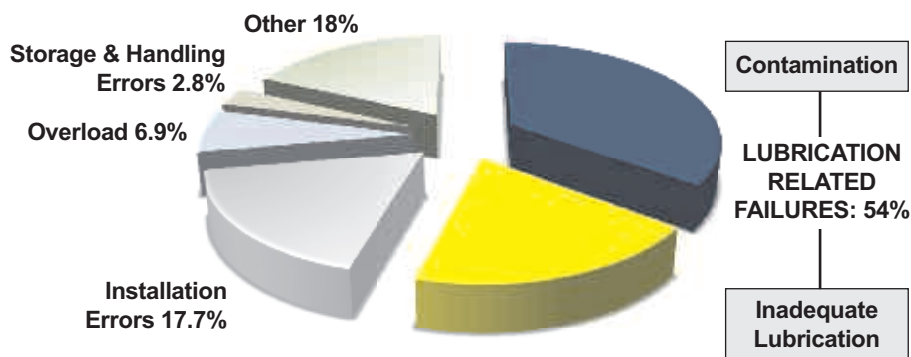
- Today's machinery has guards and covers that make access to lubrication points difficult or impossible while machinery is operating
- Removing guards and covers is time consuming



Why Bearings Fail

Lincoln Systems Can Eliminate 50 Percent Of Bearing Failures In Many Applications

- 54 percent of bearing failures are contributed to inadequate lubrication or contamination.
- “Too little grease”, “too much grease”, and “not often enough” impact bearing life significantly.

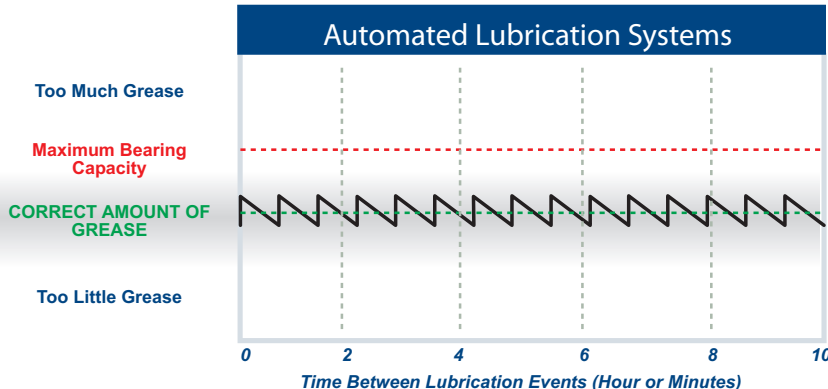
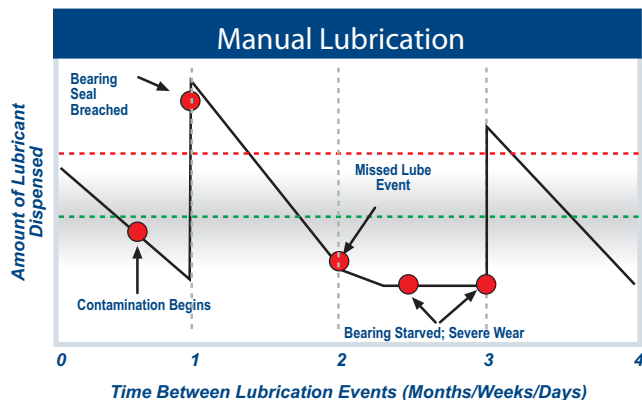


Study by a leading bearing manufacturer

Why Lincoln Automated Lubrication Systems?

- Manual lubrication typically produces inconsistent lubrication. The uneven lubrication cycle leads to wasted lubricant and allows contaminants to enter the bearing – producing premature wear.
- Consistent lubrication (small, precise amounts applied frequently) extends bearing life and prevents unplanned downtime.
- Lincoln is the largest manufacturer of lubrication systems and offers the widest range of solutions, distribution support and worldwide coverage.

Manual vs. Automated Lubrication



Small, frequent amounts of lubricant while the bearing is in motion will increase the bearing life.

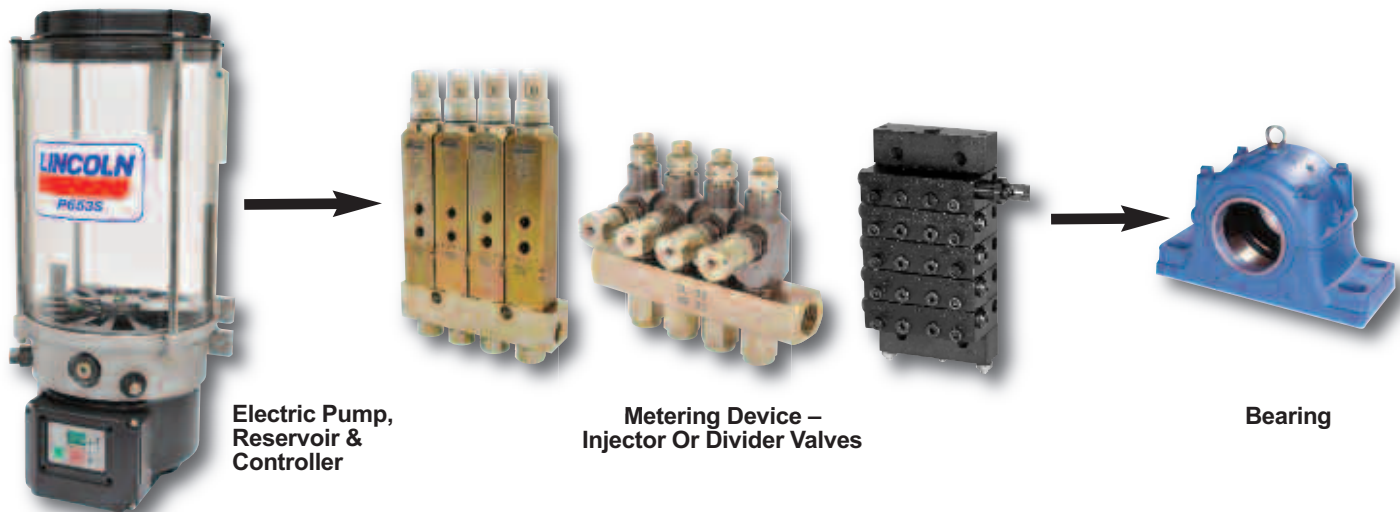
What Is An Automated Lubrication System For Bearings?

A typical automated system (grease or oil) includes a pump, controller/timer, lubricant supply line, metering devices and lubricant feed lines. Many of Lincoln's pumps integrate the reservoir, controller and fault monitor capability in one unit for design simplicity and installation cost reduction.

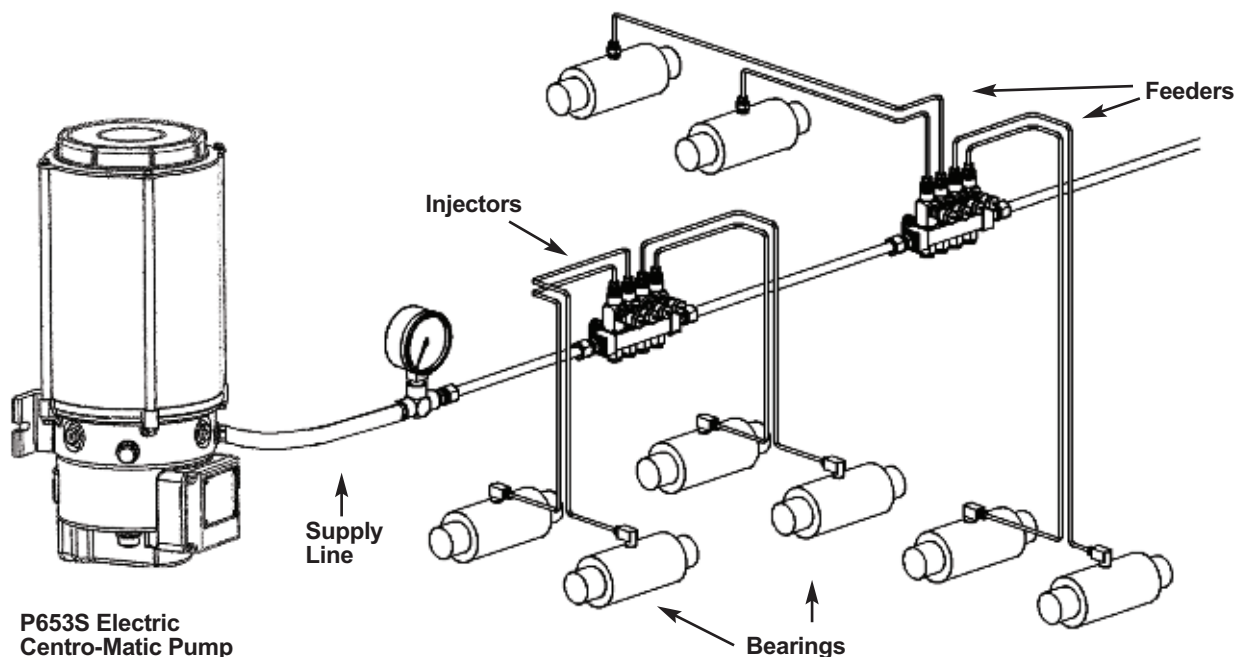
During a lubrication cycle, the pump delivers lubricant through a supply line to the metering devices (typically injectors or divider valves). A small preset amount of lubricant is dispensed from a "positive

displacement" metering device to each bearing through feed lines. A lubrication cycle can be initiated by a PLC, machine function or by an integrated timer.

Depending on the type of Lincoln system, it is possible to monitor for proper system operation, blocked line detection and low-reservoir level. Alarm signals can be connected to a PLC, light or horn for remote notification. Injector systems (Centro-Matic) have adjustable output for each point.



Typical Automated Lubrication System for Bearings



Reasons To Consider Automated Lubrication

Today's Reality

In many plants, maintenance departments are downsizing, yet there are still the same number of production machines and lubrication points that require manual lubrication. Due to competitive demands, most industries are under increased pressure to be more efficient and improve "uptime".

Increased regulations that focus on the environment and safety (lock-out and tag-out requirements) require plant maintenance managers and personnel to follow time-consuming procedures.

With more than 100 years experience in lubrication equipment and systems, Lincoln has the unique capability and system solutions to address these important issues. These universal challenges will not go away.

Manual lubrication is not consistent with "pro-active" maintenance strategies and lowering overall cost.

What Benefits You Can Expect from a Lincoln Automated Lubrication System

Lower Maintenance Cost

- Bearing, gear and chain life are increased by applying small measured amounts of lubricant frequently, while the machine is operating...increasing machine life.
- Labor for manual, point-by-point lubrication is eliminated – no more lock outs/tag outs and no removing guards and covers to access manual lube points.
- Labor for repair is reduced due to fewer bearing failures.

Increased Production

- Eliminates lost production due to required machine shut down (lock-out and tag-out procedures) for manual lubrication.

Improved Safety

- Prevents accidents that occur during manual lubrication.

Lower Energy Cost

- Improved lubrication for bearings, gears and chains translates to lower friction and lower energy cost.

Environmental Improvements

- Lincoln systems measure the exact amount of lubricant required. Waste, product contamination and housekeeping issues are dramatically reduced.

Applications: Single-Machine Bearing Lubrication



This Lincoln Quickclub QLS Oil System eliminates manual lubrication on bearings and gears for this printing press. Lubricating “on the fly” improves productivity.

For more than 70 years, Lincoln has manufactured and designed automated lubrication systems for a wide range of machines and industries. Our Centro-Matic, Quickclub and Modular Lube product lines offer integrated pump packages that include a reservoir, controller and fault monitoring. From **food, beverage, paper, metal forming, power generation, automotive and general manufacturing**, Lincoln systems (both grease and oil) are designed to handle the harshest environments, including high heat and corrosive environments. These system packages are for individual machines for any application.



The Centro-Matic Automated Electric Pump and injectors are lubricating bearings in a very abrasive and dusty environment.



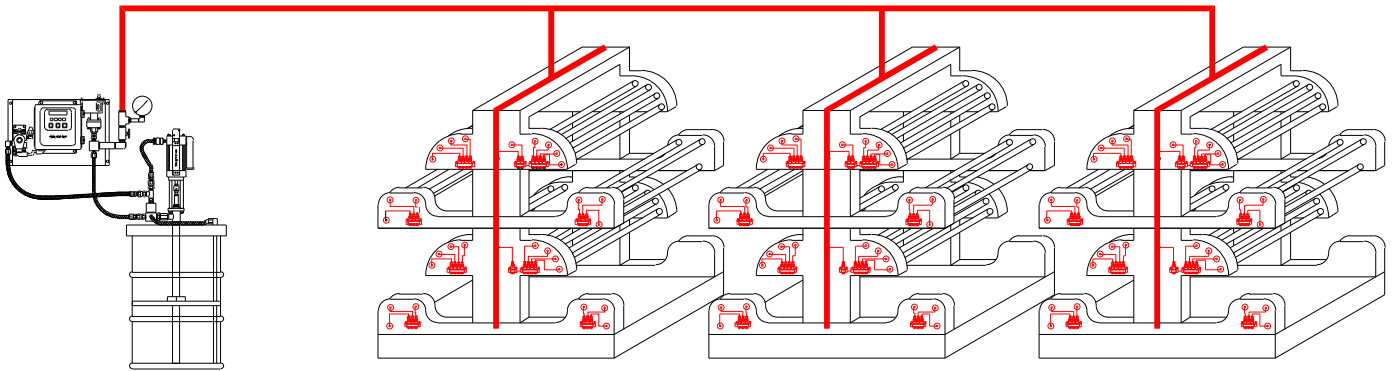
The Single Point Metering Valve enables this technician to lubricate ten bearings without removing any guards or shutting down the production line.



In this corrosive environment, a stainless steel Lincoln Quickclub System is lubricating and purging 32 points on a belt press in a wastewater plant.

Applications: Multiple Machines or Large Machines

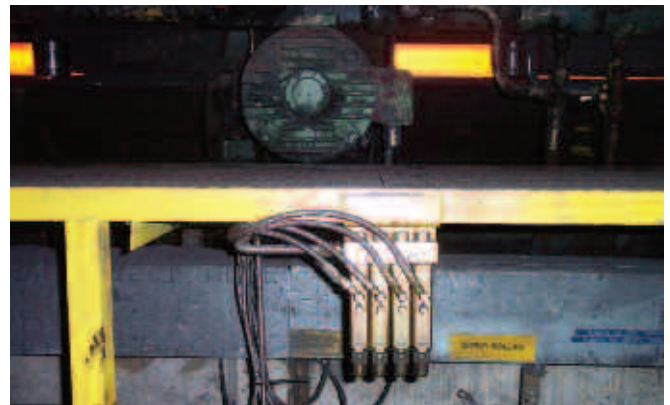
For larger machines and production lines, Lincoln offers systems to lubricate hundreds of bearings that pump directly from refinery drums or bulk tanks. Examples include **paper machines, packaging lines, assembly lines, food processing lines, steel mills and groups of machines**. These systems are capable of pumping long distances, and the adjustable metering valves (injectors) ensure each bearing receives the correct amount of lubricant. Additional lubrication points can be added for future expansion. Lincoln offers “zoning valves” that ensure only the machines that are operating will be lubricated.



A maintenance technician is adjusting injector output to one bearing on a roll forming machine. More than 100 points are being lubricated from one pump without shutting down the machine.



These Lincoln pumps deliver grease directly from a 400 lb. drum to 200 SL-V injectors located approximately 250 feet away in a steel mill.



These SL-V Injectors operate in a harsh steel mill environment that includes high heat and abrasive contamination. Purging the bearings, replacing the grease film frequently and safety are key benefits of this system.

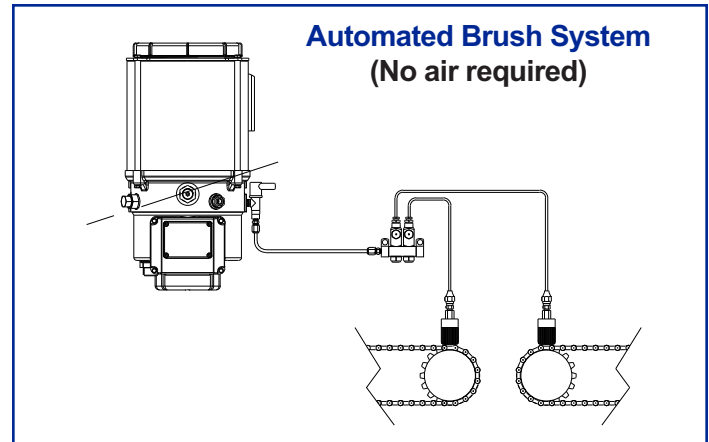
Applications: Chains

Effective and clean lubrication for chains is an issue for many maintenance managers. Lincoln has the answer with three types of systems – brush, precision spray and “metered” squirt. Chain life is significantly increased, and chain stretch is significantly reduced when lubricated with a Lincoln Automated System.

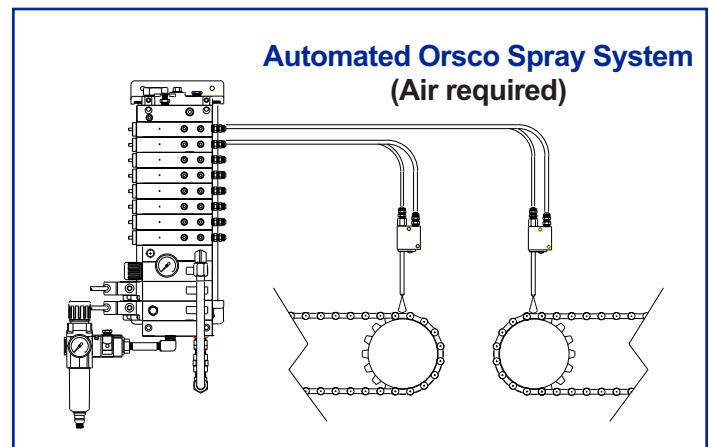
Lincoln offers the latest technology in chain lubrication. Our unique systems deliver the precise amount of oil required to effectively lubricate all types of chains without contaminating product or creating a mess. Each system is custom designed for the application. Typical chain applications include **conveyors, power & free, paint lines, ovens – anywhere that a precise amount of oil is required.**



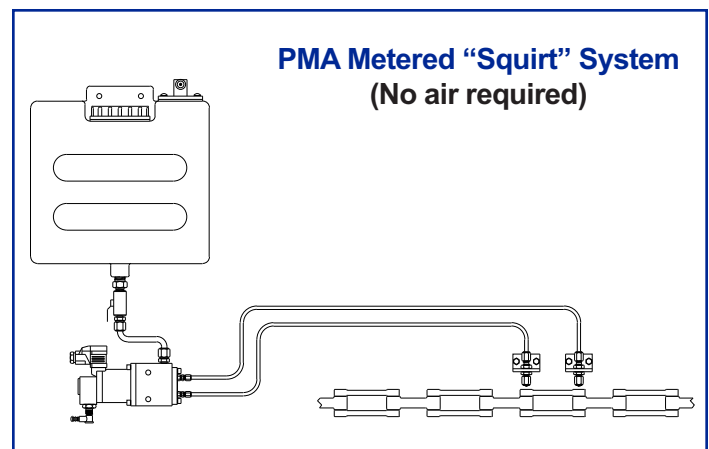
Lincoln automated brush-style systems are both an effective and a low-cost solution.



An Orsco VSR system lubricates a conveyor chain on an oven application in a food plant.



The PMA Solenoid Pump is designed for contact-free oil lubrication of the chain. The exact metered amount of oil is applied to the chain pins only.



Applications: Bull and Pinion Gears

Large and expensive gears found on **kilns, ball mills, rod mills, coal pulverizers and other rotating vessel and machine applications** require consistent, frequent lubrication to protect from premature gear wear.

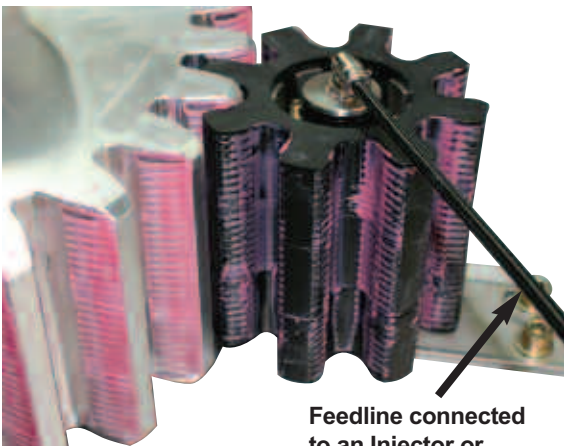
Lincoln is the only company that offers three ways to lubricate large gears with grease – Air-Assisted Spray, “Airless” Grease Spray and Lubricating Pinion Greaser. These Lincoln Systems are simply the most efficient means to apply most of the latest “tacky” bull gear lubricants.



Airless Spray System



The Lincoln Airless Spray System “warms” the grease to eliminate “freeze-ups” and will operate in a wide range of temperatures. Unlike air-assisted spray, the Airless Spray System is more consistent, has less over spray and offers a wider range of spray patterns. By applying lubricant only to the “wear side” of the gear, lubricant consumption and cleanup is reduced. Both Air Assisted Spray and Airless Spray Systems are designed to pump from a drum or bulk tank that is remote from the spray panel or spray box.



Feedline connected to an Injector or Divider Valve

Pinion Lubricator (For Slower Moving Gears)

Lincoln’s New Lubricating Pinion Greaser is mated to the bull gear and ensures each gear tooth receives a film of lubricant. The Lubricating Pinion is typically connected to a Lincoln “Injector” or “Divider Valve” that meters the grease.

The Lincoln Lubricating Pinion has been designed especially to reduce the wear on the tooth “flanks.” This where material stress is highest.

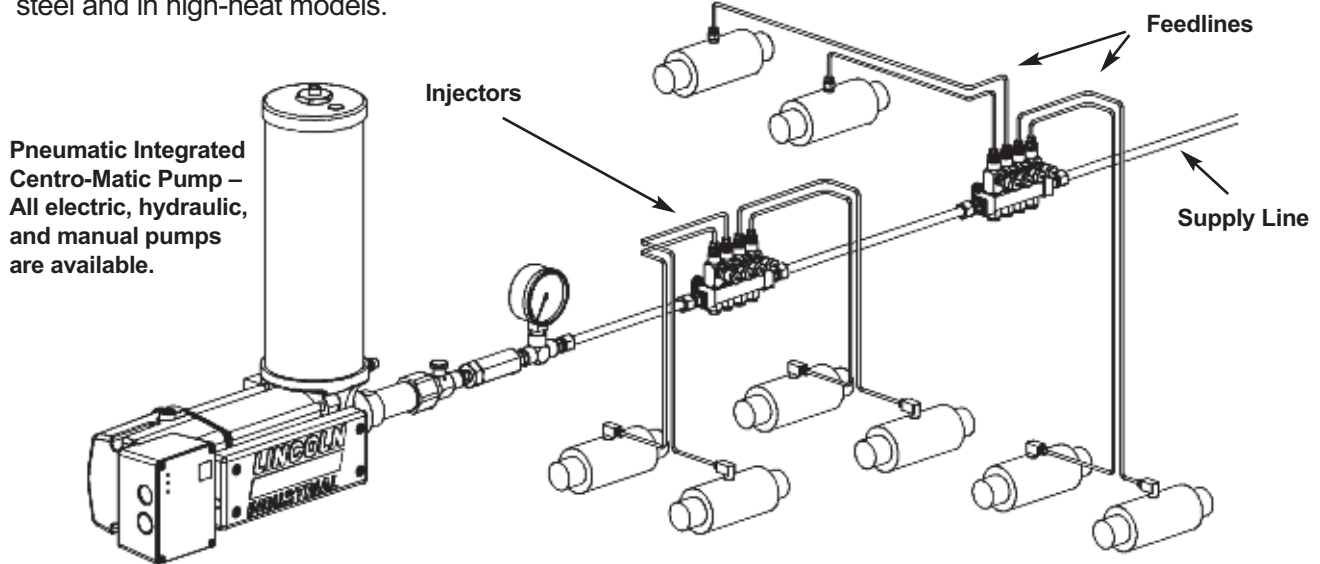
An optimum lubricant film is achieved thanks to the special design of its tooth profile. Models are available for specific size gears.

Your Lincoln representative can explain which applications work best with this type of system.

System Operation and Features: Centro-Matic®

System Overview

A pump automatically develops lubricant pressure through a single supply line to the injectors. Each injector services one lubrication point and may be accurately adjusted to deliver the precise amount of grease or oil required for each bearing. Both oil and grease injectors are available in various output ranges, in stainless steel and in high-heat models.



Centro-Matic System Features

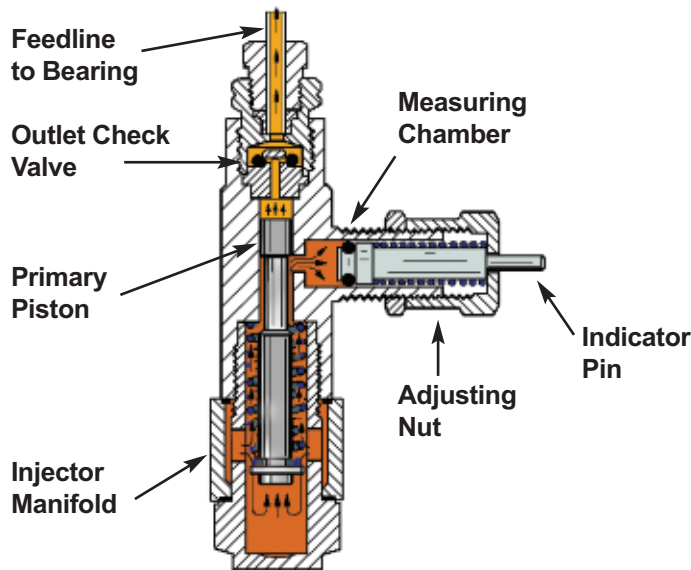
- **Extremely Flexible**
 - Easy to add or subtract lubrication points
- **Adjustability**
 - Injector outputs are adjustable – down to .001 cubic inches
- **System Monitoring**
 - Alarm systems are available to monitor pressure, low reservoir level and the flow of lubricant at the bearing (System Sentury™)
- **Capable of Pumping Long Distances**
 - Over 300 ft. with grease (pressures up to 6000 psi depending on the injector and pump models)
- **Large Number of Bearings**
 - Over 500 lubrication points (depending on bearing size)
- **Excellent in Harsh Conditions**
 - Injectors are available for high heat (up to 350°F and corrosive environments (stainless steel models available)
- **Wide Range of Pumps**
 - Pneumatic, hydraulic, electric and manually operated
- **Wide Range of Pump Reservoirs**
 - From 1 lb. to 400 lb. drums or bulk tanks



P653 Electric automated pump with an 8-liter reservoir and integrated controller (available in AC or DC voltages)

System Operation and Features: Centro-Matic®

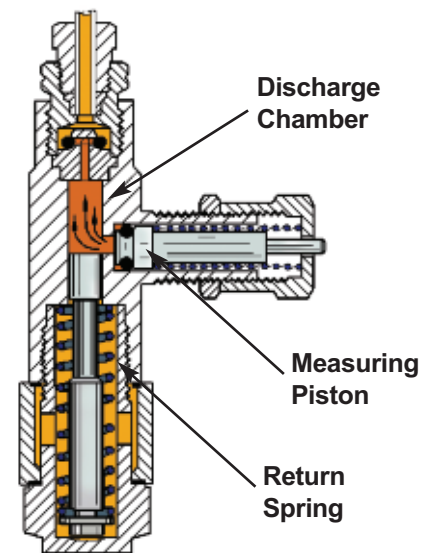
How the Centro-Matic Injector Works*



Stage 1 – Pressurized

Incoming lubricant, under pressure from the pump, moves the primary piston forward.

The primary piston forces a pre-charged amount of lubricant from the discharge chamber through the outlet check valve through the feed line to the bearing. Simultaneously, lubricant fills the measuring chamber and pushes the indicator pin out.



Stage 2 – Relieved (Vented)

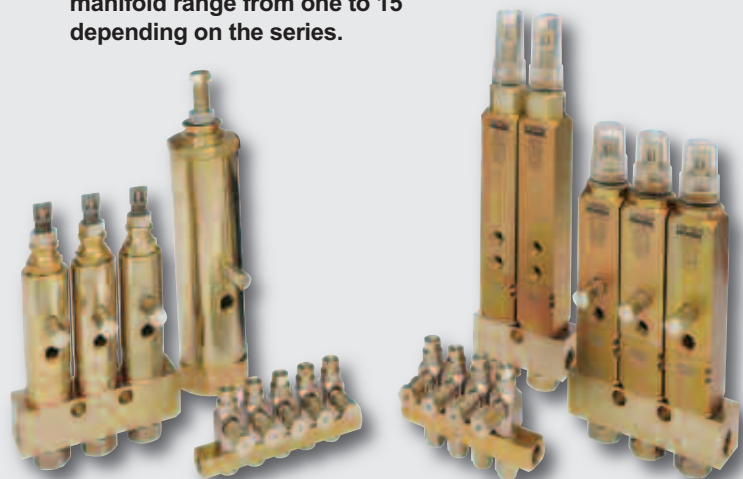
When the system is vented (pressure relieved), the primary piston returns to the rest position, allowing the measuring piston to transfer lubricant to the discharge chamber for the next cycle.

*** Other injector models operate on a different principle with similar features**



Stainless steel SL-32 grease injectors are used here due to a daily "wash-down" at this food plant.

Injectors are typically mounted in manifolds. The number of grease or oil injectors in a manifold range from one to 15 depending on the series.



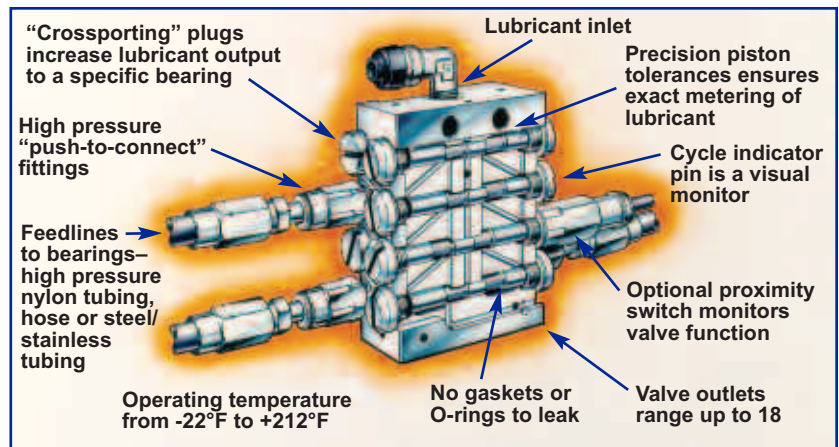
System Operation and Features: Quicklub®

System Overview

A pump (grease gun or automated) delivers lubricant to a Quicklub® valve(s) that incorporates a series of metering pistons which accurately dispenses lubricant from each outlet. The metering valve can be "ported" to supply a variety of bearing sizes. Quicklub valves work with grease or oil.

Quicklub Valve Features

- Quicklub metering valves use positive displacement to ensure accurate delivery of lubricant
- Valves are made of solid steel, one-piece construction; no seals, o-rings or springs to wear out and leak
- Verify operation with visual indicator pins
- Capable of detecting a "blocked" line or bearing
- Valves can be ported to deliver more lubricant to a larger bearing
- Stainless steel Quicklub valves are available



Lincoln Quicklub SSV Metering Valve

Quicklub Pump Features

- **No air required**
 - Available in 12 & 24 VDC and 120 & 240 VAC models
- **Wide range of reservoir sizes**
 - From 1 liter to 15 liters, grease or oil
- **Integrated alarm options**
 - For low reservoir and blocked lube line detection
- **Flexible control options**
 - Integrated controls or PLC-compatible models
- **Wide range of lubricants**
 - Pumps are capable of handling most industrial greases or oils
- **High pressure capabilities**
 - Quicklub pumps can develop up to 4,000 PSI, which ensures lubricant is delivered to each bearing
- **Data Logging**
 - Pump models are available that store system operation history
- **Manual override fitting**
 - You never lose the ability to lubricate your machine; even if the pump requires service



QLS Electric Pump
1-liter Reservoir

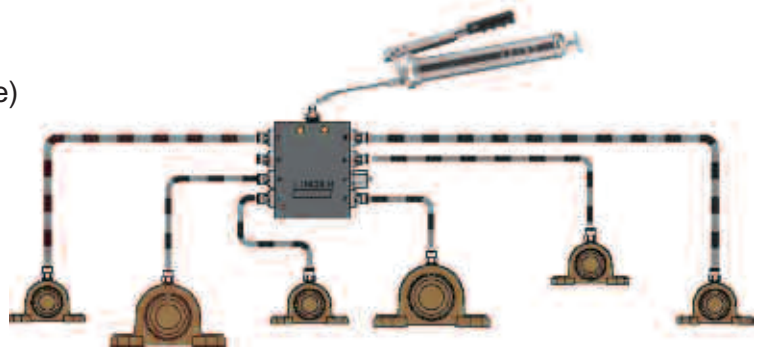


Model 233 8-liter Data Logging
Pump and SSV Metering Valves

System Operation and Features: Quicklub®

Manual Single-Point Kits

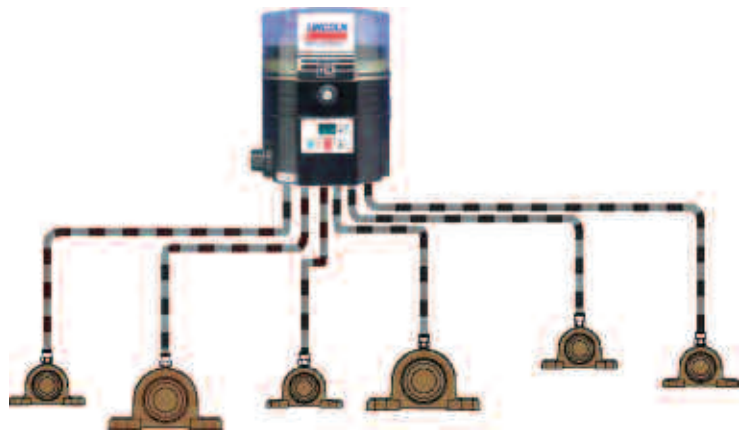
- Lubricate bearings from one easily accessible location on a machine (up to 18 bearings from one divider valve)
- Metering piston ensures each bearing receives the correct amount of grease
- Valve can accommodate various bearing sizes
- Easily upgradeable to an automated system
- Inexpensive and easy to install – includes all hardware – tubing and “push-to-connect” fittings



Lincoln's Single-Point Kit

Automated – Low Cost QLS Systems

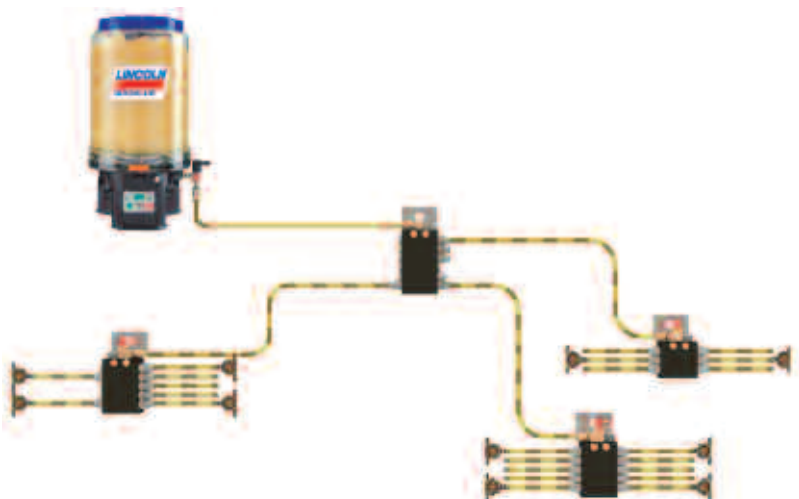
- Complete lube system “in a box” – just add tubing and fittings
- Automatically lubricates up to 25 points (depending on the bearing size and pump model)
- Timer, reservoir and metering valve are integrated – AC and DC voltage models
- “Push-to-connect” fitting makes installation quick and easy
- System fault-monitoring capability
- Manual override fitting allows for lubrication if the pump needs service
- Grease or Oil Systems available – 1-liter reservoirs



Lincoln's QLS Series

Automated – Larger 203 & 233 Series System

- Capable of handling 50+ bearings (depending on their size)
- Many pump configurations offered – AC and DC models
- Reservoirs range from 2 liter to 15 liter
- Flexible timer options or PLC controlled
- System monitoring – blocked line and optional reservoir level
- Manual override fitting allows for lubrication if the pump needs service
- “Data Logging” capability available
- Grease or oil systems available
- Capable of pumping grease long distances
- “Push-to-connect” fitting makes installation quick and easy



Lincoln's 203 Series

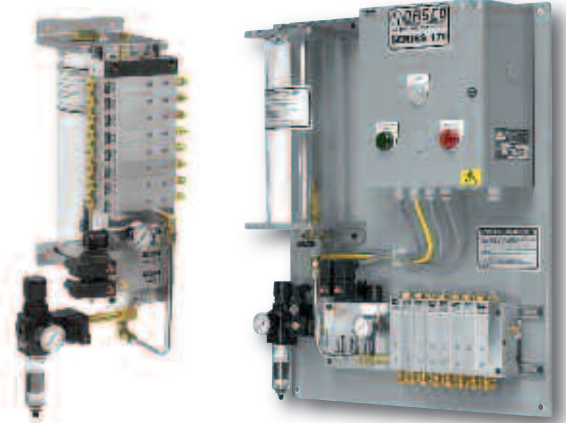
System Operation and Features: ORSCO® Chain Lubrication

System Overview

Lincoln's Orsco System is the latest technology in chain lubrication. The major difference between the Orsco oil lubrication system and other lubrication technologies is the use of a continuous, ultra-fine, non-misting delivery of lubricant.

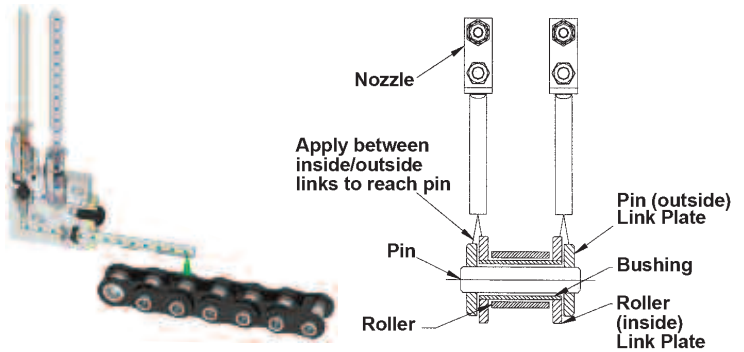
In applications where cleanliness is critical, the Orsco system achieves exceptional performance. The Orsco system has the capability to spray one drop of oil continuously for more than one minute. Each system is custom designed for the application.

Typical chain applications include **conveyors, power and free, paint lines, ovens – anywhere that precision chain lubrication is required.**



How the Orsco System Works

An Orsco or customer-supplied controller cycles the air-operated injectors that deliver small metered amounts of oil through tubing to the nozzles. The nozzles mix the oil with air and create a consistent, continuous spray that will not mist and become airborne. For larger chain and other applications, the Orsco system can be designed to spray intermittently (see the picture below).



Orsco Features and Benefits

Increases Chain Life – Applies minute quantities of oil continuously, between the inside and outside link plate and other wear points.

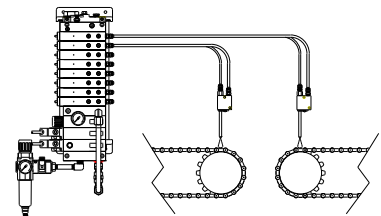
Saves Lubricant – Applies only the required amount oil with virtually no waste – and you control the amount.

Improves Safety – Keeps personnel away from potentially hazardous equipment and will not create “slippery” areas due to over lubrication.

Reduces Power Consumption – Optimizes the application of oil applied to the chain. Friction is reduced, which translates to lower energy costs.

Reduces Chain Stretch – Through improved lubrication and less friction and wear.

Cuts Downtime – Eliminates lock-out and tag-out procedures for scheduled manual lubrication and frequent chain replacement.



Both the chain pins and wheel bearings on this overhead conveyor are being lubricated with four nozzles. A proximity switch times the intermittent spray to only lubricate the wear points.



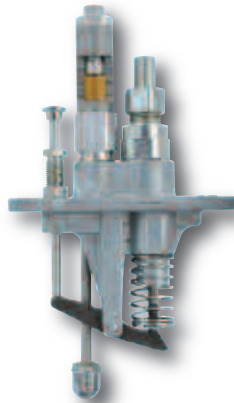
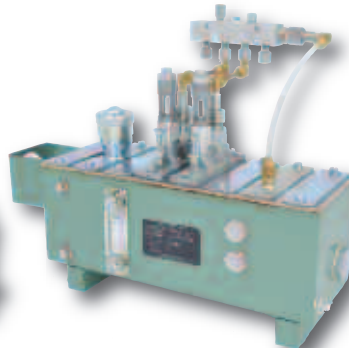
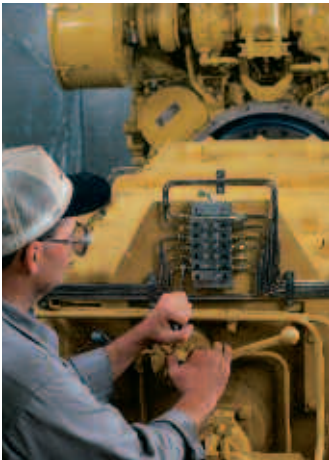
Specialty Application Systems

Lincoln Offers a Wide Range of Systems for Unique Applications

Modular Lube Systems and “Box Lubricators”

Lincoln offers a comprehensive line of high-pressure oil lubrication systems found primarily in the **petrochemical and natural gas processing industries**.

Other applications include **rubber “batch mixers”, refrigeration compressors and small oil recirculation packages**.



Systems and Replacement Components for Heavy-Duty Process Equipment

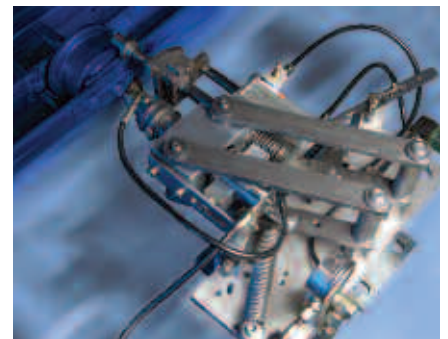
Steel, cement, paper, chemical, automotive, glass and other heavy industries use lubrication systems that come from many countries. Lincoln offers a wide line of systems and products that are a direct replacement for these components. This includes Dual Line Grease Systems, “Pump-to-Point” Systems and Recirculating Oil Systems.



Specialty Chain Applications Requiring Grease

Lincoln’s Cobra System is designed to lubricate the **rollers of large conveyors and power-free chains** while they are in operation.

The Cobra system delivers a metered amount of lubricant to the roller’s grease fitting and pumps from a refinery pail or drum. These system are typically found in **cement, steel, automotive and other industries with heavy-duty conveyors**.



General Lubrication Equipment

Overview – Manual Lubrication

There will always be requirements for manual lubrication. Lincoln offers the widest range of lubrication tools and systems in the industry...including battery-operated grease guns, transfer pumps, hose reels, meters, in-plant lube trucks, bulk tank systems, waste oil systems and fluid inventory control systems.



Lincoln offers six models of battery-powered grease guns



Lincoln has the widest offering of transfer pumps ranging from diaphragm, piston and manual



Transferring fluid lubricants and grease from bulk tanks is both cost effective and environmentally sound. These bulk tank systems eliminate drum disposal and the meters will track the volume of lubricant that is dispensed for each product.



In-plant lube trucks take all the important fluid lubricants to the machinery. This electric cart even includes a waste oil evacuation system.

Solutions For All Applications

	Centro-Matic	Quicklub	Mod-Lube	Box Lubricators	ORSCO	Grease Spray	PMA System
Bearings	X	X	X	X			
Slides	X	X	X	X			
Gears	X	X	X		X	X	
Chains	X	X	X		X		X
“Cams”	X	X	X	X	X		X

FAQ's

Q: How can you tell if a Lincoln grease system is not working properly?

A: Many of the Lincoln Systems offer monitoring capabilities to indicate if the system is malfunctioning, has a blocked line or if the reservoir level is low. The alarm signal can be connected to a light, horn or PLC.

Q: How do I get my Lincoln systems installed and serviced, if required?

A: Authorized Lincoln System House Distributors have the capability to install, design and service all of the Lincoln automated lubrication systems. The closest one to you can be found at www.lincolnindustrial.com.

Q: How far can I pump grease in a lube system, and how many bearings can I lubricate with one system?

A: Depending on the system design, ambient temperature and grease viscosity, our Centro-Matic systems can pump more than 300 feet and lubricate more than 500 bearings (depending on their size).

Q: Does Lincoln offer stainless steel and high-heat capable lube systems?

A: Yes – Lincoln offers many stainless steel metering valves/injectors. We have special heat-resistant injectors and divider valves that are capable of operating in temperatures up to 350 degrees Fahrenheit.

Q: Do I need to use a special grease in the Lincoln Automated Lubrication Systems?

A: No, Lincoln grease systems are capable of pumping most NLGI #1 or # 2 greases sold for industrial applications. Contact your local Lincoln System House Distributor for details.

Q: Can I use my machine PLC to control the lubrication system?

A: Yes, Lincoln offers many pumps without built-in controllers just for this situation.

Q: What is coldest temperature a Lincoln system can handle?

A: In most cases, the limiting factor is the lubricant. We have systems operating in -40 degrees Fahrenheit. Consult your local Lincoln System House Distributor for details and recommendations on the system design.

Q: How do I adjust my system if more or less lubricant is required at one point or all points?

A: Most Lincoln systems have an adjustable timer that allows you to control how often the system will cycle. The Centro-Matic system offers lubricant output adjustability for each bearing—grease or oil systems.

Lincoln Distribution Support



Lincoln has the largest and most capable distribution channel in the industry. Our distributors (System Houses) offer “turn-key” solutions and aftermarket support second to none. They are factory trained and maintain local inventory of system components and repair parts.

Lincoln System House capabilities include:

- Application design and system recommendations
- “Turn-key” installations and custom kits
- In-plant service and repair
- Training
- Warranty support
- System maintenance contracts
- Plant surveys
- ROI analysis



Ask your local Lincoln System House for a Lubrication System Plant Audit:

- Learn your hidden lubrication related costs.
- Know the ROI of automating your plant's lubrication requirements – for each application.
- Know the safety and environmental improvement potential.
- Create a customized plan to reduce cost, improve productivity, safety and the environment.

Return-On-Investment Calculator – ROI

Many Lincoln Automated Lubrication Systems provide a payback in less than a year. Use this ROI calculator to determine your specific savings and payback. The “Saving %” is based on Lincoln’s experience and customer feedback. Feel free to adjust these percentages to fit your application.

Contact your local Lincoln System House to receive a system cost estimate, formal proposal or a return-on-investment report for each application.

Annual Maintenance and Lubrication Related Cost and Payback Analysis

Description of Annual Cost	Cost	Savings %	Savings
Labor for manual lubrication	\$ _____	90%	\$ _____
Labor to repair bearing failure	\$ _____	50%	\$ _____
Replacement bearing material cost	\$ _____	50%	\$ _____
Lost production due to bearing failure(s)	\$ _____	50%	\$ _____
Lost production due to manual lubrication	\$ _____	100%	\$ _____
Grease savings	\$ _____	50%	\$ _____
Safety improvement factor	\$ _____	_____ %	\$ _____
Other: _____	\$ _____	_____ %	\$ _____
Other: _____	\$ _____	_____ %	\$ _____
TOTALS	\$ _____	_____ %	\$ _____

System Cost: \$ _____

Payback: _____ **Months**

Payback = (System Cost/Savings) x 12

***Your Lincoln District Manager or Lincoln System House Distributor
can assist in developing a Return-On-Investment Report using your cost numbers.***

***Since 1910, Lincoln Lubrication
Has Achieved Success Through
Innovation, Quality and Service***



Lincoln Is the Solution for Increased Reliability and Machine Uptime

- For more than 100 years, Lincoln has engineered each component to the highest industry standards.
- Lincoln has the engineering, manufacturing and product support to meet the industry's changing application requirements as well as the needs of the customer.

Lincoln's Global Distribution Is the Industry's Best

Our systems dealers have the most extensive specialized knowledge in our industry.

- Hundreds of full-serviced Lincoln system house distributors worldwide.
- Customized installation solutions.
- Lincoln and its network of global distributors support the compressor user and OEM with proper lubrication system design, installation support, system commissioning and follow up.
- Go to **www.LincolnIndustrial.com** to find your local dealer.

**Find out where the nearest
Lincoln distribution and service
office to you is located:**

America:

St. Louis, MO 63120
1-314-679-4200
FAX: 1-800-424-5359
www.lincolnindustrial.com

Europe/Near East/Africa/India:

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Form 444055 (12/10)
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