

INSTALLATION OF PNEUMATIC AUTO LUBRICATION SYSTEM IN QUAY LIFT CRANES

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Abstract - Pneumatic systems are power systems using compressed air as a working medium for the power transmission. Their principle of operation is similar to that of the hydraulic power systems. An air compressor converts the mechanical energy of the prime mover into, mainly, pressure energy of the compressed air. This transformation facilitates the transmission, storage, and control of energy. Through the installation of pneumatic auto lubrication system in quay lift crane optimum amount of lubricant is discharged to all the lubricating points as per the requirement. The paper presents an efficient design of a pneumatic auto lubrication system for the lubrication of a quay lift crane and its component study

Key Words: molybdenum disulphide, rubber hoses, couplings, PUR, moly grease

1. INTRODUCTION

By automating the lubrication process in quay lift cranes its expected to achieve more efficiency and also improve the working time and the lubrication of cranes can be finished within a very few man hours as compared with the manual lubricating process which is tedious and complicated too. Automatic centralized lubrication system automatically delivers the correct amount of lubricant at the correct time intervals to the correct locations. Several such systems can be fitted to a crane, with one for the machine house, one for the trolley and two for the gantry systems. A common problem encountered by the ports in desert conditions is the high sand content in atmosphere. Furthermore, such sand has a high silica content which is both abrasive and corrosive. Centralized /automatic lubrication systems can help to prevent ingress of sand by simply ensuring that the complete lubrication system is sealed.

Whether the equipment is stationary such as CNC milling or mobile such as trucks mining or construction equipment, applying lubricant is often most effective when it is dispensed in small, measured amounts over short frequent time intervals. However, time and human resource constraints make this approach to lubrication impossible. As a result, machine availability, production

cycles and manpower availability dictate the intervals at which machinery is lubricated which is not optimal for the point requiring lubrication. Auto lube systems are installed on machinery to address this problem.

1.1 CURRENT SCENARIO

At present the quay lift cranes are lubricated by manual lubrication methods, where the lubricant is carried to large heights and lubricant is pumped manually to each lubrication points. A quay lift crane generally has nearly 700 to 800 lubricating points, and the manual lubrication cannot guarantee the efficient lubrication of all these points. Moreover, its tedious and complicated.

2. COMPONENTS AND MATERIALS

GREASE RESERVOIR: A reservoir tank is a major component of any automatic lubrication system. For the auto lubrication of quay lift crane a 25kg capacity reservoir was installed. The moly grease, lubricant used in quay lift crane was filled in this reservoir and was taken out to the distribution lines by means of a pneumatic driven pump.



Fig -1: Reservoir

RUBBER HOSES: Standard hoses establish an optimal connection between your grease gun and lubrication spot.

Hoses are made from flexible thermoplastic construction which prevents cracking or breaking.

Heavy duty hoses have higher working and bursting pressures than standard hoses and are designed for air, battery, or hand-operated guns. Hoses are made from polyamide with polyurethane sheathing, reinforced in tear resistant polyester. Hoses ends are heavy duty Zinc plated steel.

Suitable for hydraulic application with increased resistance to abrasion for use with petroleum, synthetic or water based fluids specifically designed for diverse greasing and lubrication applications of industrial, hand held or automatic (centralized) grease distribution equipment.

The female and male plugs at the ends of the rubber hose are attached to the grease drum and handguns which is used to pump the lubricant to the specific lubrication points.

QUICK RELEASE COUPLINGS: Quick release couplings solve the problem of quick connection and disconnection of flexible hose assemblies. The connection can be made faster and easier than in the case of standard screwed couplings (threaded, flanged) because it is made by hand, with no tools. Usually, it requires only pushing a plug into a socket. Locking occurs automatically, using the spring mechanism

MATERIAL	WORKING TEMP	CHARACTERISTICS AND USE OF SEALS
NBR (nitrile)	from -40°C up to +100°C	Basic seal for hydraulics. Resistant to hydraulic oil, mineral oil, fuel
Viton (FPM / FKM)	from -25°C up to +200°C	Excellent resistance to high temperature, oils, greases, aromatic substances. Resistant to most chemicals.
EPDM	from -40°C up to +150°C	Good resistance to high temperatures. Especially recommended for hot water and steam. Good resistance to brake fluids, glycol and fire resistant
PUR (polyurethane)	from -40°C up to +100°C	Compared to NBR, more resistant to pressure pulsation, but more sensitive to dirt. Mainly used for hydraulic oil.

Table-1 Materials and sealing

C TYPE BENTS: C type bents are employed in pneumatic auto lubrication system to bend the pipes to required angles so that each pipe lines can be made to reach the required lubrication points. These bents are used to prevent the breakage of pipe lines due to excessive bending.

MOLY GREASE: Fully compounded NLGI grade 2 molybdenum disulphide grease provides superior extreme pressure properties, high load bearing capacities, protects against corrosion, is water resistant and has excellent oxidation and mechanical stabilities. It is dark grey/ black and has a smooth buttery texture. Moly grease offers

particular advantages under boundary lubrication conditions, especially where sliding or vibration actions push the grease away from the contact surface.

3. SYSTEM DESCRIPTION

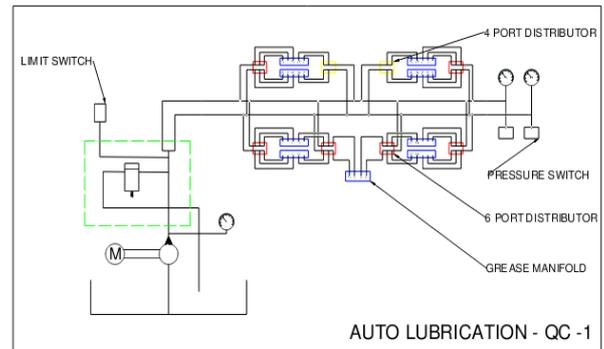


Fig-2 Schematic diagram

A quay crane is under operation only at its boom down condition. At this condition the transshipment of containers occurs from the vessel to the quayside or vice versa. The pneumatic auto lubrication system is a semi-automatic lubrication system which demands some amount of man power too for the lubrication process. Here the compressed air from the compressor is used as the energy source for pumping the lubricant. The rubber hoses connected to the lubricant pipe lines along the frames of quay cranes discharges the lubricants from the reservoir tank. The lubricant used here is moly grease, composed of molybdenum disulphide and Lithium complexes. Reservoir tank, compressor, rubber hoses, stainless steel pipes, quick release couplings, c type bents etc. are the major components of a pneumatic auto lubrication system.

4. BENEFITS OF AUTOMATIC LUBRICATION SYSTEM

- All critical components are lubricated, regardless of location or ease of access.
- Lubrication occurs while the cranes are in operations causing the lubricant to be equally distributed within the bearing and increasing the crane’s availability.
- Proper lubrication of critical components ensures safe operation of the cranes.
- Less wear on the components means extended component fewer breakdowns, reduced downtime,
- Measured lubrication amounts mean no wasted lubricant

5. SCOPE FOR RESEARCH

Each year millions of dollars are spent for new plant equipment designed to build things better and faster. However, machines continue to break down. Bearing failure is a major cause of equipment downtime in today's industrial environment, most often resulting from improper lubrication. Improper lubrication scenarios include the contamination of the lubricant by dust, dirt and moisture, inadequate amounts of lubricant applied to the bearing, and/or over lubrication of the bearing. Each bearing failure directly impacts the production cycle. While bearings can be expensive, replacement cost alone is often miniscule compared to lost production and the cost to repair the damage.

Why, in the age of technology, is this a problem? It is because many bearings are still lubricated manually. No matter how diligently a maintenance staff adheres to a lubrication schedule, it is a difficult task. Because employees are expected to manage multiple responsibilities in the lean environment of today's plants, it is common that proper lubrication is not considered a priority.

When considering the benefits of implementing an automated lubrication system, it is important to know that it could pay for itself within the first year through the cost savings it generates. Production uptime, preventive maintenance costs, repair costs, safety expenses, environmental compliance costs, lubricant costs and machine replacement costs are all positively impacted.

The user could choose to monitor the system by visual verification of delivery or use automated equipment to indicate when a lubrication cycle does not occur as planned. It is definitely an issue of scale. The more lubrication points fed by a single system, the more likely the application can justify the cost of a more sophisticated

5. CONCLUSIONS

The first step towards any effective lubrication program is the detailed mapping of all lubrication points. The lubricating points in a quay lift crane were identified and were lubricated using auto lubrication system. The efficiency and service life of the quay crane was improved by auto lubrication.

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