

**INTERNATIONAL JOURNAL OF ENGINEERING SCIENCES & RESEARCH  
TECHNOLOGY****WIRE ROPE LUBRICATION SYSTEM FOR HARBOR MOBILE CRANES****Ms. Bhushan P Patil <sup>\*1</sup>, Prof. H. D. Chaudhari<sup>2</sup>**<sup>1</sup>Student, Department of Mechanical Engineering, JTMCOE, Faizpur, Maharashtra, INDIA<sup>2</sup>Professor, Department of Mechanical Engineering, JTMCOE, Faizpur, Maharashtra, INDIA**DOI: 10.5281/zenodo.1320850****ABSTRACT**

The main aim of this project to provide an improved lubrication system for Wire Rope of Harbor Mobile Cranes, due to the multifunctionality of Harbor mobile cranes makes them effective for all areas of application in the harbor as a material handling machinery to load and unload of the ship for Break and Bulk cargo handling. Such Re-lubrication system can be installed in the line of rope reeving for effective and optimize lubrication of wire rope. Use of this techniques optimizes the use of resources and contributes to reducing the operation and maintenance cost.

**KEYWORDS:** Wire Rope Lubrication System, Harbor Mobile Crane, etc....**I. INTRODUCTION**

Due to rising worldwide demands import and export of cargo handling consistently increasing year by year. Therefore harbor operation continues day and night to full capacity to meet the demands. In order to make the business profitable and satisfy the supply chain demands use of high capacity mechanized material handling equipment safety and reliability have great importance for ropes used on Harbor mobile cranes. Harbor mobile cranes among the most powerful material handling equipment in the world. The flexibility and adaptability of Harbor mobile cranes make it more efficient in all areas of its functional application in Ports which ensures the highest efficiency in the bulk material handling equipment. Adopted Wire Rope Lubrication System is a unique and effective method for Wire Rope lubrication and groove cleaning. Only in one setup, wire rope peripheral surface and its groove form can be cleaned, where outer surface contaminated by grit dust and dirt, And at the same time new lubricant is uniformly layer applied to the cleaned surface. Application of the thin layer of lubricant during the process fills open space within the grooves of wire rope along also penetrates in between the strands to the core. This can be accomplished by passing the wire rope through grease chamber which controlled under pressure and immersion take place within the internal seal lubricating chamber. Peripheral dirt and moisture within strands of wire rope are displaced and replaced with the thin layer of lubricant. Such lubrication can be useful for tough applications where lubricants are required to prevent friction wear between the strand rubbing and tough to access the area of wire rope for lubrication due to the geometry of the application.

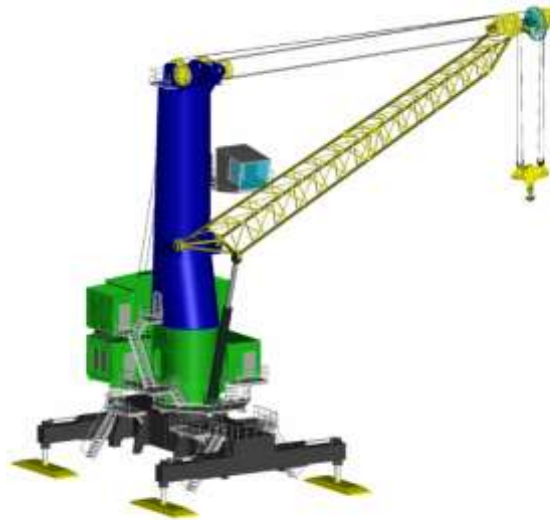
**II. WHY OPT FOR THE SPECIAL TECHNIQUE FOR WIRE ROPE LUBRICATION**

**The Problem:** Tough working conditions and access to the applications, rust, corrosion, and friction assailing in between the wire ropes: As well most traditional lubrication methods are in practice, to brush or spray the lubricants by hand, which turns to a slow, costly, inefficient and potentially unsafe procedure. Moreover, the lubricant rarely penetrates to the core of the rope and in such a condition where rust, corrosion, and friction leads to doing the most damages and reduces the service life of the wire rope,

**The Solution:** Wire Rope Lubrication System thoroughly lubricates the wire rope peripheral surface and in between the strand. That gives rope flexibility, strength and reliability help to enhance the service life. Use of this techniques in practices will remain profitable investment that since it shows the reduction in labor, cost and downtime also helps to prevent premature failure of wire rope and replacement schedules. Ensures maximum safety for operator a wire ropes.

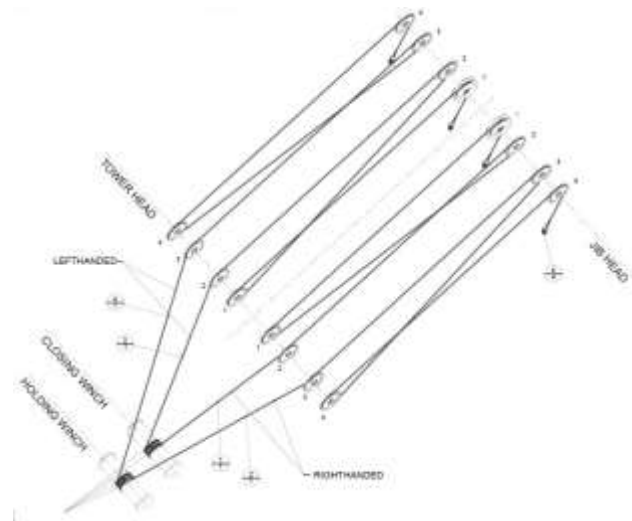
### III. HARBOR MOBILE CRANE

Harbor mobile crane is impressive. Its performance, reliability, economy, and mobility extend the benefit in any port operation, large or small. They are available in a wide range of lifting capacities and boom lengths and offers flexible solutions for the most complex of cargo handling activities.



*Fig - 1: Harbor Mobile Crane*

Harbor mobile cranes are continuous duty machines popular among the range for their immediate and short reaction times for rapid and safe working cycles. It has all motions are simultaneous, continuous and precise, which ensures the high level of safety and develops the confidence to operates. Higher performance can achieve by requiring minimum fuel consumption and optimum energy. Due low mass of inertia, a faster acceleration and deceleration time helps to achieve the higher turnover. Closed loop systems require only 25% of hydraulic oil in reference to open loop systems to operate the system. Pump and Prime mover gives the dynamic braking. Reverse power used to charge regenerative circuit, resulting in the reduction in fuel consumption. Closed loop circuits provide ease in troubleshooting and fault diagnosis due to individual circuits for each system operation of the crane. One drive system simplifies and reduces service and maintenance costs.



*Fig - 2: Reeving Plan of Harbor Mobile Crane*

These cranes mainly use four rope reeving plan in two winches used for continuous duty cycle operations. In such reeving plan, wire ropes undergoes through several bends over sheaves on jib heads, tower, and drum sheaves, wherein ropes in always in service with metal to metal contact.

As well as due to the height of the machine and typical reeving plans most of the area of the rope remains dry and difficult to lubricate due to dangerous to access. Resulting ropes undergoes for rubbing friction, corrosion and leads to premature failure, which may cause fatal accidents. Hence, in the addendum, it is essential to installing wire rope lubrication system in line to the operation. To increase the service life of the wire rope, safety and reduce the operation and maintenance cost.

#### IV. Wire Rope Lubrication

Lubrication of wire ropes is a tedious proposition, regardless of its construction and composition. Ropes with fiber cores are somewhat easier to lubricate than the core made exclusively from steel materials. Due to this reason, it is very important to carefully consider the fact of field re-lubrication while selecting a rope for an application.

The lubricants applied to working ropes, provide a dual form of protection. In that individual wires are protected from one another and the whole wire is preserved against the corrosive action of the saline atmosphere. Therefore to understand the importance of wire rope lubrication, it is necessary to understand that a wire, when in use, it is a dynamically complex mechanical device, which is composed of several moving parts. As the wire rope passes over the sheaves or in the sequence of sheaves arrangement, it is subjected to corrosion, bending, tension, and compressive stresses as it attempts to equalize the effects of the load it is carrying. The lubricant applied to the wire rope during the manufacturing process permits such equalization to occur with a minimum of abrasion in between the individual wires within each strand.

Wire rope lubrication is the reapplication of a lubricant in the field. And ensures that the friction between individual wires is reduced to the minimum; important to understand each wire within a rope is in constant contact with other wire along its entire length. If we neglect to follow a field lubrication programs, the lubricants applied to the wire rope during the manufacturing process goes dissipated and direct metal to metal contact established between the individual wires of the wire rope. As the “dry” rope is used, the abrasion of the individual wires reduces their metallic area i.e. reduction in diameter and subsequently, the total load carrying capability of the wire rope.

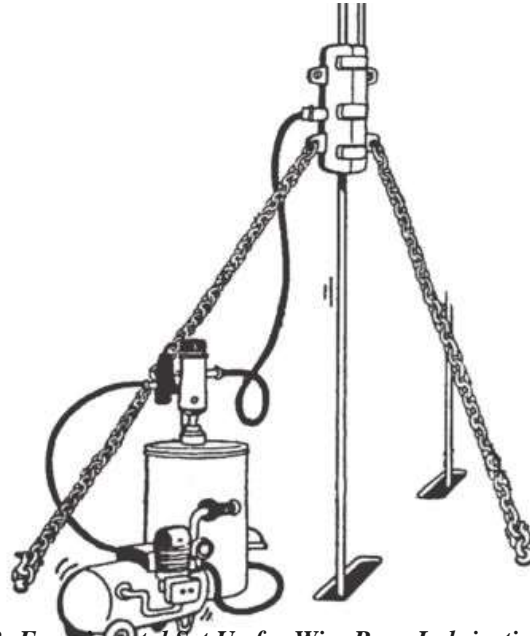
Before applying lubricants to the wire rope they must be cleaned or scrapped, if wire ropes are dirty or have accumulated layers of indurate lubricant or other contaminants, it must be cleaned with a wire brush. The wire rope must then be dried and lubricated immediately to prevent rusting. Traditionally, Field lubrication can be accomplished by spraying, brush, drip or pressure boot. It is a best practice to apply a lubricant effectively applied to drums or sheaves, wherein the rope strands tend to separate and open up slightly due to bending to facilitate maximum penetration to the core.

#### V. WIRE ROPE LUBRICATION SYSTEM

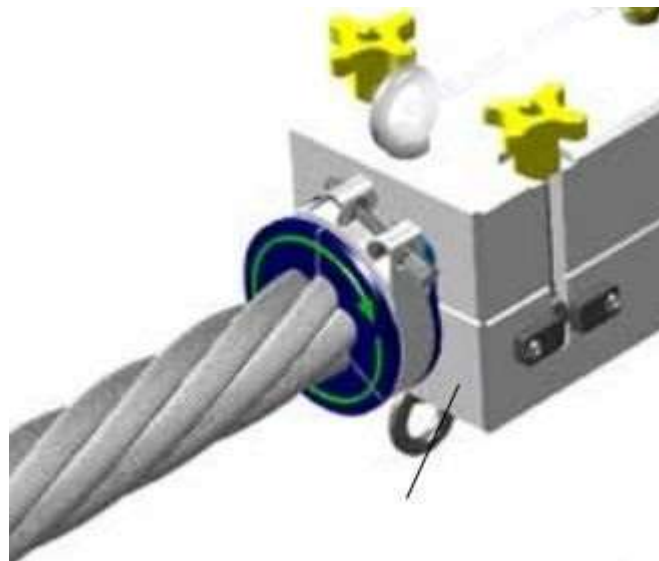
Wire rope lubrication System developed as a service tool as a special attachment to the equipment to conduct lubrication program periodically to the equipment on a monthly, quarterly or specified cycle to lubricate wire ropes. It consists of a Greasing Housing, Greasing Seal Set, Scraper Guide, and Groove Cleaner assembly that houses polyurethane seals suited to a specific wire rope size. The assembly is clamped around the rope and anchored to a fixed point. The rope is then pulled through the S Rings. The groove cleaner scrapes the rope and removes the dirt, dust, and hard lubricant from the rope to protect the seals from loose strands, flattening them out before new lubricant is applied.

As the lubricant is applied controlled under pressure in a sealed lubrication chamber, grease pump forces the lubricant between the strands to the wire rope core. The result is a thin layered groove filled lubricated wire rope on the outer strands. The greasing Housing is designed to apply NLGI #00, #0, #1, #2 wire rope greases at high pressures. The Grease Seals are designed for maximum efficiency and wear. The Scraper Guide Bushings are used to remove old grease and contaminants from the surface of the wire rope and also to guide the rope through the center of the housing. Eventually reduces wear to the grease seals. The Scraper Bushings can also be installed

at each end of the housing in the form of plates or molded split bushes, which contributes further to reduce the wear on the seals. There are two grease port inlet and outlet on each side of the housing.



*Fig. - 3: Experimental Set Up for Wire Rope Lubrication System*



*Fig. - 4: Model of Wire Rope Lubrication Assembly*

The wire rope lubrication system eliminates manual lubrication and, in turn, yields improved results. This versatile and reliable tool lubricates the wire rope core to reduce friction and heat generation for longer service life. The wire rope lubrication system utilizes optimum utilization of resources like lubricant may grease or oil and distributes in the thin layer evenly and eliminates over-lubrication wastages.



#### VI. ADVANTAGES:

1. Fast and efficient – reduces lubrication time
2. Increase operator safety
3. Easy to use with any wire rope up to 64mm
4. Helps to prevent corrosion
5. Protects the wire ropes
6. Penetrates the wire rope core
7. Reduces waste and contamination
8. Robust design for harsh environments

#### VII. APPLICATIONS:

Use of such techniques in maintenance management not limited to harbor mobile cranes but can be used in various application like,

1. Traveling cranes
2. Mobile Cranes
3. Wharf cranes
4. Ship cranes
5. Deck winches
6. Ship hoists
7. Wire ropes for ROVs (remote-operated vehicles)
8. Winding machines in mines
9. Mobile cranes
10. Oil and gas rigs
11. Chains and ropes.

#### VIII. CONCLUSION

The advance Wire Rope Lubrication techniques establish fast and effective single pass lubrication of wire ropes and, eliminates the slow and arduous task of traditional methods of lubrication. Use of lubricating device improves lubrication method and protects the wire ropes from fretting wear, corrosion by lubricating the wire rope to the core with the thin layer of lubricant on the outer strands. The use of device improves Service life, operator safety and reduces the operation and maintenance cost, the environmental impact of wire rope lubrication for any size operation, which is a great need of harbor mobile cranes.

#### IX. ACKNOWLEDGEMENT

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#### REFERENCES

- [1] American Iron and Steel Institute, "Wire Rope User's Manual", Second Edition. 1985, p. 5-17, 67-68.
- [2] "CRC Handbook of Lubrication", Volume 1, 1983, p. 193-201.
- [3] Brewer, A., "Effective Lubrication", 1974, p. 236-242.
- [4] <https://www.machinerylubrication.com/Read/372/wire-rope-lubrication>

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