

# Design & Selection of Automatic Lubrication System For SPM

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**ABSTRACT:** This paper deals with the study and review of Automatic Lubrication System. Any rotating or sliding parts may develop certain amount of heat due to friction of the moving parts and consequently, there will be some wear and tear and loss of power. The most effective method of reducing friction to minimum and to save the metals from wear and tear is efficient lubrication and the substance used for this purpose is called lubricant. So proper lubrication system for lubrication is the most important arrangement for efficient running of engines and machine parts.

**KEYWORDS:** Automatic Lubrication, Lubricants, Design.

## I. INTRODUCTION

Lubrication is the process or technique employed to reduce the friction between, and wear of one or both, surfaces in proximity and moving relative to each other, by interposing a substance called lubricant in between them. The lubricant can be a solid, liquid or gas. Lubrication can be of two types 1) Manual lubrication and 2) Automatic lubrication. In earlier times only method to lubricate the parts was manual this leads to failure of lubrication due to excessive or less amount of lubricants. This results into low production, time consuming, sometimes the physical location on machine often makes it impractical to manually lubricate the points & it also requires maximum man efforts. Thus automatic lubrication system came into existence. In an automatic lubrication system, often referred to as pressurized lubrication system, is a system that delivers controlled amounts of lubricant to multiple location on a machine while the machine is operating.

Waghmare. S.L et al. [1] This project includes design and selecting of automatic lubrication system. Which allows to do oiling on regular time period and in adequate amount. This system also ensures safety to components and labour. It reduces manpower requirement for system lubrication. P.DivakaraRao et al. [2] In centralized lubrication system the goal is to reduce friction and dissipate some of the heat generated by friction. With centralized lubrication, every bearing receives the proper lubricant in an exact amount to minimize wear and promote longer service life Here different type of oil flow rate is wanted for the lubrication points these are all easily done with COL.T. Elakkiya and A. Anitta [3] Lubrication is the process or technique employed to reduce the wear of one or both surface in close proximity. Most of the bear lubrication fail due to the too much or too less grease injected using manual lubrication. So, to replace the manual lubrication discrete wiring employed in lubrication system in heavy machines using PLC.

The work in this paper is divided in two stages. 1) Selection of components 2) Circuit design for Automatic Lubrication System. The main components of automatic lubrication system are Motorised

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pump, Metering cartridges, Manifolds, Tubings and Fittings. With the help of these components we have designed the circuit layout of automatic lubrication system for this machine.

## II. RELATED WORK

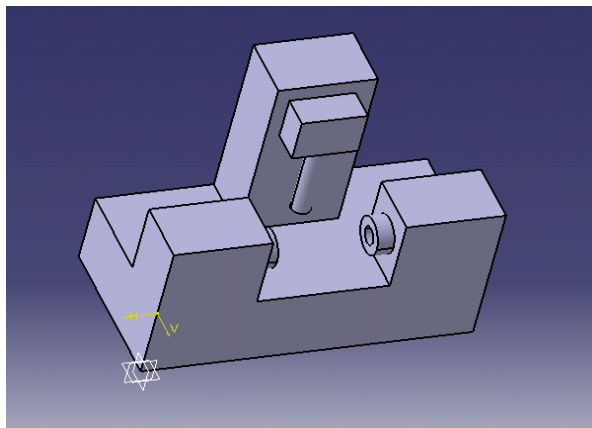


Fig 1 Design layout of machine

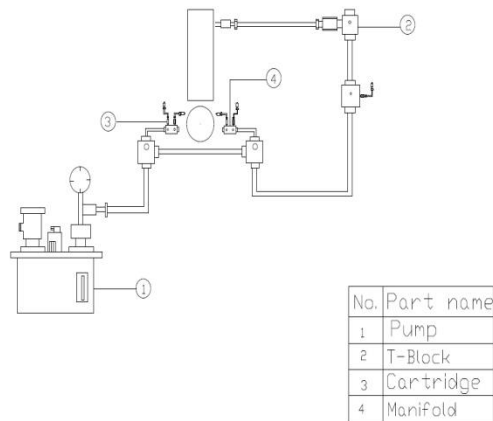


Fig 2 Flow Diagram For Automatic Lubrication System

This is two way drilling and one way reaming machine there are two spindles for drilling and one spindle for reaming. This machine is beneficial for work shop where drilling and reaming perform simultaneously on job. The motor used for drilling and reaming is of 3 HP three phase induction motor.

The job operated on this machine is a Valve Guide which is a cylindrical piece of metal, pressed or integrally cast into the cylinder head, with the valve reciprocating inside it. It is used in the cylinder head of the ships, it is the sleeve that valve moves up and down in and keeping it moving in an in and out motion.

With the help of machine layout, flow diagram for automatic lubrication system is designed. There are six lubricating points on this machine for which this system is designed.

### 1) Selection of Components

The main components of automatic lubrication system are  
Motorised Pump

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Metering cartridges  
Manifolds  
Tubings and fittings

## 1. Motorised pump :

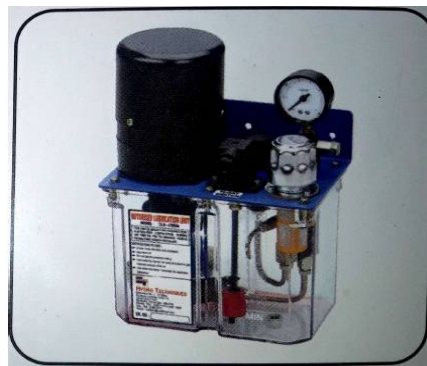


Fig 3 Motorised pump

Table no. 1 Specifications of Motorized pump CL2700Dx

Discharge of Pump	0.75 LPM
Reservoir Capacity	2.7 liters. Transparent (in polycarbonate material)
Motor	0.09 KW, 1500 rpm, Single Phase, 220 VAC
Relief Valve	Pre set at 12 kg/sq.cm.
Pressure Switch	220 V (Max), 1 Amp (Max), With 1 NO + 1 NC contact, Preset at 10 kg/sq.cm.
Float Switch	42 V (Max.) 0.2 Amp (Max.), (oil filled)

Pump it is central source of oil in lubrication line. It is mini hydraulic power pack fitted with motor and rotary positive displacement pump. This unit fitted with pressure gauge, float switch, transparent reservoir. The unit is designed for intermittent run only and best suitable for single short centralized lubrication.

**2. Metering cartridges :** The element is a valve which ejects out metered amount of oil to lubrication point. It is a sort of mini cylinder with a special check valve where stroke of piston determines the dosage of oil. The complete design of metering injector does not allow it to leak at low as well as at high pressure of oil. The ejected oil will not return back to the injector due to in-built check valve. The metering injectors are supplied along with copper seal ring.

We have selected D2 size on the basis of required amount of oil in cc. For this we calculated required amount of oil by considering area of guide ways and oil film thickness

Specifications of moving slide = L=350mm, W=300mm, H= 75mm

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Fig 4 Metering Cartridge

Table no. 2 specifications of metering cartridges

SIZE	DOSE IN CC	AREA (CM <sup>2</sup> )	Drops
D1	0.01 cc, 0.03 cc, 0.05 cc, 0.10 cc, 0.16 cc Per Stroke.	Upto 4, 4to12, 12to20, 20to40, 40to65	1/3, 1, 2, 3, 5
D2	0.25 cc, 0.40 cc Per Stroke.	65to100, 100to150	8, 12
D3	1.00 cc, 1.60 Per Stroke.	150to400, 400to650	30, 50

**3.Manifold :** Manifolds are nothing but steel blocks for mounting metering injector. These have two ports and few side outlets. On side outlets, metering injector are screwed directly while in lines ports are meant for joining next manifold. Manifolds are classified as one way(DM1),two way(DM2) upto ten way(DM10). We have selected DM-2 i.e two way for two injectors as there are two points on each side.



Fig 5 Manifolds

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Table no. 3 specifications of manifold

L	No of Mounting holes	W	Thickness	Port Size (P)
35	One	18	15	M8x1
55	One	18	15	M8x1
75	Two	18	15	M8x1
115	Two	18	15	M8x1
40	One	22	22	M10x1
90	Two	22	22	M10x1

**4. Tubings and fittings :** Tubing and fittings are basic accessories for the lubrication system. These are from the pump to the manifold and from the manifold to the lubrication point with in between metering cartridges tubing are required. For ejecting oil into the lubrication points, fittings are essential part of various threads. Tubings we have used are of 4 mm and 6 mm. 4 mm tube is used for metering cartridge and 6 mm tube is considered as a main pipe. Some fittings used for this system are as follows.

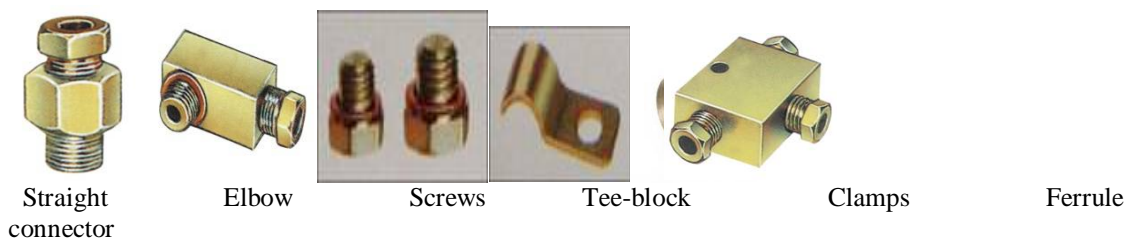


Fig 6 Tubings and fittings

Table no. 4 Fittings and their uses

Fittings	Uses
Straight connector	To connect 6 mm & 4 mm OD tube at the end point
Elbow	For joining two tubes at right angle of 6 mm & 4 mm OD tube
Screws	For fixing clamps and to plug the manifold
Tee-block	For dividing main line into three lines of 6 mm & 4 mm OD tube
Clamps	For clamping tubes
Ferrule	for fastening, joining, sealing or reinforcement.

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## III. ADVANTAGES AND DISADVANTAGES OF AUTOMATIC LUBRICATION SYSTEM

### 1) Advantages

- Appropriate Oil Consumption
- Variable Oil Dosages
- Enhanced Machine Life
- Elimination of Human Error
- Increased Reliability
- Increased Production
- Low Noise Level
- Less Power Consumption
- Less Wear & Tear
- SAFE, No Need to stop Machines
- Reduced Spares/Inventory Costs
- Overall Increased Profitability

### 2) Disadvantages

- Expensive construction
- Good sealing required
- Supply of lubrication is made via centralized lubricating system (costly)

## IV. EXPERIMENTAL RESULTS AND DISCUSSION

In order to achieve optimum reliability and maximum benefits from lubrication programme, several factors need to be taken into account. These factors are summarized by the wellknown five “R”s of lubrication:

- The right lubricant
- In the right quantity
- At the right time
- At the right point
- With the right method

Once the five “R”s are defined, you can determine the best way to lubricate a component with the resources available.

## V. CONCLUSION

The functions, properties and various components of lubrication system are explained and well studied in this paper. The lubrication can be done properly and with right type of lubricant and other specific required components. This paper deals with basic lubrication system, basic selection criteria for components required for lubrication system. Also from the Automatic Lubrication system it is concluded that the man power required for the lubricating the various oil points can be eliminated. The lubricant consumption will considerably reduced by control system optimization i.e right quantity of lubricant at right part.

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