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AUTOMATIC LUBRICATION SYSTEM FOR DRAW TOOL

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Abstract - *Automated lubrication systems provide superior options to manual lubrication. The advantages of machine-driven lubrication embrace less period thanks to bearing failure, reduced man-hours needed for the lubrication task, and raised employee safety, further as reduced material and cleanup prices. All of those completely have an effect on productivity.*

There area unit several variables to think about concerning instrumentation lubrication. Automation of the lubrication method will begin out little and easy, and might be custom-made over time to specific desires. Suppliers will facilitate confirm what's going to work best for every scenario and might assist in price profit analysis.

Maintenance of an automatic lubrication system varies with every system. However, there area unit easy rules that apply to all or any systems like compatible and clean material, routine checks of fittings and piping and visual review of reservoirs. The principle to recollect is that smaller amounts of material equipped a lot of times leads to higher lubrication and lower overall maintenance prices.

1.INTRODUCTION

When considering a die lubrication technique, you ought to make sure to gauge its result on your entire operation. whereas most folks specialize in however lubrication affects simply the manufacture of components, a detailed look reveals that it affects several alternative aspects of running a plant. However, several of them don't seem to be obvious.

The activities, costs, and results of die lubrication don't showing neatness occupy connected columns on a computer programed. once maintenance workers are deciding the simplest thanks to refill fluid reservoirs, they typically don't review the previous quarter's shipping prices. once die designers choose a alloy steel, they typically don't specialized in whether or not the fluid effort is integrated with the press controls. once engineers verify a fluid viciousness, they rarely take into account what percentage bundles of rags the press operators use every quarter. These ostensibly unrelated classes and plenty of others are connected by die lubrication selections.

Perhaps no alternative method during a stamping, forming, or fabricating facility reaches as loosely into the operation as die lubrication will. Yet, as a result of it should be custom-made to every factory-made half, lubrication typically is that the last item planned, and often it's approached haphazardly. It's definitely worth the Effort the reality is that a detailed consider the important impact of die lubrication ought to cause measurable enhancements. Rigorously planned and dead die lubrication ways will push vital efficiencies through a whole producing operation.

The principal reason for applying fluids and lubricants in forming processes is to scale back friction and take away or dissipate heat. The warmth and friction ar generated at the purpose wherever the tool and also the work meet that's, wherever the shaping, forming, bending, drawing, cutting, or punching takes place. The goal with die lubrication is to form certain AN applicable film of material is at the interface between the tool and also the work to reduce or eliminate injury to the die and markings on the half.

The goal with fluid application is to seek out the simplest potential technique to deliver needed} quantity of material to the realm within the die wherever it's required and wherever it'll do the foremost smart. once determinant the tactic, you ought to take into account quite simply the fluid delivery system

1.1 MAHINDRA CIE AUTOMOTIVE STAMPING DIVISION, NASHIK (sponsors)

Mahindra CIE is stamping unit where stamped parts of automobile are manufactured. The plant was established in 1999.

It is equipped with 19 presses ranging from 500T to 1500T. It also has automation welding facilities with 6 automation cells.

Mahindra CIE is a multi-technology automotive components supplier listed on the stock exchanges in Mumbai. Major supplies from this plant are sub-assemblies for cars and SUV'S. Clients d company are Renault, GM, Nissan, Mahindra.

1.2 OBJECTIVES

a) To minimize the heating of dies.
b) To cut back time needed for entire method i.e. die dynamical time
c) To cut back cycle time and oil needed for lubrication.
d) To cut back the quantity of labour needed.

2. LITERATURE REVIEW

Satnam Singh1 et al,(04 Apr -2017) the paper entitled Automatic Lubrication System in Lubrication process lubricant is used as fluid in machining process can reduce the cutting temperature and provides the lubrication to work piece and tool .These increase the long life of the tool and good surface quality. There are many types of lubrication system is used in industry. This paper is review of Automatic Lubrication System which is used in industry. This system delivers controlled amount of lubricant to multiple location on a machine parts while the machine is working. The lubrication consists of greasing oil to different greasing points. This study involves with design and manufacturing of automatic lubrication system. This system gives safety to part and worker and it also minimize manpower required for lubrication system. Damage due to large greasing to part can be stopped. This paper also describes the parts which are used to construct of Automatic Lubrication System.[1]

Rebsamen et al,(Sept. 4, 1973) the paper entitled Lubricating System for metal forming die this invention relates to a die set in a metal forming press and more particularly to a lubricating system in corporated in a double action die set to apply a lubricant to the metal blank placed therein for forming. Prior to this novel invention, the metal blank was sprayed with a lubricant prior to placing the blank in the press. This method required a man to operate the spray and also presented a health hazard in the area of the spray operation. It is an object of this invention to provide a lubricating system for a metal blank formed in a double-action draw die that eliminates a man from the production line and provides more efficient lubricating of the metal blank being formed. Another object of this invention is to provide automatic lubricating of the metal blank while held in place in a confined space in the draw die, thus reducing a health hazard on the production line by substantially eliminating the lubricant vapors from over spray. A further object of this invention is to provide a more uniform lubricating of the metal blank and reduce the amount of lubricant used by metering the lubricant applied to each blank processed.[2]

W. Rchter (1969) the paper entitled Automatic Stock Lubricating System, this disclosure is directed to a metal forming machine in combination with a lubricating system for automatically lubricating stock material as it is fed toward the forming station of the machine. The lubricating system includes a supply tank for containing the source of lubricating fluid. A spreader means adapted to engage the stock material is disposed in the path of stock travel for uniformly distributing the lubricating fluid to the stock material as it advances toward the forming station. A pump means is interposed in the line between the supply means and the spreader for pumping controlled amounts of lubricating fluid from the supply means to the spreader. Operatively connected to the pump is a means which is rendered responsive to the cycle of the machine for controlling the frequency of operation of the pump so that only predetermined optimum amounts of lubricating fluid are directed from the supply means to the spreader during machine operation.[3]

William K. Hawks et al, (1936) the paper entitled Automatic Lubrication System, the present invention pertains to a novel automatic lubrication System, and the principal object is to provide a system wherein a series of measuring valves applied to a number of bearings may be automatically operated at predetermined intervals. The measuring valves used in the present system are preferably of the type which receive the lubricant under pressure and from which the lubricant is discharged into the bearings under pressure by means of the same or another fluid. The invention therefore embodies a pump for Supplying the lubricant or grease, and another pump for Supplying the other fluid or oil. The pumps are electrically driven, and the action of the System is initiated by a time switch Which Sets the grease pump in motion. When the valves have been filled with grease, a mechanism associated with one of the valves stops the grease pump and starts the other pump whereby the grease content of the measuring valves is discharged into the bearings.[4]

Edward R. Pillars (1927), the paper entitled Automatic Lubrication System. This invention relates to lubrication means for machines of all kinds which are subjected to vibratory action, but particularly to automatic vehicles. It is a desideratum to maintain bearing surfaces continuously coated ' with a thin film of lubricant so that the friction between the relatively moving parts is reduced to a minimum, and as a consequence the life of the parts is prolonged. It will at once be appreciated that the life of bearings will be enormously increased if lubrication can even approximate the theoretical perfection. It has been appreciated for a long time that where parts are subjected continuously to pressure on one surface in substantially line 'contact, it is extremely difficult to maintain adequate lubrication, especially when these parts in horizontal position are given oscillatory motion. In this latter case the pressure being continuously at one point quickly removes the lubricant causing a metal to metal contact. [5] Lubrication of these parts has heretofore been attempted by means of grease forced under pressure to the desired locality. This has been found decidedly impractical and insipient, because though tremendous pressure is utilized to force the grease around the bearing surface, after

oscillation has taken place the grease is soon forced from the surface where it is needed most, i.e. where the maximum pressure is exerted on the bearing surface. There is no tendency of grease to spread itself over a bearing surface as it is well known that grease is not capillaceous. Therefore, even though careful attention is given to bearings of this nature grease lubrication will not sufficient to maintain for any extended period an even coating of lubricant over the bearing surface.[5]

2. HYDRAULIC PRESS

A press could be a device employing a hydraulic cylinder to get a compressive force. It uses the hydraulic equivalent of a mechanical lever, and was additionally called a Bramah press once the artificer, Joseph Bramah, of England. He fancied and was issued a patent on this press in 1795. As Bramah (who is additionally proverbial for his development of the flush toilet) put in bathrooms, he studied the present literature on the motion of fluids and place this information into the event of the press

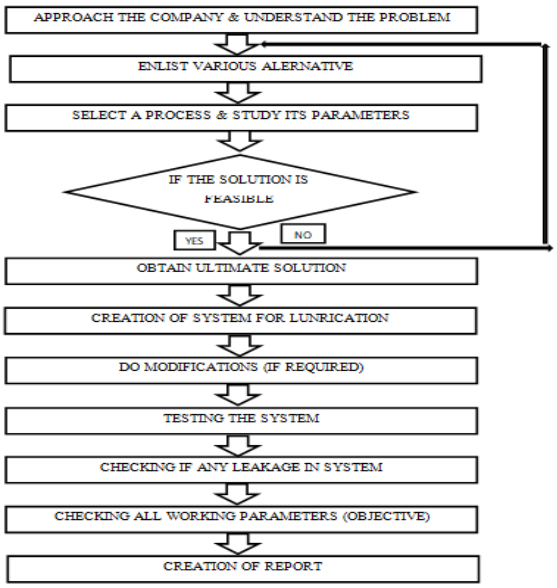
Fig -2.1: Hydraulic Press (1500 Ton)

3. EXISTING LUBRICATION SYSTEM

In hydraulic press machine, existing lubrication process is done manually on die. Two workers are required for this manual lubrication process, an unskilled worker can also perform this operation. The lubricant SHS80 (draw oil 80) or (draw oil 44) is used for the lubrication which is specially ordered by company. The die is lubricated after every 500 strokes. For this lubrication die is unloaded from the machine using crane and for this unloading process 2 to 3 workers are required. It takes almost 1 hour 30 minutes for whole process i.e. to remove the die, to lubricate it and fix it again on the machine. For manual lubrication workers uses lubrication kit. In this process first die is polished then lubricant is applied on it. The polishing process is done for removing the burrs and removing the unwanted particles. Due to this process the manpower required is more, 1.5 hour is required for lubricating a die which is more

Fig-3.1: Manual Lubrication on lower die

4. METHODOLOGY



5. PROBLEM IDENTIFICATION

For every die of each machine has standby die which was to be replaced while the first was in the stage of lubrication, so the time required for the changing of die was more because die were very huge, so for that certain time the production was getting stopped.

A separate worker was required to lubricate the die. This creates fatigue to the operator which leads to rejection of more parts and at last again reduces productivity. Lubricating die are only as good as the people who do the

work, just as a chain is only as strong as its weakest link. In many of my most recent projects, the retirement of technicians has been the problem of greatest concern. As Baby Boomers are reaching retirement age and subsequently retiring, they are taking with them a great deal of personal experience and knowledge of how they do their jobs.

5.1 PROBLEM STATEMENT

Due to absence of continuous lubrication scoring lines occurs in sheet (work piece) and sheet gets stick to the die, the temperature of dies also increases. This reduces die life and increases time of operation as well. Even if manual lubrication used, it leads to lot of oil wastage.

6. COMPONENTS USED IN SYSTEM

1. Nozzle :

The nozzle is selected based on the thickness and viscosity of oil to be used in industry for lubrication purpose. The oil used are draw oil 80 (SHS80) which is thick lubricant and draw oil 44 which is water based lubricant. The nozzle selected is manufactured by 'Spraytech' located in Navi Mumbai. And based on the working area the nozzle is given 45 degrees inclination.

Fig-6.1: Nozzle

- Lubricant –

Eastto Metal Drawing 44-

It is water soluble paste developed for the wet drawing of all grades of steel wire. The distinctive combination of fatty acids, edible fat and a non-corrosive, extreme pressure additive produces an answer that exhibits the cleanliness and stability related to synthetics, whereas affording the slip and lubrication properties generated by natural soaps. EASTTO METAL DRAWING forty four dissolved in water at rates starting from four to 100 percent to hold out severe wire drawing operations.

•Benefits:

I. Provides wonderful protection of dies and punches against corrosion

II. it's a flexible product, the rates of which might be adjusted in accordance with the drawing difficulties doubtless to be encountered

III. Will be simply removed by suggests that of cleanup and laundry systems.

IV. Further standard film resistance. It permits to hold out troublesome drawings operations. It doesn't attack the bronze part of dies and punches.

2 .gas instrumentality

Pneumatic instrumentality is push to attach kind instrumentality. Push-to-Connect fittings alter fast tube affiliation and disconnection. a range of Male and feminine Connectors, Elbows and Tees feature tube ODs starting from 1/8 to 3/8 and 10-32, 1/8 NPT or ¼ NPT threads. To confirm a leak proof work, thread sealer is normal on all male pipe threads and therefore the 10-32 UNF thread options associate O-ring for a superior seal.

Fig-6.2: Pneumatic Connector

3. Reservoir tank and stand:

For placing the reservoir at certain height for eliminating the need of pump 6 0feet height stand is manufactured of MS material and at the top of stand reservoir oil tank is placed.

Fig-6.3 : Reservoir tank and stand

4. Connecting Pipe:

Pipes are SMC made PU10. Thermoplastic hose also generally has one or two reinforcing layers that provide needed strength and adequate pressure-holding ability. The reinforcement layers usually have a braided construction, made from materials like polyester, polyamide or aramid fibres, or steel wire.

- Specification-

Outer Diameter: - 10mm
Inner Diameter: - 6.5mm

Fig-6.4: SMC PU10 PIPE

5. Compressor:

The model of compressor is name as EJTJ. The capacity of compressor is 500 Bar. For lubrication purpose lubricant oil and compressed air is supplied at a time for this 3 Bar air is supplied with oil.

Fig-6.5: Compressor

7. IMPLEMENTATION

We have implemented the optimized solution for die lubrication system on the punch, die holder and cavity assembly which is to be fixed on 1500 ton hydraulic press machine. The step by step procedure for implementation of system is as follows:

1. Removing the blank holder from the lower die:

The blank holder is removed from the cavity with the help of overhead crane which is present in the industry. With the help of crane we can move the die on entire shop floor wherever required and also can be tilted easily as per requirement. The screw fixtures are provided for lifting the blank holder and cavity and can be fixed at any position wherever required.

Fig-7.1 : Removing of blank holder

2. Inspection of dies.

The blank holder and cavity is inspected properly to decide the location for mounting the nozzle. Various factors like space available, hole size, nozzle diameter and leakages are considered during this process.

3. Drilling of holes.

The holes are drilled for fixing of nozzle in the blank holder. The nozzle diameter is 23.5 mm so as standard drill was not available, we drilled 25 mm diameter hole. We clamped the nozzle on the blank holder having hole size 8.5 mm drill and 10 mm tap.

Fig-7.2: Drilling on Blank Holder

4. Mounting of Nozzle.
The mounting of nozzle is done by clamping it on a blank holder. The nozzle outlet is inserted in the 25mm hole on blank holder for lubrication from inside.
5. Joining of pipes.
The pipes used are SMC made PU10 pipes. These pipes are connected to the air inlet and fluid inlet of nozzle. The other ends of these pipes are connected to pneumatic connector and reservoir.
6. Taking trial on connection.
The trial is taken on a die by providing the compressed air from air inlet pipe and water based lubricant from the reservoir tank was held at the height. We also neglected the use of pump by holding the tank on height and reducing cost.
7. Mounting of blank holder in lower die.
After the trial is done, we again mounted blank holder on lover die cavity using overhead crane.

Fig-7.3: Mounting of blank holder

8. Clamping of pipes around the lower die.
The pipes are properly clamped around the die cavity for smooth operation. These are tilted around the cushioning pin and clamped.

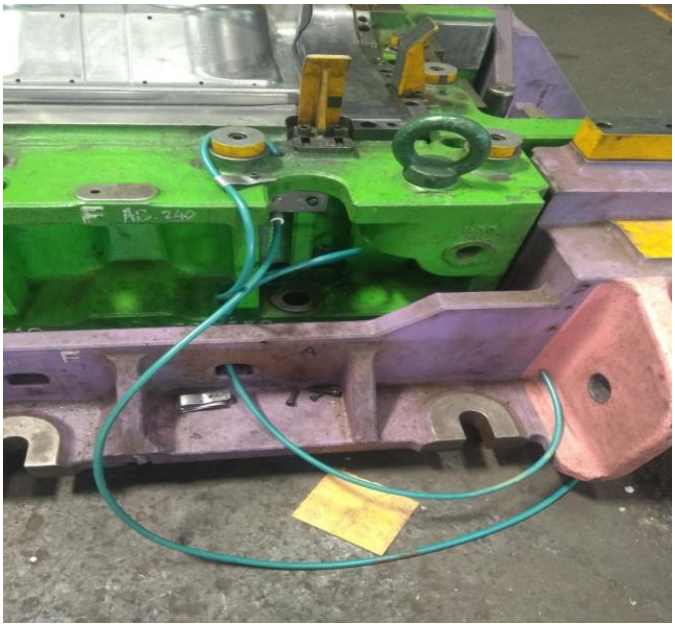


Fig-7.4: Clamping of pipes

9. Manufacturing of Reservoir tank and stand.
We manufactured the reservoir tank and painted it properly. We provided the oil outlet at the downward side of the tank and then the pipe is connected to it. Then we manufactured stand to give height to the reservoir which is of 6 feet and painted it properly.
10. Mounting of die on hydraulic machine.
We mounted the die on the hydraulic press using overhead crane. The ram was taken down and the upper die was connected to it. Later lower die was fixed below.
11. Atomizing the Lubrication process.
When the ram is taken down, it releases the air. At that time the machine will release pressurized lubricant on the die which will lubricate the die. The dies will be lubricated after each stroke.

8. TESTING

At last testing of system was done where the system is allowed to run and results were noted. The lubricant was allowed to flow through the nozzle fixed in the blank holder. This lubricant was sprayed over the lower die, blank and the sheet to be formed. This helps in achieving the required results. Previously the temperature generated was very high which is 35^0C got reduced to 28^0C after implementation of the system. The Die now can be changed after every 1000 strokes instead of 500 strokes in the previous die. Cycle time per stroke was reduced from 5 minute to 4 minute. And the oil use per hour got reduced from 40ml to 280 ml. Only 1 labour is required instead of 3 labours. Time required for lubrication got reduced from 30 sec to 180sec. The system

can be mounted on Hydraulic press as per requirement and production cycle carried out in industry.

9. RESULT

Parameters	Before	After
Temperature generated between dies	35.4°C	28°C
Changing of dies required	After 500 strokes	After 1000 strokes
Cycle time per stroke (SPM)	5 min	4min
Oil required for lubrication	40 ml	28 ml
Labor required	3	1
Time required for lubrication	30 sec	18 sec

Table-9.1: Results Table

CONCLUSION

Automatic lubrication system is a need in today's world of automation where industries are looking over reducing manpower. One of the machine about which we studied is hydraulic press where we use die for pressing of bonnets and doors of car body. There is certain procedure followed to perform this operation having certain strokes before changing a die for lubrication. Lubrication is essential to avoid wear and tear of the die and increase its efficiency. For lubrication manual procedure was carried out where workers were lubricating a die after each and every stroke. So to avoid fatigue to the operator and increase the productivity, we designed automatic lubrication system for draw tool. This can be switched to different machines and can be used for all the parts of machine. In this project, we had identified the problems occurred in machine and defined the methodology required to overcome it. We studied some papers regarding automatic lubrication and tried to implement the concepts on a system for 1500 Ton capacity hydraulic press having 5.5 SPM.

ACKNOWLEDGEMENT

We feel great pleasure to present the project stage I entitled "Automatic Lubrication System for Draw Tool ". But it would be unfair on our part if we do not acknowledge efforts of some of the people without the support of whom, this project work would not have been a success.
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