

# Analysis of Lubrication in Milling Machine

Vivek Jain  
student

Department of Mechanical Engineering  
Maulana Azad National Institute of Technology  
Bhopal, India

Dr. Alok Singh  
Assistant professor

Department of Mechanical Engineering  
Maulana Azad National Institute of Technology  
Bhopal, India

**Abstract**— Most of users and operators are well aware of that, if no proper lubrication will perform that will penalize performance in very definite way. The precision fits & workmanship for which our machines are well know will quickly be lost if lubrication is neglected or wrong practices followed. This paper is on all the essential information and instructions on proper lubrication of milling machine (horizontal). This paper covers proper oiling of milling machine parts. Diagrams and chart gives proper information for oil practices and lubrication.

**Keywords**—Milling machine; lubrication; reliability.

## I. INTRODUCTION

For achieving good lubrication, lubricant itself- whether it is right type and quality. The cost of lubricants should never be judge on the basis of price per gallon. Performance of the machine is the right criteria. Lubricating oil life blood of machine and good grade of oil is required for continues work and for its good efficiency. Lubrication information with the general practices is followed in lubrication of milling machine.

## II. MILLING MACHINE

Milling is a process in which a rotating multi-tooth cutter removes material while traveling along various axes with respect to the work piece.

## III. BASIC COMPONENT OF MILLING MACHINE

### A. Base

The base of the machine is Grey iron casting accurately machined on its top and bottom surface and serves as a foundation member for all the other parts which rest upon it. It carries the column at its one end.

### B. Worktable

On which the work piece is clamped using T-slots. The table moves longitudinally relative to the saddle.

### C. Saddle

Supports the table and can move in the transverse direction.

### D. Knee

Supports the saddle and gives the table vertical movement so that the depth of cut can be adjusted and work pieces with various heights can be accommodated.

### E. Over arm

Used on horizontal machines; it is adjustable to accommodate different arbor lengths.

### F. Column

The column is the main supporting frame mounting vertically on base. Heavily ribbed inside and houses all the driving mechanisms for the spindle and table feed.

### G. Spindle

Spindle of machine located in the upper part of the machine and receive power from the motor through belt, gear and clutches and transmits it to the arbor.

## IV. SEVEN PRACTICES TO LUBRICATE MILLING MACHINE

### A. Attention regularly

The lubricant is consumed or losses its lubricating value as a result of time and use. Attention require otherwise rate of wear increase. When the interval for lubrication is highly irregular, parts may even run dry this result costly damage to bearing and gear.

### B. Oil level

Level of oil in the various reservoirs on each machine has an importance. The correct level is indicated on a Gauge & can be only when machine is idle and oil in rest. Level of oil be inspect once in a day and at the beginning of each 8 hours shift. Whenever a perceptible drop in oil level noted, sufficient oil should be added to bring back the level to defined height. In fact an over filling of lubricant may contribute to excessive heating, leaking and foaming may also be happened. Leakage is costly as well as it may create messy condition near of machine.

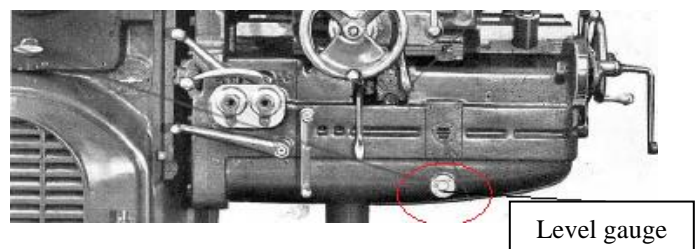


Fig.1 Level gauge [1]

### C. Oil change

It is poor economy to keep the oil for long time in service, it should be change time to time at regular intervals for effective lubrication. For normal condition, it's recommended that the reservoir be drained, flushed and refilled with fresh oil after a defined regular interval.

### D. Cleaning and flushing

When the oil is drained out form reservoir, it's always desire to flush the interiors with flushing oil to remove completely sediment or used oil or any foreign material. If this is not done these impurities may effect on machine parts or may contaminate fresh oil.

Procedure for flushing & cleaning firstly introduce flushing oil after drain out used oil and filling the reservoir up to prescribed level. Then after machine should run without load for approx 5 to 10 minutes to allow flushing oil to circulate and loosen up impurities. The reservoir then again drained, & certain with that all the flushing oil removed as much as possible before filling of fresh lubricant. Regular kerosene can also use for purpose of flushing, cleaning. In severe contaminations case and stored of impurities in reservoir tank, then it's essential to remove a cover of case for manual cleaning.

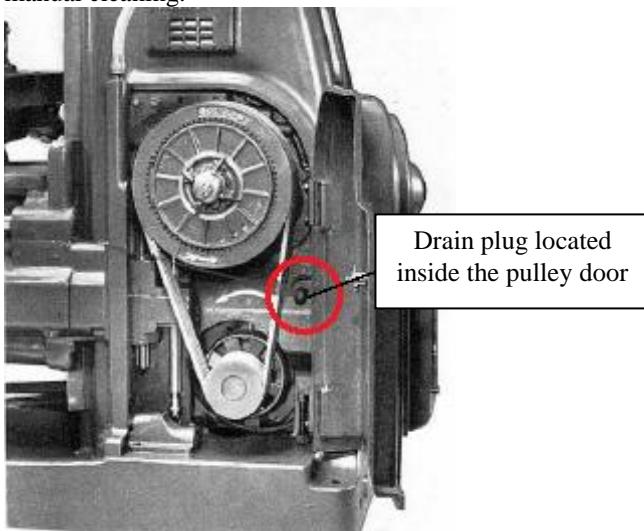


Fig. 2 Drain plug [1]

### E. Filter

Oil filter are an important factor in assuring cleanliness of the lubricant which delivered to the parts of machine. If periodic attention not given to the filter, it will be clogged due to impurities & then filter inoperative. Removing the filter or cutting it out from the system then wash or change the filter for the efficient operation & useful life of the equipment.

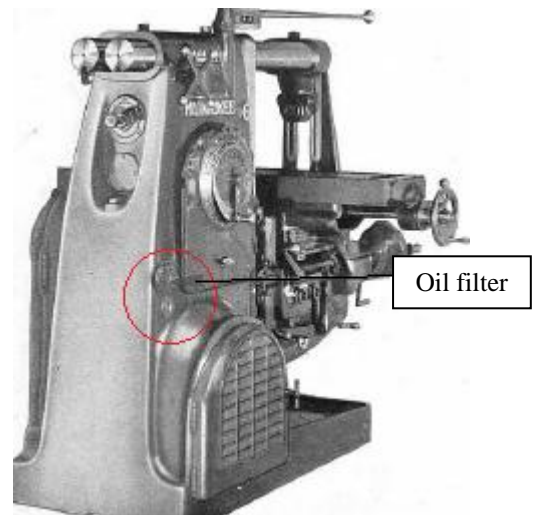


Fig. 3 Oil Filter [1]



Fig. 4 Oil filter [9]

### F. Hand Oiling

In Milling machine require lubrication by hand on some parts by either oil cups or hinged or screw cup oilers. These screw cups should be filled daily or preferably at the starting of each shift by means of oil can. The important is type of oil can for securing rapid introduction of oil. Plunger type can which delivers a controlled amount per stroke rather than the common spring bottom type can.

Greasing technique: lubrication of spindle bearing, gear of feed distribution, bearing of spline shaft and attachments is secured by the applying of the grease. Lubrication spindle bearing by the grease with a pressure gun. For normal condition of operation, introducing of grease is required in every 200 hours of working or once monthly. Two strokes from gun will normally be sufficient. Over greasing just contribute to waste lubricant around the machine.

V. BASIC LUBRICATION

A. Attachments

It is not possible to lay down any particular period or interval for disassembly and cleaning. This is done at intervals as judgment may dictate in order to replace the old grease have become hardened or deteriorated. The system should be cleaned & removing as much as possible of old lubricant and then again packed with fresh.

B. Arbor support

A screw plug in the arbor to fill the oil, this screw plug removed and oil added daily to upper line on level gauge. Oil is going to arbor support bearing through it. A special grade of oil recommended due to high load carrying capacity to secure effective arbor support lubrication.

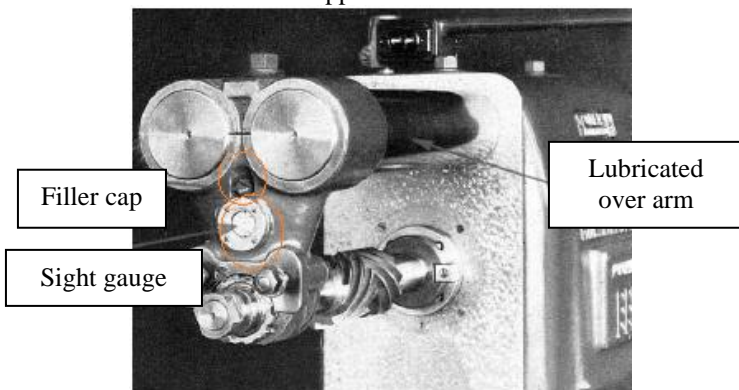


Fig no. 5 Arbor support [1]

C. Saddle

The oiling of the saddle is accomplished by a hand operated one stroke system. Saddle should be lubricated six times in a one shift. A special way lubricant is desirable to secure most efficient lubrication of saddle and avoid chatter or stick-slip movement.

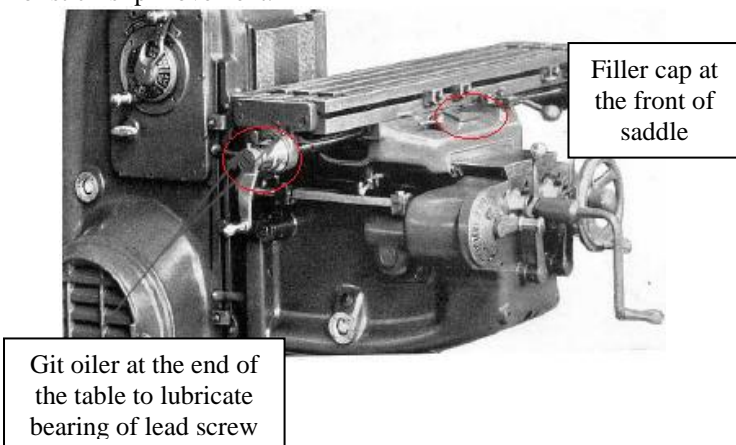


Fig. 6 Saddle [1]

D. Flow gauge

When the oil system is provided with a pump to circulate the oil then these gauges required for observation of flow to conform that the oil is circulating and going to the parts which will require lubrication. Therefore it is important that flow gauges be inspected once in a each shift at least. The machine should be stopped immediately if NO flow is observed.

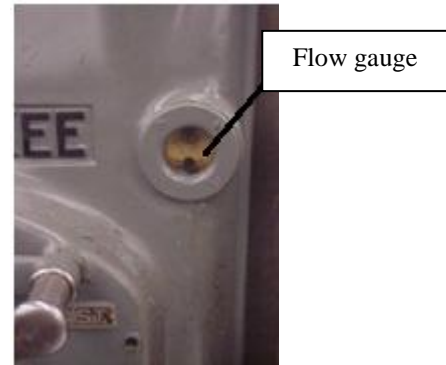


Fig. 7 Flow gauge [9]

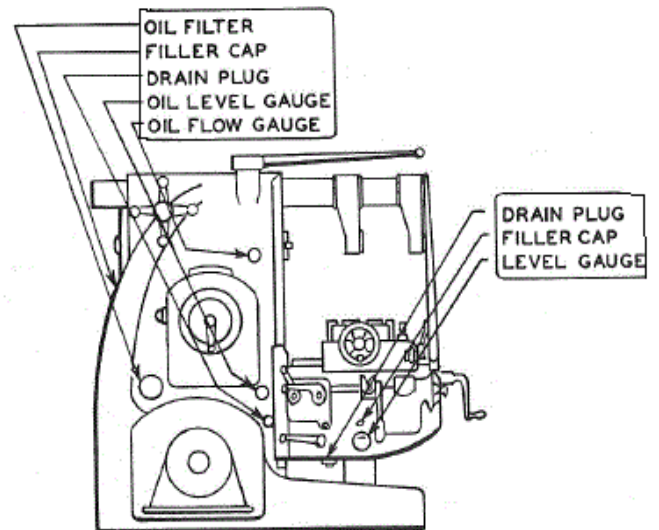


Fig. 8 Side view of milling machine [9]

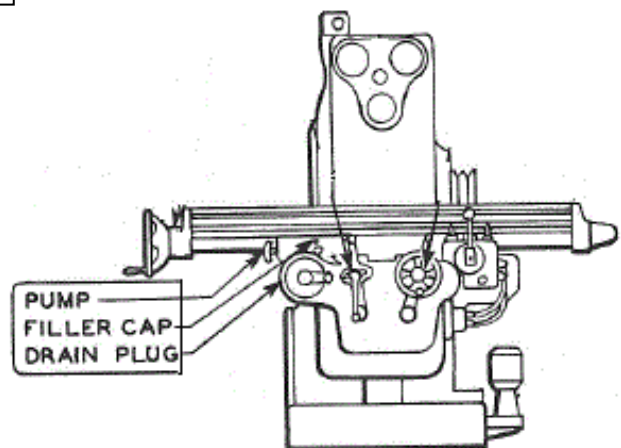


Fig. 9 Front view of milling machine[9]

## VI. AUTOMATIC OILING IN VARIOUS PARTS

Parts lubricated	Instructions	Frequency
1) Spindle drive 2) Speed gear box 3) Pulley bracket 4) Knee drive 5) Feed distribution box 6) Column and knee ways 7) Feed and rapid traverse drive	Stop motor and add oil to maintain level at upper line on sight gauge. Drain reservoir. Flush with kerosene for ten minutes period with motor running. Refill reservoir.	Every 3-4 months or 400-500 hours of machine operation, whichever occurs first.
8) Saddle and table drive mechanism 9) Knee and saddle ways Saddle and table ways	Withdraw and release pump handle. Fill reservoir.	5-7 times per day.
10) Arbor supports	Add oil to maintain level of sight gauge to upper line.	Daily.

[3]

## Hand oiling in various parts

Parts lubricated	Instructions	Frequency
1) Table hand wheel bearing 2) Cross feed hand wheel bearing 3) Bracket bearing	Fill oil cups	Daily

## VII. CONCLUSION

Necessity of lubrication is to reduce friction, wear of moving parts, operating temperature, and minimize corrosion of system. Consequences of improper attention in lubrication leads to machine failure, lubricants replacement cost (material, labor, flushing, etc.) and associated downtime. Due to which it leads to an increase in overall cost like machine parts failure cost, oil replacement cost, flushing cost. So for better life of milling machine and for increasing reliability proper attention is required in lubrication of machine parts, regular check of oil grade and oil level (level gauge).

## REFERENCES

- [1] Milwaukee milling machine manual, model no. 2H Plain, Universal and Vertical by Kearney and Trecker.
- [2] Y. S. Liao, H. M. Lin, international journal of machine tools and manufacture, volume 47, issue september 2007, Mechanism of minimum quality lubrication in high-speed milling of hardened steel.
- [3] Lubrication manual of milwaukee milling machine Plain, Universal and Vertical Knee Type Model 210CH-14 by Kearney and Trecker.
- [4] Holz k, Balders R., Cement Industry Technical Conference, issue 2011 IEEE-IAS/PCA 53<sup>rd</sup>, Lubrication and maintenance for key machine in the cement industry.
- [5] Jianmei Wang, Qinxue Hang, Intelligent Computation Technology and Automation, issue 2009, Thermo-Elasto-hydrodynamic Lubrication performances of Oil-Film Bearing in Large-Scale Rolling Mill.
- [6] Effect of minimum quality lubrication on tool wear, surface roughness and dimensional deviation in turning AISI-4340 steel.
- [7] Kaun-Ming Li, Shih-Yeh Chou, Journal of material processing technology, volume 210, issue november 2010, Experimental evaluation of minimum quality lubrication in near micro-milling.
- [8] T. Obikawa, comprehensive materials processing, issue 2014, Machining with least Quality Lubrication.
- [9] <http://its.foxvalleytech.com/MachShop3/basicmill/lubrication.htm>