

“UPGRADING AND COMBINING OF ONE` COOLANT FILTRATION SYSTEM AND DUST COLLECTION SYSTEM WITH TWO GRINDING MACHINES”

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ABSTRACT

A paper on Upgrading & combining of one coolant filtration system and dust collection system with two grinding machine is related to grinding machine. Grinding machine perform grinding operation. Grinding is a material remove and surface generation process used to shape and finish component made up of metal and other component. For grinding operation the lubrication in the form of coolant is necessary. It is used for to get high accuracy and good surface finish of components. There are total six grinding Machine in grinding shop and for each grinding machine one separate coolant system and dust collection system is required. After grinding operation burr of grind component is mix with coolant and store in coolant tank and again it is recirculation from main tank. The old grinding machine made by Hindustan Machine Tool India Company. It is better grinding machine at that time. The coolant system is also better at that time. But day by day new products are coming in market and some product is made up of metals and it required precise and accuracy as well as high surface finish. The old coolant system does not give much precision and accuracy to the metals. So to increase the accuracy and good surface finish the automatic magnetic cum paper band coolant filtration system is play major role for lubrication. After the upgrading and implementation of coolant filtration system the next step is to combine that coolant filtration system with two grinding machine by piping system. The dust collector system used for removes dust at a time of dressing of wheel. so the combining of one dust collection system with two machine is beneficial for cost saving of company the reason and advantages as well as benefits of this project are discuss in further report.

INTRODUCTION-

PROJECT 1-UPGRADE COOLANT FILTRATION SYSTEM

OLD COOLANT FILTRATION SYSTEM-

The old coolant filtration system is used for grinding machine. It is used for smooth operation and for maintain the RA value which is required in between 0.01 to 0.1 as well as high surface finish. But we could not get required RA value because the coolant come from main tank mix with burr and this hammer on wheel as well as component. So it reduce the thermal deformation of work piece but not able to maintain RA value. The Filtration system is used to separate burr particles from main tank. The fluid can be liquid, a gas or supercritical fluid. The filtration system is help to filter the coolant from burr. Burr is removed material from grinding component. It is very small in size. When grinding is going on the coolant is mix with that removed burr from component and for reused that coolant to avoided that burr for that old coolant filtration system was used.

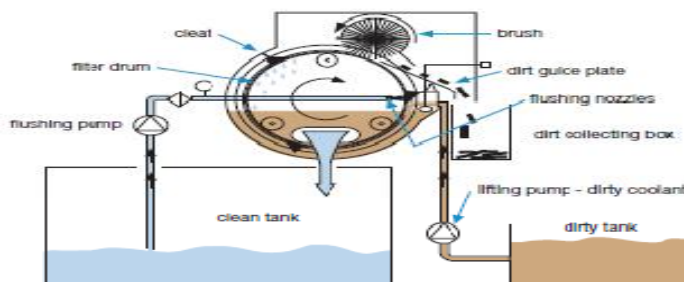


Fig : Coolant filtration system

REASON FOR SELECTION OF THE PROJECT-

- In the grinding shop various types of component are grind. There are of two type of grinding operation first one is dry type which is use for rough finish. In that coolant system not necessary. And another is wet type which is use for very fine surface finish. In that case coolant is very important.
- When Grinding Burr mix with coolant oil & fine particles are recirculation continuously with coolant which may create scratches on grinding surface while grinding.
- Grinding burr & coolant separation system are very old & aesthetically not looking good.

- Coolant oil needs to change after every two month. Means the life of coolant is two month only.
- Bad smell coming from coolant tank if recirculation oil stop more than two days in case of grinding machine breakdown.

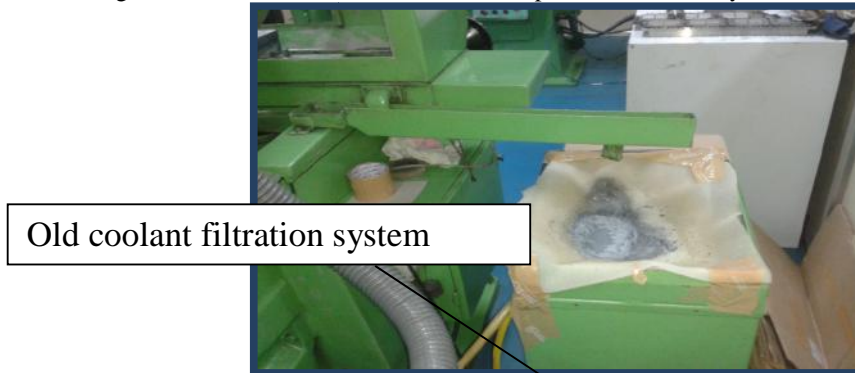


Fig 1.1 : Old coolant filtration system

WHY - WHY ANALYSIS:

Bad smell of coolant oil & small burr particles are recirculation with coolant oil

Wet Sponge get tear. Sponge particles & burr gets mix with coolant oil.

Burr with sponge particles gets settle at bottom of tank, it is difficult to clean and also time consuming process to clean tank.

Need to change coolant oil filtration method (system)

For that purpose we had taken some trial on the basis of why why analysis

TRIAL-1

SPONGE KEPT IN PERFORATED PLASTIC TRAY-

The old filtration system are design in such a way that the coolant are come from grinding bed and directly goes in main tank. To avoid that we had kept a perforated plastic tray over the filtration system and on that plastic tray we kept a sponge to avoided direct mixing of coolant and burr. In that sponge the burr are remaining on sponge and coolant are goes in coolant tank but after some days we had facing some problem, the observation of these problem as follows,

OBSERVATION:

- Sponge does not break but need to replace within 2 days.
- Grinding burr settle at particular area of sponge. Also small particles get pass along with coolant oils. Filtration is not so effective.
- Aesthetically not looking good.
- We can see in picture as follows,



Fig1.4: Old filtration system with sponge & perforated tray.

TRIAL 2

NET MADE ON WHICH SPONGE ARE KEPT-

For above observation we had decided to take further trial to avoided mixing. For that we had taken out perforated plastic tray and add the fine size wire mesh in between sponge and old filtration system. Due to this, double filtration of burr and coolant done. The observations are as follow,

OBSERVATION:

- Due to addition of fine wire mesh with sponge, filtration of coolant oil improved but again burr get accumulate at local area & need to spread manually to avoid spillage of coolant oil.
- Burr particle less than 100 micron still passing from double filtration which may create scratch of grinding surface.
- Aesthetically not looking good.

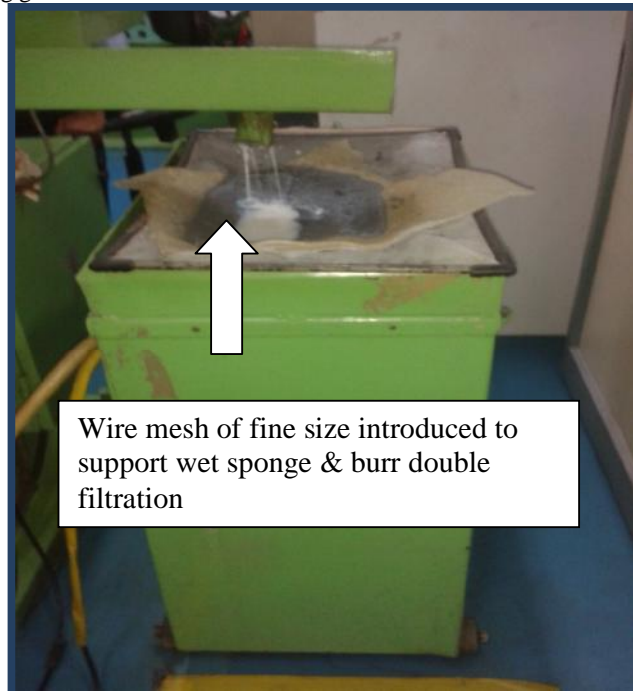


Fig 1.6: filtration system with wire mesh & sponge.

TRIAL 3

**AUTOMATED MAGNETIC CUM PAPER BAND FILTRATION SYSTEM-
FILTRATION SYSTEM-**

Filtration is commonly the mechanical or physical operation which is used for the separation of solids from fluids by interposing a medium through which only the fluid can pass. The system mainly consist of main tank, magnetic separator, paper band filter, dustbin, control panel & supply pump.

MAIN TANK-

Main tank is fabricated from a thick MS sheet with an angle frame construction, with lifting hook for easy lifting of the system; main tank is also provided with drain plugs valve in order to facilitate smooth working of the system.

MAGNETIC SEPARATOR:

Disc type magnetic separator is designed as per the disc provided to it minimum four to maximum thirty two discs type magnetic separator available. Gear box is fixed to disc magnets shaft to roll the discs. When coolant fall on disc type magnetic separator, magnetic particles are separated because high pull of magnet. Scraper blades are provided to collect the magnetic dust while rotating the discs. With the help of scraper blade arrangements, dust falls into dustbin. The semi clean coolant falling through magnetic separator is allowed to fall in the paper band filter.

PAPER BAND FILTER:

A three-phase induction motor through a gearbox drives the paper band filter. A float switch does the activation of the motor. The coolant after passing through the magnetic separator comes on the paper band where magnetic particles separated from the coolant. The accumulation of the dust on paper band raises the coolant level on the paper. A float senses the rise in the level of the coolant. The float actuates the limit switch which gives signal to operate the paper band drive motor. The indexing of the paper is continued till the level of the coolant on the paper goes down. The paper is collected in dust collection tank for disposal. For large system as a precaution two float switches are provided. The filter paper roll used is normally 100 meters in length with standard width of 450 mm.

CONTROL PANEL:

The control panel can be mounted in any convenient portion of the system or as per the recommendations given by the customer. The control panel is designed with necessary interlocks & safety of the system. The details of the control panel are as per the electrical circuit diagram & the bill of material.

DUST BIN:

Dust bin is fabricated with CRCA sheet with wheels to facilities easy movement. This tank is required to be cleaned periodically.

FILTRATION PROCESS:

In order to understand how to operate & maintain your filter unit, it is important to understand the following.

1. Machine through may be used coolant is collected in return magnetic separator.
2. Magnetic separator out coolant is passed to paper band filter for filtration process.
3. The coolant coming out from the paper band filter is allowed to fall in a main tank.
4. Coolant from main tank is supply pump supply to machine.

APPLICATION-

- Filtration is used to separate particles and fluid in a suspension, where the fluid can be a liquid, a gas or a supercritical fluid.
- Filtration, as a physical operation is very important in chemistry for the separation of materials of different chemical composition.
- This is one of the most important techniques used by chemists to purify compounds.
- Filtration is also important and widely used as one of the unit operations of chemical and industrial engineering.

OBSERVATION:

- For separation of fine burr, paper band is used which will not allow particle more than 10 micron size to get mix with coolant oil.
- All iron particles gets separated due to disc type magnetic separator.
- Standard upgraded filtration system with less manual intervention.

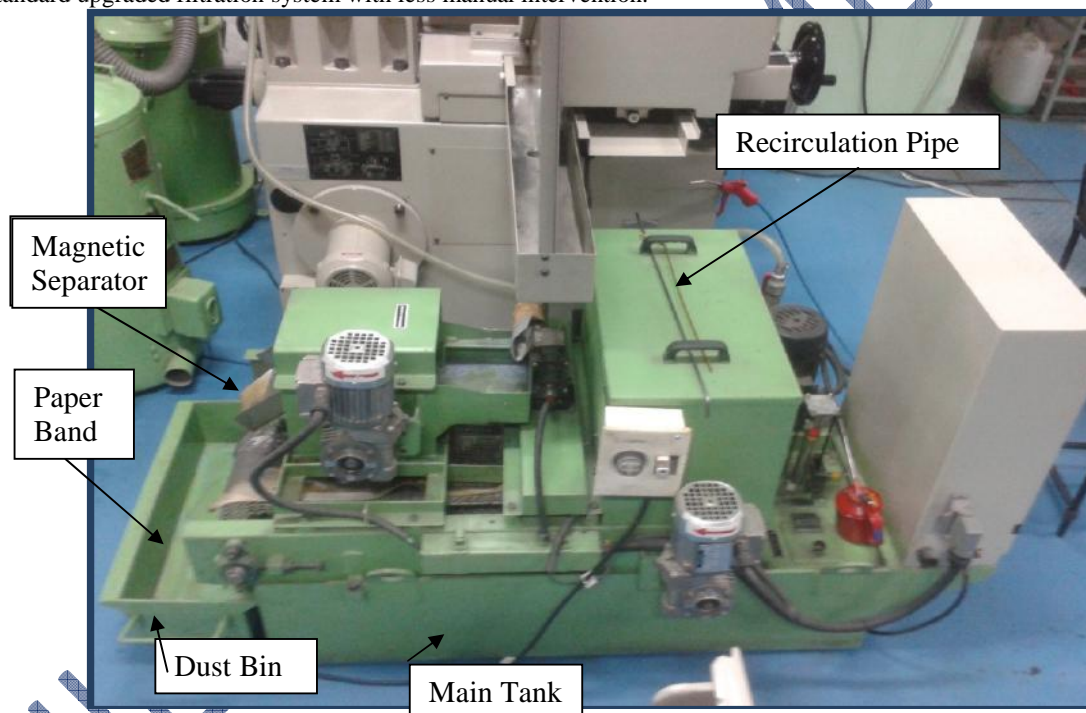


Fig1.7.2: Automated magnetic filtration system

After implementation these automated magnetic cum paper band filtration system they have some advantage, which are follows,

ADVANTAGES OF NEW MAGNETIC CUM PAPER BAND FILTRATION SYSTEM:

- Better filtration system which does not allow more than 10 micron size particles with coolant to recirculation.
- Coolant oil life increased from 2 months to 4 months
- No odor of coolant oil since implementation.
- Burr (iron) particles gets collected in separate dust collector, can easily scrap.
- Less manual intervention required & standard filtration system for coolant.
- Possibility of scratch mark due to burr while grinding on grinding surface reduces.
- Low operating cost.
- Improve product quality.

FUTURE PLAN:

- Combining of one coolant filtration system with two Grinding Machines.

PROJECT 2-COMBINING OF ONE COOLANT FILTRATION SYSTEM WITH TWO GRINDING MACHINES

The combining of one coolant filtration system with two grinding machine is very essential for industrial purpose.

There are some reasons for selection of this project which are as follows,

REASON FOR SELECTION OF THE PROJECT-

- ✓ More space required for keeping coolant filtration system
- ✓ Two different coolant system for two machines.(No standardization)
- ✓ Filtration system cost is high (1.3L/set)
- ✓ Need separate manpower for changing coolant oil & possibility of more leakage & spoilage of coolant oil on floor.
- ✓ More consumption of sponge & Cotton

BEFORE



Fig 2.1: New coolant filtration system of individual machine

AFTER

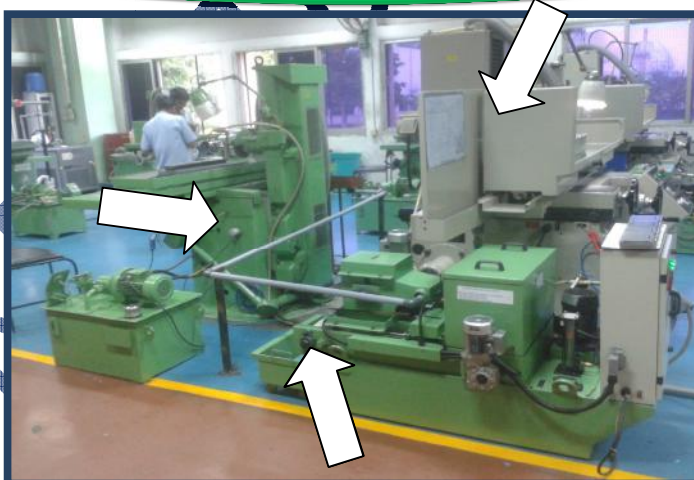


Fig 2.2: combining coolant filtration system with two grinding machine

BENEFITS AND CONCLUSION-

- ✓ Cost saving (130000 Rs.) by combination of filtration system for two grinding machines instead of 2 filter.
- ✓ Space utilization and '5S' improved.
- ✓ Electricity saving by running only 1 filter system instead of 2 filters.
- ✓ Low maintenance.
- ✓ Manpower saving for changing of coolant.
- ✓ Aesthetically looking good.

PROJECT 3-COMBINING ONE DUST COLLECTION SYSTEM WITH TWO GRINDING MACHINES DUST COLLECTION SYSTEM-

Dust collector is a system used to enhance the quality of air release from industrial and commercial process by collecting dust and other impurity from air.

It is an online process for collecting any process generated dust from the source point on a continuous basis. A dust collector system consists of blower, dust filter, a filter cleaning system and a dust removal system.

REASON FOR SELECTION OF THE PROJECT-

- ✓ More space required for keeping Dust collector.
- ✓ Separate dust collector required for each grinding machine.(No standardization)
- ✓ Need separate manpower for Cleaning Dust collector.
- ✓ Aesthetically not looking good

SEPARATE GRINDING DUST PARTICLE COLLECTION SYSTEM

BEFORE



Fig: Grinding machine with separate dust collector.
Combined Grinding Dust particle collection system

AFTER



Fig 3.2: Combine dust collector for two grinding machine

BENEFITS AND CONCLUSION -

- ✓ No need to buy new dust collector for new grinding machines.
- ✓ Cost saving of 42000/dust collector. Additional asset can be utilized in other shop for grinding machine if required.
- ✓ Electricity saving by running only 1 dust collector system instead of 2 dust collection System.
- ✓ Manpower saving for Cleaning Dust collector system.
- ✓ Space of total 3 dust collector saved and same space utilized for other new machine(2 sq feet/asset)
- ✓ '5S' improved. Aesthetically looking good.

REFERENCES:

- 1) Article on "water treatment solution: filtration", retrieved on the 15th October 2013.
- 2) Lecture notes, postgraduate course on "filtration & size separation" at the department of chemical engineering, England.
- 3) Span associates limited made manual on "Coolant filtration system"
- 4) Star delta pvt. Ltd made manual on "Dust collection system".
- 5) www.larsenandtubro.com/asw