

Fettling the most ignored operation in Foundries

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Keywords – Casting Fettling, cleaning operation

Abstract – We in Mahindra and Mahindra do lot of casting development required for making different automobiles vehicles. In most of the Indian foundries fettling is not important activity and hence not given much attention. Every year we face acute shortage of castings from April to Jun and all the castings suppliers give a common reason that less manpower due to labour on leave. In some of the part the labour goes for farm harvesting during rainy session as they get more money and that job also is not as dirty as fettling. The casting supplier does not know how much business he has lost and how much we lost in these months. This is every year's story, no improvements so far. Most of our Indian foundries they think that fettling is outsource activity; if the contractor is having big place and manpower then he is qualifying for doing fettling. Very few foundries are having procedure for fettling, what to grind, how much to grind is based on experience of that individual operator. The small automation like horizontal milling machine if they put grinding wheel in place of milling cutter then it can grind two faces at a time. This type of m/c is called as "Snag Grinders". With such automation productivity increases as well as consistence in grinding so no rejection due to excess grinding. There are fully automated machines where once the program done the machine take care of all operation and complete fettled castings comes out, only the operator is required to do small work inside cavities. With this paper my intention is to motivate casting supplier to do good fettling which operator will enjoy, will take less efforts, and keep good surroundings and environment.

Fettling in Non-Automated foundries

Foundry process designer take lot of efforts to design pattern, core boxes and other tools, process and then we get casting like after nine month a mother deliver a child. How much efforts she take during nine months that only she knows, in same way efforts taken by designer and making the first casting he only knows that. After pouring when casting come for cleaning. Fettling department can give good face or bad face to the first sample. Most of the time fettler does not know which area to grind or remove and wrong operation start right from first sample casting, and then re-sampling starts. Hear are our foundries differing from foundries out of India. They will make all fettling arrangements before they make casting and so no chance for mistake,

all elements of APQP followed, and PPAP documents made as design, prelaunch and other stages and it updated as per the feedback. I have noticed very few foundries follow such type of working and so first few months goes in solving problems.

Fettling is one of the important activities in foundry but equally neglected. Many leading foundries in India kept the fettling as it is without adding any modern tool and equipments.

The photograph explains the situation and condition of fettling shop –

- a. No sufficient light,
- b. Bad work place, no definite work area.
- c. No proper arrangement of working
- d. Heavy noise at workplace
- e. Safety is neglected
- f. Lac of proper tools
- g. Lac of machines

Most of the manual activity & so high level of efforts, No hygiene conditions around, maximum efforts for small work, how we can expect good work. Can they work with full efficiency? Our finding is that due to this almost at every fettler operator works for more than 12 hours. With this type of working how can we get good work?



Manual Fettling, High efforts – low output, no define work area, no proper tools, dirty work area



Unsafe working, no safety equipments used.



No proper light in work area, dangerous situation.

India is a country where 70% of our population is engaged in work related to farming. Most of the these operator get good wages during the harvesting time and so most of them happy to do this job than doing the dirty job of fettling. Being a democratic country nobody can stop them and so fettler has to wait for them and casting supplier do nothing than to see the huge heap of casting produced and giving different reasons to customers.

We as a automobile manufacturing company face this problem every year and so we are trying to create seriousness about this.

Fettling in Automated Foundries

As said above foundries which are out of India they followed all steps of APQP keep on updating the documents as per feedback and final SOP is made available for operator, most of the work is automated and so very less chance for mistakes.

Part development process is so systematically followed so that all are aware of details of that part, feasibility study done in details right from castings making to finish machining all operations are discussed and understood by foundrymen, even detailed study of averaging operation is done and so what care is required to take in fettling is put on the paper, they consult with customer min 5-6 times for any change in design which will make their process simple. Before making the actual part the foundry team visit to customer or machine shop to understand how the machining is takes place, what is care need to be taken during fettling?

Such type of focused approach then result into “first time right” casting development.

Simple Automation

Automation is the most important part of fettling, Snag grinders are widely used to remove fines from all side of casting. Since the foundry process itself is modern with high pressure molding and robotic assembly with minimum to no manual variation machining allowances kept 2.5 to 3mm maximum. Since with robotic assembly variation is less and so fins generation around the castings is less.



With good quality input to fettling, work becomes simpler and easier which gives required output with desired quality.

Workplace



The above photos shows all arrangements like –

- a. Maximum use of day light
- b. Ergonomically designed work place
- c. All required tools available near by
- d. Neat and clean work place
- e. All safety tools provided
- f. Less noise

Where operator can do maximum with fewer efforts.

Automation in Fettling –

With all problems with our fettlers and demand for castings in the market, it is time to think and act for implementing automation which will make fettling less dependent on manual efforts.

With snag grinders we can increase output by @15-20%. By providing proper work place we can further increase output by 10-15%. Some foundries implemented full automation where casting like cylinder block go-inside with all fines and comes out with 1mm fines and all handling is done automatically.

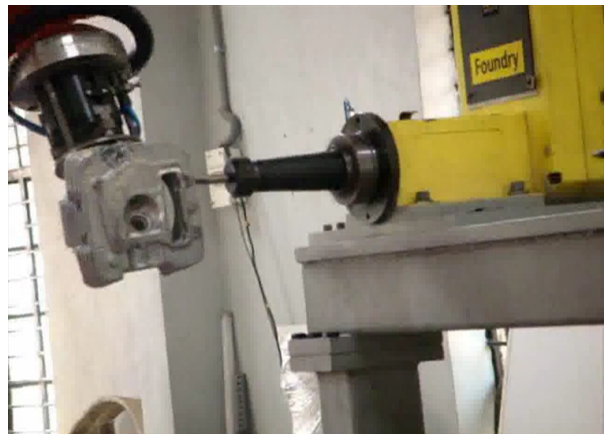


Above & below photographs shows automatic fettling of critical casting like cylinder block, where all faces ground in 2min time, which manually takes 15-20min with manual turning, face changing for swing grinding, and holding the heavy swing grinder in hand.

Once the programme is set then only casting loading in fixture and unloading from fixture is the only activity need to be done by the supplier and just to see if anything wrong in the working of the mc which generally need not to monitor if you are doing regular maintenance activity.



Below is the automation for AI electrical motor casing where castings is handled by robot and fettling tools are stationary. All operations are programmed only need monitoring.



Below is the automation for removing sand from Al Cylinder Head castings. The machine is rigorous vibrations and due to that all sand comes out. Manually it takes @10 minutes, machine takes 50 seconds, total time 1 minute. Productivity increased by 6 times.

The sand which comes out is collected with the help of bottom conveyor and transferred to recycled area.

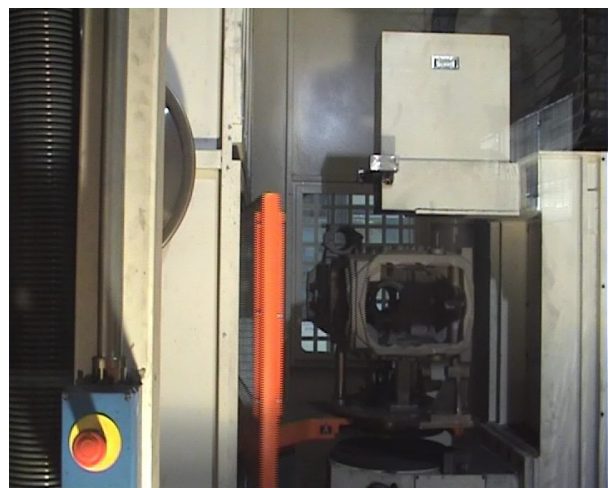
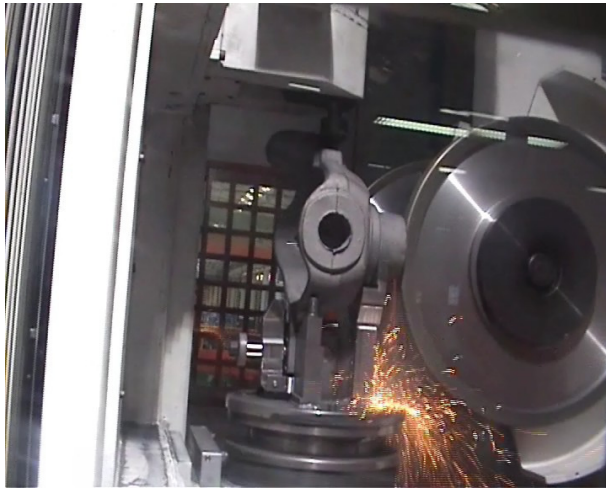


Happy operator does only loading and unloading of casting in mc, rest taken care by machine he need to just press the ON/OFF button.



Sand is transferred to recycled area by conveyor and the cleaned cylinder head is kept on separate pallet which took away for next operation.

Modern Fettling or It is CNC Machineshop – Yes ! It is Fettling



How Automated fettling is cheaper than age-old method

| | Foundry A | Foundry B | Actual Process Time | Modern Fettling |
|------------------------------|------------------|------------------|---------------------|-----------------|
| Total Throughput Time | 361.5 Hrs | 193.5 Hrs | | 48 Hrs |
| No. Of Days | 15 Days | 8 Days | | 2 Days |
| Coer Making | 48 Hours | 24 Hrs | 2.5Mins | |
| Fettling | 120 Hours | 48 Hrs | 120 Mins | 2.5 Hrs |
| Transportation | 144 Hours | 72 Hrs | | |
| | | | | |
| Inspection - NVA | 12 hours | 12 Hrs | | |

| | | | | |
|------------------------------------|------------------|------------------|--|------------------|
| Casting Requirements - Nos. | 100 | 100 | | |
| Casting Cost (Rs) | 5000 | 5000 | | |
| Online Inventory - Qty | 1500 | 800 | | 300 |
| Inventory cost Blocked (Rs) | 7,500,000 | 4,000,000 | | 1,500,000 |

Advantages of Automation –

- a. Excellent repeatability.
- b. Productivity increased by 30%
- c. Dispatch time reduce from 6 days to 2 days.
- d. Manpower can be use in other work.
- e. Working environment is like machine shop, help in reducing less manpower turnover, less or no noise in working area.

Declaration:

I hereby declare that above paper is based on my experience of last 24 years. During that I have visited many foundries in India and abroad. In last 5 years I am involved in development of critical castings like cylinder block / cylinder head and during development I strongly felt that automation in foundry is need of the hour and we have no choice if we want to meet the today's requirements.