Field Report

Group 5

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Places Visited:

1. Potter House (Rupal, Gandhinagar)
2. Scrap shops (Memnagar, Ahmedabad)
Description of Field:

The first field visited was a small pottery business situated in an area Rupal in Gandhinagar district, which was completely run by the whole family with one hired worker for assistance. The different stages involved in the production of earthen pots was carried out in different regions with some consideration of the conditions needed for the process (like all the drying was done under the sun in one localized area, slurry was made in a separate area). Machinery was utilized in several processes like motorized potter's wheel, use of Blunger and usage of motor to rotate pots while application of Ochre. The primary use of the earthen pots was stated to be for water storage and help in keeping it cool.

The second field visited was a scrap market in Memnagar. The shops visited in the visit were of scrap metal, scrap shop, a carpentry business and an ice trade. All the businesses were relatively small and the interactions included the owner, labours and scrap collectors. The individual cases are discussed in the sections described below.

Introduction

The visit was aimed at identifying the major issues the people faced in their respective work and further attempts finding viable solutions that are affordable, familiar and used local resources - these parameters could be compromised if the added benefits outweigh the advantages of those traits.
Field Visit 1: Potter’s house, Rupal

Fig Procedure of pot making
The black and red soil along with water is added to a structure as shown in figure and mixed in order to make slurry.

This process is important as it segregates and maintains a uniform particle size otherwise which the pots might develop cracks while firing. At the same time, it is very hectic and tiring process for the potter. So, in order to save labour and make the process more efficient, following ideas can be incorporated:

- Changing the structure from rectangular to circular:
  By this change, the effort being applied in rotation automatically reduces making the process more efficient.
- Use of mechanical system having rotor (as shown in figure):
This design can be used for the process which will help in making it more efficient and saving labour. A hand lever parallel to ground would be rotated by the potter, which would be connected to a gear box and the fan blades as shown. The blades would be given support from the ground in order to provide more mechanical strength to the structure.

**Problem:**

The needle used for pattern design on the pot is too thin and is difficult to hold and draw with.

**Causes**

- The needle needs to be thin so that too much material doesn’t get removed from the surface
- Regular pens can’t be used on the wet surface of the pot

Pattern must be engraved so it doesn’t get altered or leave noticeable marks. It acts as a pen with invisible ink.

**Problem:**

Geru (ochre) isn’t shiny if it dries quickly, shine is apparently a quality demanded by the users of the product. This prevents the women and men painting pots from working under a fan in summers.

**Causes:**
Red ochre (Fe2O3) achieves its red color from the hematite mineral. The changes in the environment of the ochre solution could change the crystallization process on the pot surface affecting the shine.

Solution:

- Alternate coloring dyes/paints could be utilized for coloring, however this might affect the already limited market for ochre producers. Also, since the potters prefer working with bare hands, chemical substances might not be appropriate whereas guru on the other hand is not harmful for the skin.

- The hematite crystal's properties could be explored in the field conditions (if not already done). This could help us alter the solution, crystal or the working conditions. Moreover, this study could assist in other projects like study of mars.

Problem:

The ochre mixture's temperature reduces significantly causing issues in the winters to the pot decorators while dipping sponge into the mix with bare hands.

Solution:

- Gloves could be use but the potters don’t feel very comfortable with existing gloves so a glove that allows them to work with minimal hindrance, this, however would not be profitable (or possible in practical use) due to the the cost included.

- A roller with sponge may be employed, this would prevent the user from feeling the texture of the ochre mixture.

*Fig: Solution mechanism*
Problem:

Breakage of pots due to larger debris penetration into the slurry or deformation of the blocks during the sun drying process. The pit couldn't be completely covered for effective drying.

Causes:

- Children in family may introduce debris during play
- stray/pet animals or birds may enter the slurry area.
- natural causes like a sand gale or leaves.

Solution

- A wire mesh could be placed on top of the pit or more material efficient alternative could include a mesh border around the boundary of the pit extending inwards.
- Ventilating holes above the slurry in the pit would allow air flow even if the top is completely covered.

Problem:

The cutting of blocks in the slurry pit is tiresome and time consuming, this process is carried out by means of a stick.

Causes:

The slurry needs to be cut into blocks of size that could fit inside the blunger.

Solution:

- A metal grid plead on the slurry in the pit could be used. Cost, corrosion, weight etc may limit the idea's practical application. Also, the change in blunger design would require making of a new grid.
- Roller cutter with a movable structure places on top of the pit should be able to cut blocks easily.

Problem

The usage of wood produces smoke inside the furnace which results in discomfort when the furnace door is first opened. The heated pots are also difficult to handle with hands and the further cooling at room temperature is time consuming.
Problem:
The seating position while beating the pot for shaping is tiresome and induces pain in the arm of the user.

Problem:
It was observed that same axle was being used for different set of wheels on which pots were made. Due to this the wheels were wobbling.

Solution:
Different axle should be present for different set of wheels.
Problem: Furnace

1. Insulation problem
2. Heating inefficiency
3. Temperature measurement is not there.

1. Insulation Problem
   - The insulation material being used in furnaces is glass cotton. It’s basically covers the dome structure of the furnace and the entrance door.
   - The structure is made of red bricks. Bricks have high thermal conductivity. chances of heat loss by radiation is more
   - Not the complete covering of the furnace was done.

2. Heating efficiency
   - Because of improper insulation the heat loss is more
   - The burning time increases because of which there is more use of wood to burn to keep the fire burning. The temperature required to maintain inside the furnace (as said by the potter) is 500 degree Celsius. The heat is loss through improper insulation.
3. Temperature measurement is not there

- There is no proper way to measure the temperature inside the furnace. Temperature plays an important role in shaping the pot. The temperature at which the pots are heated is assumed by prior experience.
- Even the temperature at which the pots are removed from the furnace is unknown to the potters working over there. Leads to injury to hands and even to the eyes.

Solutions

- The covering should be extended to lower parts of the dome. The next level should be placing of the concave mirror like a strip around the circumference of the dome. As the mirror have less thermal conductivity and reflection is high so they will reflect the heat back to the pot and the heating will be uniform and the efficiency of the furnace will increase. The heat loss can be minimized by doing this. Secondly if the material can be changed then we can choose mineral wool in place of glass wool. we can also imply the method of having a double layered wall. Also, to provide uniform heating to the pots the platform can be manually rotated where the pots are basically placed.
- For measuring the temperature, we can place thermo couples (4 units) all around the surface of the furnace. The thermocouples will be connected to the system of microcontroller and temperature amplifier attached to the furnace on outside part of it. The system will notify the porter both at the time when the temperature has reached to required limit and also when the furnace will be safe to open and go inside and handle the baked pots.

The problems mentioned above leads to damage of about 30-40 pots in one batch. If the above-mentioned solutions can be implemented in the process of making pots then the efficiency can be increased. The total number of pots can be increased to 270 -280 in one batch.
Field visit 2: Scrap shops, Memnagar, Ahmedabad

Problem:

The task of scrap collector is physically, emotionally and socially draining, the workers didn’t wish to work in the job but the scope was restricted. They must pull a cycle cart around the locality (~ 20 km) in extreme weather, even with the immense toil their earnings are quite low.

Cause:

The scrap is usually bought by them from houses by going door to door and from construction sites. One visible cause for this is the competition between the scrap collectors. Inconsistency in prices of scrap can be attributed to the highly competitive nature of the business. Sometimes the collectors are forced to cut their profits to ensure a minimal earning to sustain their families. Such a situation arises due to the uncertainty that other scrap collectors might be willing to buy items at lower prices, this makes the collector lower the prices and their profits.

Solutions:

• If all the collectors agree and adhere to rates mutually agreed on, then the profits of the entire community could be increased. But such a collaboration demands time, effort and guidance - all of which are sparse for the collectors.

• If the collaboration is through the medium of a mobile application then the time required for a collaboration would reduce significantly, also other people willing to take part or assist the collectors can engage too. The interface design must be developed specifically for the problem to allow ease in usage, for eg. usage of pictures and local language usage are some primary requirements (further field visits may be needed)

• Assorting the junk into groups and selling them to specific sectors could increase profit, like plastic bottles to plastic vendor, paper to a person dealing exclusively with paper, etc. This is however limited by lack of knowledge about the items in the junk. The app could guide, teach and assist the user in this sorting process. We could scan the base of plastic containers with mobile camera which could identify the resin identification code mentioned on the base and help arrange them on basis of type of PET code. This adds a skill to the work which would help increase the cost of the service. Then the assorted items would yield higher profits.

Problem:

There is rarely much safety regulations followed in the scrap shops while dealing with scrap (like rusted iron and machinery usage).
Causes:

- The workers don't feel comfortable with existing gloves, masks and other safety instruments which are affordable.
- Since the profit margin is slim for the dealer, they try to cut costs by compromising on the safety of workers (For every Rs.2 earned, around Rs.0.8 is the profit earned). The competition amongst the dealers demand further reductions in profit.

Solutions:

- Designing affordable gloves with minimal discomfort by increasing porosity, elasticity while ensuring strength.
- A detailed analysis of the market could help lift the profits.

Problems:

1. The scrap metal shop poses a major threat to life due the the presence of flammable substances in the collected scrap (like oil, gas etc.) and the obvious unawareness about those substances inside the containers. The working conditions and machinery involve heat, flames, electricity, etc. that increases the risk of fire.

2. The machinery involved in the carpentry shop visited did not have functioning safety mechanisms, which were either not available in the machines design or were damaged. For example, the machine used to cut patterns onto wood using a needle like blade did not have any mechanism to stop the machine's arm from popping up in case the blade breaks. Despite the existence of the solution of such issues, they were not in use as the workers were unaware of the solutions and were not included in the machine's design.

3. The weighing platform used to weigh the scrap metal was too big which added to the maintenance cost.

4. The transportation of ice results in water loss causing environmental concerns. The energy that was used in freezing water is lost by conversion of ice to water again.

5. The sawdust in the carpentry shop is thrown away which instead could be used in other sectors for profit and environmental reasons.
Conclusion:

The various problems are identified and attempts have been made to solve the issues with a more detailed approach towards specific issues chosen based on the extent of effect they may have on the whole process of production and trade. Such problems were of inefficient mixing of black and red soil that also demanded heavy physical labour, a mechanical mixing structure run on manual power was designed to reduce this effort and increase equal distribution of soil in the slurry while minimizing the time involved.

Second problem discussed in detail was of furnace that used wood as fuel that posed environmental and efficiency issues. The problem was tackled by improving the insulation in the furnace and therefore minimizing the heat loss - this may help reduce the amount of wood used. Also, mirror was installed on the inside walls of the furnace that act as concave mirrors that help direct the heat to the centre and prevent heat from leaving the furnace.