

Case-V: A simple fulcrum based device to eliminate child labor and increase safety in spray cans dismantling

1. Introduction

The slum dwellers of Gyaspur, who work for the garbage collection contractors of Ahmedabad Municipal Corporation, sell off spray cans collected in garbage to earn extra money. They break off the plastic knobs of spray cans before selling the metal to *kabadiwala*. The process is sometimes done by children using stones and that possibly could cause injuries to them. Also, the gases coming out of the cans could be hazardous. The team visited Pirana village and Gyaspur slum to understand the lifestyle of villagers and slum dwellers staying a few kilometres apart. Design process of a device for breaking spray cans more efficiently and easily is reported here.

Visit to Pirana Village

Interactions:

Sarpanch, Ajay Bhai: He gave general information about the village. The village has Hindu and Muslim communities. Some part of villagers are tribal people. There are around 700 houses with around 2500 population. The village has one primary, one private (trust Gurukul), and one high school. Both, Gujarati and English medium students study in the Gurukul. There are 3 functional Anganwadi. The main profession of the villagers is agriculture. Most of the farmers of the village grow wheat, rice, vegetables, etc. Underground water is the main source of water for village. There is a bore well which pumps out underground water to supply to village through water distribution system. Primary health care sub centre of the village is one medical service point for the villagers.



Figure 24 Interaction at Sarpanch Ajay Bhai's place

Asha workers: We visited one of the Anganwadi of the village. We interacted with 2 workers in the Anganwadi- one of them cooks mid-day meals and another teaches kids. They take care of kids of age 3- 5 years. Strength of Anganwadi was 35-40 but about 25 of them regular. This Anganwadi staff conduct camps for vaccinations of young kids. She also told that they provide training to school dropout girls in sewing, singing, etc.

Kids from the village: We interacted with some kids of the village. Children in the village were enthusiastic when we visited. Earlier they were scared to talk to but after when we started interacting with them they opened up. They told us the different games they play like- *maar dhadi*, *lukka-chhuppi* (hide and seek), *kancha*, etc. Hushana Banu, who studies in 7th class, is very bright and she teaches her younger brothers every day. She liked teaching and wanted to study English. "*Mujhe bade hoke teacher banana hai!!!*" (I want to be a teacher) were Hushana's words.

We asked the kids how we can reuse burnt matchstick. They gave interesting replies like - "*kajal lagane k liye*" (to put kohl/eyeliner), "*A, B, C... padhne k liye*" (to learn A, B, C...), "*mandir banana k liye*" (to make temple/structural show piece).

We then asked them about different uses of a bicycle. Their replies included -for carrying things, using tyre as swing, using the tyre to play, for pulling water from the well using its chain, for exercise in circus (told by an old lady), for sharpening the knife, to give lifts to people.

Kids told even us that they used household materials like mud, thermocol to make their toys like mud mobile, mud house, fish of thermocol, etc. Then the kids took us around the village.



Figure 25 Interaction at Anganwadi

With some women: In the presence of the Sarpanch, they said that there are no issues concerning them. After the Sarpanch left, one of the ladies said, "*pipe k tutane k karan paani ki dikkat hai Hume....Sarpanch the isliye humne kuch nai bola...do din se paani hi nai aaya*". (Water issues due to leakage in pipe, but we didn't say anything earlier because Sarpanch was there)

They informed us that girls in the village study till 10th or 12th and don't go for further education as the girls are not allowed to go far for education; rather they learn *mehendi* (henna), sewing, etc. While we were leaving, two ladies, Zareena and Apsana Banu, said, "*hum din bhar ghar pe khaali baithe rehte hai...agar ho sake toh kuch seekhne ka Mann hai. Humne Rs 900/- diye gram hut main silai seekhne k liye...Lekin do mahine main sirf kuch din hi seekhaya aur koi raseed bhi nai di*". (We sit idle at home, if possible we wish to learn something. We paid Rs. 900/- to Gram Hut for learning sewing/stitching. But they taught for only few days, even did not give bill for the amount we paid.) They also told that they can't go far for learning and want to utilise their time. They said that they get bored in house all day and really want to learn something.

Observations by the Kids:

Gulnaaz: "Unn logo ne bataya ki waha pe ek se aath hi school chalti hai... aage padhne ke liye unn logo ko Ahemdabad aana padta hai. Phir humne waha pe kuch aur to se baat ki aur unhone bataya ki humare yaha ladkiyaan college nai kar paati... waha pe ladkiyon ko sirf mehend , siwon(stiching) yeh sab seekhate hai. Phir unhone bataya ki yaha aganwadi main siwon aur yeh sab kuch nai seekhate ... sirf bolte hai. Phir unhone bataya ki humse bhi bola ki yaha siwon chalega ,humko pata hai ki free of cost hona chahiya phir bhi humse 900/- rupaye liye par jitni unhe umeed thi utna nai seekhaya aur bola ki aapko machine milega par kuch bhi nai diya. Unn logo ne sarpanch se bola par unhone bhi kuch nai kiya." Gulnaaz didn't like the fact that even after taking money from these women, they didn't teach her.

Professor Gupta said," Bahut gambhir samasya hai. Desh main kai jagah corruption aur log apne aude ka galat fayda bhi uthate hai. kya karna chahiye iske liye?"

Affan: recommended that people can buy small machines.

Anamika: In Juhapura they met a girl, who lived in colony of beggars. She told that the girl couldn't afford a machine but she knew stitching by hand so may she can teach them. But the problem was their location is quiet far so it would be difficult.

Alka: We can get those ladies in touch with some NGOs who can teach them. She said that she would try to contact some NGOs and map them to these ladies.

Gulnaaz: People faced water problem too as the pipe breaks often.

Mamta: She told that she noticed two young girls washing clothes. She even told that there was a girl, Hushana, who wanted to be a teacher and even taught some kids in her colony.

Professor Gupta pointed out that though lot of people went to a place together but their observations were different. He even encouraged Mamta to teach younger kids at her place just like Hushana.

Mamta told us that she likes music and even sang a song for us. She has a very melodious voice!!!

Visit to Gyaspur Slum

The community comprises of AMC garbage trucks drivers, who work for the AMC contractor for handling garbage. They live there with their families.

Interactions

Men in the community: They told us that they work as driver of AMC garbage trucks. They bring garbage in the trucks from different parts of Ahmedabad and dump it in Pirana dumping yard. They work for the contractor of AMC, who maintains the AMC trucks.

Mann asked," *aapki pagaar kitni hai?*" (What is your wage?)

They replied that they get Rs 100/- per day as labourer and Rs 140/- per day as driver for working about 9-10 hours in a day. They have come from Jabua, Madhya Pradesh. They are living here since 7-8 years and the land belongs to municipality. They get electricity from the connections in a nearby garage and pay for it. Their kids attend school in Jabua. They told us that water available from bore well is so salty that they can't use it for drinking so they buy water tank for Rs 500

every few days. They keep the water in plastic tanks and cover it with wooden planks. They have small medical centre (private) nearby for health issues. They earn extra by segregating the waste materials and selling the plastic and metal to tin contractor.

Women in the community: When we asked some women about what they use during menstruation, they told us that all of them use cotton cloth and reuse it after washing. *"Humare paas kuch aur istemaal karne k liye paise kaha hai!!"* (We dont have money to use something else!) said one of the ladies.

They told us that there were no toilets so go to bushes nearby and even though they face difficulties at night due to darkness but still can't help it. For cooking, they use chulhas but since they are accustomed to the smoke, they don't face any problems. They told us that Aganwadi workers from Narol and Batua village take care of their injections and medicines during pregnancy and vaccinations of kids. They mostly use the furniture donated to them by the people of society from where they collected garbage. When we asked them if they availed any government schemes provided for them, they said, *"hume koi jankari nai hai iske bare main."*

We saw one lady, Shakuntala, hitting used deodorant bottles with a stone and removing its cap. When we asked her what she was doing, she replied that she collects used spray cans from the dumping yard and after breaking the caps sells the metal body to tin contractor.

Rinku asked, *"aapko chhot nai lagti patthar se?"* (Don't you get hurt by the stone?) The lady just smiled in response.

Observations by the Kids:

Mann: *"Hum Pirana gye the...wahape jo log subah aapka kachra uthane aate hai woh log rehte the."*

When the AMC drivers went to dumping yard to dump the garbage, they experienced some breathing problems. But municipality didn't provide them with any mask. Their kids went to school back home and during vacation came back and helped their mothers. *"woh log spray ki bottle jo kacchre main aati thi...uske dhakkan nikal nikal k bechte the. Unke paas pair main pehne k liye jute bhi nai the."* They had to construct their homes by themselves and the municipality didn't help them in it. *"unke yaha jo paani aata tha woh bahut hi salty tha... woh use pi nai sakte the. Isliye unhe roz ek tanker mangwana padta tha jiska costing 500/- Rs hota tha...jo sab log milke mangwate the."* Their income was not much, they got Rs 100/day only.

After hearing this, words of Professor Anil Gupta were, *"isse yeh baat zahir ho rahi hai ki takleef main aur kitne kam sadhno se bahut saare logo ko jeena padta hai apne desh main. Aur jab aap logo k paas zimadari aayegi... apke paas adhikar hoge... aapke paas nirnay lene k kishamat hogi....tab aapko yeh baat dhyan rakhni hai ki logo ki takleef ko kaise kam kiya jaye. Ek is workshop ka udeshya yahi hai ki thodi 'samvedna' paida ho. 'samvedna' ka arth kaun batayega?"* RinkuRajpal: *"samvedna do shabdo se bana hai...'sam' aur 'vedna' matlab kisi aur ki pida hum mehsoos karein aur hume aihsaas ho uthna hi jitna usko hota hai"*.

Thus, Professor Anil Gupta said, *"Humari samvedna badegi toh kuch takleefin kam hogi."*

Problems and Ideas from Children Workshop

Pirana village

Main problems observed:

- Cleanliness problem
- Drainage problem
- Education problem
- Leakage problem

Solutions for cleanliness problem:

Two phase solution: Provide dustbins to collect waste from houses and separate the garbage into 3 categories at mass collection sites: (a) Bio degradable, (b) Plastic and (c) Wet

Solutions for drainage problem:

By covering the pipes which are open and digging of pits connecting to drainage pipes.

Solution for education problem:

Collaborating with learning camps offered by NGOs and connecting people who have skills but no equipment.

Solution for leakage problem:

Pipes joints should be closed.

Akhil Soni, a summer school participant, gave the overview of the problems identified by the team at Pirana Village. He listed the following problems- no dustbins in the village so lack of cleanliness, lack of drainage facility thus leading to clogging of drains, and the local school has classes only till 10th grade are some problems identified. Children have to travel to Ahmedabad to study further. Girls are not allowed to go to school. Girls are supposed to be taught sewing and mehndi art at local Anganwadi for free. However, they are charged fees for the training and taught only for two-three days. There was leakage in a water pipeline which made the area dirty.

Priya Singh, a summer school participant, mentioned that since there are no dustbins so a kid, Dashrath had come up with a solution for the same. .

Dashrath, said that there should be a truck with a crane that can visit the area and collect garbage from these dustbins to maintain cleanliness.

Another child Mamta, also suggested that the garbage should be separated into bio-degradable garbage and plastic; the bio-degradable garbage can be recycled and any money earned from the recycled waste can be used for betterment of the community. They also suggested that plastic waste can also be sold to help solve the area's problems.

Gulnaz suggested that since proper sewing and mehndi training is not provided at the Anganwadi, there can be a camp by experts to train a few women. *"Agar kuch aurtein seekh jayengi, toh woh gaon main kisi ko bhi seekha degi."* These women can then train other girls and women in the community.

The children felt issue regarding lack of educational facility needs to be taken up with appropriate authorities of the area.

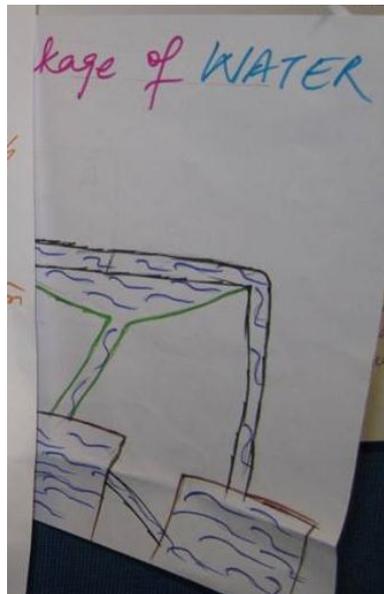


Figure 26 Solution frequent leakage of water pipeline

Mamta thought of a solution to tackle frequent breaking of water pipelines. She suggested that to avoid the waste of water and consequent dirt due to the wastage, the water from broken pipelines should be collected in an underground tank. According to Mamta, stored water can then be transported to the original tank after pipeline is repaired and thereby reused (Figure 26).

The group also suggested that children of the community can paint various walls in the area in their spare time to make the place look clean and tidy and increase its aesthetic value, which would motivate the villagers to keep the place clean.

Gyaspur slum

Some major problems observed by the children and the participants were- lack of awareness in education and government facilities, open defecation, problem involved in spray can breaking, poor quality of drinking water and lack of electric supply.

Mann suggested that all the people living in this area should collectively build toilets or seek the concerned authorities help for this. He had an innovative solution to help the people living in *kutch* homes. He thought of a foldable home. The advantage of this home is its mobility for the migrant community. (Figure 27)

Rinku on the other hand suggested use of *Shulabh* toilets to solve problem of open defecation.

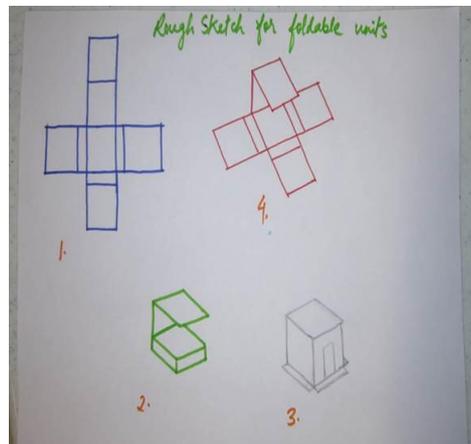


Figure 27 Foldable Home

Sailesh and *Swapnil* thought of making a filter since water available in this area is either salty or contains impurities. They have thought of a filter with different levels using coal and stones for purification. (Figure 28)

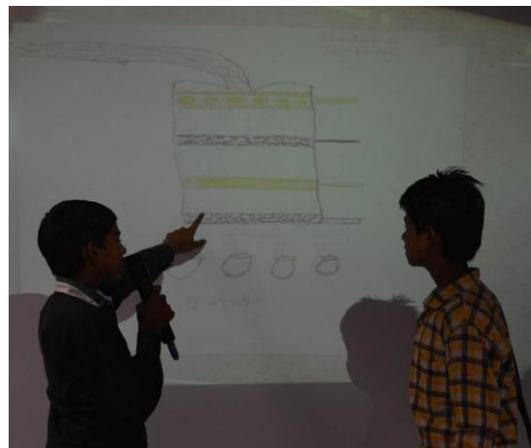


Figure 28 Filter for Water Purification

The team members empathized with the difficulties of a woman who was removing metal caps from spray bottles. The women's hand may get injured and they are also exposed to the gases coming out from it. They thought of making a lever that can be used to remove such caps and thereby reduce drudgery. (Figure 29)

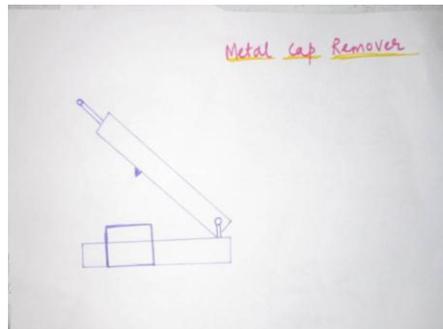


Figure 29 Spray Can Cap Remover Design

The children workshop ended at the stage of putting their ideas on paper with the help of summer school participants and discussing them in front of everybody. After wards summer school participants followed the design process to identify that particular problem and solution to solve it.

2. Brainstorming

Prof Shashank Mehta guided in problem mapping to narrow down one problem using brainstorming. A relationship map of various entity, systems and group is prepared to understand the eco-system around the place and people staying Gyaspur Slum. The issues are categorized in three broad categories namely, (i) fun & entertainment, (ii) product related problems and (iii) service related problems (Figure 30).



Figure 30 Problem Mapping using Brainstorming

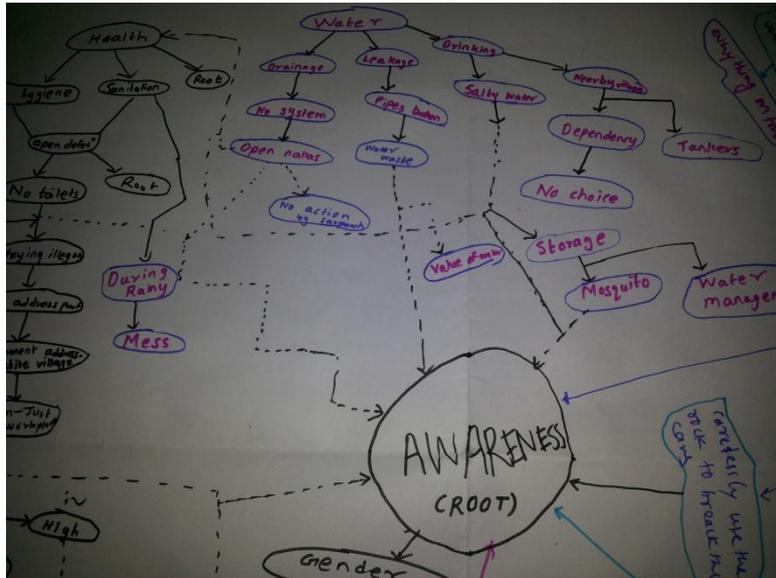


Figure 31 Map of the system

As the system was mapped, it is found that service related issues have one common root which is the awareness issue as shown in Figure 31.

3. Problem Definition

It is said, "A problem is half solved when it is defined properly". After seeing institutional and service related problem, the participants decided to work on making the process of removing plastic knobs from spray cans more efficient and injury free.

These people, working in garbage collection, segregation and dumping yards, are poor. Selling metal collected from spray cans e.g. Deodorant, etc is additional income source for the people staying in Gyaspur Slum.

They follow the following process/routine for earning those extra 700-800 Rupees a month:

Process:

(a) Garbage Collection

- They go door to door to collect garbage.
- In the process of door-to-door garbage collection, they segregate cans, bottles, plastic, metal, etc. which could be sold to *Kabadi*.
- AMC gives garbage collection trucks to the contractors, who hire these people on monthly wages.
- The contractors are responsible for the maintenance of the trucks, not the drivers.

(b) Segregation

- Very tough to segregate the cans from the heaps.
- Maintain a separate bag in which they collect the cans, etc.
- Trouble in carrying two separate bags.
- Chances of infection if the waste contains medical wastes.



Figure 32 A Kid breaking cans in Gyaspur Slum

(c) Breaking

- At the end of the day, they bring all the cans to their dwelling place.
- The next day, children and women break the cans using stones (Figure 32).
- In this process they might get hand injury, health issues due to spray gases.

(d) Selling/Earnings

- When they gather and break enough of the cans so that they can collect around INR 500 – 600, they go and sell the metal collected after removing plastic knobs to the local *kabadiwala* in nearby market.
- They meet their day to day demands using these funds only as their salary is as low as INR 4000 to the drivers and INR 3000 as labourers
- The man works as the driver, the women and child as labourer. So, some families gather a total of INR 10000 per month
- They just stay here for work.

Problem of Breaking Cans:

Breaking the plastic knobs off the cans is chosen after discussing with the local people and it is also most dangerous part of the process due to chances of getting injured by stones and possible health hazards due to the gases.

Issues focused in this problem are as following:

Possibility of hand injury.

Child labour.

Possible health issues due to spray gases.

Feedback

Prof PVM Rao: Look at the useful parts of cans and what *kabadiwala* wants? Review Recycling process of the cans and metal from them.

Prof PVM Rao told the team to look at the useful parts of cans. What is useful for kabadiwala. He told us to review the recycling process of the cans. We should consider only that part. He suggested us to look at many things. We have to consider many things when we are trying to design a real product from a prototype like cost, user's opinion, easy to use.

Prof Anil Gupta and Prof MP Ranjan told us that we should design such a product that reduces the child labour as child labour is mostly involved in this process and not in any case promote it.

Prof Sanjay Sarma told us to look at Glove Box and Bolt Cutter. The Glove Box and Bolt Cutter are very expensive and they are not capable to afford it. Cost are the main factor which we have to keep in mind.

4. Design Process

Keeping in mind inputs from our mentors and professors during the problem identifying stage, a box type structure and a hammer or a fulcrum to break cans was discussed, which is one of the idea came out of children workshop as well. Hammer or Fulcrum to do the job of stone in current process and box to trap the gases coming out to reduce health issues.

Three variants of the design are as following:

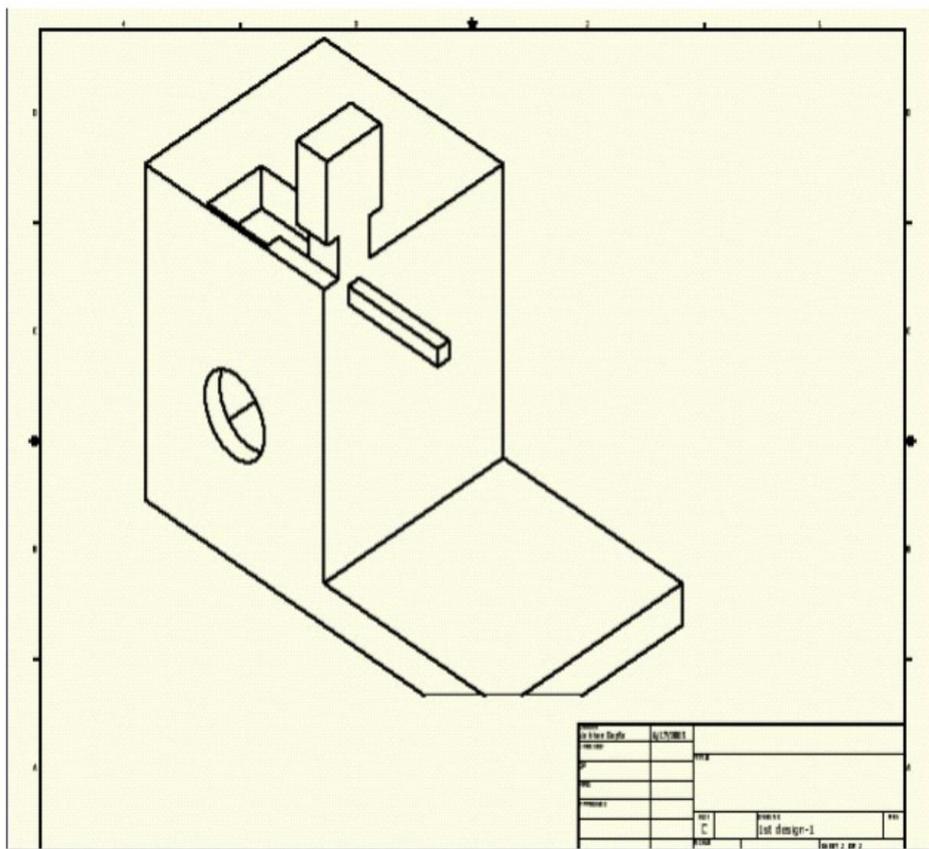


Figure 33 Design 1 for spray can breaking

As shown in figure the prototype will work on the force generated at the pivot attaching the handle and hammer. A deodorant can will be inserted in the circular cavity to provide a support and control the movement of deodorant when it is hit by the hammer as the handle is moved.

5. Feedback

Prof M P Rajan- He said that design will require more force to break the can.

Mentor's - They found the design less practical.

Prof Katherine Bisset Johnson- She said this design is only theoretical feasible.

Fabricator- He found the design difficult to be made.

Design 2

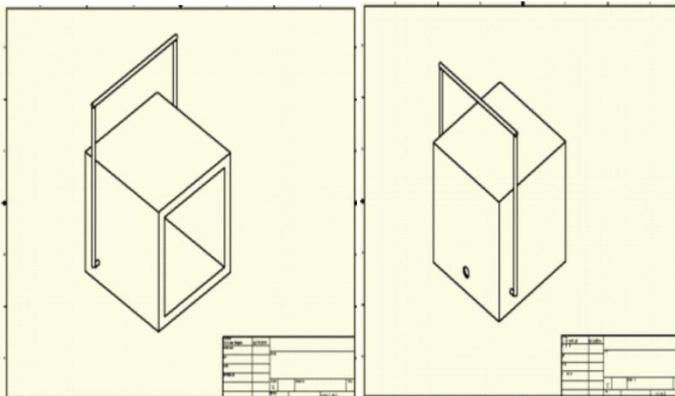


Figure 34 Design 2 for spray can breaking

In this idea we thought a box type structure with attached a knobs cutter. This cutter hold the knob of cans and then cut this knob. This idea was based on Prof. Katherine's feedback.

After interaction with fabricator he found these design to be less feasible for it to made by him.

Innovator's and Mentor's told us these design will require more force.

Design 3

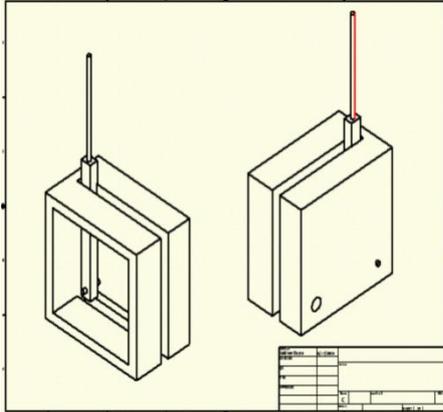


Figure 35 Design 3 for spray can breaking

In this idea, the fulcrum like thing will be used to hammer the can. The box is used to contain the gases. There is a sharp tool attached to the hammer which will be used for the hammering purpose. There is a cavity provided where the spray can fits in. Also the fulcrum action increases the force acting on the top part of the can.

Prof Shashank Mehta suggested that a round arm action will be more efficient and provide more force than the action we thought of.

Innovators suggested us that we should use galvanized pipe for the base of the hammer.