Project under EPICS I2P Air Purifier for an Old Age Home

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Abstract: The project is meant for an old age home as we worked under EPICS (Engineering Projects in Community Services) during our mini project by following EPICS design process. We identified community partner's need and accordingly we came up with "I2P Air Purifier". This air purifier is capable of monitoring and cleaning the air present in a room automatically, when the set limit exceeds as per doctor's prescription. I2P air purifier consists of two parts, one is monitoring part which displays temperature, humidity, LPG leakage, carbon content and other gases present in the air and gives indication whenever required about exceeded levels and other part is filter which consists of several layers through which air passes and gets purified. The device is portable and can be used anywhere.

Keywords: Community partner, EPICS, EPICS design process, Monitoring device, Filter.

I. INTRODUCTION

The paper talks about our learnings throughout the project work and how the projects in EPICS are better than other engineering student projects and we experienced few things which were very new to us. [1] *Edward J. Coyle*, mentioned that the projects under EPICS will help students to make their technical background strong and also it will help students in gaining the skills which is very important for their upcoming life. [2] *Tamecia R. Jones*, stated that under EPICS students don't do the projects they actually learn the project, and hence we learned about each and every part used in the project. [3] *Dr. William C. Oakes*, in his paper told that the EPICS should be a part of the curriculum and we did this project as our mini project which justifies Oakes sir's statement. Our community partner is "Happy Old Age Home" which is taken care by Mr. Srinivas. Previously it was his nursing home, which he converted into an old age home to provide shelter to aged people. From past three and a half years he is working on this old age home. All expenditures that he spends in the old age home is nothing but his earnings from his nursing homes.

II. METHOD USED

The major task was team formation which helped us in every perspective as we all are from electronics background. The method opted by us is EPICS design process.

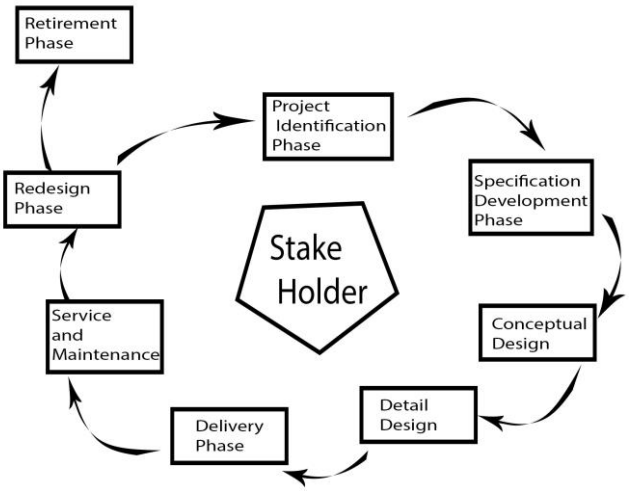

Fig.1. EPICS Design Process

Project Identification: This was our first task. During this task we met our community partner i.e., Old Age Home and he replied very interestingly to all our questions which showed his interest towards us and at that time he really wants someone who can help his old age home, he found us right and hence we started working with him.

The problems told by him and observed by us are as follows:

- Steam or bath on the bed itself without allowing anything to get wet.
- Water heating problem.
- Old age home should have its own source to run it.
- Water filter setup.
- Electricity & water bills at commercial rates.
- Controlling air pollution in a room.
- Water filter setup problem.
- Lifting heavy people.
- Food trolley.

The problem selection itself was a great task because we have to take care of old age home, along with that we should not do our project outside the field of electronics.
Hence, we thought of taking up the problem of air pollution which is related to our field (monitoring part) and plus point with this was that it can utilised by everyone in a cheaper price.

Specific Development: After selecting the problem we went again to the community partner for his requirements in the product. After taking inputs we did product survey of existing solutions so that we can come up with something new which will be cost effective because water purifiers are in use but not air purifiers just because of their higher prices.
Conceptual Design: In this phase every one of us came up with at least one idea and after considering all ideas we came up with the picture of our overall flow and we came up with our first prototype.

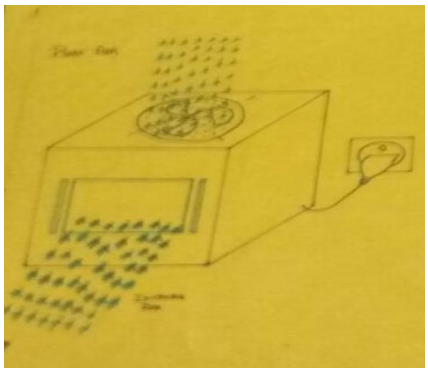

Fig.2. Prototype

Detailed Design: In this phase we dig deeper towards our project which nothing but implementation of our ideas with the help of our conceptual flow. From this stage we came to know what are the components which we are going to use and they are going to work by reading their datasheets.
[4] *Yinping Zhang*, in his batch study proved that among all filtering techniques he reviewed HEPA, UV and PCO based filter and found that these technologies can be used for removing a kind of indoor impurity. In the filter also each layer is used for removing a particular kind of impurity.
And our filter is made of different layers which justifies the Yinping Zhang's statement. We divided whole project in two parts

A. Monitoring part: It consists of sensors which are being used for taking inputs, LCD display for displaying the results along with the indications through LEDs and buzzer, UV lamps and DC fans are used for cleaning purposes. Arduino is used for connecting all the devices with each other. So that when limit exceeds UV lamps and DC fans can run parallelly.

B. Filtering part: This part consists of several layers as shown in Fig 3, where each layer has its own speciality.

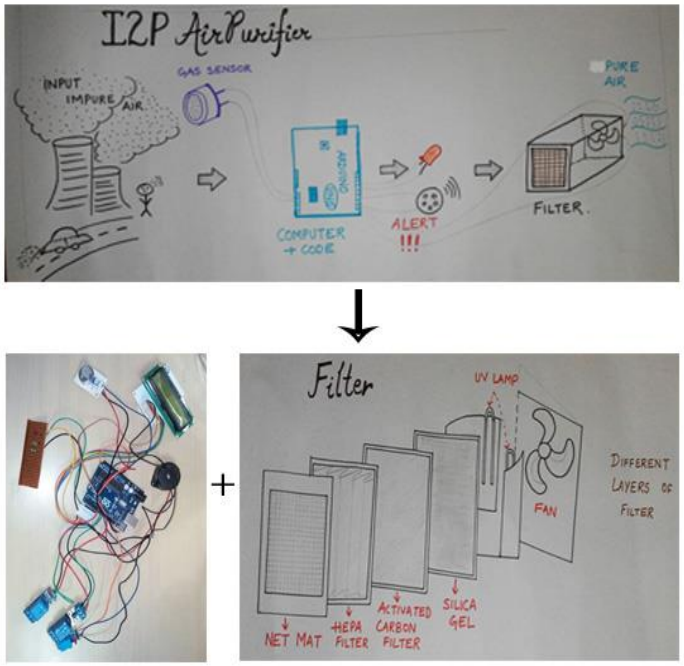

Fig. 3. Conversion of Conceptual Design to Detailed design

[4] *Ajay N Bhagwat*, stated that HEPA filter can provide efficiency up to 99.97% in cleaning minute particles and bacteria present in the atmosphere and this the first layer in our filter.
[5] *Subramanian Sundarrajan* mentioned in his research paper HEPA filter and activated carbon filter are sufficient to remove dust particles from the air and activated carbon is the last layer in our filter.

Delivery Phase: In delivery phase we met with our community partner and have taken review regarding the project at that time he suggested us to add one more thing in the filtering part which is fragrance because whenever someone is changing diapers of old people a bad smell used to come.

Fig.4. Delivered product

Service and Maintenance: The service and maintenance should be in such a way that the product should work for longer period. Coming to filter we have to change each layer after certain period, approximately once in a year we have to change. But this replacement will not cost much.

Retirement phase: Till now we did not get any complain from our partner side. Since, it works only when the limit exceeds so our community partner is even not bothered about increase in electricity bill due to I2P Air Purifier.

III. RESULTS

The project was tested by our community partner and was satisfied from our work.

The following are our learnings from each step of the process.

- Product identification taught us selecting the appropriate thing and hence we came up with this problem statement.
  "Happy old age home needs to live in **fresh atmosphere or protection from air pollution** as there is breathing problem in a room due to an excess of **carbon dioxide in the atmosphere and harmful gases due to fuel consumption."**

- Specific Development taught us how to deal with different kind of persons and it helped us in increasing our communication skills.

- Detailed design increased our technical knowledge it removed the layer between theory and practical. It was the great experience when implemented everything.

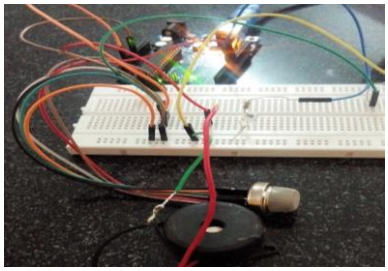

Fig.5.Implentation

- The learnings from delivery phase is, how we can convert our project in product how to bridge that gap.

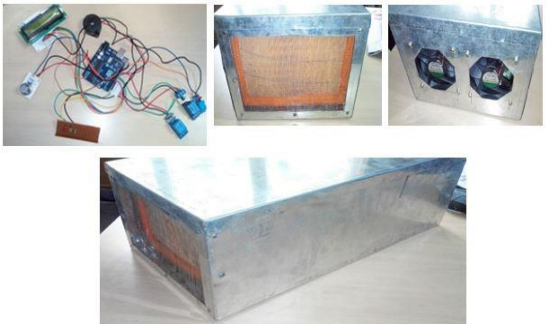

Fig.6. Project

Fig.7. Product

IV.CONCLUSION

Project is successfully delivered to community partner.

At last we can conclude that the device which we made consists of two parts

- Monitoring Device
- Purifying filter

The experience which we got from the project is that how practically we solve the problem with the help of theoretical knowledge and while working as a team we got different ideas or perspective to solve a particular problem and we came to best solution for our community partner. This gave us the confidence to guide ourselves to do real-time projects.

DISCUSSION

While making our Project, we got general idea of how we think and how we innovate our ideas to solve the problem and to achieve the goal of our community partner. After successfully delivering the project to the community partner (Happy Old-age Home), we have observed that our project is done in a unique way and there is no product like this in the market at this price. Based on the product survey eKjUt team has reduced the cost of the project without compromising the quality of the components.

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