

Proposal for FAB LAB at Pabal

Title : Developing various small rural technology project using FAB LAB

Background :

Vigyan Ashram (www.vigyanashram.com) is working in the area of rural technology from last 23 years. It has developed various rural technologies viz. Pabal geodesic dome (Low cost housing), Earth Resistivity Meter (for ground water prospecting), Mech Bull tractor (Low cost farm equipment), onion storage, poultry cages, various food products, Biogas from non-edible oil cake etc. Many enterprises are started based on these technologies. The technologies developed are special because many of these ideas came from school dropouts trainees at Vigyan Ashram.

Vigyan Ashram gives training to school dropouts in various technologies. It trains them by “Learning While Doing” method of learning. Students participate in real life work. Almost everything in the ashram campus is made by the students as a part of their projects. The projects include constructing classroom, school benches, toilets, agriculture, electrical fitting, computer assembly etc.

Center for Bits and Atoms of Massachusetts Institute Of Technology (MIT) (<http://cba.mit.edu/>) conducts the class of “How to make almost anything” at MIT, USA. Director of CBA, MIT Dr.Neil Greshenfield and Director of VA Dr.Kalbag share many similar ideas and philosophy and soon the idea of FAB LAB was born.

FAB LAB is a collection of modern tools using which you can make almost anything. MIT setup six labs around the world. One of the lab is in Pabal , others are in S.Africa, Ghana, Costa Rica, Norway and US. Under the agreement with MIT, it will supply machines for the lab. But Vigyan Ashram have to make provision for its operations, maintenance etc.

Vigyan Ashram wants to work on various ideas and projects that will be beneficial to the people and new enterprises can be started by these projects. We are looking for support to finance these ideas and the development work.

Objective :

We believe least developed nation will need most advanced technology. Idea of the lab is “Instead of giving solutions, create environment so that people can find out their own solutions”.

1. To challenge creativity of the rural students (especially DBRT) by giving them various projects.
2. To develop and standardized few projects in technologies so that they can become new enterprises
3. To develop capacity in Vigyan Ashram to undertake microcontroller based projects.

4. Need for the proposal :

VA is working on developing various ideas. To carry forward the projects in the lab, we need support. Initially we thought support may come from Govt of India Dept of Science & Technology. But in spite of last 2 years follow up at various levels there is not much response from Govt.

VA is urgently needs to appoint Engineers, who can liaison with MIT for various projects especially in the area of microcontrollers. In order to attract good talent to work in village like Pabal, it is necessary to pay a reasonable salary.

Projects :

This is the list of ideas on which we want to work on. FAB LAB project provides us enough opportunities to explore into these projects. Depending on the success we get, while working on the ideas, few projects can definitely take the shape of the products. As it is our regular system such products can start new enterprises for our students and others.

- 1) Milk Sensor : A simple instrument to test good milk and spoiled milk. The idea is to develop a low cost instrument which can be used by local milk collection center. Spoiled milk will be identified at collection point and its mixing with the good milk will be prevented. It is said that 2% of the total milk

collected gets rejected in the milk processing plant. 2% in the value term is very huge amount considering size of the country.

MIT has developed a step response electronic circuit based on our request. We got the program and circuit at Pabal. We need to calibrate the circuit and validate it. It also needs to be presented in product form.

2) **A Data logger, 8 channel.** Where a 'chip' is removable and data can be transferred to a PC and processed. We collect various data such as rainfall, humidity, max-min temperature etc. We also want to be able to collect data such as the water level in wells. If we have one person going around different locations and collecting these 'chips' where the data is stored for previous 24 hours, we can collect this in a central place and process.

3) **Electronic fuse.** Many of our people have the habit of putting a bigger size fuse wire if it blows repeatedly. Also it takes a long time for replacing. An electronic 3-phase fuse would be useful to farmers for water pumps.

4) **A Power-off meter.** Our power supply goes off frequently. For our control purposes it will be useful to have a record of when the power was off- the total time during an interval. We also want to record the voltage fluctuations. We want to measure quality of electricity we are getting.

5) **Electronic fence.** We wanted to protect our farm from stray grazing animals. Fencing is very expensive. So we used a timer circuit, and connected an ignition coil. This gave a short pulse of high voltage for a fraction of a second, and repeated at desired frequency. This worked fine on dogs and sheep. We did not test on cows. The animals learnt within 2-3 contacts and then do not go near the wire fence. But the people who own the animals come and damage this so that their animals can graze, in this area. That is what we want to prevent.

We can have wireless fence, where we will get an alarm if any object of particular height crosses the signal between the transmitter and receiver.

6) **Water table alarm for wells.** Farmers have wells where the water table goes down below 9 meters and then the pumps don't pump out water. So they lower the pumps on a hanging platform. When the rains come, the table rises, and some times it floods the motor and they have to rewind the motor. This happens every year. Some alarm to indicate a rising level would be useful.

7) **Diesel Engine tuning device :** Many diesel engines are not working properly because they are set by intuition only. The power stroke of a diesel engine produces acceleration in the rotation of the flywheel. This energy is then used for the compression and exhaust strokes. Theoretically measuring the acceleration of the flywheel and the slowing down in the compression and exhaust stroke could diagnose almost all the ills of the engine, besides measuring power output etc. Normal engines have a RPM of 1500 to 1800. If we attach a fluorescent colour marker on the flywheel and sense it with an electronic device, this could be analyzed time taken per revolution and detect all the health status of all the engine functions.

8) **Battery remolding :** Due to frequent shortage lead acid batteries are in demand. Battery remolding and fabrication become a good business. There is at present no standardization or course on the subject. We want to take this opportunity to develop our capacity in ashram to do battery remolding. This will give rise to creating new enterprises in battery repair.

Setup :

MIT has provided following equipment's to VA with the support from National Innovation Foundation, USA. The equipment's are of the value of @ US \$ 25000.

- 1) Laser cutting Machine
- 2) Roland Milling Machine, 3 D scanner
- 3) Vinyl cutting machine
- 4) Scroll saw
- 5) Computers (Knnopixx Operating System)
- 6) LCD projector , Printer, Digital Camera

7) Electronic table (Oscilloscope, Soldering equipment etc.)
MIT also provided drawing tools and drivers written in open source software.

3. Duration : 2 Years

Methodology

1. Vigyan ashram wants to immediately appoint electronic engineers in the lab.
2. They will solely be responsible for working on the project list.
3. Depending on the capabilities of engineers, we will decide the priorities of the work.
4. We will use our link with professors from MIT and IIT to check the state of art of our work.
5. Atleast few prototypes of ideas will be made in first 6 months.
6. The ideas which look promising during the project and trials will be shortlisted and attention will be given to convert them into standard circuits and products.

Outcome :

1. With the help of appointed electronics engineers, Vigyan Ashram will venture into area's of microcontroller. As an organization we will acquire the skills in this area. Which will be useful for our future development. In the past Vigyan Ashram acquired skills in the areas of mechanical engineers, computers, WLL, web development etc. Now even the person leaves the organization, VA retained the skills. We hope to repeat it again.
2. Few ideas will take shape of products. I am optimistic about milk sensor and wireless fence which has tremendous potential.
3. We will have good documentation, which can be hosted on website for the idea's which do not work and cannot be made progress. May be with someone else help, we will be able to take it up.

Budget

We have the machinery and basic infrastructure, main support required is of the salary of the new recruits.

Sr.No	Details		Total
1	Mechanical Engineer	Rs.6000pm	72000
2	Electronics Msc/Engg	Rs.6000pm	72000
3	Diploma Holder	Rs.3500 pm	42000
4	Consumables *		50000
5	Miscellaneous		25000
	Total		261000

- Above budget is for one year. We may need support for one more year depending upon the achievements in the first year.
- Most of the material is available in the fab lab supplies. Hence cost is limited to Rs.50000/-.
- Miscellaneous covers travel expenses, communication expenses etc.
- Appointment of person will be done phasewise, mainly based on the availability of good candidate.
- A reasonable budget for salary is considered mainly to attract and retain good engineers to work in village like pabal.

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