6.5.2 The institution reviews its teaching learning process, structures & methodologies of operations and learning outcomes at periodic intervals through IQAC set up as per norms and recorded the incremental improvement in various activities

Case Study-I

Developing Higher and Advanced Learning Skills

Developing Higher and Advanced Learning Skills

Initiatives:

- Aptitude Training
- Industry Expert sessions
- Software related Training
- Mock Video Interviews & Recording
- Campus Drive Specific Trainings
- Mock Interviews by Experts
- Entrepreneurship Development Programmes

Outcomes:

- **Placements:**

Academic Year	Total Number of Offers	Highest Package (INR)
2021-22	573	10 LPA

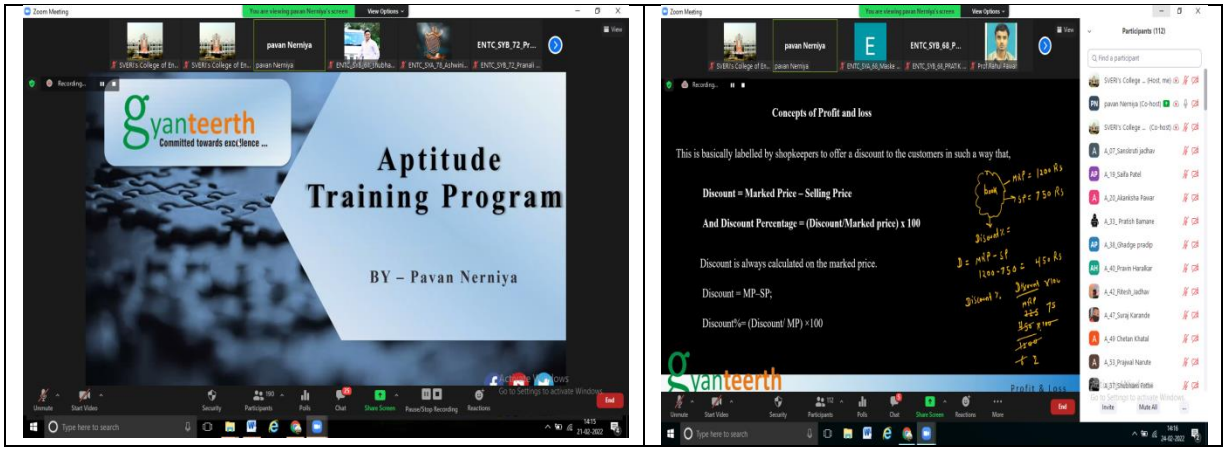
  - 68 Offers by TCS (3.6 LPA)
  - 108 Offers by WIPRO (3.5 LPA)
  - 49 Offers by Capgemini (4.25 to 7.5 LPA)
  - 82 Offers by Infosys (3.36 LPA)
  - 15 Offers by Zensar (04 LPA)
  - 11 Offers by Hexaware (3.5 LPA)
  - 7 Offers by Byju (10 LPA)
  - **573*** Offers till today

- **GATE Qualifiers:-07**
- **Higher Studies :- 11**

Developing Higher and Advanced Learning Skills

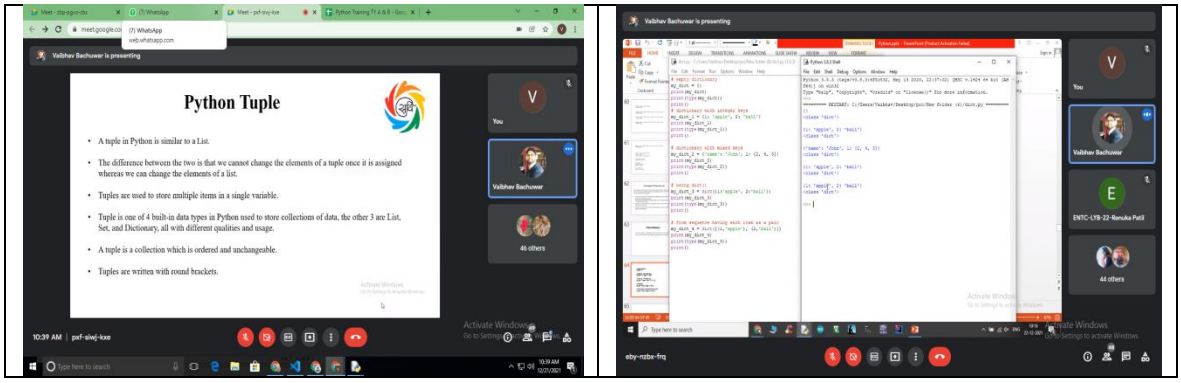
Initiatives

- **Aptitude Training**



- **Industry Expert sessions :-**
  Expert Session on "5G for Advance Communication Systems" by Dr. Sandip Dhanave

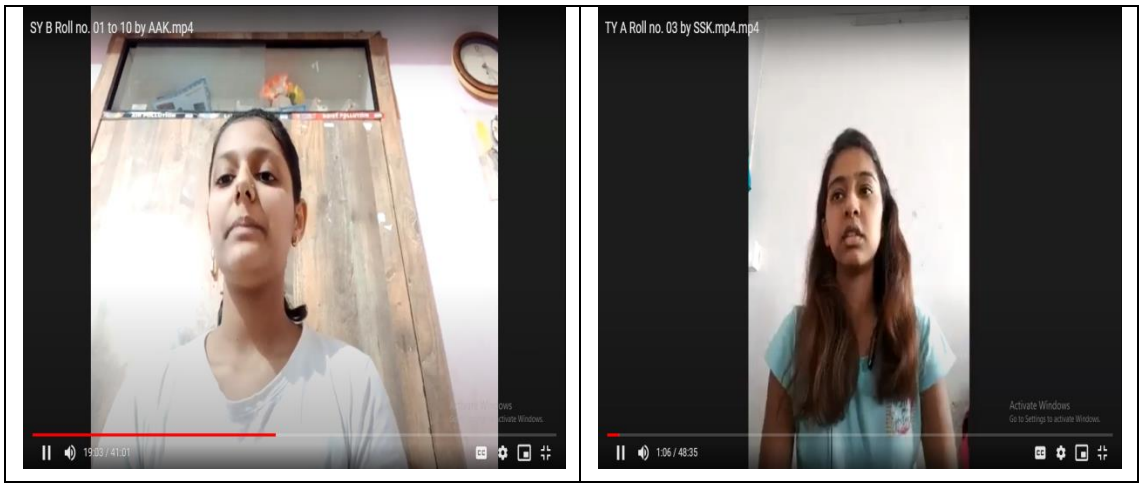
- **Software related Training:-** Python Programming Training by ADJ Infotech



Developing Higher and Advanced Learning Skills

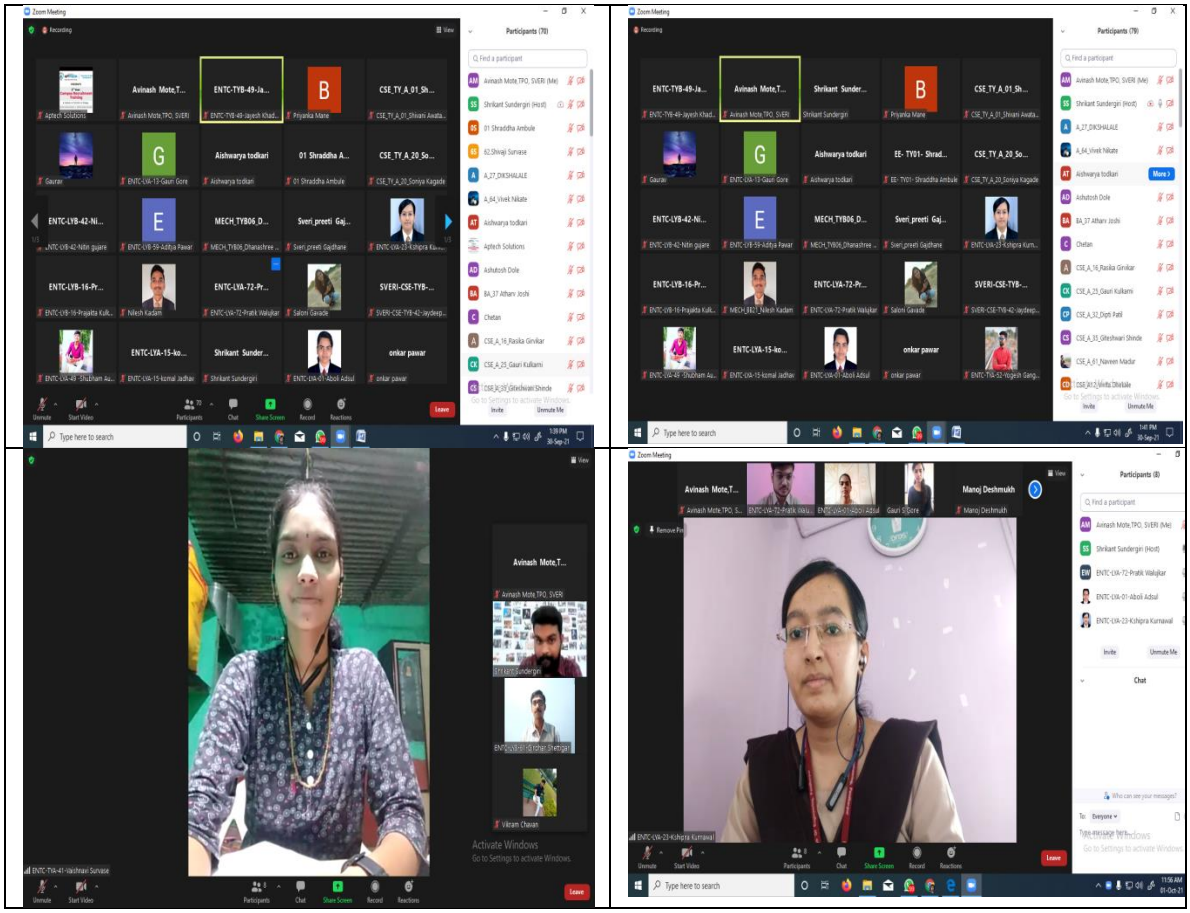
- **Mock Video Interviews & Recording :-**

  Mock Interviews of SY & TY Students conducted by Internal Faculties:-



- **Campus Drive Specific Trainings**

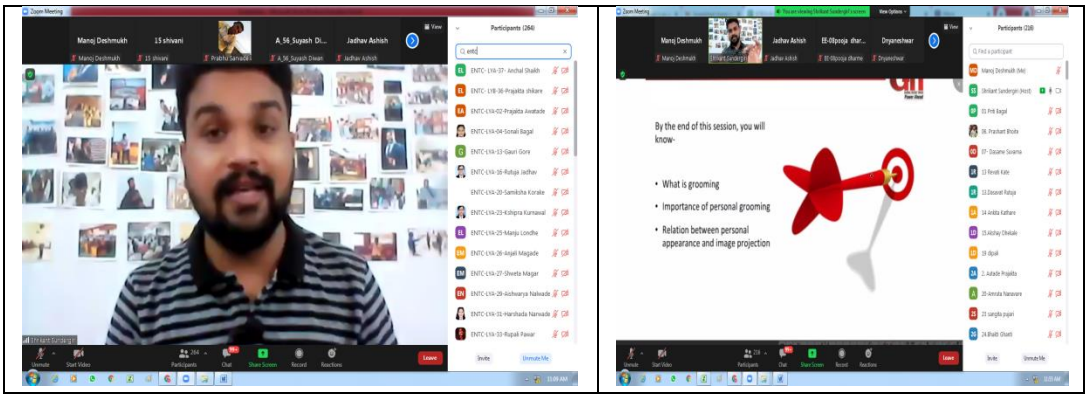
  TCS Specific Training & Mock Interviews:-



Developing Higher and Advanced Learning Skills

- **Mock Interviews by Experts**

  Mock Interviews conducted by Industry Expert- Mr. Shrikant Sundargiri:-



- **Entrepreneurship Development Programmes**

  Introduction to SVERI's Sobus CoE and Orientation for Nascent by Dr. Nitin Kulkarni

Case Study-II

Promotion of Research Culture amongst the Students

SVERI's College of Engineering, Pandharpur

Mechanical Engineering Department

NAAC-IQAC Contributions "Inculcation of Research Culture amongst the Students"

Academic Year	Number of students presented Papers in National / International Conferences	Number of students participated in National / International Conferences	Number of students participated in Project Exhibition	Achievement/ Award	Model/Products Developed
2021-2022	29	113	09	04	06

(Dr. S. S. Wangikar)
Head, Mech. Engg. Dept.
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C.O.E. Pandharpur

Conference Publications

A.Y. 2021-22

Conference Publications				
Sr. No.	**Title of Paper**	**Name of Authors**	**Name of Conference**	**National / International**
1.	Fabrication of Micro-channels using CO_2 LASER Machining & Soft Lithography for Lab-on-Chip Applications	Avinash K. Parkhe, Amol Dhondiba Sul, Prathmesh Ramesh Kirgat, Atharv Santosh Joshi, Prakash Bhimrao Ghadage, Vijay Rahane	National Conference on Relevance of Engineering and Science for Environment and Society-R{ES}^{2} 2021	National
2.	Brick Manufacturing Machine	Chetan C Jadhav, Nilesh Sanjay Kadam, Abhijeet Sunil Khote, Santosh Hanamant Patil, Akshay Balasaheb Pansare	National Conference on Relevance of Engineering and Science for Environment and Society-R{ES}^{2} 2021	National
3.	Thermal Analysis of Battery Module	Akash Prasad Ajgar, Avinash Sandipan Londhe, Avinash Basavraj Dhabade, Paras Mahavir Mule, Digambar T. Kashid, Subhash V. Jadhav	National Conference on Relevance of Engineering and Science for Environment and Society-R{ES}^{2} 2021	National
4.	Parametric Influence Study for Laser Cutting on Acrylic	Manthan M Dixit, Saurabh G Wadekar, Dipak P Shinde, Harshal R Nagtilak, Sandeep S. Wangikar, Nitin D. Hingmare	National Conference on Relevance of Engineering and Science for Environment and Society-R{ES}^{2} 2021	National
5.	Development of a Compact Solar Vegetable Dehydrator	S. V. Jadhav, S. S. Wangikar, A. M. Kulkarni, M. K. Patil, A. A. Bansode, A. A. Mulani	National Conference on Relevance of Engineering and Science for Environment and Society-R{ES}^{2} 2021	National
6.	Development and Analysis of Refrigerator using Peltier Effect	Praduya K. Bhuse, Abhijeet A. Shinde, Pavan S. Parkam, Rohan A. Pandhare, Pratiksinh S. Mandwale	National Conference on Relevance of Engineering and Science for Environment and Society-R{ES}^{2} 2021	National

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Sr. No.	Title of Paper	Name of Authors	Name of Conference	National / International
7.	Study of different Positions of Sprinklers for Irrigation System	Aditya Motewar, Rushikesh Patil, Rohit Khandagale, Dnyaneshwar Bansode, Sandeep S. Wangikar	National Conference on Relevance of Engineering and Science for Environment and Society-R{ES}^{2} 2021	National
8.	Design and Development of Micrchannel for Milk Protein detection using CO2 Laser Machine	S. M. Khomane, Sneha Mirajkar, Vaishnavi Lakheri, Madhuri Parchandrao	International Conference on Joint Modernistic & Innovation Technology (ICJMIT-22)	International
9.	Experimental setup and Study of Solar Operated Chaff Cutter	S. R. Gavali, Avinash K. Parkhe, Kiran Hambirrao, Milind S. Jagadale, Omkar Dandge, Yasar Y Khatik	National Virtual Conference on Advanced Research in Science Engineering and Technology (ARSET-2022)	National
10.	FU-EL (Fuel and Electricity) Powered Two Wheeler	Mangesh Misal, Harshvardhan Ubale, Aniket Sarawale, Suraj More, A. A. Mote	International E-Conference on Innovation and Emerging Trends in Engineering, Science and Management	International
11.	Arduino based Accident Alert System using GPS, GSM and Accelerometer	Sanjay N. More, Abhinay R. Gaikwad, Aftab B. Shaikh, Pratik P. Deshmukh, Jaydev D. Nanaware	International E-Conference on Innovation and Emerging Trends in Engineering, Science and Management	International
12.	Brick Manufacturing Machine	Chetan C. Jadhav,Nilesh Sanjay Kadam, Abhijeet Sunil Khote, Santosh Hanamant Patil, Akshay Balasaheb Pansare	International E-Conference on Innovation and Emerging Trends in Engineering, Science and Management	International
13.	Development of Log making Machine for Kitchen Food Waste	Sandeep S.Wangikar, Manthan Milind Dixit, Saurabh Ganesh Wadekar, Dipak Pandurang Shinde, Harshal Rajendra Nagtilak	International E-Conference on Innovation and Emerging Trends in Engineering, Science and Management	International
14.	Design and Fabrication of Compact Paper Recycling Machine	M. B. Kulkarni, Atharv Kulkarni, Madan Patil, Aniket Bansode, Aman Mulani	International E-Conference on Innovation and Emerging Trends in Engineering, Science and Management	International

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15.	Design and Analysis of Compact Bore Well Motor Lifting Machine	Uttam Anuse, Saurabh Kadasare, Samarth Chavan, Sumeet Chavare, Yuvraj Shelar	International E-Conference on Innovation and Emerging Trends in Engineering, Science and Management	International
16.	Development of auto feeder mechanism for cricket ball throwing machine	Chandrakant K. Vhare, Admane Dhananjay, Chavan Yogesh, Kale Ayush, Waghmare Sachin	National Conference on Recent Trends in Science and Advances in Engineering	National
17.	Development of Driving Guidance System for Automobile Driver	Chandrakant K. Vhare, Arati Lale, Dhanashree Sonawane, Namrata Parvat, Gayatri Joshi	National Conference on Recent Trends in Science and Advances in Engineering	National
18.	Design and Fabrication of Sugarcane Lifting Machine	Shashikant D. Thorat, Pranav M. Bhandare, Yogesh S. Autade, Vinayak S. Gawali, K.S.Pukale, B. P. Ronge	National Conference on Recent Trends in Science and Advances in Engineering	National
19.	Design of Multi-Powered Solar Boat	Yogesh Patil, Amol Mali, Salim Shaikh, Avinash Madane, Digambar Kashid	National Conference on Recent Trends in Science and Advances in Engineering	National
20.	Multipurpose Fertilizer Spreading Machine: Design and Fabrication	Sushant Jadhav, Akash Mane, Sandip Bagul, Omkar Jagtap, Rambhajee Nagargoje, Digambar Kashid	National Conference on Recent Trends in Science and Advances in Engineering	National
21.	Design and Development of Onion Segregation Machine	Sachin A. Kshirsagar, Shreeyash R. Chavan, Ridham G. Parmar, Pruthviraj S. Deshmukh, K.S.Pukale	National Conference on Recent Trends in Science and Advances in Engineering	National
22.	Hydraulic Spring Stiffness Testing Machine	Kanhaiya Sudarshan Vairagkar, Chaitanya Dattatray Wadekar, Thomas Ashley A,	National Conference on Recent Trends in Science and Advances in Engineering	National
23.	Design & Manufacturing of Water Jar Cleaning Machine	Chandragupt Parchandrao, Ghanasham Chitari, Rahul Satapute, P. A. Dhawale	National Conference on Recent Trends in Science and Advances in Engineering	National

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Sr. No.	Title of Paper	Name of Authors	Name of Conference	National / International
24.	Design and Development of Solar Operated Peanut Harvesting Machine	Irfan R. Mulani, Nitin T. Eakmalli, Nihal Y. Mujawar, Saurabh S. Gaikwad, P.K. Patil	National Conference on Recent Trends in Science and Advances in Engineering	National
25.	Experimental Investigation & Optimization of Wire Electrical Discharge Machining (WEDM) Parameters for Surface Roughness & Material removal rate in Machining of AISID3 Tool Steel	Shailesh Pawar, Onkar Phalake, Pravin Somdale, Omkar Patil, Sachin Sonawane	National Conference on Recent Trends in Science and Advances in Engineering	National
26.	Advanced Cardan Propeller Shaft Joint	Vinayak Bapat, Vaibhav Bhosale, Saurabh Dhotre, S. S. Jadhav	National Conference on Recent Trends in Science and Advances in	National
27.	Design of Underwater Remote Operated Vehicle (UW-ROV) with Camera, Temperature and Depth Sensor in Optimum Cost	Komal Achugatla, Shraddha Gajakosh, Deepjyoti Sathe, Dr. R. R. Gidde	National Conference on Recent Trends in Science and Advances in Engineering	National
28.	Design and Fabrication of Exhaust Gas Power Generation Machine	Omkar Mashalkar, Vaibhav Londhe, Rohit Chatage, Dr. R. R. Gidde	National Conference on Recent Trends in Science and Advances in Engineering	National
29.	Vibration Analysis and Fault Diagnosis of Vertical (Rotary Table) Insert-moulding machine and Press Machine (with Feeder)	Omkar Pawar, Dhondiram Waghmode, Nanasaheb Shinde, Dnyaneshwar Shitole, Sandipraj Salunkhe	National Conference on Recent Trends in Science and Advances in Engineering	National

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Fabrication of Micro-channels using CO_2 LASER Machining & Soft Lithography for Lab-on-Chip Applications

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ABSTRACT

Microchannels are one of the most significant parts for the Lab-on-Chip applications. The microchannels fabrication is a crucial task. The Soft Lithography is one of the most favored methods of microchannel fabrication. The use of CO_2 LASER machining for microchannel fabrication using Acrylic sheet is studied in this paper. The experimentation is carried out to see the effect of LASER scanning speed and laser power on the depth of the microchannel mold. It has observed that the channel depth is increasing linearly with increasing LASER power and decreasing with increase in speed. The straight microchannel configuration with Y shaped inlet having circular & elliptical obstacles has been fabricated using CO_2 laser machining on acrylic sheet. Also, the fabricated molds are used to prepare the further microchannel molds using the Soft Lithography technique and then the microchannels prepared from Soft Lithography are used as a mold for the lab-on-chip applications like check the mixing length & mixing phenomenon etc.

Keywords: CO_2 LASER, Soft Lithography, Acrylic Sheet, Micro-Channel, Molds, Lab-on-chip.

1 Introduction

Now a day's micro total analysis systems (μTAS) play significant role in many of the applications and Microchannel is one of the prominent part of these systems. The Microchannels are having applications in various fields like medical, diagnostics, chemical, biological, etc. [1][2]. The Microchannels can be fabricated by using the Acrylic material more economically and efficiently as compared to other materials like Polymers, Silicon, and Glass. Due to low cost and straight forward fabrication these Microchannels are mostly used in Engineering and Medical applications [3] [4] [13] [15]. There are various methods to fabricate the Microchannels such as hot-embossing [5][6][14] injection molding [7] micro milling [8] infrared laser ablation [9] Photo chemical machining [10] [11] [12].

The CO_2 laser machining is mostly suitable for fabrication of Microchannels or molds of it [16]. The use of CO_2 laser machining not only speeds up the fabrication process, also there is flexibility to change the channel design as per the requirements. The CO_2 laser machining is very more useful for micromachining [17]. The use of CO2 LASER machining for microchannel fabrication using Acrylic sheet is studied in this paper. The experimentation is carried out to see the effect of LASER scanning speed and laser power on the depth of the microchannel mold. It has been observed that the channel depth is increasing linearly with increasing LASER power and decreasing with increase in speed. The transparent acrylic sheet is used for the fabrication of molds using LASER machining. The straight Microchannel configuration with Y shaped inlet having circular & elliptical obstacles has been fabricated using CO_2 laser machining on an acrylic sheet. Also, the fabricated channel molds are used to prepare the microchannel using the Soft Lithography method

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and then the microchannels prepared from Soft Lithography are used as a mold for the lab-on-chip applications like check the mixing length & mixing phenomenon etc.

2 Materials and Methods

The acrylic sheet is commonly used material for various applications. We have used this material (an acrylic sheet) in transparent shown in figure 1 below from for fabrication of microchannel molds or directly microchannels. The channels fabricated from this material will be used for lab-on-chip applications. The CO_2 LASER machining process is used for fabrication of molds using acrylic sheet and. The Soft Lithography is also one of the techniques used for the fabrication of channels or molds. The molds fabricated from laser machining are also be used in the Soft Lithography techniques based on requirement of channel in lab-on-chip applications. As per the requirement we can use any mold or channel fabricated from LASER machining and the Soft Lithography.

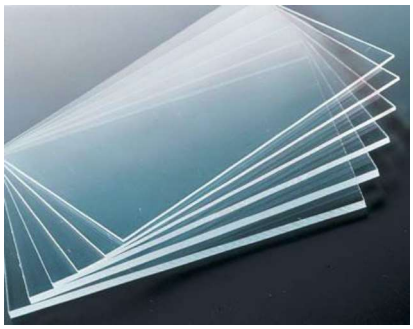

Figure 1: Acrylic Sheet

3 Fabrication of Micro-channels or Molds using LASER Machining

In the Laser cutting technology laser is used to cut the materials and mostly used in industrial applications. Laser machine works by giving high laser power as an output through computer and then it cuts the material as per design. The melting of material taking place and leaving the edges with a high surface finish. This machine can cut the various materials like acrylic, paper, pressboard, rubber, fiberglass wood, plastic, cloth, leather etc.

Thus, the CO_2 LASER machining is mostly useful for micromachining. The use of CO2 LASER machining for microchannel fabrication using Acrylic sheet is studied in this paper. Then, the detailed experimentation is carried out to check the effect scanning speed and laser power on its depth. It is observed that there is increase in depth of channel or molds, when laser power increases and vice-versa.

Figure 2: CO_2 LASER Machine

The above figure 2 indicates the CO_2 LASER machine used for the microchannels or molds fabrication. The acrylic sheet will keep cutting or engraving area of machine. The input will be

given through computer as image or Auto-CAD or CATIA drawing. We have to set required cutting laser power and travel speed through same computer and the fabrication is carried out as per given inputs and molds or channels are fabricated.

3.1 Design of Micro-channel or Molds

The following figure 3 indicates the drawings (with dimensions in mm) of microchannels with different configurations (Y type channel with Circular & Elliptical obstacles). This drawing will be given as a input to the machine and accordingly the fabrication will be carried out on acrylic sheet.

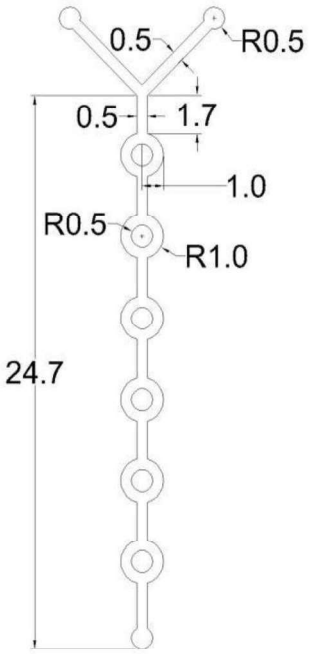

Figure 3: Microchannel with Circular Obstacles

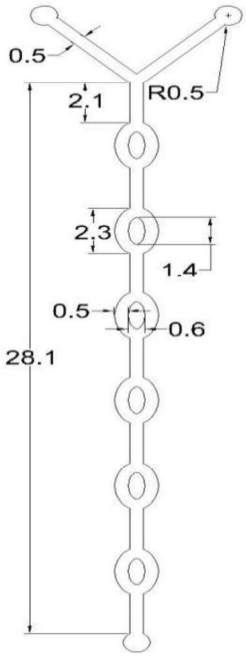

Figure 4: Microchannel with Elliptical Obstacles

3.2 Fabrication of Micro-channels or Molds using LASER Machine

Laser machine works by giving high laser power as an output through computer and then it cuts the material as per design. The following micro-channels shown in figure 5 & figure 6 with Circular & Elliptical obstacles are fabricated using LASER machining process and using following selected parameters on LASER machine.

Table 1: Performance Parameters of LASER Machine

Width of Channel	Scanning Speed	Laser Power	Depth of channel Achieved
0.5	100	60	0.516
	100	40	

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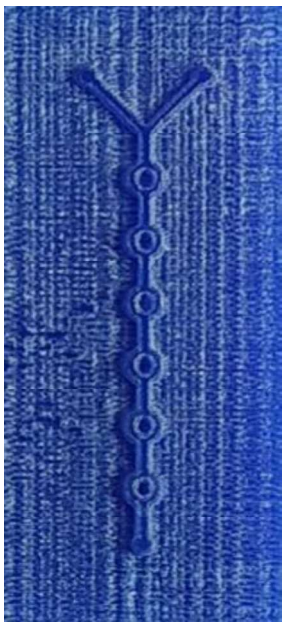

Figure 5: Fabricated microchannel or mold with Circular Obstacles

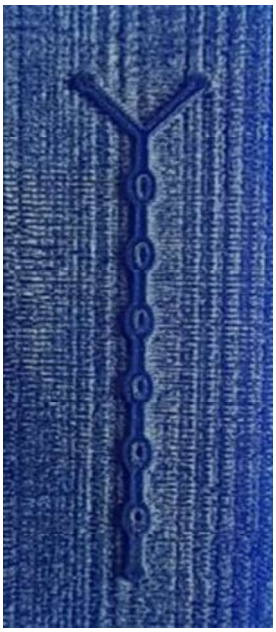

Figure 6: Fabricated microchannel or mold with Elliptical Obstacles

4 Fabrication of Micro-channels or Molds using the Soft Lithography

The Soft Lithography process includes fabrication channel or mold using Polydimethylsiloxane (PDMS). After the CO_2 fabrication of channel or mold it is filled by PDMS and then degassed in vacuum designator to remove the sir bubbles. Then, the PDMS solution is cured at room temperature or by baking in oven. After cooling, the PDMS mold can be peeled off from the mold and it will be used for micro molding. The detailed soft lithography process used for fabrication of channels is shown by following figures 7 & 8.

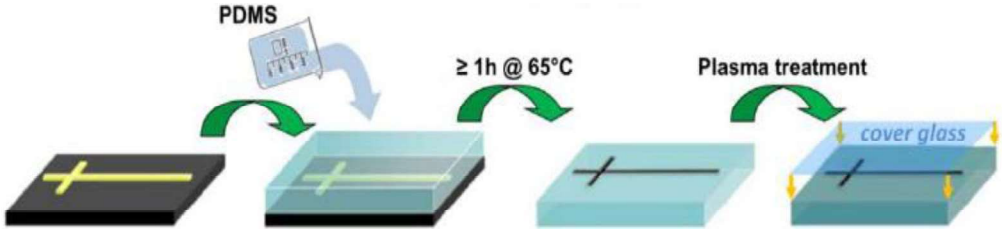

Figure 7: Soft Lithography Process for Microchannels fabrication

Figure 8: Pouring of PDMS during fabrication of Microchannels using Soft Lithography

5 Conclusions

The Microchannel is one of the essential components for Lab-on-Chip applications like biological, medical and chemical applications. The fabrications of Y-shaped micro-channels are carried out using Laser machining with circular & elliptical obstacles is straight microchannel or molds. The fabrication is carried out for given dimensions. The depths recorded as around 0.5 mm. The fabricated molds from laser machining are used the soft lithography process for fabrication of PDMS micro-channels.

The Y-shape micro mixers with two different geometries such as circular and elliptical have designed. CO_2 Laser Machining is used for mold making of micro mixer. The Y-shape PDMS channel with circular and elliptical obstacles will be used for further experimental analysis or testing in Lab-on-Chip applications.

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Thermal Analysis of Battery Module

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ABSTRACT

The rate of development of Electric Vehicles has gained momentum in the recent times. The factors like cost, lifetime and safety of the battery are becoming very important. One of the most important components, which are presently in one way deciding the cost and also very important hurdle in the development of the EVM is the battery. Thermal management of vehicle battery plays important part in deciding the battery performance and therefore the proper analysis of the battery thermal management system (BTMS), it is very essential for proper functioning. Analysis of the BTMS can be done in three ways; analytically by solving equations, numerical simulations using ANSYS FLUENT and on MATLAB/Simulink. In this work, simulations are done using ANSYS to understand the amount of heat produced and cooling required for the battery. This work focuses on analysis of lithium-ion battery cell using ANSYS FLUENT in order to study the flow characteristics of air flowing overbattery module. It is observed that such a battery module is prone to overheating and therefore, requires proper cooling arrangement to ensure it efficient operation. Here we mainly focused on finding heat transfer rate and it is observed that optimum air flow rate has to be maintained to ensure maximum cooling and better performance.

Keywords: Electric Vehicle, BTMS Cooling, Heating, ANSYS, Battery Module.

1 Introduction

There are so many blending methods of hybrid EV and 100% EV in vehicle Industry. As per the mixing level, different size and shape, type and numeral of cooling types are fixed in Electric Vehicles. Disparate conventional vehicles, battery cells as source of energy have severe requirement on running environment. They are particularly responsive to temperature. To make sure proper thermal working surroundings, a BTMS will usually be included with battery cells. It mostly consists of following systems: liquid cooling system, air cooling system, phase change material, direct refrigerant cooling system, thermo-electric heating and cooling and last but most simple heat pipe. Therefore, understanding of the suitable working necessities of battery is essential and simulation is done to know how much air and cooling required, and what kind of management systems are capable of meeting these demands in an adequate and efficient manner, as discussed in [1]. The performance and durability of a battery pack in an electric vehicle can be maximized with this cornerstone. Furthermore, due to the battery's limited capacity, the vehicle's electric range is limited. Finding the electric energy usage of BTMS and looking for potential savings is really useful. This discovery will aid battery performance by reducing EV energy usage and electric range.

2 Literature Review

Focus on EVs with other hybrid EVs, semi hybrid EVs and battery EVs have rapidly growth has been found in market, as condition of global warming over world has been 21st century most difficult issue and

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the environmental challenge of greenhouse gas production have been increased. The key challenge for EVs is to discover a reliable and long-lasting energy source, which aids in the development of innovative energy storage systems capable of supporting high mileage, rapid charging, and high-performance driving. Because of higher energy to density ratio, higher specific power to weight ratio, lighter weight, lower time for self-discharge rates, higher recyclability and re - usability, and longer cycle life than other reusable batteries such as lead-acid, nickel–cadmium, and nickel–metal hydride batteries, reusable lithium-ion batteries were previously recorded as the most and common sustainable energy storage tool for EVs. They also have the benefit of having no memory effect. To avoid harmful consequences of lithium-ion batteries, room temperature and maximum temperature differential between cells should be no more than 4–5 °C, as discussed in [2-4]. The energy to density ratio of lithium-ion batteries is better than every last challenging batteries, nonetheless, today's EVs must test at higher energy density batteries than ever before, and more cells in the module must be supported to extend the discharge time. This strategy boosts the batteries' self-heat production and heat accumulation, putting the BTMS at the pinnacle of its utility. The thermal and overall behaviors of the battery were tested at the module level, with total heat generation, heat transfer types, and thermal boundary conditions checked, while various BTMS were investigated at the module level. and tested over fixed period with battery conditions sensors. They examined the capacity of the air-based battery thermal system and the direct liquid-based battery thermal system, respectively, based on cell kinds (serial, parallel, and mixed) and indirect liquid cooling system categories (tube cooling and plate cooling utilizing small channels)., as in [5]. The preceding simulation review studies were mostly concerned with heat transfer methods or materials. In comparison to all other subject study on battery thermal difficulties, there is very little research on the battery thermal management system. As a result, each BTMS has been thoroughly studied in terms of thermal cycle possibilities, and a portion of simulation has been described further in this work. Also, the study has done on battery power capacity calculation so during numerical analysis the capacity has been given and helps solving. All pervious simulation mostly focuses on MATLAB/Simulink based battery simulation but in this we have been tried in ANSYS FLUENT. Density based solver is gives highest most accurate solution and can be compared with analytical solution.

3 Theory and Calculation

Cooling - Battery cells will create electricity and heat due to their inefficiency. When the battery temperature reaches the ideal level, and even before that, this heat must be removed from the battery pack. As a result, thermal control necessitates pack cooling.

Heating - The temperature of the battery pack drops below the lower temperature range in colder climates. As a result, a heating device, such as a PTC heater, is required to get the battery pack to the right temperature in a shorter amount of time.

Insulation – The temperature difference between the inside and outside of the battery pack is significantly greater in cold or hot weather than in normal weather. As a result, the temperature of the battery will rapidly fall or climb outside of the acceptable range. To avoid this, good insulation can reduce the rate at which the battery temperature drops or rises, especially when the car is stopped on the road.

Ventilation - To eliminate the toxic substances from the battery pack, ventilation is essential. This function is integrated with cooling and heating functions in various systems, such as air systems.

Battery capacity Calculations

Charge (C) = Current (A) * Time(s)

and

Charge (C)*Voltage (V) = Energy (J)

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Since Amp hour (Ah) is measure of charge and Joules is measure of energy you can't convert mAh to joule without knowing Voltage at which charge is transferred

So,

mA means 1/1000 of an Amp for an hour and there are 60 * 60 = 3600 sec per hour,

1mAh = 0.001*3600 = 3.6 coulombs of charge.

Choosing 1 volts for voltage can convert mAh to joule

3.6 (C) * 1(V) = 3.6(J)

According to example if we have 2V battery it stores twice energy than 1 V battery

Methods for heating and cooling battery pack, as discussed in [3].

4 Methodology

So, for battery thermal management system simulation we use ANSYS R21 model and the geometry has been drawn in Solid work 2020 version. First for all these simulations we make space for air and 10 cell battery modules. When we combine all battery modules, we get pack so we can install. Analysis of battery pack is difficult so we make model of 10 cell pack and simulate in steady, density based standard k epsilon turbulence model.

To bring model into space claim we have to import it into IGES format. After importing we can close space claim tab and go further. Next is meshing, here we can discretize model into small no of part so whatever equation solver solve with high accuracy. More number of meshing means highest time for mesh and closest to actual value of cell temperature. For next setup we have to give some names like inlet, outlet condition also solid cell, fluid air space and material condition here in meshing. After completion of cell and boundary condition setup we can go for setup of physical conditions. Here we can set steady and density-based solver with five process precision and in this we turned on single energy source. Importing of new plots done, for volume-temperature plot mainly done. Addition of lithium-ion material also done here and after applying pre-processing condition one can close tab move to next for solution and result after calculated up to 500 iterations. In result we analyzed various condition and rendering of planes and volume rendering condition for temperature, mass flux, velocity and cell temperature can be closely monitored for single source of energy. Following are some methods to calculate temperature and cooling rate for battery pack out of which we used ANSYS FLUENT simulation.

1 Analytical Method

2 ANSYS FLUENT

3 MATLAB/Simulink

5 Modelling and Analysis

Following figures 2 & 3 show the lithium-ion battery cells module containing 10 cells is analyzed under steady and viscous and in SST k-omega turbulence model. Total here 141328 meshed cells having air as main fluid having density 1.225 kg/m^3

We know that for thermal analysis we have to draw geometry and below geometry is given. Here are some details about geometry

Cell Diameter = 10 mm

Cell Length = 50 mm

No. of Cells = 10

Module Volume = 25*25*50

Consecutive Distance between Cells = 1 mm.

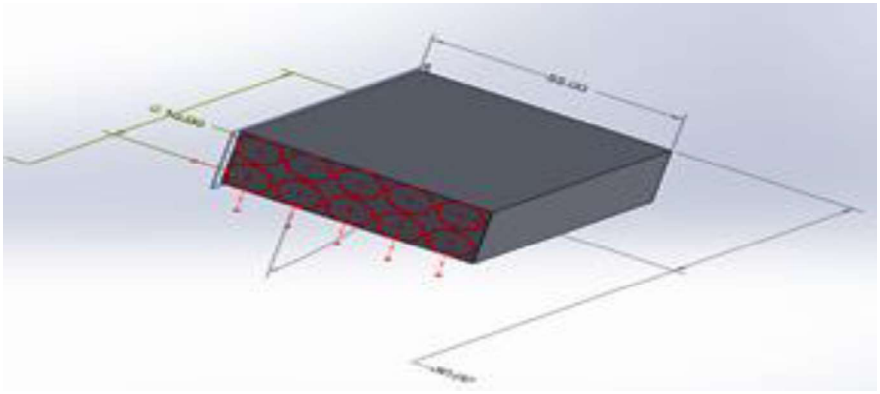

Figure 1: *Geometry*

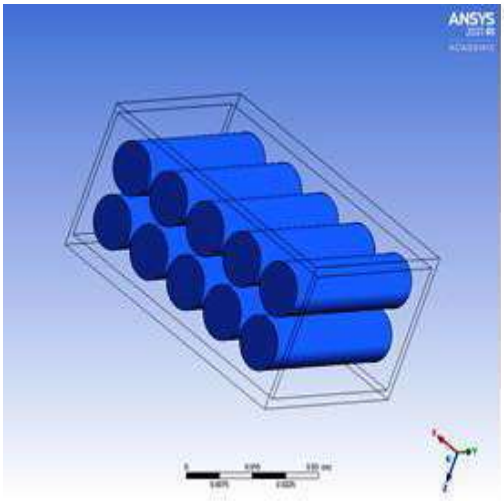

Figure 2: *Cells*

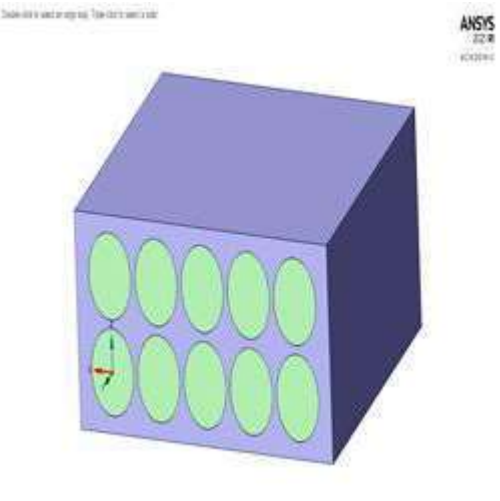

Figure 3: *Module*

After Meshing of Cell Module, we can make discrete cell so equation is solved with high quality and accuracy. Meshing converts large block area into small number of element and nodes so during simulation time it gives large number and percentage of accuracy. After meshing, we setup physical conditions and further result is analyzed which shows for single energy source temperature plot is being constant or very small changes occurs and after increase of air flow rate the drop can be seen in simulation over period of time. The meshed image of model is below having different mesh for fluid and air part as per design as shown

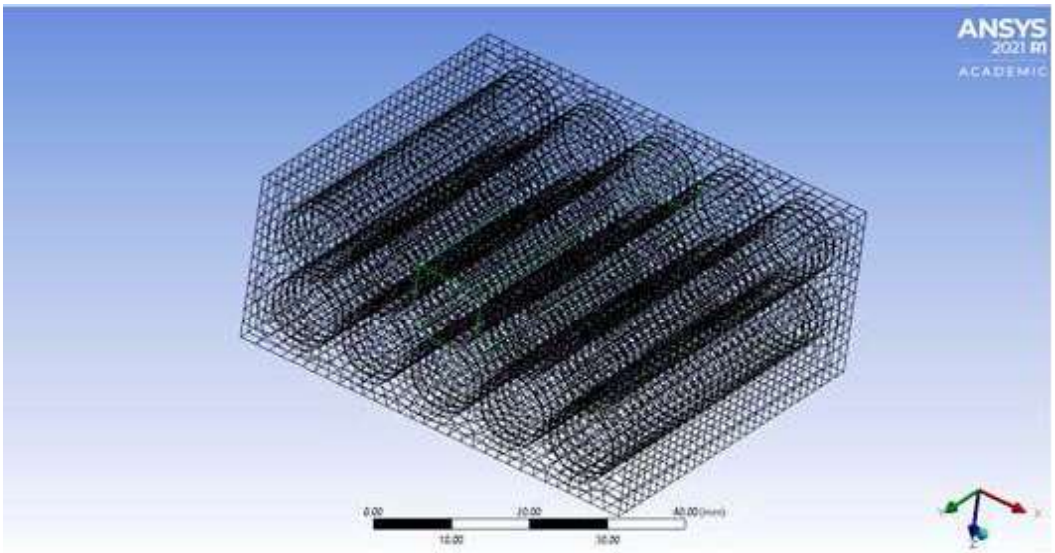

Figure 4: *Meshing*

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So here after meshing we setup above mentioned conditions and part of meshed result is shown below for analyzed and flow of air around cells and heat carried out side of channel first, we had velocity analysis and temperature analysis in volume rendering. Due to Cell the gap between them is not cooled and we can easily find this. We have made conclusion on this is to cool down all cell of modules cross side cooling required cause small change in temperature of cell affect badly to battery pack health condition.

5.1 Case 1

We know that as the mass flow rate and velocity of air rise, the cell temperature decreases. To obtain this we done velocity and temperature analysis and get at 3 m/s air we had 307.4 °k temperature. Here volume rendering shows result. If you once look at both profiles you can find easily that the first cells cool down more cause lower temp of cooling air so henceforth the reddish yellow cells are hot with compare them

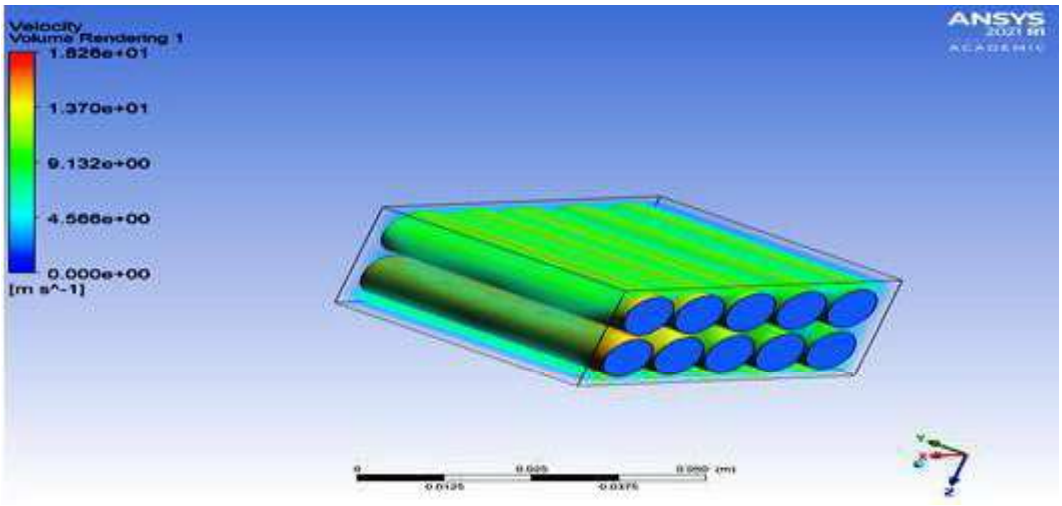

Figure 5: *Velocity Render*

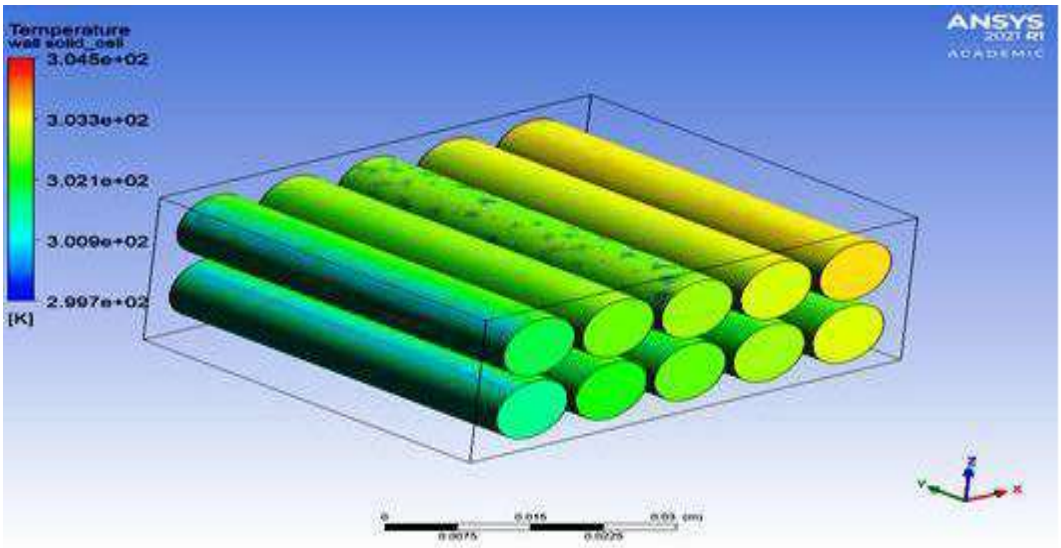

Figure 6: *Temperature Render*

5.2 Case 2

To obtain more cooling we here try with increasing of air flow rate to 9 m/s and we found that the temperature we get in previous analysis is quiet more so here we get 302.5 °k. So, the analysis part is shown below. If you look closely at case 1 and case 2 data the increase in air flow rate had significant effect on temperature of cell. Temperature drop is quickly shown in result. The analysis is same with only inlet parameter change.

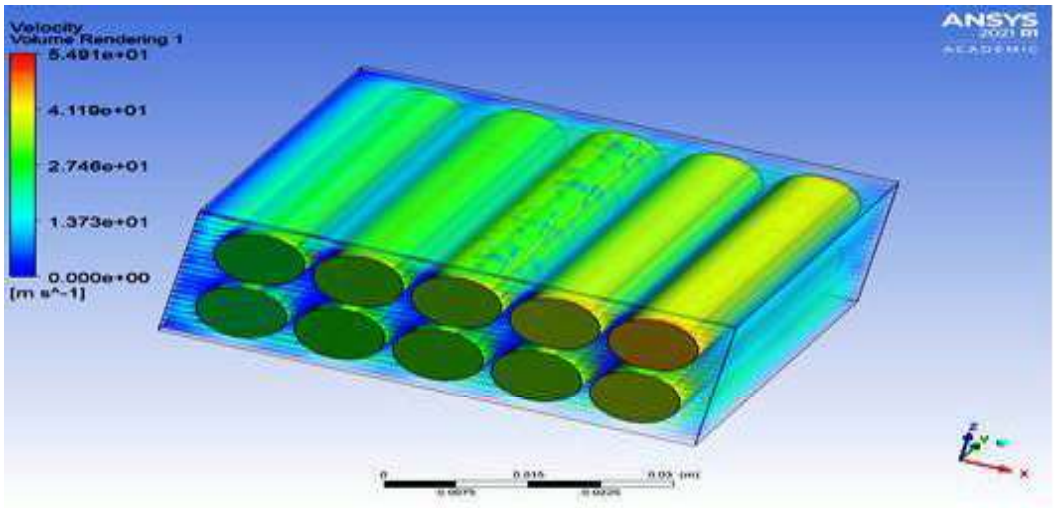

Figure 7: *Velocity Render*

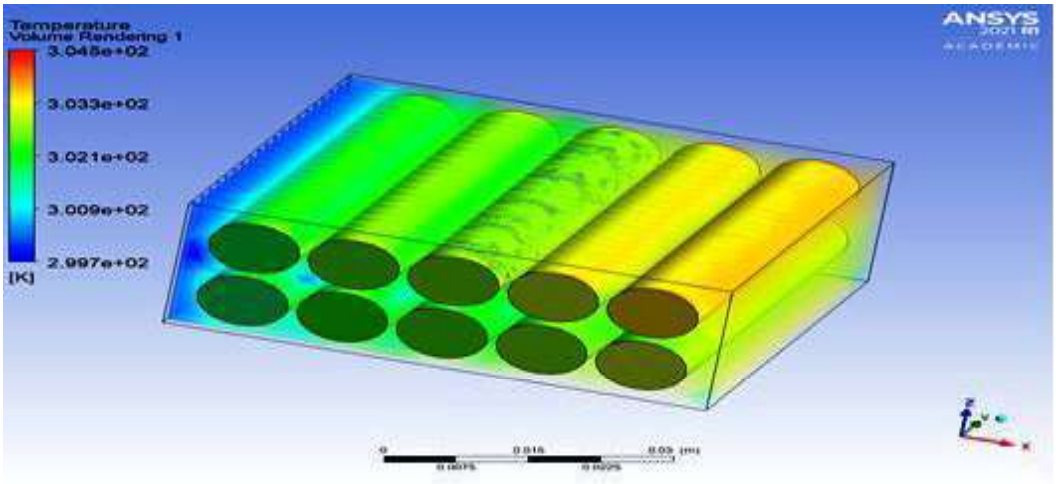

Figure 8: *Temperature Render*

5.3 Case 3

In this last case we add utmost air flow rate 15 m/s and we get temperature very close our inlet air temperature 300.04 °k and our inlet temperature condition is 300 °k. So, if we had air flow rate, we had significant temperature drop in module cell and the purpose of our analysis comes to end as we achieve decrease in temperature of cell. This all things conclude their solution to find battery capacity and depend on battery capacity battery thermal management system control.

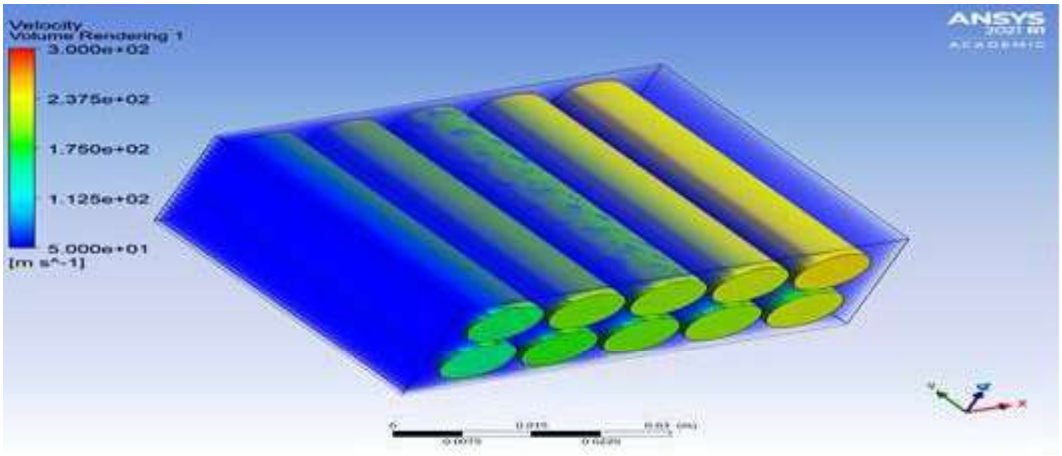

Figure 9: *Velocity Profile*

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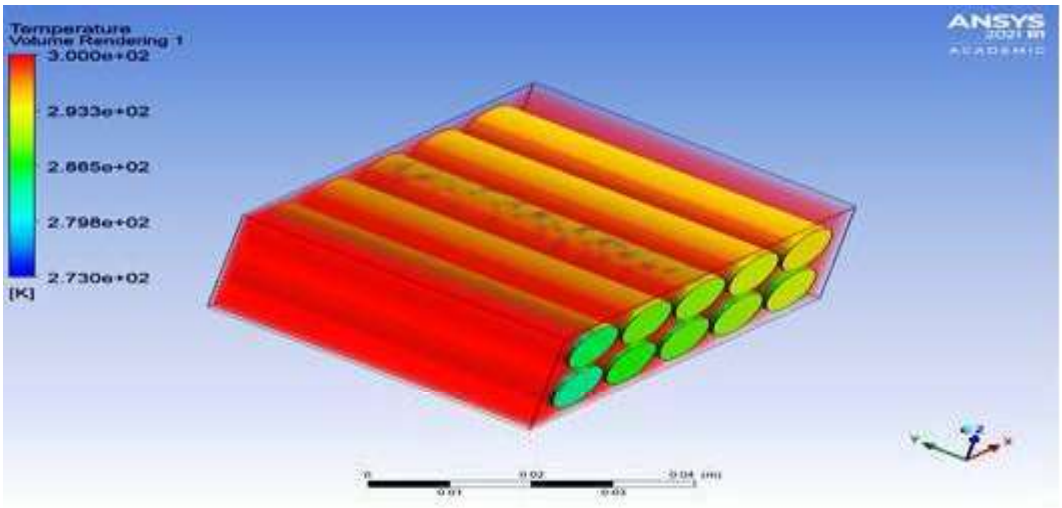

Figure 10: *Temperature Profile*

So, in this case you can easily see due to more air rate the highest heat transfer takes place at module and the cooling of cells are takes place. Due to more heat transfer time required to cool down reduced so much. We did simulation and modelling for almost 7 air flow rates and based on it draw table below comparing velocity and outlet air temperature.

Table 1: *Variation of Outlet Air Temperature with respect to Velocity change*

Sr. No.	Velocity (m/s)	Outlet Air Temperature (°k)
1	3	307.4
2	5	305.25
3	7	304.85
4	9	302.5
5	11	301.75
3	13	301.13
7	15	300.4

5.4 Mathematical Expressions and Symbols

Heat Transfer Rate is calculated by,

$Q = mCp\Delta T$

Q is Heat Transfer Rate [in kW]

m is Mass Transfer Rate [in Kg/s]

Cp is Specific Heat at constant pressure [in joule per kelvin per kilogram]

ΔT is Approximate mean temperature difference [in kelvin]

So, from this we can calculate q and to find q we need to find m

m = ϱ. A. V

Here is example when velocity of air 3 m/s find heat transfer rate

m = 1.225*0.5*.0.25*3 = 0.45 Kg/s

and

Q = 0.45*1*7.4 = 3.33 kW

(Note: Assume at 300 Degree Kelvin, Cp = 1 kJ/kg.k)

Based on this calculation, we had found heat transfer rate with respect to velocity as mentioned in table 2.

Table 2: *Variation of Heat Transfer Rate with respect to Velocity change*

Sr. No.	Velocity (m/s)	Heat Transfer Rate (kW)
1	3	3.33
2	5	4.01
3	7	5.18
4	9	3.47
5	11	2.83
6	13	2.24
7	15	0.91

6 Result and Discussion

After modelling and analysis, we got results through simulation of battery module of thermal management system. We have studied first plot of velocity verses temperature, in which we got result that, as we increase air flow rate the cell temperature goes below. The heat around cells is being carried out to outside the channel and the healthy condition for battery maintain. The air flow rate had significant role in cooing down temperature parameter. Analysis shows that if we had more flow rate the time required for cooling down reduced and hence it benefits battery capacity calculation.

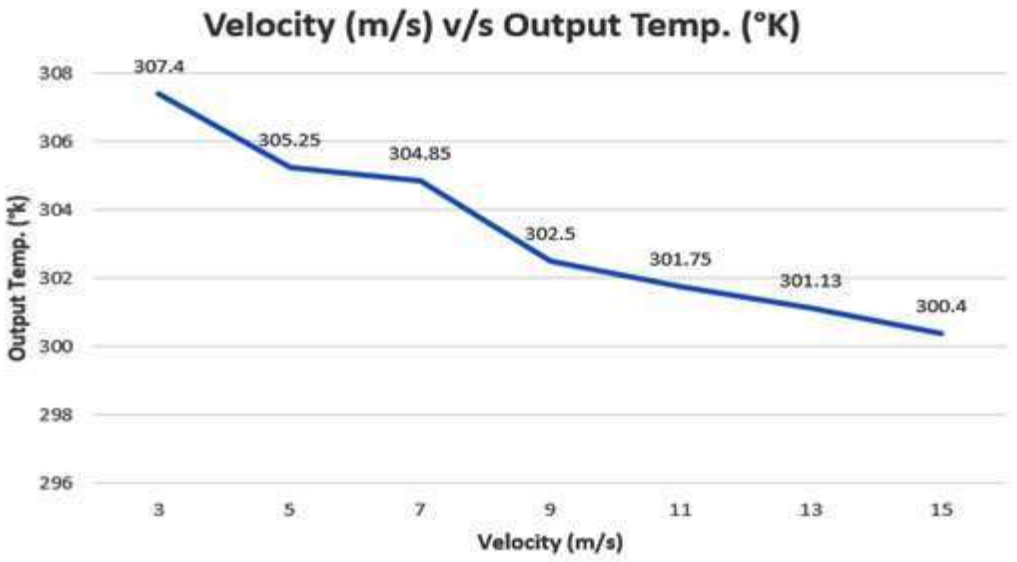

Figure 11: *Graph of* Velocity *Vs Output Temperature*

The second parameter which we have considered is Mass Flow Rate of air and here also we got helpful result. As we increase the flow rate significant drop in cell temperature can be easily shown. The mass flow rate mainly depends upon density of fluid and we had constant density value of air. The graph shows that mass flow rate is also a important parameter to reduce cell temperature and helps in maintain battery thermal management operations.

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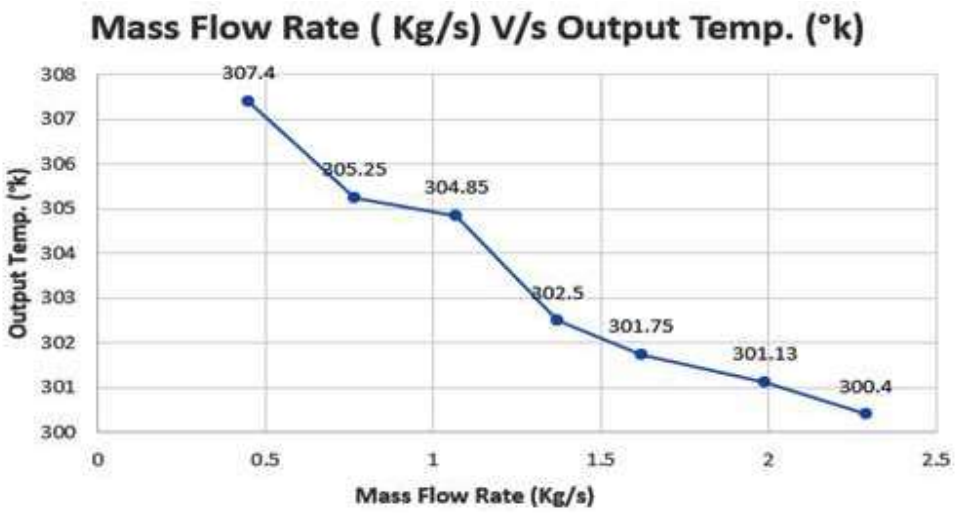

Figure 12: *Graph of Mass Flow Rate Vs Output Temperature*

During battery module design the heat transfer rate takes key role to remove heat from system depend upon fluid used in it. We know that for heat transfer rate first need to calculate heat transfer coefficient and them q can be calculated. We calculated Q and when graph is plotted, we get that after a certain velocity the amount of heat transferred in certain volume reduces as more volume of air is gone through over it. The decrease in fall states that we are successful in our operation to cool down cells and the finally we get small heat cause temperature automatically reduces to certain value near to which we provide intake air. So, we find that heat transfer rate is main key to design battery thermal management operations and analysis gives more correct result.

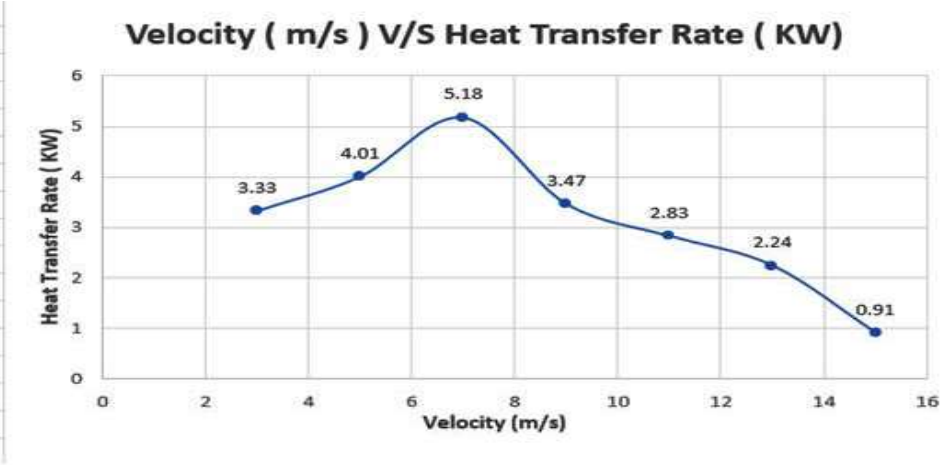

Figure 13: *Graph of Velocity Vs Heat Transfer Rate*

7 Conclusion

Because of high energy density and long cycle life, lithium-ion batteries are commonly utilized in electric vehicles. Temperature has a big impact on the performance and life of lithium-ion batteries, therefore it's crucial to keep them in the right range. Therefore, a numerical study of the heat generation phenomena and important thermal concerns of lithium-ion batteries is carried out. In a battery thermal management system, the velocity of the air and the mass flow rate of the air are two critical characteristics that determine the cooling performance. Furthermore, it has been observed that a 7 m/s air velocity provides the optimum cooling results. In future there is lot of chances to simulate model numerically and calculate

proper temperature suitable for battery charging and discharging. The analysis can be also done for complete battery stack used in the electric vehicles.

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FU-EL (Fuel and Electricity) Powered Two Wheeler

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Aniket Sarawale[3], Suraj More[4], A. A. Mote[5]

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ABSTRACT

With growing oil prices and escalating environment worries, cleaner and supportable energy solutions are demanded. Present transportation contributes large amount of energy consumption and emission of pollutants. We mostly use the vehicles like scooter, moped scooter, car etc. due to this the air pollution also get increased. Due to pollution the diseases are also increased. The petroleum product such as petrol is non-renewable sources. It gets exhausted in future, so to prevent environment from pollution and to save fuels like petrol the electric vehicles are introduced. But in a rural region the number of charging stations are very less (probably no) and people are not that much aware about electric vehicles. So, the hybrid vehicle is the proper and sustainable solution. Any vehicle is a hybrid, when it combines two or more source of power. Hybrid electric vehicles are admired because of their ability to achieve related performance to a standard automobile while prominently improving fuel efficiency and tailpipe emissions. In this paper, hybrid vehicle technology has been manufactured, with Power split configuration having internal combustion engine and battery as the secondary running source. In this project we make a hybrid scooter which runs in two mode.

Keywords: *Battery, BLDC motor, combined throttle valve, controller, DC-DC convertor.*

1.INTRODUCTION

An emphasis on green technology is greatly demanded of modern cities. The significant growth of today's cities has led to an increased use of transportation, resulting in increased pollution and other serious environment problems. Gases produced by vehicle should be controlled and proactive measures should be taken to minimize these emissions. The automotive industry has introduced hybrid bike that minimize the use of combustion engines by integrating them with electric motors. Such technology has a positive effect on the environment by reducing gas emission. The greatest challenge in research activities today is developing near zero- emission powered vehicles. Hybrid vehicles rely on two or more energy converters for generating propulsion. Each energy converter is fed by an appropriate on-board energy reservoir. A hybrid electric vehicle (HEV) is comprised of an internal combustion engine together with one or more electric machines. The engine converts fossil fuel from the fuel tank into mechanical power while the electric machine converts electric energy from an electric energy storage system, such as a battery, into mechanical power. There are some problems on previous hybrid bike, the charging stations are not available at large amount so there is main disadvantage. This factor, we tried to solve in this project. In this project the bike will run in two modes.[1][2]

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2. LITERATURE SURVEY:

In India, very few technologies are implemented as compared to other countries, also we are using BS – 4 and slowly moves towards BS-6 for future automobile life. Also, there are much more prices of petrol and diesels in India and that increases and decreases daily and also may increase in future. So, reservoirs of petrol and diesel are diminishing, hence we need to use this petrol and diesel very carefully. Also, high use of petrol and diesel leads to pollution in the environment and there are many gases from exhaust like NOx, CO2 and PM Etc. For this reason, many countries have started working with electric vehicles and hybrid vehicles and also started implementing this technology. Hybrid technology is the best way to save the fuel and also reduce the pollution and easy to implement in India, because there are many electric vehicles are available; but there are no more charging stations are available in India; but still India is working on charging stations. There are few hybrid bikes are available in the market and are not implement with high and new technology; but our aim is to make the hybrid bike that implemented with all new and high technologies that make it unique. For this we take survey on prices of petrol and diesel by going on petrol pumps and ask the public about the petrol and diesel rate and also take reaction of petrol pump employees and also public about the increasing and decreasing the price of petrol and diesel. Also, we discuss about electric bikes with people and take reactions of peoples and that reactions are such positive reaction and they said if the requirement of people had successfully completed about electric bikes, then they also happily accept electric bikes in future.[3]

3. OBJECTIVE:

3.1 To determine the specifications of BLDC motor, Battery, Controller.

3.2 To determine the solution without disturbing the petrol system.

3.3 To provide a sustainable solution on the problems of petrol bike and electrical bike*:*

By considering the disadvantages of petrol bike and electrical bike we decided to find out the golden mean to this problem by Adding the electrical driving system in the existing petrol bike.

4. METHODOLOGY:

following steps are followed while making Hybrid Bike:

4.1 Research:

Initially we did study on Electric vehicles. Form that we come to know about how electric vehicle works, its principle and different components used in electric vehicles to drive it. Along with that we did study of cost analysis of petrol bike to determine the running cost of it.

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4.2 Selection of components:

On the basis of above study of electric vehicle, we selected the components required to drive the electric system like motor, controller, battery, combined throttle valve etc. Further we worked on the selection of specification of components which are required to drive our system

4.3 Preparation of circuit diagram:

After selecting components and their specification we made a circuit diagram. It helped us in the fabrication and attachments of the components on the petrol bike. It gave us a basic idea about installation of components.

4.4 Fabrication and Attachments:

Here we made a space in an existing petrol bike for the attachments of selected components. We make a provision to install a battery and controller and other accessories like motor, combined throttle valve.

4.5 Assembly:

After finalizing the positions for the components, we started assembling it. We fitted motor at the right side of the rear wheel of bike. Then we go for fitting of battery under the seat and controller. And here after assembling all the components in the bike our final Hybrid bike is ready for the analysing and testing.

4.6 conclusion and results:

Here we carried out many trials of the hybrid bike to find out its performance parameters like average, running time, battery charging time and discharge time etc.

5. ELECTRICAL COMPONENTS AND THEIR SPECIFICATION:

Here to convert the existing petrol bike into hybrid bike by adding the electrical components in it following components are used:

5.1 BLDC Half Hub Motor:

Brushless DC motor is used to drive the system. Half hub motor is used to fit at the rear wheel of the scooter.[4][5]

Parameters	Specification
Voltage	60V
Power	1800 watt

5.2 Lithium Ion Battery:

To store the electrical energy while driving on the electrical mode the battery is used.

.

Parameters	Specification
Type	Rechargeable
Voltage	60v
Weight	5kg
Power	1800 watt

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5.3 BLDC Controller:

A motor controller may be a device or group of devices that serves to control in some predetermined manner the performance of an electrical motor. A motor controller might include a manual or automatic means for starting and stopping the motor, selecting forward or reverse rotation, selecting and regulating the speed, regulating, or limiting the torque, and protecting against overloads and faults. Motor controllers are often manually, remotely, or automatically operated. A motor controller is connected to an influence source like A battery pack or power supply, and control circuitry within the sort of analog or digital input signals.[6]

6. CALCULATIONS:

Motor specification and calculation	Battery Calculation
Rpm = 3000, Volt = 60 V, Power = 1800 W Power equation: Power = I *V Where, V = 60 V, P = 1800 W, I = 1800/60 = 30 A To find torque of the motor P = 2x3.14xNxT/60 T = Px60 / 2x3.14xN T = 1800*60 / 2*3.14*900 T = 19.10 N-m Torque of the wheel hub motor T = 19.10 N-m	To find the current Watt = 1800 W Volt = 60 V P = V x I 1800 = 60 x I I = 30 Amps

RESULTS AND CONCLUSIONS:

- Battery cost - 48000 /-
- Fuel cost (1 Full charge Battery) - 15 /=
- Mileage (1 Full charge Battery) – 45(approx50) Km
- Running cost of the vehicle per Km - /=
- Speed of the vehicle-Max speed 55-60 Km/hr.

The below table shows the comparison between petrol bike, electric bike and hybrid bike tested under normal conditions.

Sr. No	Mode	Person's weight(kg)	Price (Rs)	Distance (KM)	Price Per Unit Distance (Rs)
1.	Petrol	60	120	30	4
2.	Battery	60	15	50	0.3
3.	Hybrid Bike	60	125	80	1.5

The project discloses a hybrid system consisting of an electrical and combustion (IC) based power drives. The rear wheel is being propelled by battery and also powered by electric DC hub motor, i.e., it includes one

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cylinder, air cooled combustion engine and a BLDC motor based electrical power drive used for hybrid powering of the vehicle. The controller is meant to vary the speed of hub motor. it's great advantages over the previously used internal-combustion engine that's driven solely from gasoline. This hybrid combination makes the vehicle dynamic in nature and provides its owner a far better fuel economy and lesser environmental impact over conventional automobiles.

HEV is a vehicle that uses two sources of power- petrol and battery. In heavy traffic and inside the city there is no chance for moving fast. At that time, if vehicle is run by IC engine, more fuel is wasted due to variation of acceleration. If the vehicle is run electric hub motor through battery, the consumption of power is reduced. The technology of hybrid petrol electric bikes is an emerging field in now a day and the total turn one on these types of vehicles very profitable for the future and solves the issue of natural resources scarcity and is an eco-friendly bike. This type of vehicle is very cost effective for middle-class families. As this hybrid vehicle emits 50% less emission than normal vehicle it plays an important role for reducing pollution to certain extent without compromising with efficiency. The project focuses on constructing a hybrid bike with a minimal additional weight that is capable of greater efficiency through its use of regenerative motor and various other mechanisms.

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Development of Log making Machine for Kitchen Food Waste

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ABSTRACT:

In every kitchen, left-over organic matter is required to be recycled because it can be hazardous and further, the waste should be stored in a certain way. Tons of kitchen wastes are produced daily in highly populated areas.The trash heaps are usually left open to the environment and the elements. Landfill, recycling, animal feed, biological reprocessing, incineration, composting are the basic methods used in India. To overcome this, a machine that disposes your catering and food business with comprehensive kitchen waste is developed. In this project, the waste food from dumping yard or from different municipality bins in the city is collected. Further, the collected food from different bins is needed to dry in sunlight, and the dried food waste is put into the mixture which makes it uniform and chop. After this mixture falls in the hopper by gravity it falls into drum. Drum consists of screw conveyor, the main function of screw conveyor is to transfer and compress this food to the end of die. The end die is a square in shape so that the log shape will be as a bricks. By checking the nutrition value of this log, it can be sent for cattle feeding and/or by checking burning value, it can be used as burning material. So, this project is useful for the kitchen waste management.

Keywords: Compositing, Kitchen Waste, Log, Recycling, Screw Conveyor.

1. INTRODUCTION:

Food waste management in India is becoming a critical problem due to the continuous increase of the Indian population. Indians waste the maximum amount of food as much as the whole of the UK consumes – a data point which will not be most indicative of our love of surfeit, because it is of our population. Most of the food is wasted in weddings, canteens, hotels, social and family functions, and households. Still, food wastage is a horrendous issue, so is food waste management in India. Our streets, garbage bins, and landfills are spoiling our environment and have sufficient evidence to prove it. This specific project deals with an early problem. i.e.

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food/ kitchen waste. As we are from the Pandharpur city, situated in Maharashtra. We get this idea by analysing/observing our city. City Pandharpur, also famous as South Kashi of Maharashtra. Around 1.2 million pilgrims visited the Pandharpur city during the "Wari" period. In one year 4 major Waari held that attracts the lots of pilgrims. The arrived Pilgrims take a stay around 1-2 days under the umbrella of Lord Vitthala.The pilgrims who are coming in Pandharpur for them a lot of food made and near about 30-40% food gets waste, that waste food gets dumped in to the dumping yard. Lots of Pilgrims throw the food into dustbins, some at the side of roads, so it's getting hard to collect separately the food waste. And due to the rush time municipality did not get enough time to separate it, so they dumped it all waste/garbage.We are proposing an Idea to collect the food waste separately and start working on it to make the billets/logs from it.

2. OBJECTIVES

2.1. To study the different food waste techniques.

2.2. To developed a model of Log making machine by using software.

2.3. To fabricate the developed model of Log making machine for Kitchen waste.

2.4. To analyse the performance of fabricated model.

3. METHODOLOGY

3.1. Study of food waste management system.

3.2. Analysis of problem and find solution.

3.3. Make final design of log making machine.

3.4. Developing model using Catia.

4. DESIGN & WORKING PROCEDURE

4.1. PARTS DETAIL

4.1.1. Mixer

Mixer is used to chop the food waste and make it into uniform, the mixer situated above the hopper in such a way that food waste coming out of the outlet of the mixer will fall into the hopper.

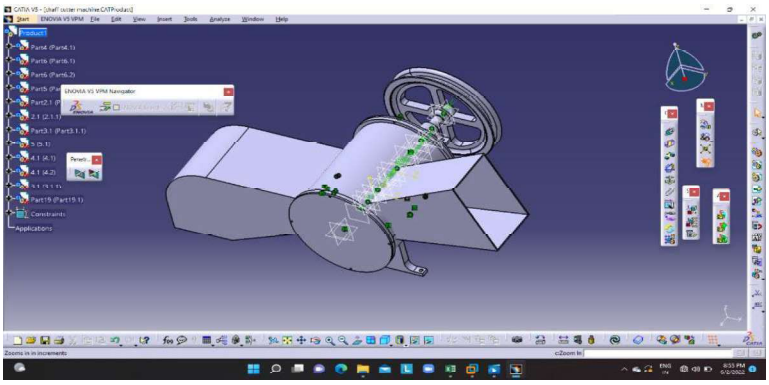

Fig 1: Mixer

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4.1.2. HOPPER

The crushed food waste is feed into the hopper. The food waste slides over the hopper by gravity into the drum. Hence the hopper is designed as conical shape.

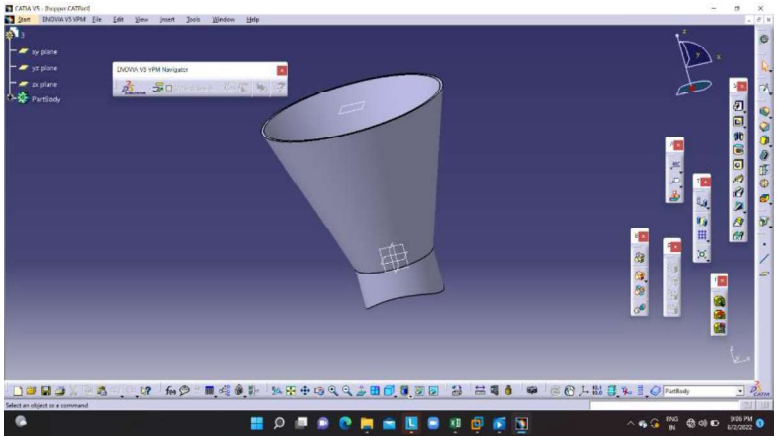

Fig 2: Hopper

4.1.3. DRUM

The drum is used to collect the food waste from the hopper. It is also used to store the food waste. The die is attached at the one end of the drum. The screw conveyor is placed inside the drum. It also acts as a support for the screw conveyor. The food waste extrude from the drum should acquires a cylindrical shape, so that the square shaped die is placed at the one end of the drum. The food waste is made to pass through the die which is push by the screw conveyor.

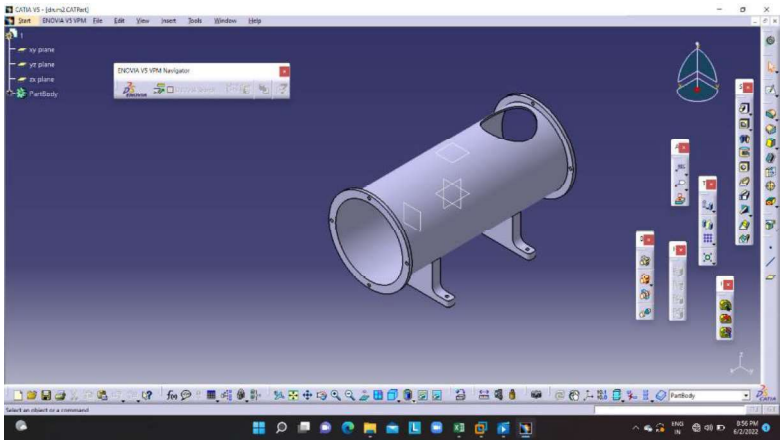

Fig 3: Drum

4.1.4. SCREW CONVEYOR

The purpose of the screw Conveyor is to transfer and compress the crushed food waste and also pushes the food waste to extrude it through the die. It consists of hollow cylindrical shaft consists of screw plates. The one end of the hollow shaft is coupled with the pulley and the other end of the shaft is simply mounted at the end of the drum.

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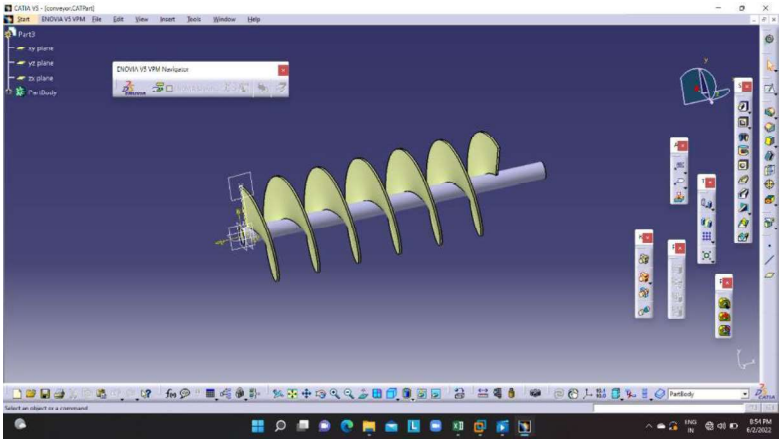

Fig 4: Screw Conveyor

4.1.5. STAND

The stand is designed for supporting the whole assembly.

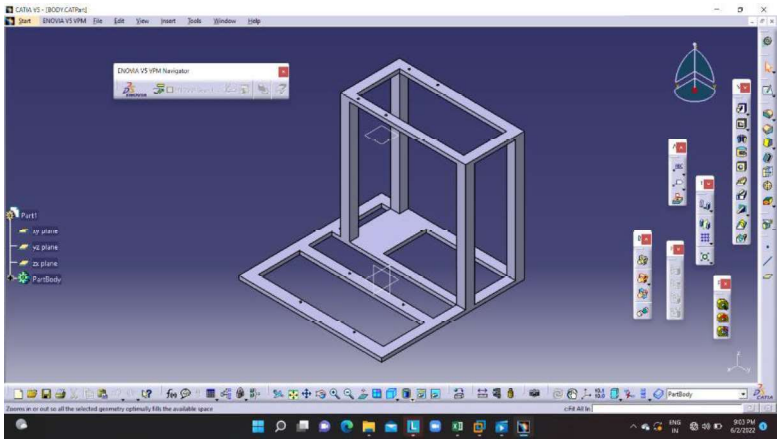

Fig 5: Stand

4.1.6. BEARING

Bearing should be attached to the motor side of the drum. Bearing is used to reduce friction and allow free rotation of the screw conveyor and mixer.

4.1.7. ELECTRIC MOTOR

To rotate the conveyor and mixer AC motor is used.

4.1.8. PULLEY

Pulley is used to transfer the power from the motor to the screw conveyor and mixer by reducing the rotations. Two pulleys are used one for the conveyor and another for the mixer.

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4.2. FINAL DESIGN:

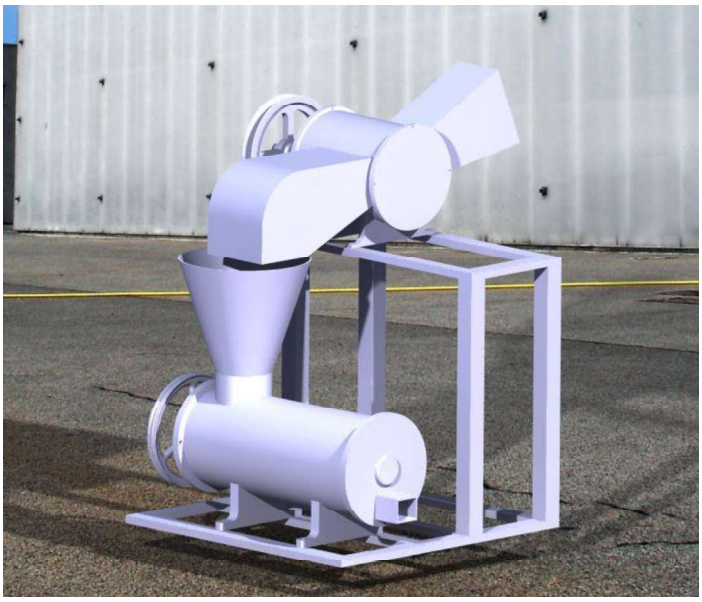

Fig 5: Final Design

4.3. WORKING PROCEDURE

In this project, the waste food from dumping yard or from different municipality bins in the city is collected. Further, the collected food from different bins is needed to dry in sunlight, and the dried food waste is put into the mixture which makes it uniform and chop After this mixture falls in the hopper by gravity it falls into drum. Drum consists of screw conveyor, the main function of screw conveyor is to transfer and compress this food to the end of die. The end die is a square in shape so that the log shape will be as a bricks.By checking the nutrition value of this log, it can be sent for cattle feeding and/or by checking burning value, it can be used as burning material. So, this project is useful for the kitchen waste management.

5. CONCLUSION

Kitchen waste material is converted into log which will be useful for

1. After checking the nutrition value of log material we can use for animal food purpose.
2. We can also use for burning purpose.

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DEVELOPMENT OF AUTO FEEDER MECHANISM FOR CRICKET BALL THROWING MACHINE"

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ABSTRACT
Cricket is one of the most popular games in India. We have developed an automatic feed mechanism for cricket ball throwing machine to help young and passionate players improve their cricket skills. The mechanism consists of a DC geared motor with ribs connected to a shaft. The motor rotates at a specific interval desired by the user. The rotating fins push the ball into the ball-throwing machine. The rotation of the DC motor is detected by an induction sensor and sends a signal to the PLC. This program is designed to control the time interval at which ball is delivered to a throwing machine. This eliminates the external effort required to feed the balls in turn to the cricket-throwing machine
Keywords: DC geared motors, PLC, cricket, machine, External Efforts etc.

I.INTRODUCTION

In today's highly competitive world, every job requires maximum practice to achieve the required skills. In cricket, a bowling machine is a device that repeats the throwing of a ball of a certain length,line, and speed so that the batter can practice (usually on the net) and hone certain skills. In the context of unprecedented pandemics and the uncertainty of the physical crowd, the need for these machines for batters becomes more acute. 4,444 professional cricketers train for an average of about4-6 hours each day over 5 days a week. This includes network training and various forms of trainingsuch as flexibility, strength and conditioning, stamina building, gym and reflexes, fighting, bowlingand playing on the pitch. Even beginners need a fair amount of ball play practice. Usually bowling

alleys exist to throw the ball to the batter, but if you continue bowling with the same energy, your body gets tired. This is why you need a cricket ball throw that can run continuously at a certain length and speed. Also, the for this ball throwing machine there is need of certain external human efforts to feed ballsinto the machine which is very hectic job for human being to do it for long period of time.

During this pandemic times it becomes necessity maintain the COVID protocol and avoid unwantedgathering of people.

II.METHODOLOGY

1. Conceptual design:

In Auto feeding Mechanism We have used a storage rack to store the balls. The Capacity ofthis Rack is calculated to be 36 Balls. This Mechanism is feasible and easy to use.

Figure 1.CAD Model of mechanism

The storage medium was made of acrylonitrile butadiene styrene (ABS). It is mounted on the ball launcher at an angle of 7°.

This mechanism consists of a 12 V dc gear motor with fins mounted to the shaft. Fins Help put the ball in turn into the Ball throwing machine. An inductive sensor is used to sense a rotation of a DC motor and send a signal to a programmable logic control called a PLC. Power for the PLC is providedby a switched-mode power supply with an output of 8.8A. Three switches are used. When the first switch is turned on, it sends a signal to the PLC and the PLC sends an output according to the programbeing downloaded. A program has been developed in three time periods, i.e., 20 seconds, 30 seconds, 40 seconds. The beep will always sound for 2 seconds at the end of each time cycle. When the time is up, the motor starts to spin and the ball is put into the Ball throwing machine. When the motor finishes one revolution, the induction sensor sends a signal to the PLC and stops the motor and startstiming for the next cycle. If, in the case of a user turning on one or more switches at the same time,an arrangement shall be made so that

the beeps sound continuously until the single switch or noneremains ON.

2.Closure:

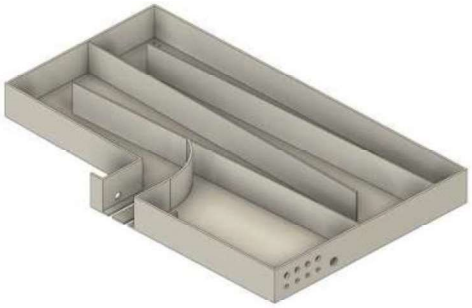
Above chapter briefs us about construction and working of Auto feeding mechanism for ballthrowing machine

III.List of Components –

1.Metal Componant

A. Storage Rack:

Storage Rack is manufactured from acrylonitrile butadiene styrene (ABS). The part is manufactured by using 3D printing process. The reason behind using this material is that this material offers high strength and toughness and also this material comes with glossy and finished look. The dimensions of storage rack are 900*550*90 mm.



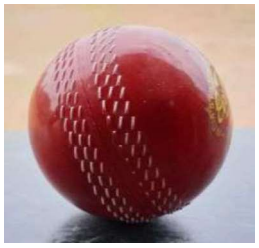
B. Motor:

Motor is used to rotate the fins which in turn pushes the ball into the ball throwing machine.Motor specifications:

Type:	DC motor
Max Torque:	4 Kg-cm
Speed:	10 rpm
Voltage:	12 V
Current:	450mA
Weight:	150 gm

C. Synthetic cricket ball:

The balls which we have used for the designing the Auto feeding Mechanism is SyntheticCricket Ball .



Ball specifications

Diameter: 63 mm

Weight: 70 g

D. Supporting stand:

To support entire storage rack stand is required. The storage rack is made of Mild steel

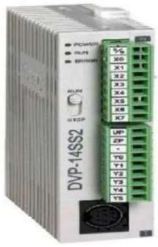
E. Fin:

For applying motor torque on ball, we have attached Fin on shaft of motor. With the help of thisfin ball is push forward.

2.Electrical components

A. Programmable Logic Control (PLC)

switched-mode power supply supplies power to the PLC. The negative voltage from SMPS is given to S0.X0 is connected to main ON/OFF switch. X1 is connected to one end of Inductive sensor. While X2, X3, X4 are connected to the three switches. Positive voltage from SMPS is given to the C0. While Y1, Y2 are connected to positive ends of Relay



B. Switched-Mode Power Supply

Specifications: Current: 8.8AmpVoltage:24V

C. Inductive Sensor

It is used to sense one revolution of shaft of DC motor. When DC motor completes onerevolution it is sensed by inductive which in turn sends signals to the PLC.

D. DC to DC convertor

As the output coming from SMPS is 24V and our motor and Beep requires 12V supply we haveuse DC to DC convertor. After converting the voltage, the output of DC convertor is given to motor and beep

E. Beep

A beep is used to alert the batsman that ball will be delivered in short time

F. Switches

Switches are provided so that user can select any one of the time interval which he/she wants.

G. LED

16 mm LED is being used which indicated which switch is ON/OFF

IV. Calculations

For the proposed Auto feeding Ball throwing Machine we need a dc motor. For pushing the ball into the machine, we need to calculate the required torque.

a) Torque Calculation

Mass of the Ball (m)=150gm=0.15 kgCoefficient of Friction(μ)=0.4 Diameter of Ball(d)=70mm

Force due to weight= m*g

=0.15*9.81

= 1.4715 N

Normal Force = Force due to weight

=1.4715 N

Force due to Friction = μ* Normal Force

=0.4*1.4715

=0.5866 N

Total Force = Force due to weight + force due to friction

= 1.4715+0.5866

=2.0601 N

Perpendicular Distance=76.75 mm

Perpendicular distance * total force

= 76.75*2.0601

=158.11 N-mm

=0.15811 N-m

The torque required to push the ball into the machine is 0.15811 N-m

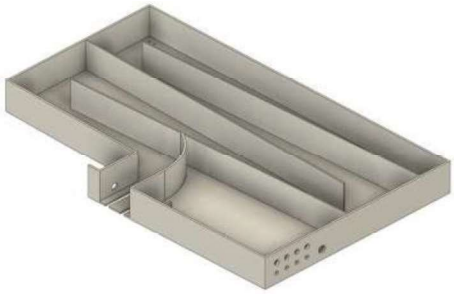
We have used Storage rack made up of acrylonitrile butadiene styrene (ABS). Its is required tocalculate quantity of balls that can be stored into the storage rack

b) Closure:

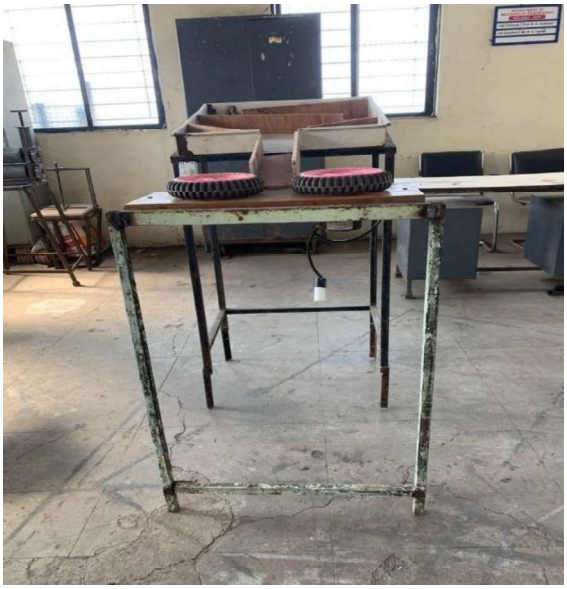
This chapter briefs about the torque calculation

V.FIGURES AND TABLES

V.1 CAD Model of mechanism



V.2 Storage Rack



V.3 Final Modules

CONCLUSION

➢ Cost of ball throwing machine around 2.7 lack which is too expensive because it developed byforeign manufacturers, but there has no existing machine that has Auto feeder mechanism installed. So that is not affordable to local Academy and institute

level practice purpose.

- It becomes a hectic job for a person to feed balls one by one into the ball throwing machine. For this purpose, there is a need to affordable Auto feeder Mechanism for Cricket Ball throwing machine

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DESIGN AND DEVELOPMENT OF ONION SEGREGATION MACHINE

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ABSTRACT
Onion is an important vegetable crop which is seasonal in production but grown all over the India. According to journey of market six of bulbs plays an important role in its price large size onion bulbs produced in Gujarat, Maharashtra, Karnataka & Tamilnadu and are exported from Mumbai & Kolkata ports to Dubai, Kuwait, Saudi, Singapore. Small size onion bulbs produced in Karnataka & Andhra is exported from Chennai to Singapore, Srilanka and Other countries while medium bulb type onion stored for long term storage. Roller segregation is fast & accurate but a little damage to bulbs. Literally it is solution over consuming, labor intensive which improves economic considerations of farmer. Grading of onion bulb is usually important steps in processing operations which brings overall improvement not only in Marketing system but also in raising its quality. In India traditional method is followed which is manual segregation. Onion grades were developed but that cost more than usual & is not affordable by ordinary farmers. So, keeping in view we have designed onion segregator based on chain arrangement.

Keywords: Segregation, Onion Bulbs,PLA, 3D Printing, Onion Graders.

1. Introduction

Onion is one of the important crops cultivated in India. India is the second largest producer of onion in the world.

Improvement of quality and value addition of agricultural produces has gained higher concern in recent times in India due to creation of new opportunities for sale of agricultural commodities in open market at competitive prices. Until now almost everywhere in India, the onion segregation is done manually.

This manual segregation increases the cost of onion tremendously to customers and to producers. The manual segregation also needs more labour. Now the need of automation arrives in the agricultural sector also due to the higher competition from across the globe. So, we have to increase the quality and efficiency of the segregation process. This type of new ideas will surely help a lot of people, to focus back to agriculture and this will lead to new innovations in the agriculture sector. Segregation according to the sizes is an important value adding technique for most agricultural products. And also, the price of the many agricultural products varies significantly according to their uniformity in size. Uniformity in size not only makes the product more attractive to consumers but also improve its processing qualities. In order to achieve uniform size of onion the proper segregation is required, with the aid of automation that goal can be achieved.

A simple, manually operated machine is designed and developed for grading onion bulbs. The grader was fabricated in the Arunoday Enterprises, Kolhapur. The following factors were considered while developing the grader: (a) Suitability of machine for the grading of onion bulbs in the fields. (b) Ease of operation and maintenance. (c) Energy efficient and low cost of operation. (d) Minimum damage to bulbs.

The developed prototype On-farm Onion Grader Unit consisted of (i) Feed hopper, (ii) Rollers, (iii) Collection unit, (iv) Mainframe

Feed hopper

The horizontal section of feed hopper is rectangular in shape and is fabricated out of PLA Polylactic Acid of 5 mm thickness. The hopper was inclined for smooth delivery of bulbs over rotating rollers.The feed hopper was mounted on the main frame to feed the onion bulbs on to the grading unit.

Collection unit

The Collection unit partitioned into four compartments on one side. The first compartment was located from the start of feed end of the roller, while the second and the third and fourth compartment were provided at some distances respectively, from the feed end to the rear end. This was arranged based on the required grade of onion and space between the rollers available above the compartment. The overall dimension of the collection unit is measured in millimetres. The collection unit is provided with vertical dividers to guide the bulbs in appropriate compartments.

Main frame

The feeding hopper unit and the collection unit all are assembled on a structural frame. The main frame of the machine was fabricated out of rectangular bar mild steel. The machine is having length of 30-inch, width of 7 inch and height of 15 inch. We have assembled some of the parts with each other with the help of glue gun.

Roller

There are four rollers which are mounted on the four shafts. These shafts are mounted parallelly. Over the first roller we have made holes of diameter 15 mm, 25 mm diameter holes over second roller, 35 mm diameter holes over second roller, 45 mm diameter holes over second roller for the purpose of separation of onion through holes.

Material Selection

PLA

1. PLA material boasts high strength and stiffness, comparable topolystyrene (PS) at room temperature.
2. Energy consumption by PLA while production is less than other plasticand greater thermal processing capabilities.
3. It is a thermoplastic which means it can be reheated several times withoutany significant change in the mechanical properties.

ABS

1. High impact strength and ductility, which combine to give exceptional toughness.
2. Good chemical resistance.

3. Design of Machine

CATIA V5 (Version 5) is primarily a CAD software used for parametric and non-parametric modelling. It is capable of working alongside products with different brands. CATIA V5 is modular, meaning customers can buy as much or as little functionality as required.

We have designed the total model of our project on CATIA V5 Software.

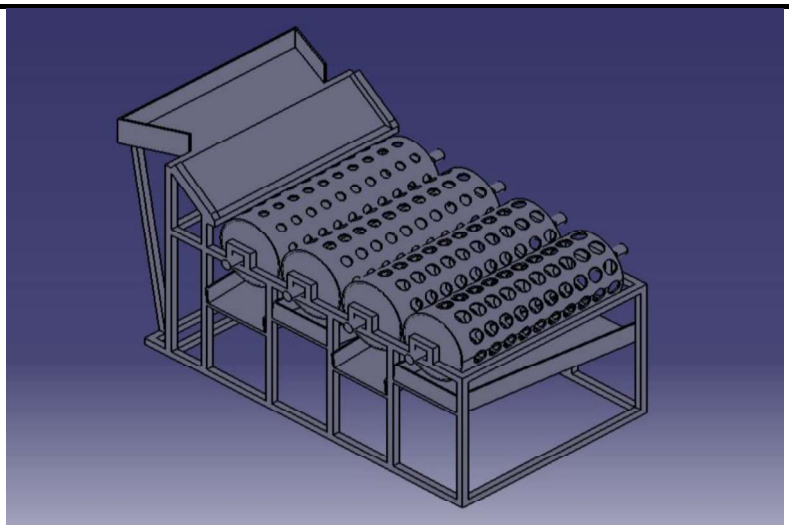

Figure 1: Design of Machine on CATIA V5 Software.

3.Development of Machine

Rollers

Rollers of the machine are made using material called PLA (PolylacticAcid).

Figure 1: Different Types of Rollers.

Figure 2: Top View of Machine

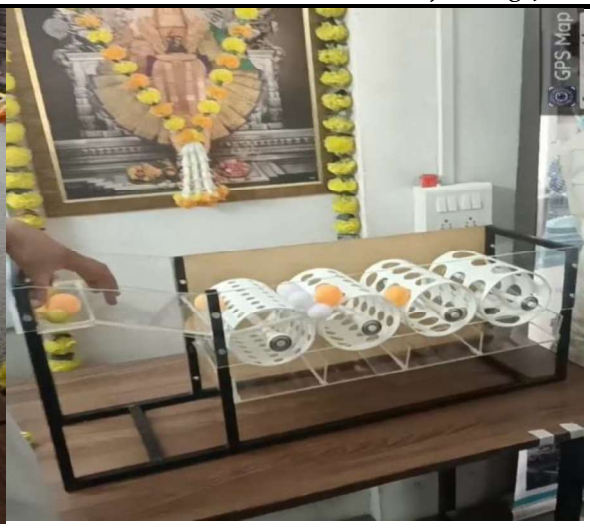

Figure 3: Front View of Machine.

4. Result and Discussion

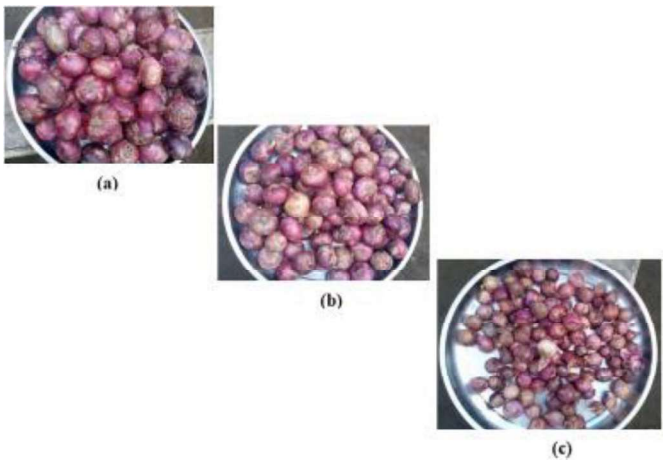

Figure 4: Result after Sorting.

The first roller separates the onion having diameter size less than 15 mm, second roller separates the onion having diameter size less than 25 mm, third roller separates the onion having diameter size less than 35 mm and fourth roller separates onion having diameter size less than 45 mm.

The percentage of feed collected and percentage of target onion size collected from a particular outlet was calculated by using the following relationships:

Feed collected (%)= (Weight of onion in the outlet (kg) /Weight of feed (kg)) * 100

[Target onion size collected (%)] = Weight of target size collected in the outlet (kg) / Weight of onion in the oulet (kg) x100

Bulb damage

The mechanical damage to onion bulbs during grading operation was determined by visual observation.

The graded bulbs were manually sorted for damage of bulbs due to abrasion and the weight of total damaged bulbs collected in each outlet was noted. Thereafter, the damage percentage was computed using the following relation:

Mechanical damage (%) = (D/W)×100

Where,

D = Weight of damaged onion bulbs in all outlets, kg

W = Total weight of onion bulbs in all outlets, kg

Grading capacity

The grading capacity of the onion grader was estimated by weighing the total onion bulbs collected per unit time from the all outlets of the grader and was calculated by using the following relationship:

Grading capacity (kg/h) = Weight of onion bulbs collected in all outlets(kg) / Grading time (h)

5. Conclusions

An efficient, fast, precise and automatic system for Grading of different varieties of onions. It can be an alternative to the traditional methods with better productivity and effectiveness. We have developed and implemented a working model of onion grading machine successfully with very effective performance. From this model of onion grading machine, we have studied many the mechanical concepts which comes under this project.

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Students participation Project Competition

A.Y. 2021-22

Sr. No.	Name of Students	Details of Achievement
1.	Amol Dhondiba Sul Atharv Santosh Joshi Prakash Bhimrao Ghadage Prathmesh Ramesh Kirgat	**Best Paper Presentation Award** in Mechanical Engineering Stream in National Conference on Relevance of Engineering and Science for Environment and Society – R{ES}^{2}, 2021.
2.	Madan K. Patil	**2nd Prize in ASHRAE Pune Chapter** - Student Design Competition - Paper presentation 02 Oct. 2021 and won prize of Rs. 2000/-.
3.	Pranay Disale	**Second Rank** for the project at National Level Project Competition (BVPROTECH-2022)
4.	Salena Mirajkar Vaishnavi Lakheri Madhuri Parchandrao	**2nd Prize** in National Level Paper and Project Competition

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Head, Mech. Engg. Dept

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Accredited with B++ Grade by NAAC

AiJR Publications

National Conference on

"Relevance of Engineering and Science for Environment and Society "

R{ES}^{2}, 2021

Certificate of Participation

This is to certify that, **Amol Dhondiba Sul** of **SVERI's College of Engineering, Pandharpur** has participated in National Conference on **R{ES}^{2}, 2021** organized by **Karmayogi Engineering College, Shelve, Pandharpur** on Sunday, 25th July 2021 and presented a research paper titled **"Fabrication of Micro-channels using CO2 LASER Machining & Soft Lithography for Lab on Chip Applications."** This paper has awarded as **Best Paper Presentation** in **Mechanical Engineering Stream.**

Ms. P. B. Jadhav	Ms. J. K. Hipparkar	Prof. Dr. Abhay A. Utpat	Prof . Dr. S. P. Patil
Sub-Coordinator	Sub-Coordinator	Convener	Principal

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This is to certify that, **Atharv Santosh Joshi** of **SVERI's College of Engineering, Pandharpur** has participated in National Conference on **R{ES}^{2}, 2021** organized by **Karmayogi Engineering College, Shelve, Pandharpur** on Sunday, 25th July 2021 and presented a research paper titled **"Fabrication of Micro-channels using CO2 LASER Machining & Soft Lithography for Lab on Chip Applications."** This paper has awarded as **Best Paper Presentation** in **Mechanical Engineering Stream.**

Ms. P. B. Jadhav	Ms. J. K. Hipparkar	Prof. Dr. Abhay A. Utpat	Prof . Dr. S. P. Patil
Sub-Coordinator	Sub-Coordinator	Convener	Principal

STUDENT DESIGN COMPETITION-PAPER PRESENTATION

02 OCT 2021

Student Design Competition (Paper Presentation) was organized on 02 Oct 2021(ONLINE).Presentation on various topics were done by students of Engg Colleges of Pune.

Based on psn, following prizes were given

1. First Prize (Rs 2500/-) – Mr Vicky K Nannaware – JSPM College of Engg, Hadapsar,Pune
2. Second Prize(Rs 2000/-)- Mr Madan K Patil – SVERI College of Engg, Solapur
3. Third Prize (Rs 1500/-) –Mr Sufal S Jain- MMCOE. Karvenagar, Pune
4. Consolation Prize(Rs 500/-) –Mr Kalpesh Ketkar- DYPCOE, Akurdi,Pune

First Prize winner will represent ASHRAE PUNE Chapter in Student Design Competition-Paper Presentation at **ASHRAE RAL (Region at Large/ 18 Countries/31 Chapters)** Level to be held on 23rd Oct 2021 online.

Congratulations to ALL!!!!!!!!!!!!!!!!

(K K Ghosh)

Secretary & Student Activity Chair

BHARATI VIDYAPEETH
(DEEMED TO BE UNIVERSITY),
COLLEGE OF ENGINEERING, PUNE

Department of Mechanical Engineering

CERTIFICATE OF APPRECIATION

This is certificate is presented to **Pranay Disale** for securing the **Second** rank for the project entitled **Digital Device for Measurement of Geometrical Tolerances of Gear Blank of Planetary Gear Box** at **"National Level Project Competition (BVPROTECH-2022)"** held on *21st May 2022* organized by BV (DU), COE, Department of Mechanical Engineering in association with SVR InfoTech, Pune.

Dr. D. G. Kumbhar	**Dr. K. B. Sutar**	**Dr. V. S. Sohoni**
Coordinator, BVPROTECH-2022 Associate Professor, Department Mechanical Engg.	Conveyor, BVPROTECH-2022 Professor & Head, Department Mechanical Engg.	Chairman- BVPROTECH-2022 Principal BV (DU), COE, Pune.

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This is to Certify that Mr./Miss. Madhuri Parchandrao

of S.V.E.R.I.S. Pandharpur has secured ~~First~~ / Second / ~~Third~~ prize in

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Best AWARD

CERTIFICATE OF ACHIEVEMENT

This is to Certify that Mr./Miss. Saleha Mirajkar

of S.V.E.R.I.S. Pandharpur has secured ~~First~~ / Second / ~~Third~~ prize in

National Level Project / ~~Paper~~ Presentation Competition held on

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Dr. D. M. Patil
Convener

Dr. S. V. Anekar
Principal

MEDIA PARTNERS

Model Development

SVERI's, College of Engineering, Pandharpur

Mechanical Engineering Department

Model/Product Development

A.Y. 2021-22

Sr. No.	Name of Product developed
1.	Onion Planting Machine
2.	Mulching Machine
3.	Solar Operated Weeder Machine
4.	Solar Operated Multipurpose Lifter
5.	Sugarcane Lifting Machine
6.	Multipurpose Fertilizer Spreading Machine

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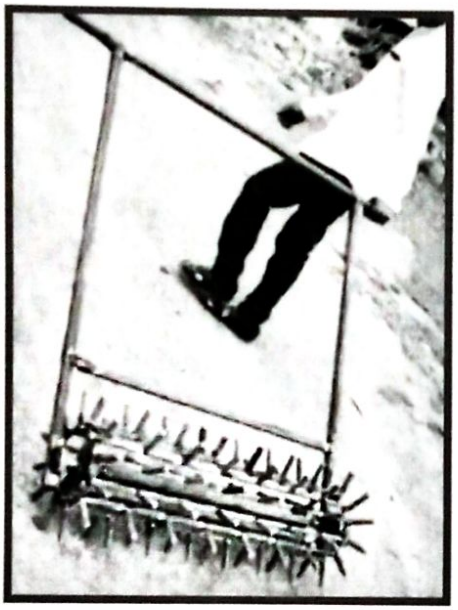
SVERI's College of Engineering, Pandharpur
Department of Mechanical Engineering

Product Development (A.Y. 2021-22)

Product: Onion Planting Machine

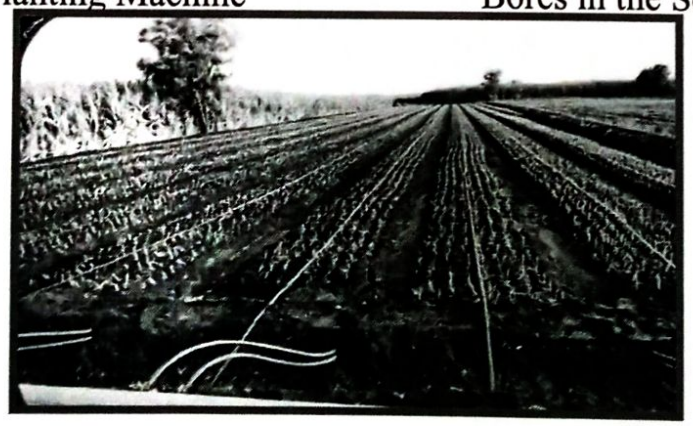
Scope: Now a days, it is quite difficult to find the spare labors for the agriculture work and there is need to develop new mechanisms/machines which will reduce human efforts.

Fabricated Machine: This project is meant to debate the look for onion boring machine. This machine is used for the agricultural purpose and it is also employed in the farming. It works on the human efforts which Is to be applied on handle of machine



Onion Planting Machine

Bores in the Soil for planting



Deployment of Technology

Description: This machine consists of two circular rings which are connected by two rods. As this ring is going to rotate so for this purpose rings are

	connected by one another rod which is placed centrally. To support rotating rings bearings are also used for smooth operation. Inside the rings number of equispaced slots is created. In these slot number of rods are attached. On these rods number of holes is created in which tubes are placed which will create the holes in the land for farming of onion.
Application:	For onion planting
Benefits:	Increase the production rate by reducing the efforts of farmer and by increasing the production quality

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Product Development

Product :- Mulching Machine

Scope:

- For laying plastic paper (mulch) in the farm and punch a hole on paper for plantation in one pass, mulching machine is required
- As manual work becomes automated the working is easy and time efficient
- Automatic covering of paper edges with the help clay carried out rapidly.

Fabricated Machine:

Specification

- Available from 2.5 feet to 4 feet
- Capacity:- 1 Acres per 30 min.

Application

1. To lay plastic mulch and punch a hole on paper in one pass.
2. To complete all above operations in minimum time.
3. To reduce the cost of machine, this eventually reduces the investment of small farmers.

Benefits

Available for any covering size, Increases in work efficiency.

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Product Development

Name of Product: Solar Operated Weeder Machine

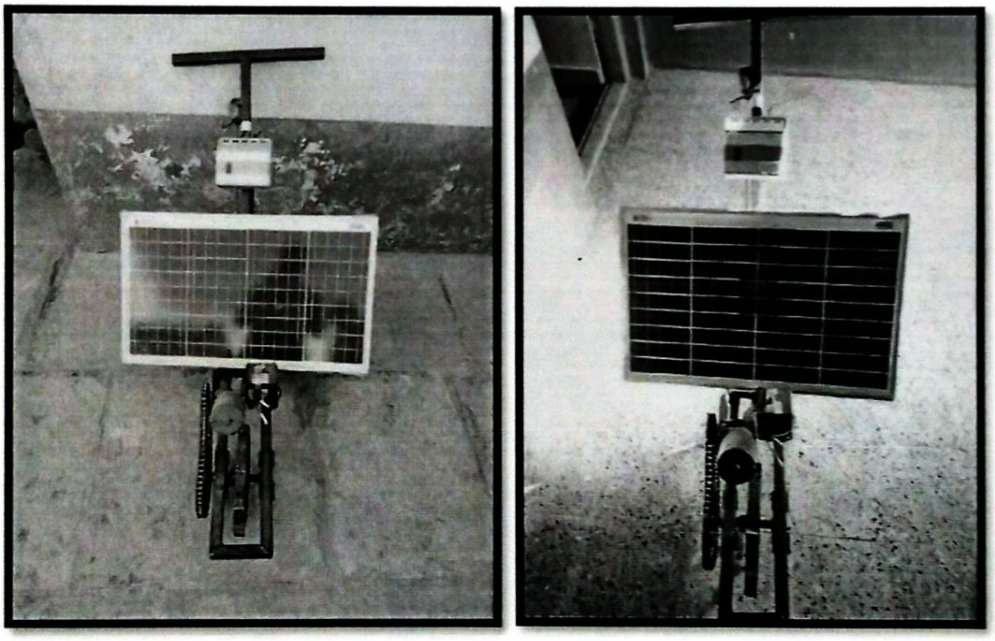
Scope: Solar powered weeding machine is suitable for weeding purpose and have no side effects. It avoids the use of any chemicals and hence prevents the crops from chemicals. And also it is operating by using natural energy.

Application: It is used for weeding crops.

Benefits:

- It reduces farmer efforts.
- It reduces farming cost.
- It reduces cost of weeding.
- It is maintenance free machine.
- No electric power required.

Photograph:



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Product Development

Name of Product: Solar Operated Multipurpose Tiller

Scope: Solar operated multipurpose tiller operates on the solar power and due to which labour cost is reduced and also reduce human efforts. Our Multipurpose Tiller is used for various farming operators as it is provided with detachable blades assembly.

Application: It is used for the trilling, bowing and removing weeds.

Benefits:

- It reduces farmer efforts.
- It reduces farming cost.
- It reduces cost of weeding.
- It is maintenance free machine.
- No electric power required

Photographs:

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Product Development

Name of the Product: Sugarcane Lifting Machine

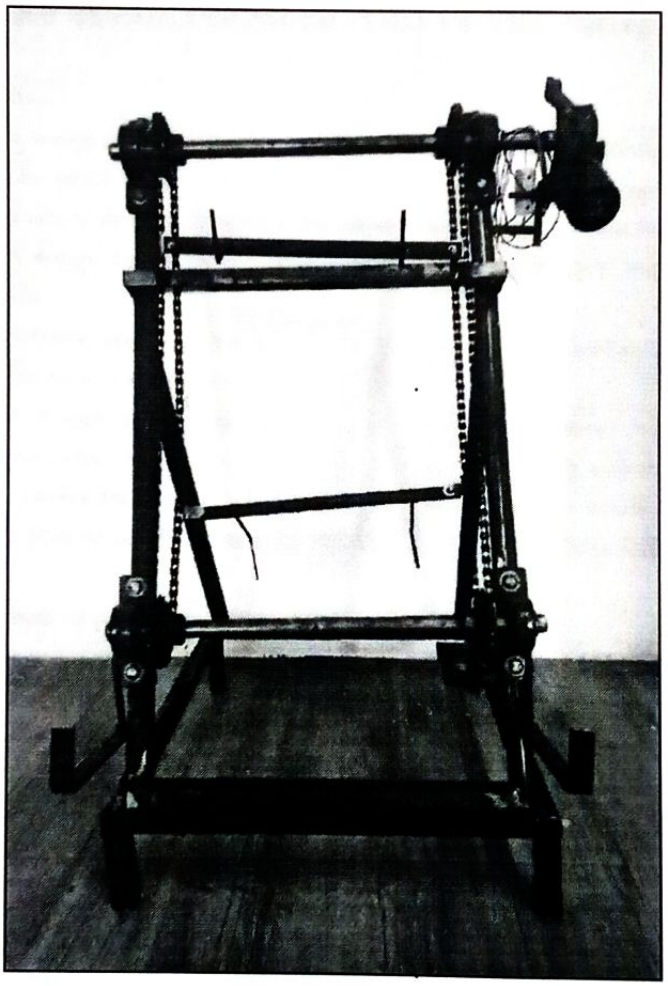
Scope: In this project the proposal concept is to replace the manual work of sugarcane lifting by automated system. Now a day's even through automation plays a vital role in all industrial applications in the proper lifting of sugar cane from industries.

Applications: It is used for lifting the sugar cane in farm reduce the human efforts.

Benefits:

- It reduces labour efforts
- It is maintenance free machines.

Photograph:



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Product Development

Name of Product: Multipurpose Fertilizer Spreading Machine

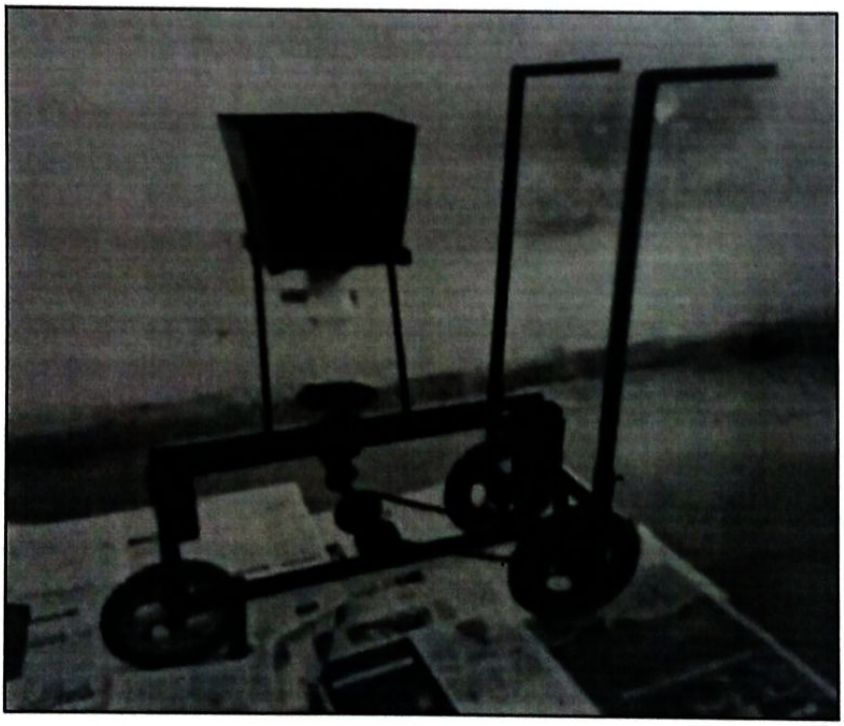
Scope: As day by day the labour availability becomes the greater concern for the farmers and labour cost is more. This machine reduces the efforts and total cost of throwing of fertilizer.

Application: It is used for the throwing the fertilizers.

Benefits:

- It reduces farmer efforts.
- It reduces cost of labours.
- It is maintenance free machine.
- No electric power required

Photographs:



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