L D College of Engineering, Ahmedabad
Mechanical Engineering Department
Report on Online Kaizen 2020

1. Brief Description of the Event:

Schedule of online evaluation: 05 April 2020 to 09 April 2020
Number of students participated: 151
Number of faculty members as Evaluator: 16
Involvement of project Guides: 38
Number of Project evaluated: 38

Mechanical department evaluated 38 projects through various online platforms for online Kaizen-2020. Constructive and motivating suggestions were given by evaluators to the students for completion of remaining part as well as for further improvement. The evaluation consisted of online meeting using different platforms, assessment of poster of project, mentoring for further enriching the projects, implementation of suggestions given during 1st and 2nd Interim Review and reports if any. Students participated with very much enthusiasm and passion. All the faculty members of the department encouraged them to develop positive attitude in this difficult situation. One group from East India (Nagaland) was also part of the evaluation process. Following are the details of the evaluation.

Group No.	Enrollment No.	Name of Student (Surname first)	Title of the project	UDP/ IDP	Project Guide	Evaluator	No. of students present online	Online platform used for the interaction
M01	170283119022	Rayma Irshad Jusabbhai	Increasing the concentration of effluent using solar energy	IDP	Dr N M Bhatt	Dr. R. G. Kapadia	4	Duo
	170283119024	Santani Harsh Gopaldas						
	170283119029	Thakar Ravi H.						
	170283119031	Vaghela Nimesh Atulbhai						
M02	160280119100	Saumitra Kumar Singh	Numerical and	UDP	Prof. Mayur M	Prof. R O	4	Zoom

	160280119105	Shah Shashwat Chandreshbhai	experimental investigations of rocket nose.		Makwana	Paliwal		
	160280119112	Tanwani Niteshkumar Kamleshbhai						
	160280119122	Tamboli Wasim Bashir						
M03	160280119005	Bhatt Vedant Devendrakumar	Semi-automatic electric arc welding machine	IDP	Prof. Y. D. Vora	Prof A V Patel	4	Email and WhatsApp
	160280119033	Gujarati Chintankumar Sunilbhai						
	160280119046	Limbani Prit						
	160280119055	Pansuriya Abhishek						
M04	170283119018	Patel Malhar Kaushikbhai	Automatic type pressure monitoring and control system	UDP	Prof. D. M. Chandra	Prof. H. P. Patel	4	Email
	170283119027	Sonagara Devang Manubhai						
	170283119028	Suthar Jeenal Hareshkumar						
	170283119032	Vaghela Pratikbhai Vitthalbhai						
M05	160283119019	Patel Hirenkumar Vrajlal	Design and development of dual cooling system	UDP	Prof. R. O. Paliwal	Dr. R. G. Kapadia	4	Zoom
	170283119004	Chauhan Jignesh Dhirajbhai						
	170283119014	Nakum Mitesh Dineshbhai						
	170283119015	Panchal Chetankumar A						
M06	160280119093	Rana Jimil Gopalbhai	Design and Development of Self Sustaining Electromagnetic	UDP	Dr. S. S. Pathan	Prof A V Patel	4	Email and WhatsApp
	160280119120	Vegad Chirag Narshangbhai						
	160280119124	Baraiya Hemal Devji						

	160280119125	Goswami Aniket Ketan	Suspension system					
M07	170283119001	Ahir Mayur Mahendrabhai	Design and Development of Water Tank Cleaning	UDP	Dr. B.K. Patel	Prof A V Patel	4	Email and WhatsApp
	170283119003	Bochiya Hitesh Hamir						
	170283119008	Gajjar Tanay Prashant						
	170283119012	Maheshwari Bhavik P						
M08	160280119038	Joshi Vishalkumar Rajanikant	Design and development of special purpose dustbin for disposable waste management	UDP	Prof. P. V. Jotaniya	Dr. R. G. Kapadia	4	Zoom
	160280119091	Rajan Dhruv Manishkumar						
	160280119121	Jeet Dipankumar Vyas						
	160280119129	Shah Dhruv Ashwinkumar						
M09	160280119061	Patel Ankitkumar Kaustubhray	Theoretical and experimental evaluation of deep freezer	IDP	Dr. R. G. Kapadia	Dr N M Bhatt	4	Zoom
	160280119069	Patel Hetvi Utpal						
	160280119106	Shah Virag Divyesh						
	160280119111	Tank Yogesh M						
M10	170283119007	Dikhole Girish Pramod	Design and development of solar operated river cleaning machine	UDP	Dr. M. D. Chaudhari	Prof. R. O. Paliwal	4	Zoom
	170283119013	Maradia Neel Ramankumar						
	170283119016	Parekh Mihir Hiteshbhai						
	170283119017	Agheda Parth Nilesh						
M11	160280119011	Brahmbhatt Akshay Dharmendrabhai	Design and Development of Foldable Roof	UDP	Prof. S. P. Shah	Prof. Y. D. Vora	4	Email and WhatsApp
	160280119018	Chaudhary Rajan H						
	160280119024	Chudasama Naishal Rajendrakumar						

	160280119067	Patel Harnishkumar Kalpeshbhai						
M12	160283119018	Parmar Piyushkumar Ranchhodbhai	Experimental investigation on cladding process through ASME section ix code using welding techniques	UDP	Prof. A. G. Momin	Dr. P R Rathod	4	Zoom
	170283119002	Barot Darshankumar Rajubhai						
	170283119009	Kanojiya Divyesh Sudhirbhai						
	170283119026	Sathwara Abhishek M						
M13	160280119035	Hirani Rajkumar Natvarlal	Experimental investigation of wear characteristics of DLMS produced parts	UDP	Prof. H. M. Gajera	Prof. Y. D. Vora	4	Email and WhatsApp
	160280119104	Shah Parshva Vipul Kumar						
	160280119113	Tundiya Hansraj						
	160280119116	Vaghela Chirag Pareshkumar						
M14	150280119114	Thakkar Ketul Rajubhai	Design and implementation of built in suspension system in bicycle	UDP	Prof. D. R. Shah	Dr. N K Pancholi	4	Zoom
	160280119073	Patel Kishan Chetanbhai						
	160280119098	Sanura Hiten Vrajlal						
	160280119115	Vadher Jignesh Jayeshbhai						
M15	160280119077	Nisarg Patel	Design and Development of Centrifugal Clutch Testing Machine	UDP	Prof. D. U. Panchal	Prof. Y. D. Vora	4	Email and WhatsApp
	160280119083	Prajapati Dipeshkumar Mansukhbhai						
	160280119086	Prajapati Shubham Hiteshkumar						
	160280119107	Sheth Dhruvil Nareshbhai						
M16	160280119036	Jalondhara Prakash Sondabhai	Experimental Study of Single Point	UDP	Prof. A. C. Pambhar	Dr. N K Pancholi	4	Zoom

	160280119045	Lathiya Nimesh Jitendrabhai	Incremental Forming					
	160280119070	Patel Hitenkumar Kantibhai						
	160280119087	Prajapati Zeel Ashvinkumar						
M17	150280119134	Tenzoba Walling	Development and Geometrical analysis of Friction Stir Channel in Copper Plates.	UDP	Prof. S. R. Pandya	Dr. S. S. Pathan	4	Zoom
	160280119127	Neuto Justin Kinny						
	160280119128	Imsong N Putu						
	160280119130	Zhopol Sale						
M18	160280119109	Solanki Deep Ashokbhai	Design and development of potato planting and harvesting machine	UDP	Prof. S. J. Patel	Prof S A Sarawat	4	Zoom
	160280119114	Umaraniya Yashkumar Navinchandra						
	160280119117	Vaghela Jay Gordhanbhai						
	160280119123	Zala Hardeepsinh H.						
M19	160280119088	Pratik Shingala	Parameter optimization of plasma transferred arc hard facing	UDP	Prof. K. P. Hirpara	Dr. P R Rathod	4	Email
	160280119090	Raiyani Nirav Batukbhai						
	160280119097	Sabhaya Prince Sureshbhai						
	160280119110	Sutariya Harsh Rakeshbhai						
M20	160280119084	Prajapati Manoj	Development of system for internal polishing of nonmagnetic tubes using ferro fluid	UDP	Prof. V. D. Sonara	Dr. S. S. Pathan	4	Zoom
	160280119094	Rathod Arvind Damajibhai						
	160280119099	Saravaiya Akshay Haribhai						
	160280119118	Vank Sunilbhai Fuljibhai						

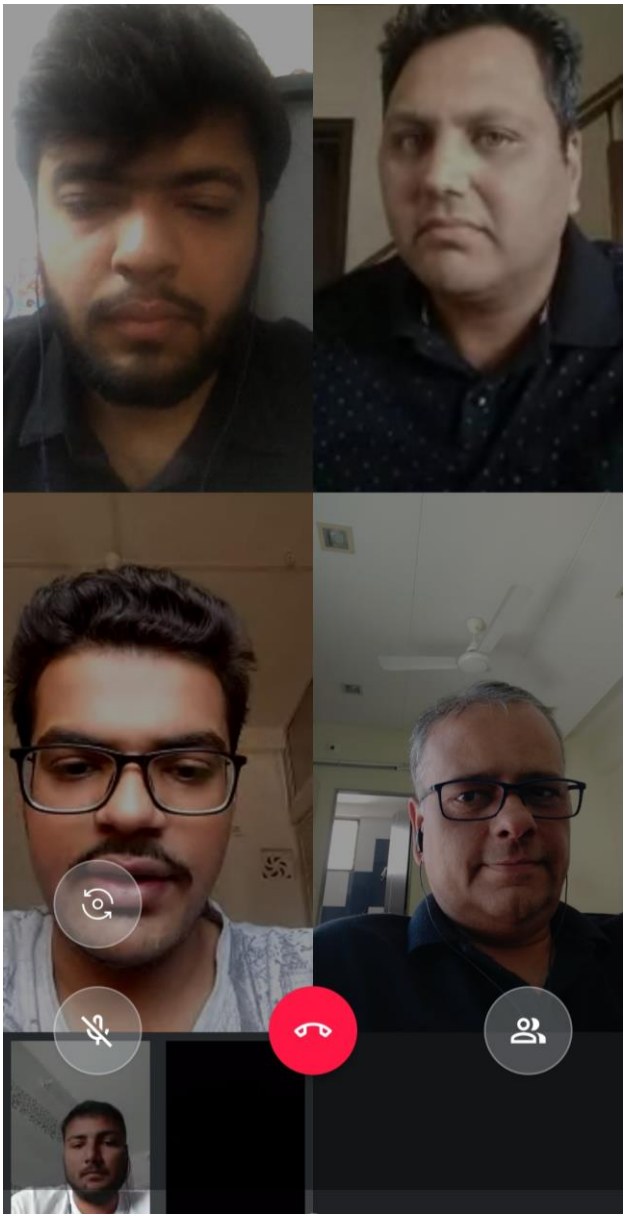
M21	160280119007	Bhoya Dipakbhai Gulabbhai	Design and Development of Fire Safety Robot	UDP	Prof. N.H.Pancholi	Dr. S. S. Pathan	4	Zoom
	160280119009	Bhuriya Pruthviraj Bharatbhai						
	160280119012	Buchiya Shailesh Punjabhai						
	160280119016	Chaudhari Rajkumar H						
M22	170283119010	Kodiyatar Kana K	Design and implementation of bike seating sefty system	UDP	Prof. G. N. Sutaria	Prof. S. A. Sarawat	4	Zoom
	170283119011	Kodiyatar Lakhman V						
	170283119019	Patel Parimal Suresh						
	170283119030	Trivedi Manojkumar G						
M23	160280119034	Gurjar Aniket Ashwin	Design and development of staircase climbing system	UDP	Dr. K.G. Dave	Prof. S. A. Sarawat	3	Zoom
	160280119042	Vadher Karan						
	160280119039	Kachroo Ashutosh						
	160284119001	Parmar Devraj Kiritbhai						
M24	160280119010	Bhuva Keval	Design and modification of the pantograph in trains	UDP	Prof. S. B. Bhatt	Dr. S. S. Pathan	4	zoom
	160280119027	Dihora Savan Mukeshbhai						
	160280119040	Kakadiya Arpan Ravjibhai						
	160280119092	Rakholiya Aniket Vasantbhai						
M25	160280119049	Meniya Ghanshyambhai Bhupatbhai	Design and development of vehicle lifting mechanism	UDP	Prof. K. A. Patel	Dr. K. G. Dave	4 on phone	Email
	160280119056	Parmar Mayurkumar Arsibhai						
	160280119047	Makwana Vishal Dahyabhai						

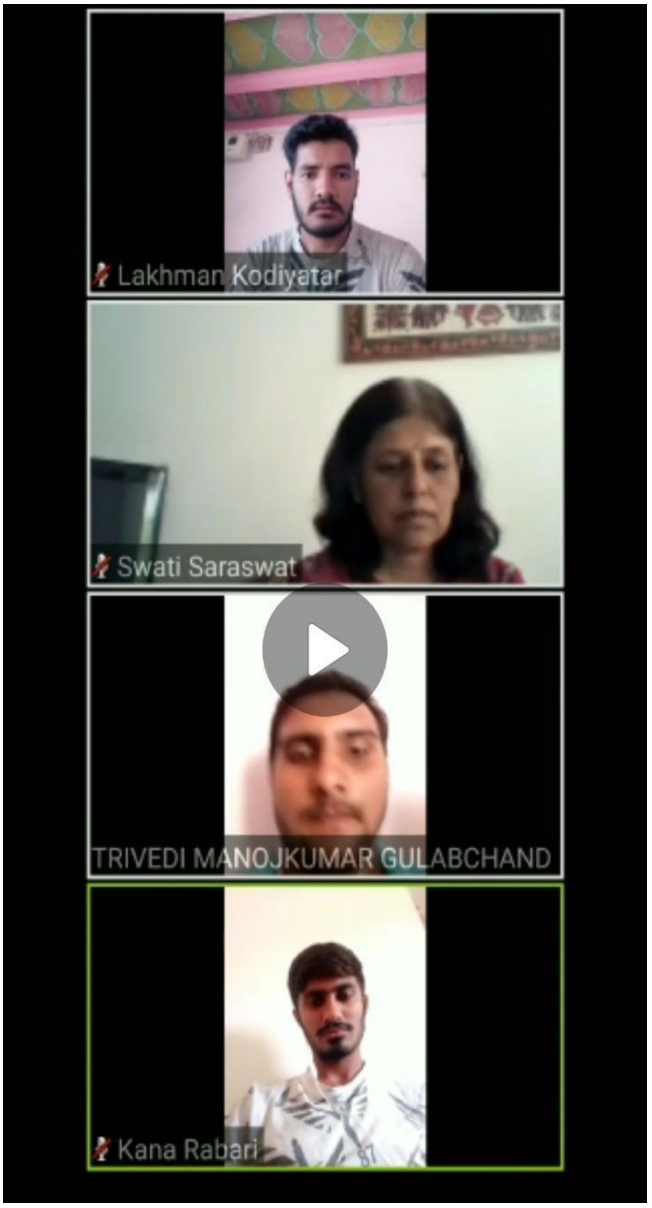
	160280119021	Chauhan Raj Vinodbhai						
M26	160280119025	Dave Harnish Viren	Design and development of multipurpose all terrain robotic system	UDP	Prof. M. M. Makwana	Dr. K. G. Dave	4 on phone	Email
	160280119044	Koriya Janak B						
	160280119079	Patel Pavan H						
	160280119075	Patel Nikunj B						
M27	160280119013	Chaudhari Ankitkumar Shankarbhai	Design and development of hoarding assistant mechanism	UDP	Prof. S.B. Shah	Dr. K. G. Dave	4 on phone	Email and zoom
	160280119014	Chaudhari Mayankkumar J						
	160280119017	Chaudhari Tanmay P						
	160280119030	Gamit Tejaskumar Ukajibhai						
M28	160280119006	Bhavsar Ajay Satishbhai	Design and fabrication of bladeless turbine	UDP	Prof. S. A. Saraswat	Dr. U A Patel	4	Email
	160280119050	Mevawala Jenil Dharmeshkumar						
	160280119058	Parmar Pradipbhai Kalabhai						
	160280119062	Patel Ankushkumar Ashwinbhai						
M29	160280119068	Patel Harshkumar Pravinbhai	Development of LPG refrigeration system	UDP	Prof. H.A. Shukla	Prof. R. O. Paliwal	4	Zoom
	160280119078	Patel Parth Dineshkumar						
	160280119081	Patel Vishvakumar Kantilal						
	160280119102	Sevak Jaykumar Kiritbhai						
M30	160280119071	Patel Jainik Rajeshbhai	Fabrication of beach cleaning machine	UDP	Prof. M. D. Patel	Dr. U A Patel	4	Email
	160280119072	Patel Jay Bhagubhai						

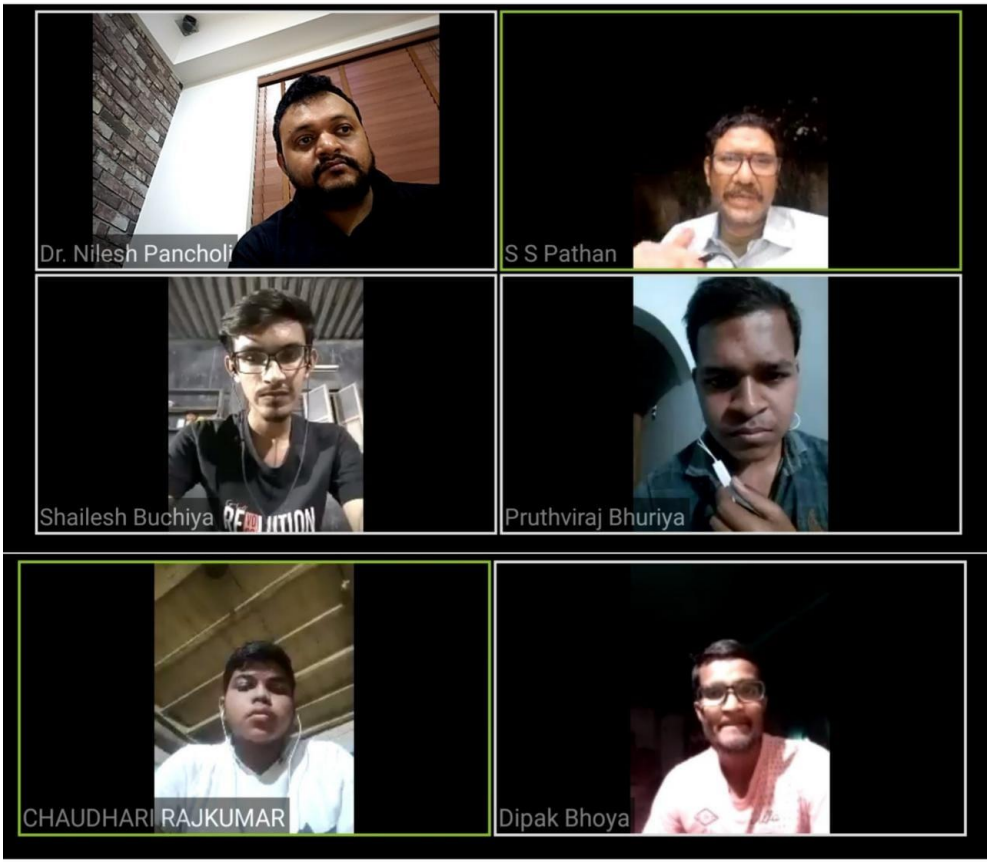
	160280119074	Patel Meet Anilbhai						
	160280119080	Patel Rajkumar Dahyabhai						
M31	160280119023	Chudasama Himanshu Hiteshbhai	Timing screw design for shape bottle	UDP	Prof. N.K. Pranami	Dr. U A Patel	4	Email
	160280119051	Mistri Romit Rajeshbhai						
	160280119060	Patel Ajaykumar N.						
	160280119064	Patel Devarsh Maheshkumar						
M32	170283119020	Rajput Prakashsinh P	Design and development of regenerating bicycle.	UDP	Dr P R Rathod	Prof. H. P. Patel	4	email
	170284119001	Pandey Ashwin A						
	170283119005	Dauwa Deepsinh J						
	170283119023	Sachaniya Ankitbhai M						
M33	160280119031	Gohil Mohan	Mathematical Modelling and simulation of thermal spray coating process and validation	IDP	Prof. D.K. Patel	Dr. P R Rathod	4	Email
	160280119037	Oza Jenishkumar Dineshbhai						
	160280119041	Kapadiya Krunal						
	160280119052	Modh Smit						
M34	160280119004	Bhagora Jay Naineahkumar	Energy conservation with automation	UDP	Dr. U. A. Patel	Prof Mitul Makavana	4	Email
	160280119089	Rathod Rahul						
	160280119004	Bhagora Jay Naineahkumar						
M35	160280119085	Prajapati Nikhil Dasharathbhai	Analysis of dynamic capacity of bearing	UDP	Prof. M. K. Vyas	Prof Mitul Makavana	4	Email
	160280119103	Shah Moksh						
	160280119082	Pisuwala Mohammed Arbaz Mohammed Faruq						

	160280119108	Abhijitsinh B Solanki						
M36	160280119026	Dave Tanmay A	Design, development & implementation of solar window blinds	UDP	Prof. H. R. Patel	Dr. B K Patel	3	Zoom
	160280119032	Gor Kathan J						
	160280119048	Memon Ubaid Salimahmed						
	160280119029	Gajjar Kathan						
M37	160280119053	Muniya Hardikkumar Manojbhai	Design and analysis of highway solar and wind power generation using vertical axis wind turbine	UDP	Prof. N. K. Patel	Dr. B K Patel	4	Voice Calling
	160280119054	Panda Dhrupatkumar Parsinhbhai						
	160280119059	Parmar Prashantkumar Jagdishbhai						
	170283119021	Rathva Chhatrasinh Soganbhai						
M38	160280119063	Patel Bhargav Vishnubhai	Design and development of seed sowing machine	UDP	Prof. H. P. Patel	Dr. P R Rathod	4	Email
	160280119065	Patel Dhruv Harshadbhai						
	160280119066	Patel Dhruv Bhadreshbhai						
	160280119096	Raval Janmenjay Janakkumar						

Some Screenshots of evaluation process are as under:



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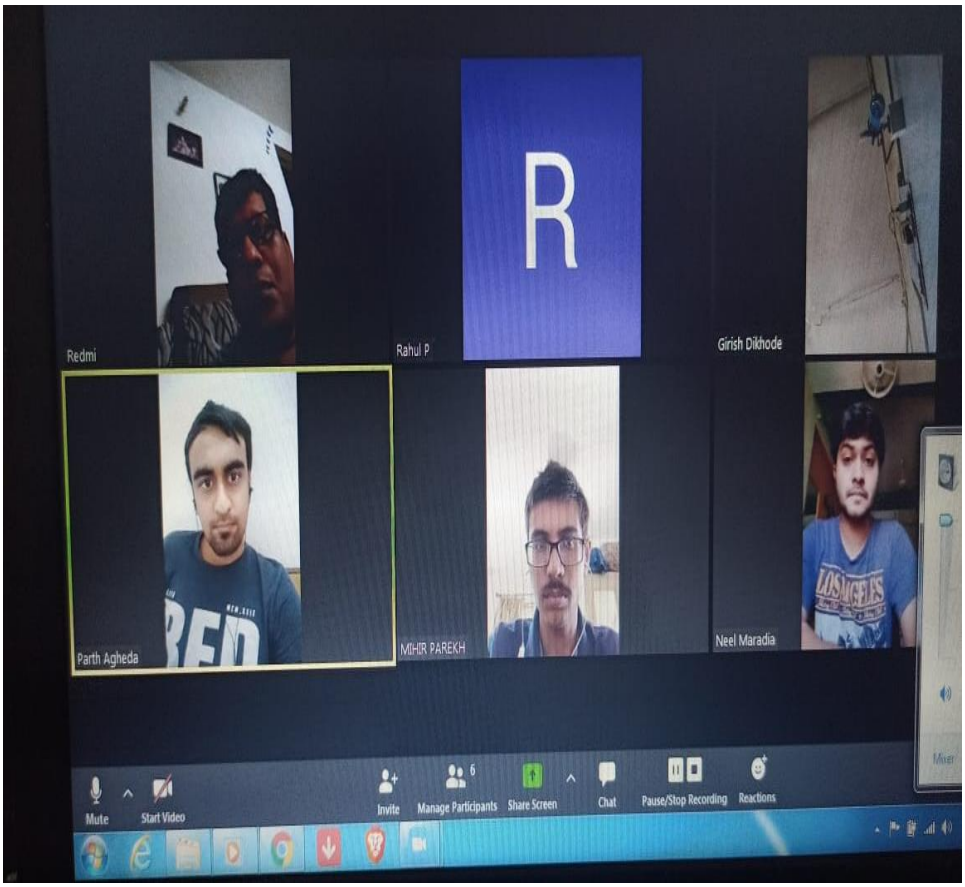
S S Pathan
Shailesh Buchiya
Pruthviraj Bhuriya
CHAUDHARI RAJKUMAR
Dipak Bhoya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Girish Dikhode
Parth Agheda
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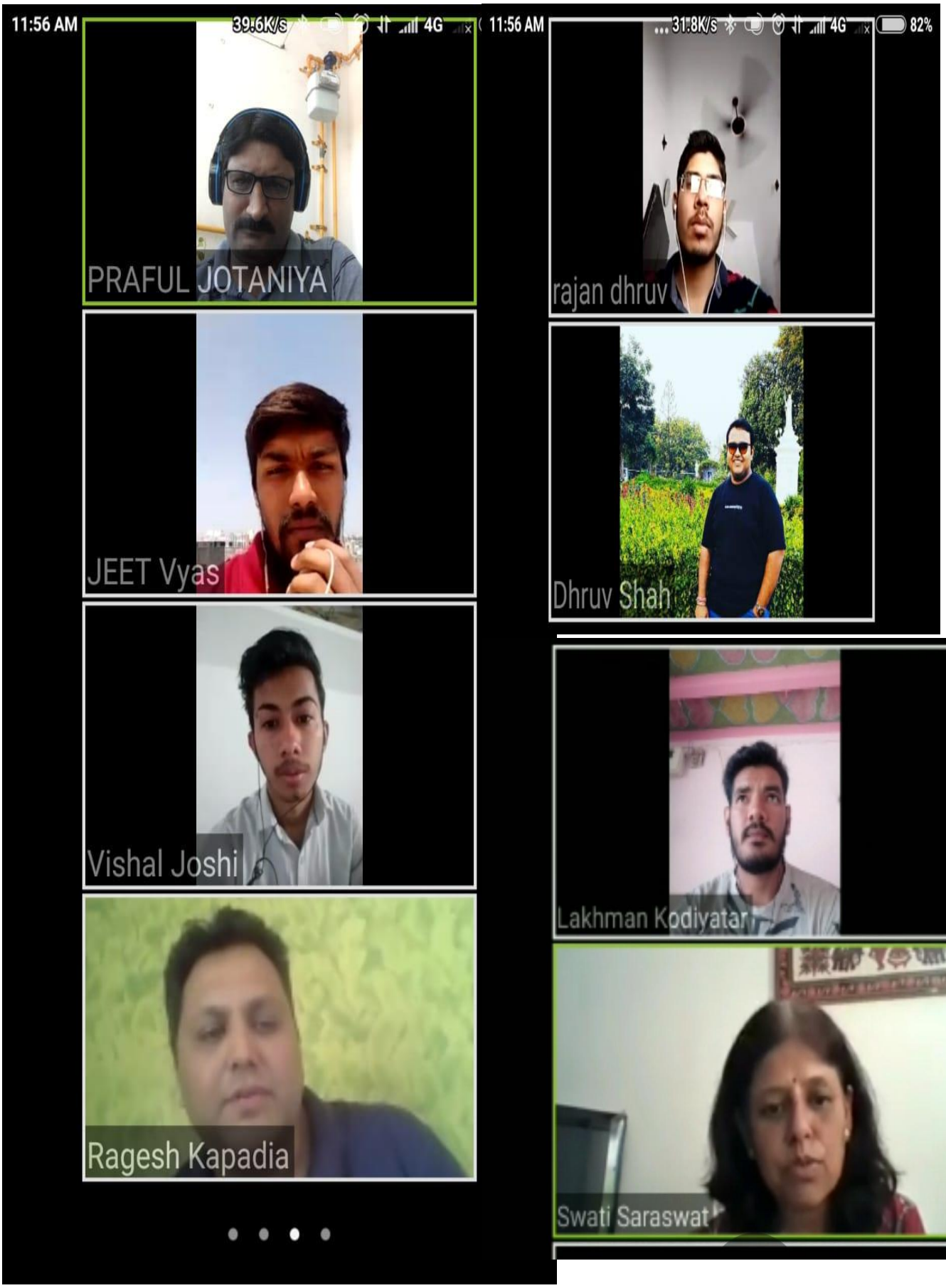
Neel Maradia
Mute
Start Video
Invite
Manage Participants
Share Screen
Chat
Pause/Stop Recording
Reactions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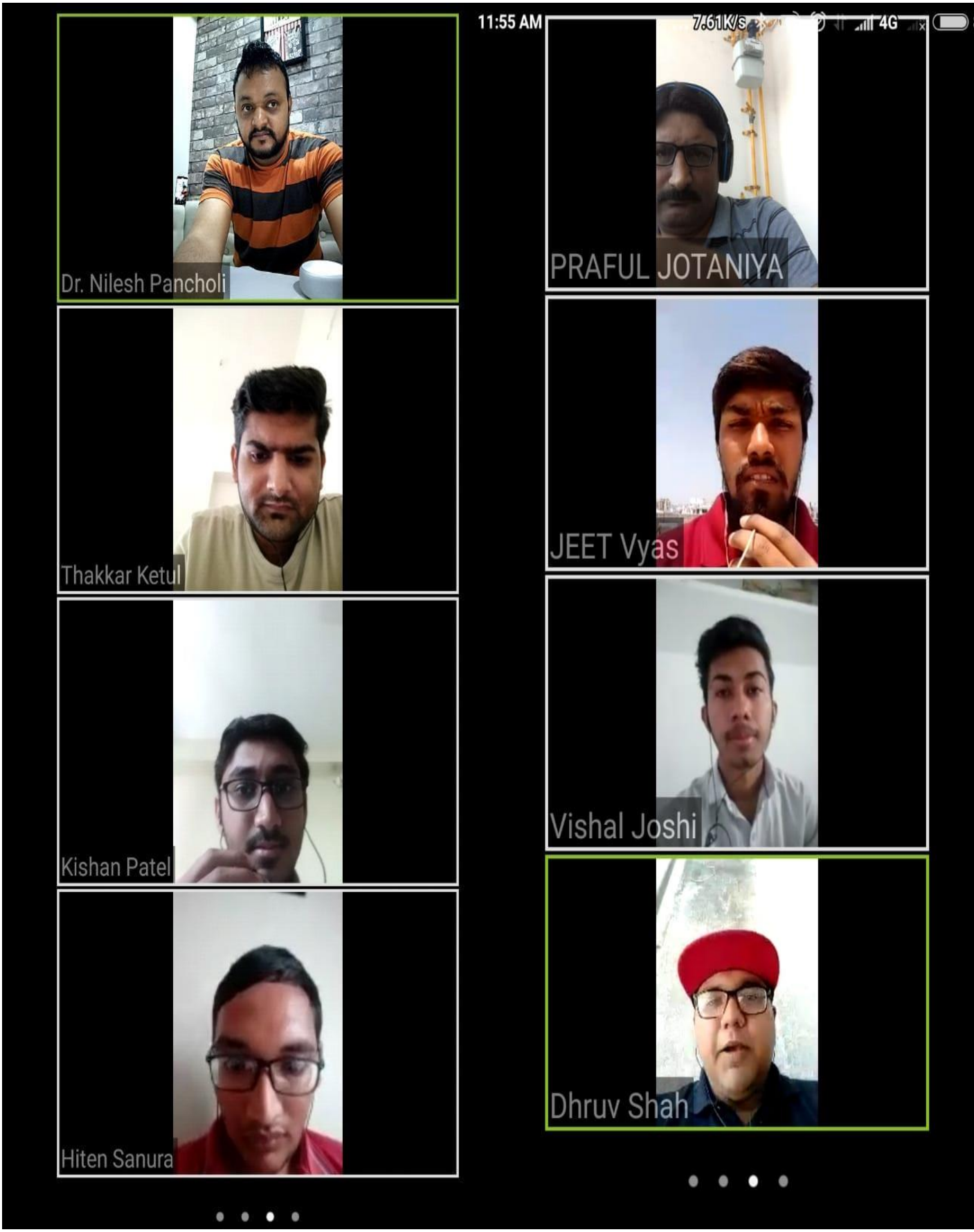
Dhruv Shah
Lakhman Kodiyatar
Swati Saraswat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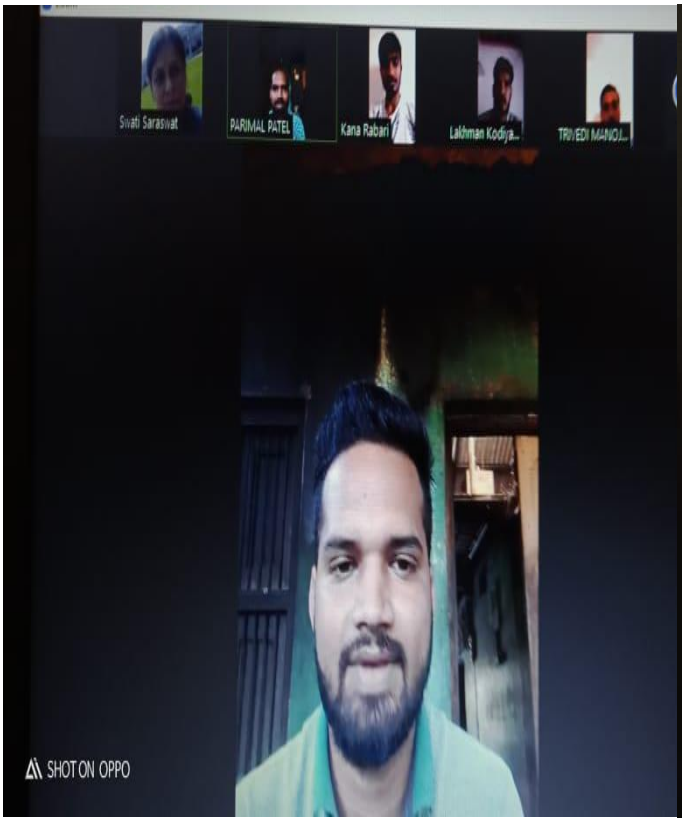
Dhruv Shah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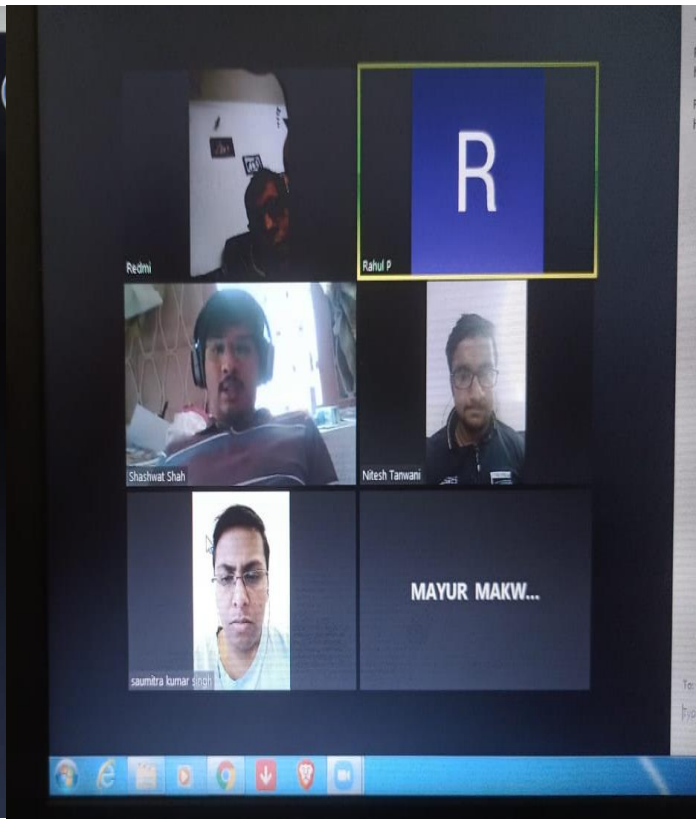
PARIMAL PATEL
Kana Rabari
Lakhman Kodiya...
SHOT ON OPPO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R
Rahul P
Shashwat Shah
Nitesh Tanwani
saumitra kumar singh
MAYUR MAKW...


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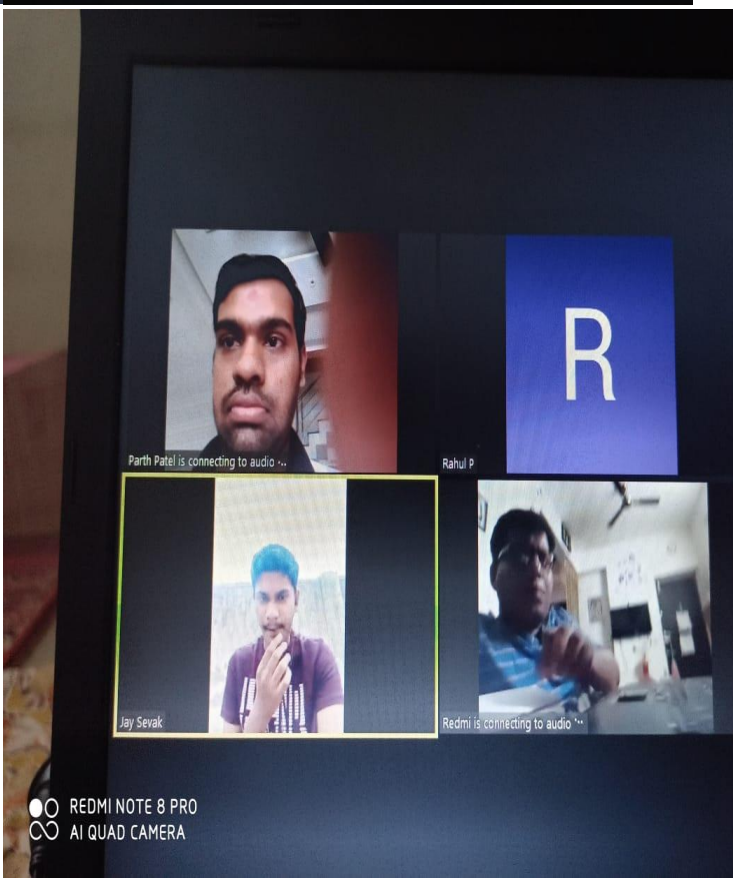
Darshan Barot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Rahul P
Jay Sevak
Redmi is connecting to audio ...
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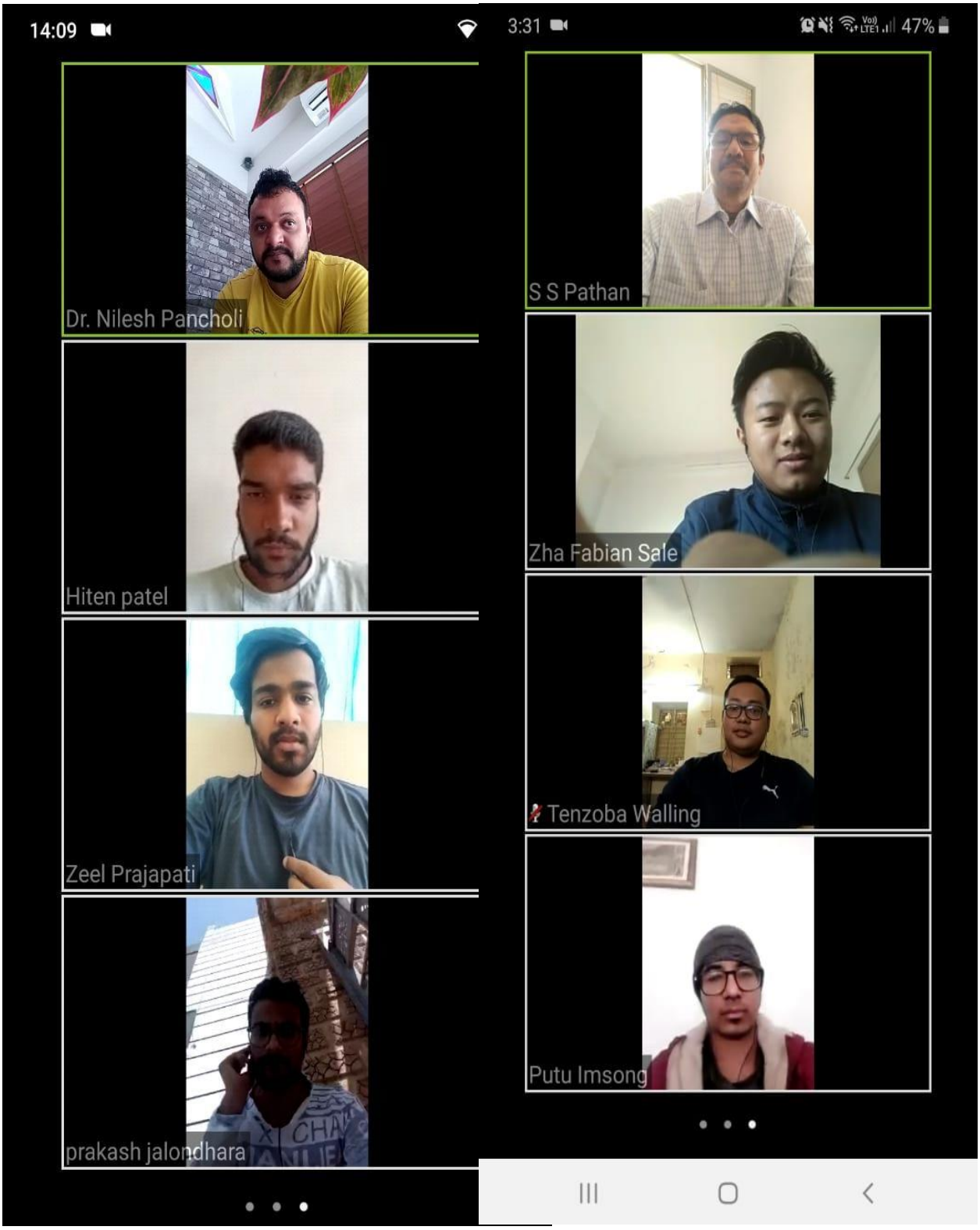
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Dr. Nilesh Pancholi
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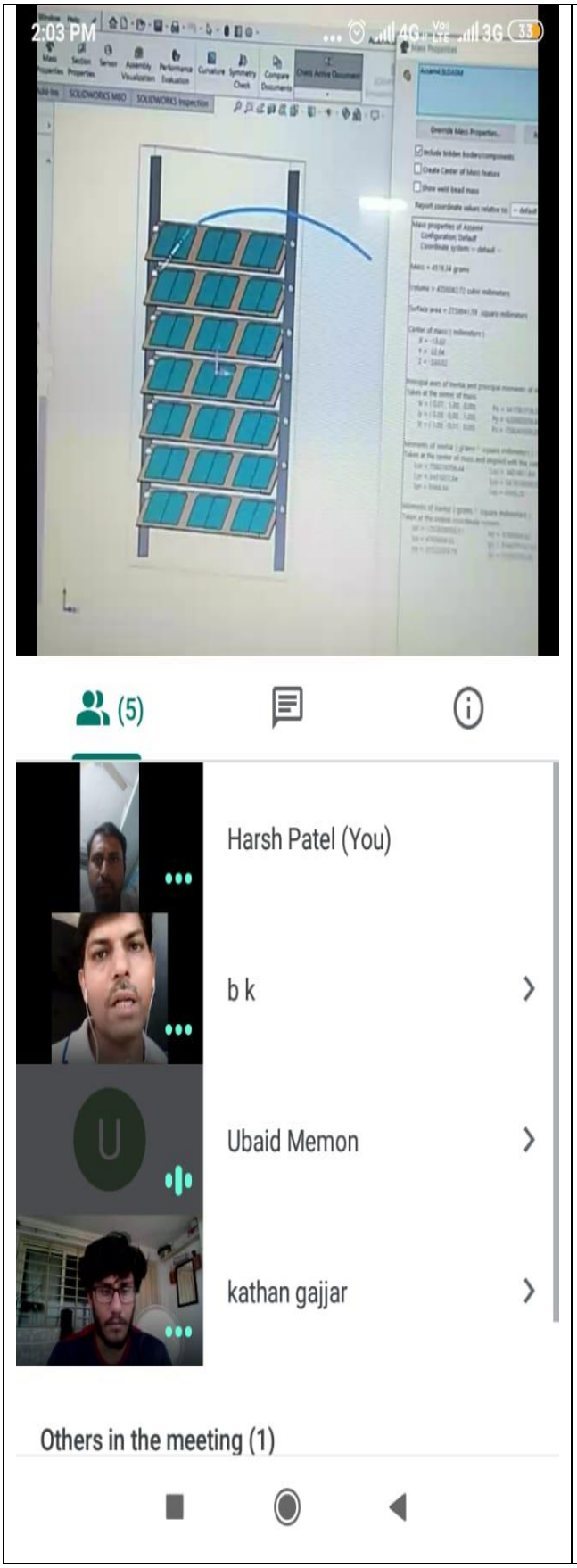
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Others in the meeting (1)


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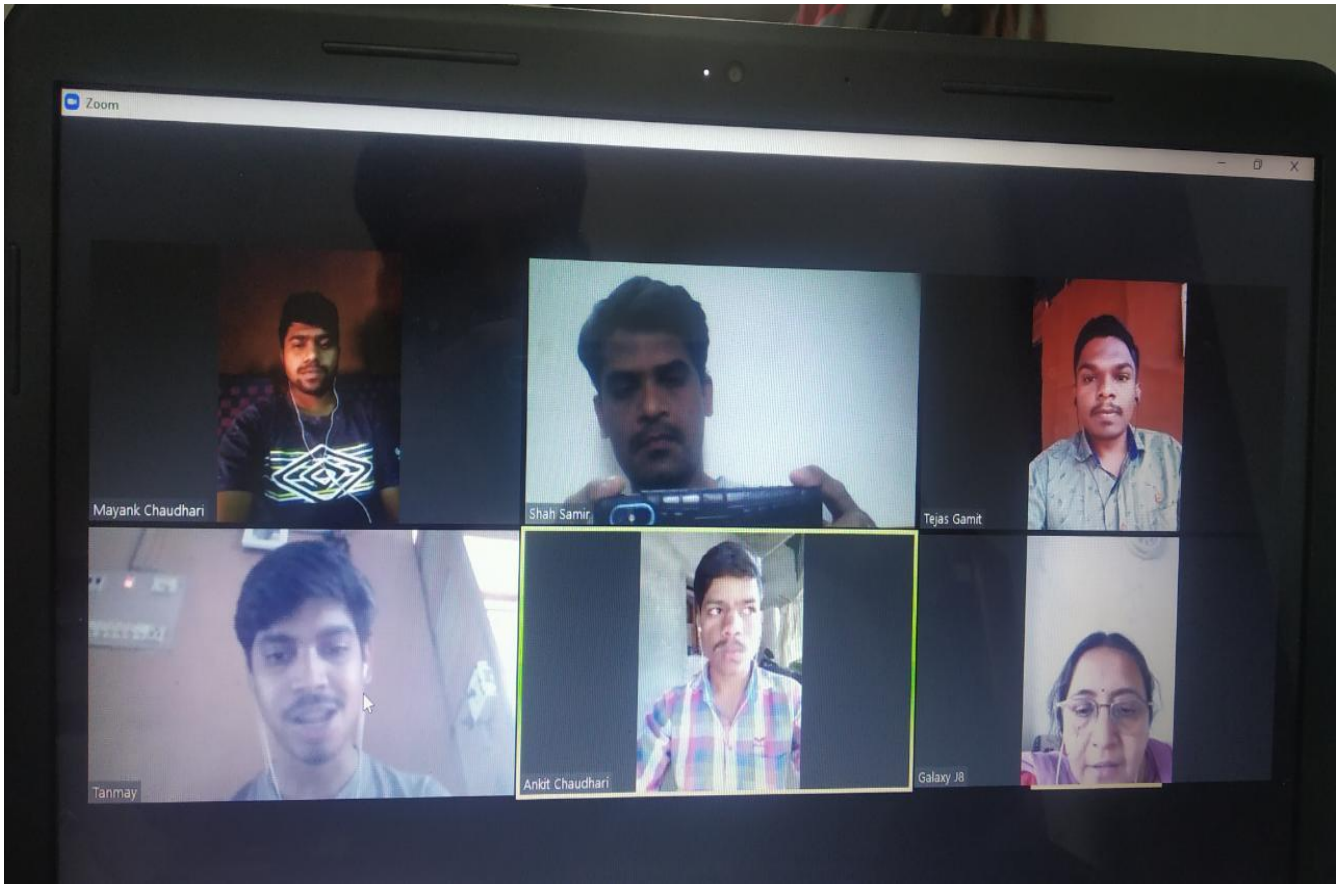
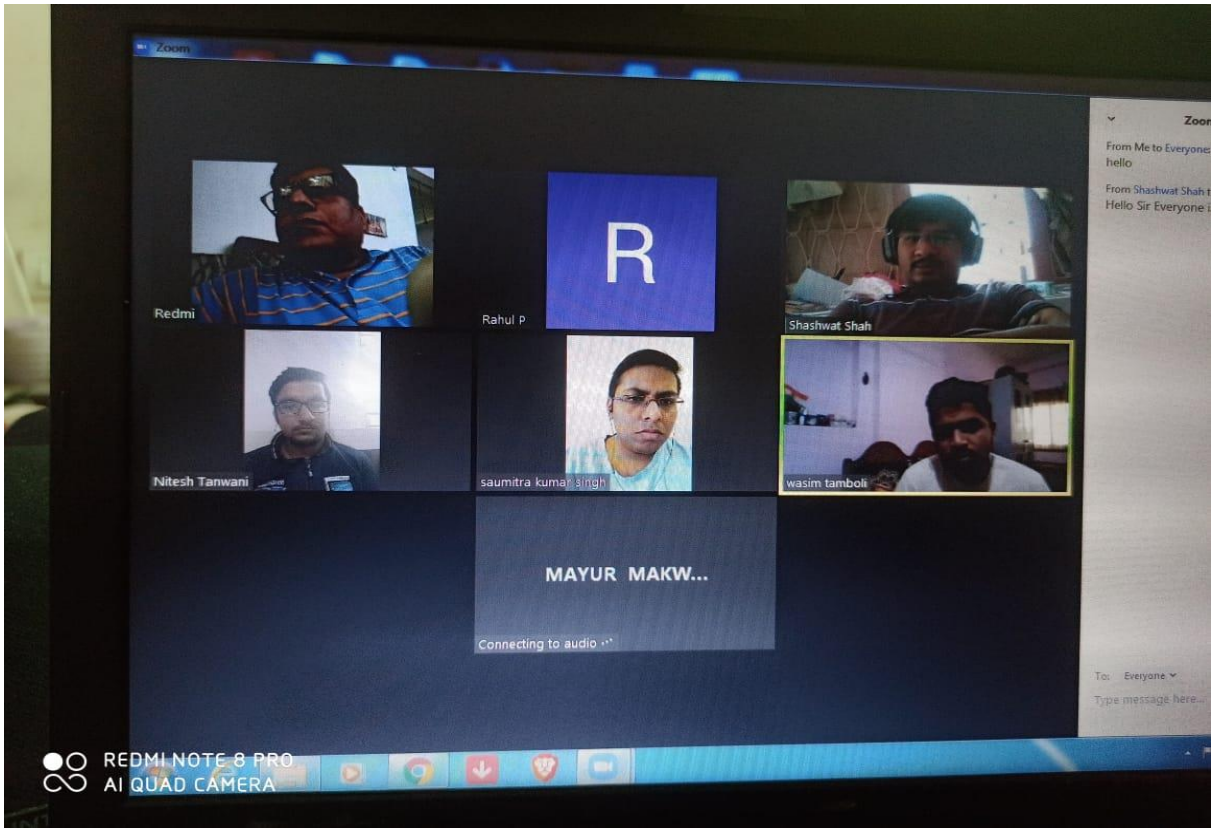
ABHISHEK SATHWARA
PIYUSH PARMAR
Kanojiya Divyesh


Zoom
Mayank Chaudhari
Shah Samir
Tejas Gamit
Tanmay
Ankit Chaudhari
Galaxy J8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Shashwat Shah
Nitesh Tanwani
saumitra kumar singh
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2. Details of Innovative Project

Project on Societal Impact

Title: Design and Development of Staircase Climbing System

Prepared By **Guide: Dr. K. G. Dave**

1. **Aniket Gurjar**
2. **Karan Vadher**
3. **Ashutosh kachroo**
4. **Devraj Parmar**

ABSTRACT

In this Project Design and Development of Staircase Climbing System is a mechanical sys- tem for lifting people up and down stairs. This system is useful for handicapped and old aged people for independent living and betterment of life. In this system a chair is attached to the ban- ister, person gets onto the chair and is lifted up or down the stairs by the chair which moves along the banister. The main objective of the project is to reduce the overall cost of the system and should be at the affordable cost to society. The design was done for 85 kg of load.

Components and Physical Image

Chair (Foldable)
Guide rail (rod 40mm outer diameter)
Electric hoist (PA 250)
Two Linear (half) bear-ing (40mm diameter)
Two Caster wheels(35mm diameter)
L shape angle (5mm thickness)
Brass Fastener pins(Anchor type)
Wires(1 ampere, 4 core)
Bolts (stainless steel 1/2 inch HEX head)

Development and Installation

The staircase climbing system has rail guide or rod which is fixed to the wall at an angle of stairs with the help of fastener pins in such a way that rod remains parallel with the stairs. Now two linear bearing are fixed on back of the chair in such a way that chair's seat remains horizontal. And two caster wheels are fixed at the bottom of the chair to transmit the load downwards to the L shaped angle. This caster wheels should freely roll on the L shaped angle which is fixed on the stairs. Now after the free move- ment of chair along the rail guide, Electric hoist is fixed on the upper side of the stairs.

Electric hoist (PA 250) is a device having single phase motor attached with the drum having wire rope. The steel wire rope coming from the hoist is attached to the chair. This electric hoist is operated with the con- troller which has three position toggle switch and one emergency stop button. So when the chair is at the bottom and hoists start winding the rope wire it will pull the chair upward and when the chair is upper end and the rope wire is rewound due to gravitational force the chair will move downwards. So when person sits

on chair can ascend and descend the stairs easily with the help of controller of electric hoist. Controller of the electric hoist is fixed to the arm of chair so that user can easily operate it. Automatic Re-wind reel is used for winding and rewinding of the cord of controller during the movement of chair.

Future Scope & Application

From the feasibility study, it has been observed that the overall cost of the system should be in affordable cost to society. So the main objective of the project was to reduce the overall cost of the system without reducing the system reliability. This system provides the easy way for aged and physically handicapped for mobility over stairs.

After getting controller attached to the arm of the chair one can easily ascend and descend over stairs. Architecture is cost effective and portable with in less time. This system can be implemented on straight stairs only like in our house and in many public places like old building, temple, small restaurants. And further system can be modified for even turns.

Project on Industry Impact

Title: Design and development of semiautomatic Electro Arc Welding Machine System for improving productivity and reducing labour fatigue

Prepared By **Guide: Prof Y. D. Vora**

1. **Bhatt vedant**
2. **Gujarati Chintan**
3. **Limbani Prit**
4. **Pansuriya Abhishek**

ABSTRACT

Presently, the fabrication industries are considered as backbone of all industries in India and competing all over the world. Also due to certain reasons, the quality and productivity in such industries is very low and manufacturing cost is very high. Moreover workers are facing health problems also. Fully automatic welding robots are available, but their cost is too much high and small 7 medium scale units cannot afford and it also leads to unemployment. The IDP project is taken from M/s Karnavati Engineering Plant. Industry needs around 5 labour and complete the task in 7 working days so industry can hardly manufacture 5 tanks in a month. By doing so, worker's eyes are affected due to harmful light rays produced from arc and gas separated during working is also dangerous for worker's health. Now a days, industry is using electric arc welding process which is also time consuming process. Thus the continuous working results in fatigue of labour.

In this project, an attempt has been made to eliminate worker's problem and to improve the efficiency/productivity and manufacturing productivity of the plant by reducing the labour fatigue. To solve the existing problems related to manufacturing of tank supporting structure and labour, an exhaustive study is carried out at Karnavati Engineering Plant onsite manufacturing unit. The design and development of semi-automatic arc welding machine is done. A new welding setup (fixture) means semi-automatic welding system is developed and designed for the three dimensional welds of pickling tank structure.

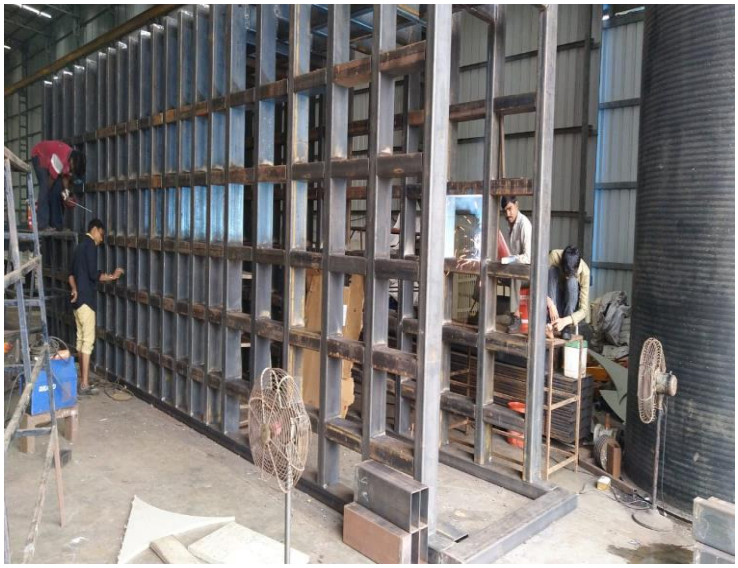
Design

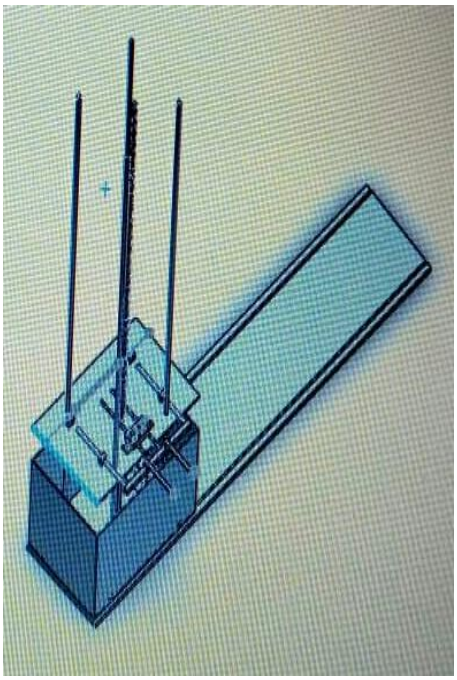
Two MIG welding torches are attached with lead screw for horizontal welding movement. Horizontal lead screw take power from DC motor connected with SMPS. Whole platform is guided by vertical lead screw. Whole trolley moves on rail arranged parallel to one side of tank. Trolley moves on rail with help of AC motor. When Limit switch attached to trolley sense material, trolley stops. DC motor starts it rotation, this

rotation is converted into horizontal movement of welding torches with help of lead screw. After travelling specified distance DC motor reverse its direction. In this return stroke welding occurs. After completing horizontal welding, vertical lead screw rotates and lifts up whole platform. After travelling certain distance it rotates in reverse direction, in this movement of platform, vertical welding occurs. These whole things are controlled with help of pre-programmed Adriano. After completing parallel side horizontal and vertical welding, trolley moves further and perform same task.

Application

By doing some changes in fixture all type of MIG welding can be performed. So our product is usable in all fabrication industry using MIG welding process. This machine has ample scope in future in fabrication industry as it will reduce cost of product and increase production rate.





Project on Environmental Impact

Title: Increasing the Concentration of Effluent Using Solar Energy

Prepared By **Guide: Dr N M Bhatt**

1. Irshad Rayma,
2. Harsh Santani,
3. Ravi Thakar,
4. Nimesh Vaghela

ABSTRACT

Effluent is defined by the United States Environmental Protection Agency as "wastewater - treated or untreated that flows out of a treatment plant, sewer or industrial outfall. Generally refers to wastes discharged into surface waters". The Compact Oxford English Dictionary defines effluent as "liquid waste or sewage discharged into a river or the sea". Effluent is treated in two halves, (a) Chemical process and (b) Mechanical process. The project looks forward in the area of Mechanical processes where it is intended to use the solar energy instead of MVRE (Mechanical Vapor Recompression Evaporation) and MEE (Multi Effect Evaporation). Novel black absorber coating which has very high solar absorptivity of 93.5%, is applied on the surface of heat exchanger which delivers hot water at 70-75°C temperature. Booster mirror is also used to increase the solar radiation falling on the heat exchanger surface. A low cost experimental setup to increase a concentration of an effluent using

solar energy has been fabricated and tested under outdoor condition of Ahmedabad, India (23.0225°N, 72.5714°E). During the experiments hot water temperature of 70-72°C was obtained which is sufficient for further process of the effluent. The system is designed to treat 180 l/day of effluent at 60-62°C using vacuum chamber maintained at 200mbar vacuum using principle of flash evaporation. Using solar energy, cost of fuel is totally saved. Using the system about 30 MJ/day of heat energy can be supplied using solar energy.

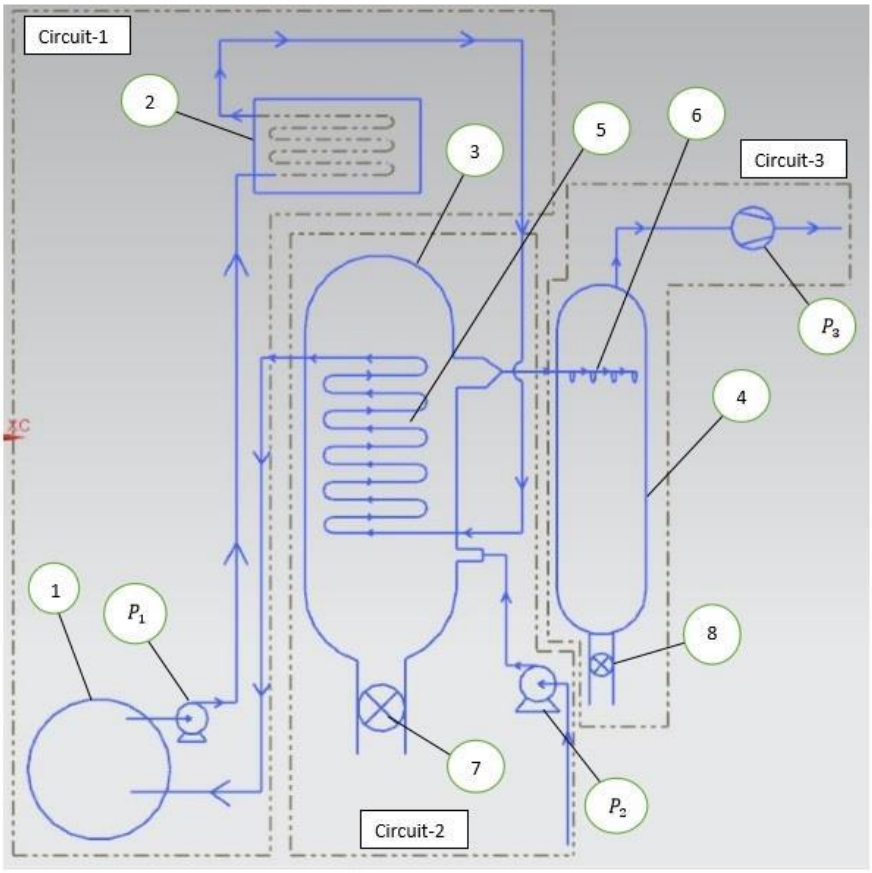
Operation of Project

1st Circuit (Coated Heat Exchanger Circuit)

The circuit consists of make-up water tank (1), a heat exchanger coated with black body flexi cord coating (solar absorptivity of 93.5%) (2) and a pump. The make-up water is heated by the heat exchanger by absorbing solar radiation falling on it. The radiation is enhanced by provision of booster mirror. The make-up water in turn heats the effluent stored in effluent tank (3). During initial experiments, make-up water was heated up to 70- 72°C.

2nd Circuit (Water to Effluent Circuit)

This circuit consists of effluent tank (3) which has heat exchanger inside it and a pump. The concentrated effluent is heated by the heated water in the effluent tank. The heated water exchanges the heat with the effluent and low temperature water is returned to the black coated heat exchanger (2). The effluent can be heated up to 60°C which is sufficient for further process.



Components

1 Make-up water tank
2 Heat exchanger
3 Effluent Tank
4 Vacuum chamber
5 Heat exchanger coil
6 Nozzles
7 Drainage
8 Strainer
9 Water pump (P1)
10 Effluent pump (P2)
11 Vacuum Pump (P3)

3rd Circuit (Vacuum Chamber)

The heated effluent is then sprayed into vacuum chamber through nozzle under vacuum. The vacuum chamber is maintained at a pressure of 220 milibar using a vacuum pump. When high temperature and low pressure effluent is sprayed through the nozzles, effluent is converted into low pressure vapor which is then condensed and concentrated effluents is collected by the screw pump.

Future Scope & Applications

Main objective of the project is reducing fuel consumption of effluent treatment plant using solar energy which is renewable one and thus reducing the global warming by reducing emission of CO2. As solar energy is freely available, cost of heating the effluent is almost negligible. Highly durable selective coating having high solar absorptivity reduces the system cost and make the system viable. The system discharges a polluted effluent at the end of process and then it mixes with the water therefore eventually water gets polluted, while the system is aiming to ZLD (Zero Liquid Discharge). Large scale systems of the prototype developed can be used for (1) Textile, Bleaching & Dying industries (2) Food, Dairy & Beverage industries (3) Pulp & Paper industries (4) Sugar industries

Project on Defense Impact

Title: Numerical and Experimental Investigation of Rocket Nose

Prepared By **Guide: Prof Mayur M Makvana**

1. **Saumitra Kumar**
2. **Shashwat Shah**
3. **Tanwani Wasim**
4. **Tamboli Nitesh**

ABSTRACT

A nose cone is shaped to offer minimum aerodynamic resistance and is meant to pass through different layers of the atmosphere at different speeds. Hence it is important to analyze the different shapes of the nose to determine the geometric shape that will give optimum performance. Comparison and analysis of conventional nose profiles at different atmospheric levels and variable Mach numbers have been done. The objective was to identify the optimum nose cone profile for varying temperature and velocity for different atmospheric levels. The data was gathered by mathematical modelling and simulation using ANSYS Fluent software. The analysis was done on different nose profiles, including but not limited to Ogives, Von-Karman and Power series, with Mach number ranging from 0.8 to 2.0. Nose profiles were analyzed for different atmospheric pressures and air density as present in different layers of the atmosphere.

From Analytical results obtained with the help of ANSYS Fluent and theoretical results calculated from the mathematical formula optimum profiles for different Mach regions are:

For Mach 0.8 & 0.9 (Subsonic Region): For lower speeds, especially subsonic speeds, most optimized drag is of Sharp Von-Karman Nose cone.

For Mach 1.2 & 2.0 (Supersonic Region): For higher speeds, especially supersonic speeds, most optimized drag is of 3/4 Hypersonic Power series Nose cone.

Introduction

Nose cone is an essential part of a Rocket. Our aim in the project has been to investigate nose cones but they are available in quite different some of them are as follows. All of these profiles are in use in industry. These profile are analysed on the basis of the drag co-efficient at different Mach speed.

Sharp cone	Tangent sharp Ogive	Sharp Haack
Blunted cone	Tangent blunt Ogive	Sharp Von-Karman
Truncated cone	Tangent truncated Ogive	Hemisphere
Elliptical	Power Series	Parabola

Objective

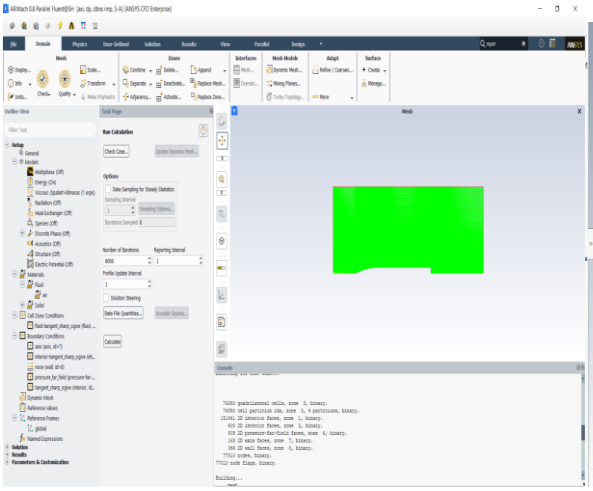
- Analyze different nose cone profiles by using mathematical modelling and advance simulation methods.
- Obtain different data from analysis carried out.
- Compare the data to find optimal nose cone profiles which causes minimum drag for all atmospheric levels and for in the speed range of Mach 0.7 to 2.0.

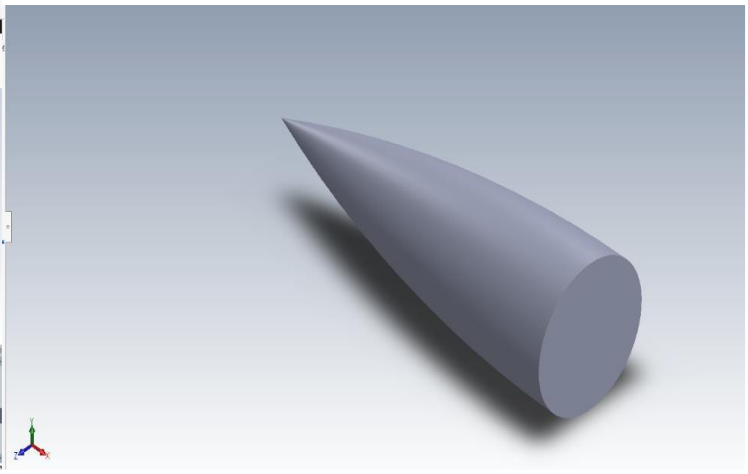
METHODOLOGY

- Model formation
- Coordinates generation in PyCharm
- Import the coordinates in .xlsx file
- Import the coordinates in .txt file
- Import .txt file in SolidWorks
- Final model formation

ANSYS SOLVING METHODOLOGY

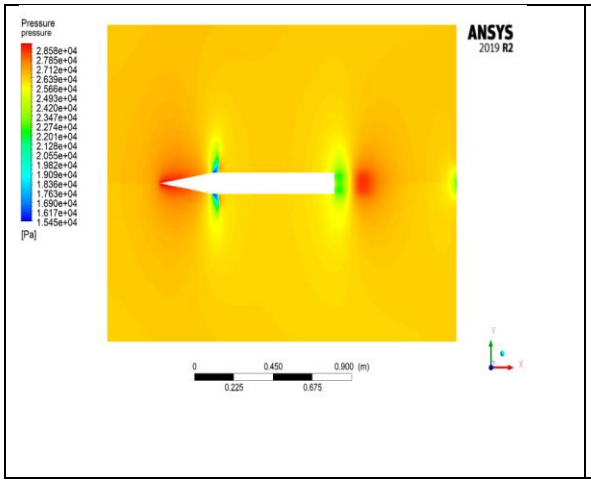
- Geometry
- Meshing
- Setup
- Solution
- Result

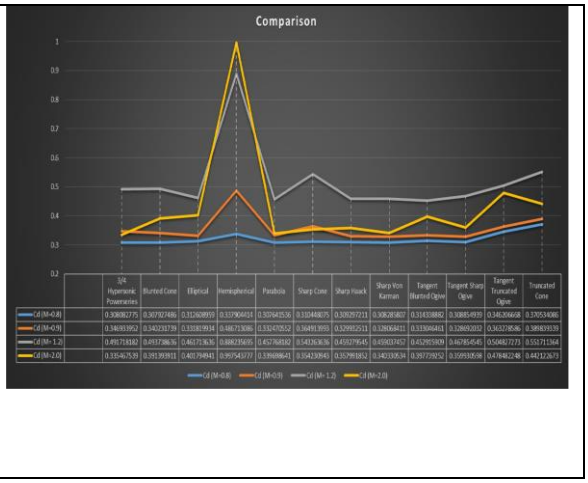




Result

Results were obtained in Post-CFD rather than in fluent due to the high flexibility of the software. Velocity and Pressure profiles were obtained to study shock wave formation. The drag coefficient is also calculated for each profile for all different speeds to compare with each other and find the optimum design for every speed. The results are shown in the subsequent section.





Drag co-efficient were found for different profiles and at different pressure. So a large number of values were generated which are compared on the basis of there drag co-efficient. As can be seen in the graph, Parabola and Sharp Von-Karman are the optimum profiles for subsonic and lower supersonic regions.

While Hemispherical Nose cone has almost the highest drag coefficient for all the Mach number and due to local supersonic zones around it, stability is also very bad.

Conclusion

From Analytical results obtained with the help of ANSYS Fluent and theoretical results calculated from the mathematical formula optimum profiles for different Mach regions are:

- For Mach 0.8 & 0.9 (Subsonic Region): For lower speeds, especially subsonic speeds, most optimised drag is of Sharp Von-Karman Nose cone.
- For Mach 1.2 & 2.0 (Supersonic Region): For higher speeds, especially supersonic speeds, most optimised drag is of 3/4 Hypersonic Power series Nose cone:

But as the speed increases it is seen that the value of drag coefficient decreases this can be addressed by the shock wave generation at higher speed.

3. Feedback of faculty members and students

Mechanical Department has evaluated final year project through different online modes and evaluators has given their motivational and valuable suggestion to students for improvement in project. Feedback of evaluators on online Kaizen 2020 are as under.

Dr. N M Bhatt

Professor and Head

Amid the threat of COVID-19 pandemic, Mechanical Engineering Department of L. D. College of Engineering, the oldest engineering institute in Gujarat, decided to conduct the online evaluation of final year project of their students. The review was conducted to keep the students engaged with the work for which they have spent lots of time and energy. The faculty members tried to bring out contribution of all the individuals and at the same time evaluated their team work too. They highlighted various aspects of societal, industry, sustainability, etc. and motivated the students for the way forward. Students and faculty members were very much excited for first ever project presentation through online platforms and participated with equal zeal against the difficulties. Many congratulations to the students and faculty members.

Dr K G Dave

Associate Professor

The recently concluded online Kaizen 2020 project evaluation was an innovative approach of online teaching-learning technique during this difficult situation of covid19.8 The students have a wonderful time for getting an opportunity for being evaluated by various learned reviewers. All the students felt fortunate of motivational and inspirational comments. The future scope for exploring their projects as an innovative project and chance of getting assistance under various start-up and innovative schemes of government was discussed in detail. It have observed that the poster and report of project are well prepared by students. It have witnessed that students were very happy and enthusiastic for online evaluation process.

Prof R O Paliwal

Associate Professor

This project is based on idea to clean any water body like pond, river, and water reservoir by applying latest engineering concept. During online review I have seen concept idea is clear in each students mind. This is one of the best project in this year. Students have done hard work only testing required at kankaria or riverfront after lockdown is over. Over all very good work. This project has potential for improvement in future scope. Project has got SSIP grant and can be patented in future.

Prof A V Patel

Associate Professor

All the students of the groups which I have reviewed done good work. They have prepared good posters and reports. The interaction was also worth. They have got good practical ideas and learn how to correlate the theoretical knowledge with practical applications. They also learned actual physics behind the practical application. Moderate try was done to develop mathematical model for the process. Overall good progress.

Dr. U A Patel

Assistant Professor

Three projects group reviewed by myself with electronic devices with email to facilities. The time taken was quite less and easy to review in such time. The students so far from college may be connected and communicated easily.

Feedback of students regarding this online evaluation process are as under.

Aniket Gurjar

Enrollment : 160280119034

In online Kaizen 2020, It was a great experience interacting with examiner discussing our project about its working and design calculations. Also examiner pointed out the area in our project for further improvement , as more easy and feasible way of controlling the system

Dipak Bhoya

Enrollment : 160280119007

It was very good experience on zoom video meeting. We enjoyed discus about project. Sometimes there was connection problem due to weak network. Dr. S. S. Pathan sir also gave us advice to focus on technical aspects rather than physical model. It was over all very good experience.

Rayma Irshad

Enrollment : 170283119022

Our review was scheduled on 5/4/2020. The review was conducted by Google Duo. The review was very fruitful and both faculty gave their important input for the project and we discussed the whole project concept and the results obtain by the experiments. As sir suggested some changes in the report as well as in the banner we are completing

Patel Ankitkumar Kaustubhray

Enrollment :160280119061

It was first experience of online project review and it was quite informative. Each one of the team member presented different parts of the project. Also presented the banner. Examiner first asked the questions individually and also in group. Examiner assessed the project and pointed out the mistakes that were made and informed us to correct it. And he also gave the complement about our work and wishes for success in future.

4. Best practice for the evaluation of projects in the Mechanical department

Interim reviews of B.E. final year projects were organized by the department to critically evaluate the student's work for the improvement in the further stages of the project work. The reviews were carried out by the expert faculty of the particular area that helps students to find out their focusing arrears and to be prepared for the final GTU presentation. The suggestions of the reviewer help the students to improve their presentation skills, demonstrating ability and built up their confidence level to present their work more effectively. The preparation of the presentation and report writing improves the documentation skill, which also help the students. Mechanical Engineering Department practising the following best practices to meet

the program outcomes and program educational objectives as most of them are addressed by the final year project.

Use of Design Engineering principals and PMMS to improve the quality of projects:

Meeting is organized with all final year students regarding the following points by the project committee.

- Application of Design Engineering principles, which they are practicing in the previous semesters and the impact of their DE learning in the final year project.
- Guidance regarding how to select project area. It should relate and beneficiary to Society, Defense, Industries or may be Research-based.
- Information regarding UDP and IDP and, expectation of GTU from the project work - credit, PMMS work, etc.
- Guidance regarding available faculty members and their specialization area. Guidance regarding resources available at the department - COE Siemens and COE welding, various laboratories, etc. and outside resources.

Feedback from the review committee and modification in the work

The Mechanical Engineering Department organizes **two Interim Reviews** for the project work as continues evaluation system during a semester. A student has to be make a presentation during both the reviews with a review card. The review committee suggests the point to improve the project; this review card must be shown to the project guide and to be discussed with them about the suggestion of the review committee. After each review, the students have to comply with the given suggestion and incorporate them during the next review presentation. The review cards must be signed by respective guides and the record has to be maintained by the project committee. Feedback of the students is also considered and record is maintained for future reference. Progressive project report is also prepared by the students and reviewers give suggestion on report writing skill for final report for GTU Examination. The project review committee not only suggests the technical improvement in the work but also comment on the presentation skills and the ability to demonstrate the work effectively. Some of the guidelines given by the committee are listed below.

Points to be considered while making an effective presentation

- List the points before starting the actual work on the presentation. The flow of the presentation should be easily understood and effective.
- Identify the area and the objective of the work.
- Brainstorming and mind-mapping methods should be applied effectively.
- Figures, charts and other demonstration methods are more effective instead of the statements.
- References and the courtesy must be mentioned in the presentation.
- Rehearsal and mock presentation help making effective presentation before expert committee.
- Make a presentation to respective guide and incorporate his/her suggestions.
- Background and font color, style, size should be clearly visible and attractive.

Points to be considered while delivering the presentation

- Domain knowledge improves your confidence in your work which will play an important role while making presentation.
- Clearly mention the objective. Presentation outline make the presentation more attractive.
- The depth of the topic and the time to explain the topic must be managed properly.

- Pictures, diagrams, Surveys and statistics, examples, and case-study may give your presentation an extra edge.
- To overcome fear and stress the student has to think about the present situation only, not to think about the earlier experiences.
- For effective presentation pitching and voice, modulation can play an important role.

Photographs of Project Evaluation throughout the year