

Shantilal Shah Engineering College
Bhavnagar
Electrical Engineering Department
VIDYUTAM



Volume-VII

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DR. SARVEPALLI RADHAKRISHNAN

**TRUE TEACHERS ARE THOSE WHO HELP
US THINK FOR OURSELVES**

Acknowledgement

It is great pleasure to be part of the “Vidyutam”, Volume-VII. We would like share our gratitude to Dr. Mangal Bhatt, Principal, SSEC and Prof. (Dr.) K. P. Badgujar, Professor and Head of department for their continuous support during preparation of “Vidyutam (Vol. VII)”. I am also thankful to Principal sir and H.O.D sir to give this beautiful opportunity to the students and faculties to wander in the world of journalism. We would like to expand our deepest gratitude to all the faculty members and staff members for their cooperation to accomplished the task .

“Vidyutam” started with an objective of Knowledge sharing and spreading the heterogeneous activities of Electrical Department at SSEC, Bhavnagar and it is gradually obtaining appreciation from the scholars, faculty members and readers from various institutes. With this, We are presenting the seventh volume of “Vidyutam” to our genuine readers.

Edited by:
Dr. Astik Dhandhia
Assistant Professor,
EED, SSEC.

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Principal's Message



Dear Readers,

It is my pleasure to congratulate the Team “VIDYUTAM” for August 2021 issue!!

This year we are celebrating 75 Years of Independence of our beloved country. It is our responsibility to commit ourselves for the country by delivering our duties with higher levels of enthusiasm and vigor.

There has been significant improvement in the activities carried out by the department during the period. It is progressing to achieve accreditation with the efforts of one and all in the department. I am sure the target will be achieved.

Wishing all a Independence Day 2021!!!

Dr. Mangal Bhatt
Principal,
SSEC, Bhavnagar

Head of Department's Message



Dear Readers,

It gives me pleasure to present you the seventh edition of “Vidyutam”. This is a platform for students and faculty members to represent their technological and academic activities. This volume also augments the work done at department during the previous year. I am very happy to inform all that we have submitted NBA-SAR during this period. I would like to congratulate our faculties and students for continuing teaching learning activities through online mode.

I acknowledge the efforts put by the team “Vidyutam”.

Keep it up !!!

Dr. K.P. Badgujar
Prof. & Head,
EED, SSEC, Bhavnagar

Electromagnetic Launch System for Space Application

Prof. Mayur Gojiya,
Assistant Professor, EED, SSEC, Bhavnagar

Introduction

Conventional launchers use high quality combustible fuels in large quantities, which are costly and not environmentally friendly, also having limited size in earth. Additionally every space program adds debris in space, orbiting the earth which is a critical problem for future space missions. The huge fuel cost and floating debris in space are the major current issues. India has already addressed the first one and proposed economic launch vehicle PSLV and GSLV but it is required to note that these are not environmentally friendly solutions. The cheapest source of energy available on the earth is energy in the form of electricity, the use of an Electromagnetic (EM) launch system can be extended in this direction. In this article, a brief review on the Electro Magnetic launch system is presented.

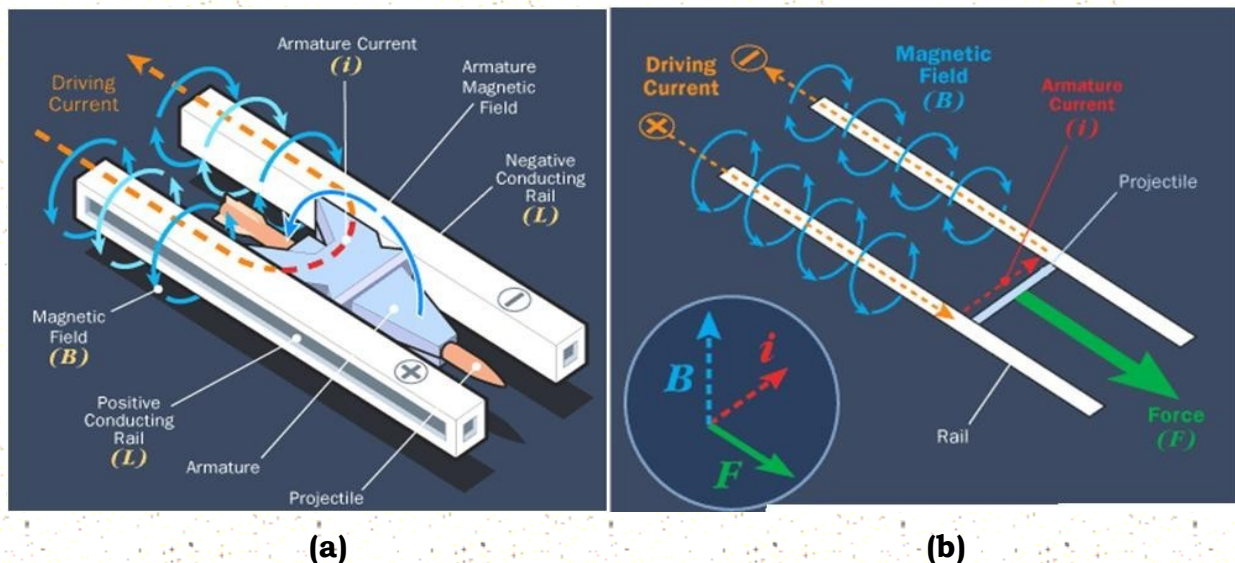


Fig.1 Structure (a) and working (b) of Electromagnetic launcher [5]

Operating principle of Electromagnetic launcher

An Electromagnetic launcher, also known as Rail gun, works on the principle of motoring acting that is, "When current carrying conductor placed in magnetic field conductor experiences force."

• Structure

As shown in Fig.1 (a) EM comprises of two parallel conducting rails, between these rail projectile is placed. Projectile is enclosed in an armature, which is made of conducting material.

Armature slides along with rails. The rails are energized with Pulsed power system. The electrical power system which delivers a stock of energy is known as pulsed power energy. Pulsed Power system comprises of energy storage devices and triggering circuit. Pulsed power system stores energy slowly over long time period followed by a triggering event that lead to rapid release of stored energy to load [1].

The density of energy in such system are very high as compared to conventional power system. The delivery time period of this power system is very small (of order micro, neon or mili second).

• **Working**

The rails are lengths of conductive metal, such as copper. They can range from 4 to 30 feet long.

The armature bridges the gap between the rails. It can be a solid piece of conductive metal or a conductive sabot - a carrier that houses a dart or other projectile. Some rail guns use a plasma armature. In this set-up a thin metal foil is placed on the back of a non-conducting projectile. When power flows through this foil it vaporizes and becomes a plasma, which carries the current.

Here's how the pieces work together:

An electric current runs from the positive terminal of the power supply, up the positive rail, across the armature, and down the negative rail back to the power supply.

Current flowing in any wire creates a magnetic field around it - a region where a magnetic force is felt. This force has both a magnitude and a direction. In a rail gun, the two rails act like wires, with a magnetic field circulating around each rail. The force lines of the magnetic field run in a counterclockwise circle around the positive rail and in a clockwise circle around the negative rail. The net magnetic field between the rails is directed vertically.

Like a charged wire in an electric field, the projectile experiences a force known as the Lorentz force (after the Dutch physicist Hendrik A. Lorentz). The Lorentz force is directed perpendicularly to the magnetic field and to the direction of the current flowing across the armature.

- **Types of Pulsed Power System**

- Capacitive System
- Pulsed Homo Polar Inductor System
- Pulsed Alternator
- Magneto Hydro Dynamic Generator
- Capacitive System

- **Capacitive System**

A bank of capacitors are used as energy storage device. Capacitors are charged for same potential difference and discharge through power electronic switch triggering to rail gun. Discharging of capacitor bank produces large voltage as well large current impulse which in turn apply thrust on projectile.

The limitation of this system are large space requirement by energy storing device (capacitor bank), the life of energy storing system is less, leakage of energy [1, 2].

- **Pulsed Homo Polar Inductor System [3,4]**

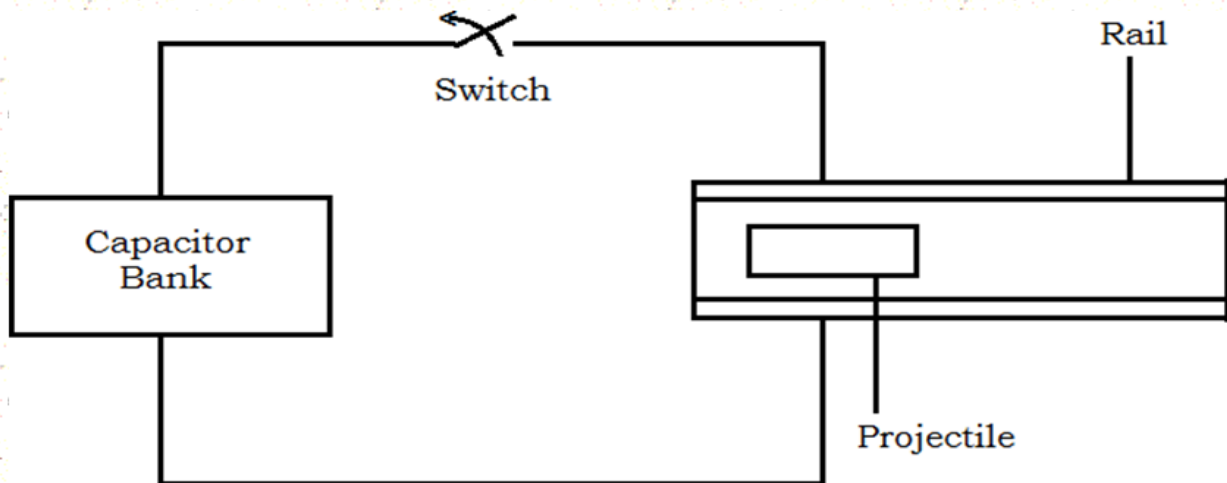


Fig.2 Capacitive System

Homo polar generator is faraday's disc, rotated in magnetic field as shown in Fig.3. Disc is made up of conducting material, so at room temperature there is free electrons are available which are behaving as current carrying conductor. Free electrons experiences force and get concentrated at surface and constitute potential difference between surface of the disc and shaft. Maximum 100- 200 V can be generated with this generator which are not sufficient for pulsed power system.

That's why homo polar generator is used in conjunction with series inductor. Firstly, with opening switch in closed state an inductor is charged. When opening switch is opened stored energy in inductor is released in rail gun.

Limitations of this system are

All generator output power is transferred through sliding contacts maintenance issue to be address. Opening switches are needed to pen the inductor and transfer current to gun. Demonstration of single shot operation is possible but multiple shot mega ampere interruption is not easily developed.

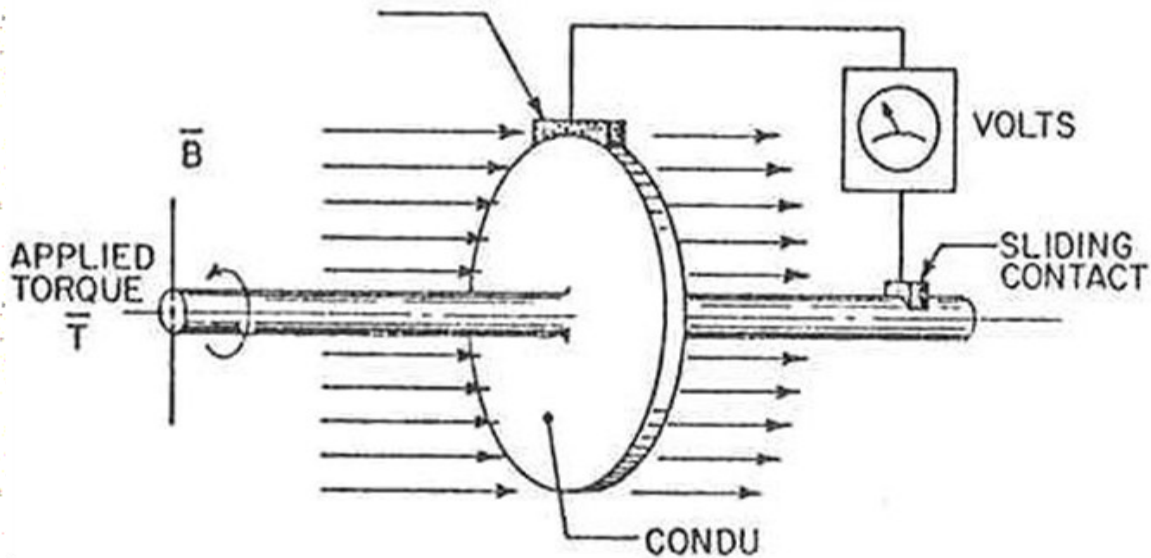


Fig.3 Homo Polar Generator

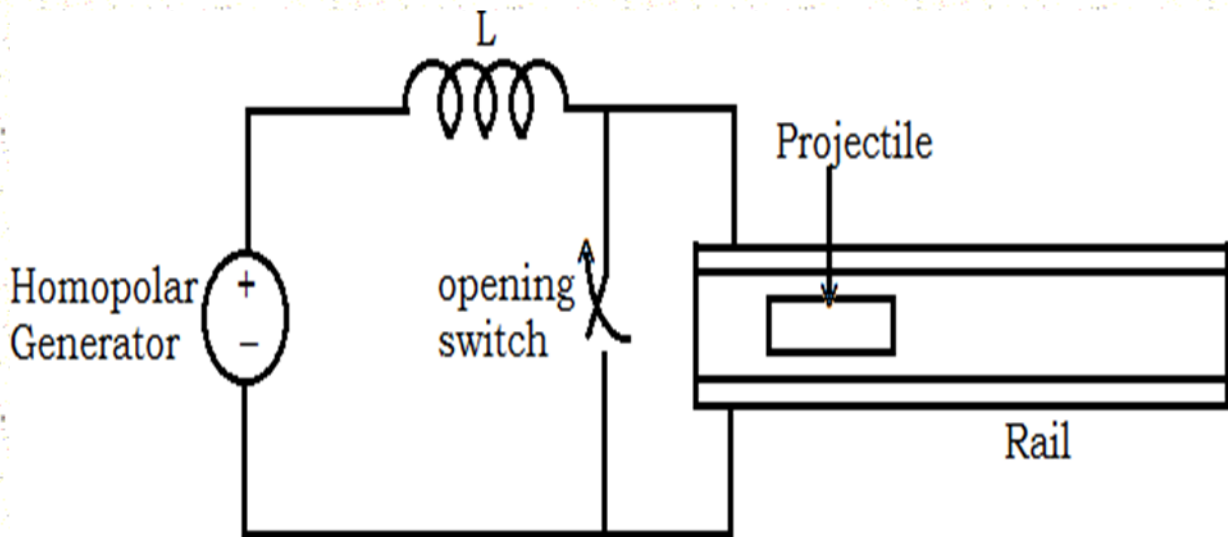


Fig.4 Pulsed Homo Polar generator

• Pulsed Alternator [6,7]

Pulsed alternator is a simple alternator followed by rectifier. The winding showed in red color in Fig.5 is field winding and showed in silver is stator winding. The rotor is made rotated at constant speed, field winding is momentary energized which in turn induces alternating voltage in stator winding. Stator winding is multiphase winding. The peak value of generated voltage increases as current impulse in field winding increases, as long as field current remains constant peak of the generated voltage is maintained and as impulse decreases generated voltage also decreases. As alternator winding is followed by rectifier circuit the output current is resultant of all three phase rectified signals as shown in Fig.6.

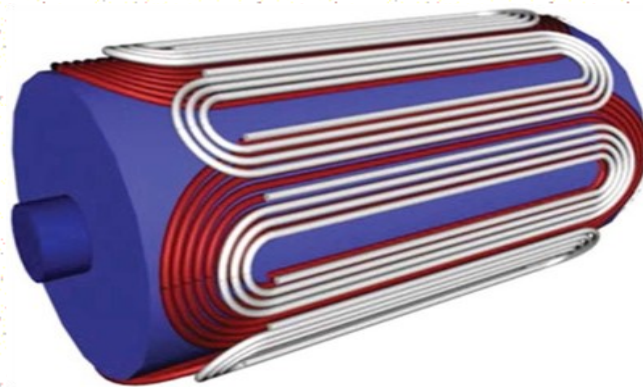


Fig.5 Pulsed Alternator

Pulsed alternator is a simple alternator followed by rectifier. The winding showed in red color in Fig.5 is field winding and showed in silver is stator winding. The rotor is made rotated at constant speed, field winding is momentary energized which in turn induces alternating voltage in stator winding. Stator winding is multiphase winding. The peak value of generated voltage increases as current impulse in field winding increases, as long as field current remains constant peak of the generated voltage is maintained and as impulse decreases generated voltage also decreases. As alternator winding is followed by rectifier circuit the output current is resultant of all three phase rectified signals as shown in Fig.6. This system is suffering from thermal management, development of fast operating high voltage, high current Sic power electronic switches and cost.

MHD generator comprises of a vessel equipped with static electric field and electrode segments as shown in Fig.7. From most right side of vessel hot ionized gas is injected. As the gas is ionized, while passing through electro static field there will be separation of charge particles take place and potential difference induced across electrode segments placed perpendicular electro static field.

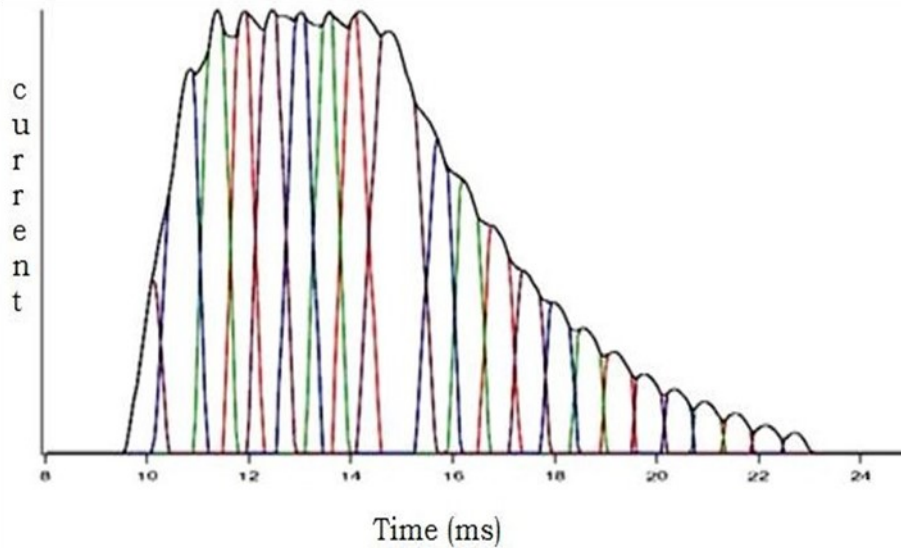


Fig.6 Output Impulse current

• **Magneto Hydro Dynamic Generator (MHD) [8]**

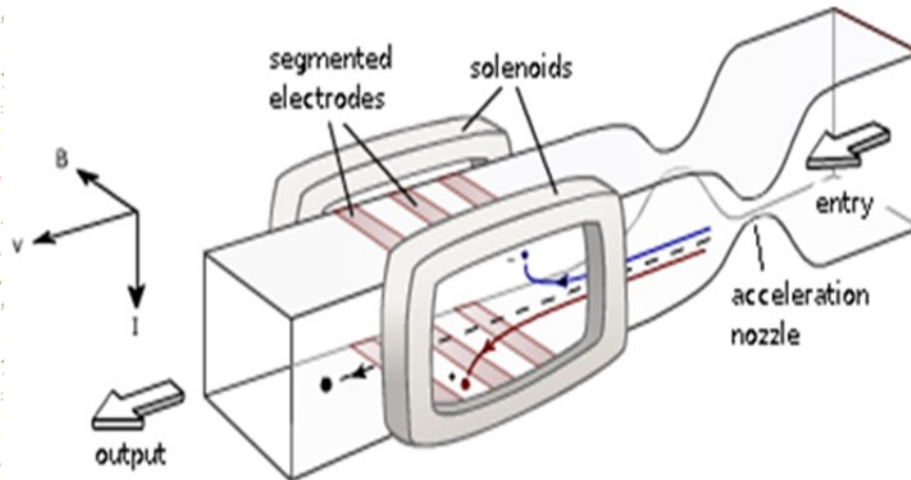


Fig.7 Magneto Hydro Dynamic Generator

The shape of voltage pulse induced depends on the rate at which hot ionized gas is flowed and rate at which separation of charge particle is carried out. The induced voltage is applied to rail gun to launch projectile. Available output is a DC signal.

This generator also finds its application in thermal power stations to improve efficiency of the plant. This generator need no water as well fuel to be burnt. Also it is not carrying any rotating part. Only hot ionized gas is in motion.

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The Invisible hand

Adnan Haradwala

7th Semester

EED

It might be some conspiracy or it might be true. But there's a powerful group of people out there that are secretly running this world. The guys who are at the top of the capitalistic world and they play with God without permission. Technology has grown faster than anything in the world; almost everybody owns a digital device and maximum people have social media in their digital devices. Many people think that Google is just a search box, face book is just for interacting, seeing what your friends are doing, and see their photos/ videos. But what you don't realize is that these companies are competing for your attention. Facebook, Snapchat, Instagram, Twitter, Youtube, and many more. companies like this, their business model is to keep people engaged on the screen. They are figuring out how to get as much of this person's attention as they possibly can and how much of your life can you give it to them. There are all these services on the internet that we think of as free, but they are not free. They're paid by advertisers. Advertisers pay in exchange for showing their ads to us. We're the product. Our attention is on the product being sold to advertisers. The classic saying is: "if you're not paying for the product, then you are the product". Because we don't pay for the product that we use, advertisers pay for the products that we use. Advertisers are customers. We're the thing being sold. But we won't see this coming. It's the gradual, slight, imperceptible change in your behaviour and perception that is the product; it is changing what you do, how you do, who you are. It's a gradual change. It's slight. This is what every business has dream of it. A business with a high rate of success by an ad, sells certainty, to be successful in that business you have to have a great prediction. And for great predictions, you need a lot of data.

Some people called this surveillance capitalism, it is profiting off the infinite tracking of everywhere everyone goes by large technology companies whose business model is to make sure that advertisers are successful as possible. You might not be aware of this but everything you do online is being watched, is being tracked, and is being measured. Every single action is carefully monitored and recorded. What image you stop and look at, for how long you look at it. They know when people are lonely when people are depressed when people are missing someone, what people do at late night, they know the entire thing. What kind of personality you have, what you like/dislike everything is open to them. All of this data is giving to the systems which have minimum human supervi-

sion, the system is studying our behaviour and making better predictions about what we're going to do and who we are. Many people have the misconception it is our data being sold, companies don't earn by selling data. They build models that predict our actions, and whoever has the best model wins. All the things on the internet you did, videos you liked, an article you read all of this information is feeding to the systems and that systems will get better and better you understand your behaviour.

There's an entire discipline and field called 'growth hacking'. Teams of engineers whose job is to hack people's psychology so they can get more growth, they can get more user sign-ups, more engagement, they can get you to invite more people. Many of these growth tactics are a playbook for Silicon Valley, a bunch of companies using this type of tactics. One of the tactics is scientific A/B testing of small feature changes companies would roll out lots of little, tiny experiments that are constantly doing on users, and in overtime by running these constant experiments, you develop the most optimal way to get the user to do what they want them to do to its manipulation. By giving you a small dose of dopamine (a happy chemical in the brain) they start manipulating you. These billion dollars tech companies are feeding on people's vulnerabilities, exploiting people's psychology.

Climate Change

Parag Chavda
5th Semester
EED

Climate change is nothing but change in condition of weather around the world. It can sustain for extended period of time, may be a decade or millions of years. It is caused due to certain variation in solar radiation absorbed by earth, volcanic eruptions etc.

Certain human activities are also responsible for climate change such as “**Global Warming**”. Overall temperature of earth increase due to “**Green House Effect**” caused by carbon di-oxide, CFCs and other pollutants; also known as green house gases. Factors which can change the climate are called “Climate Forcing”; it can be either internal or external.

Internal mechanisms are caused by the natural processes inside that climate system like volcanic eruptions. External mechanisms are caused due to involvement of human beings. Example: Emission of greenhouse gases, pollution.

It has been observed that in 21th century most of the years Till now have been very warm compared to the years of 19th century. The glaciers in Antarctica are melting rapidly since the year 2002. Climate change is the gravest and very crucial problem which no one can ignore; it is spreading its leg in India too. In previous years the Average temperature of India has increased up to 1.1 degree Celsius. Monsoon becomes unpredictable due to climate change, sometimes Causes draught and sometimes flood like situation.

It is our duty to reduce this process and try to maintain a balance between human beings and environment, in order to earn profit we should not try to degrade the environment.

Here are some ways to reduce climate change:

- 1) 3R (Reduce, Reuse, Recycle)
- 2) Use less Heat and Air conditioning.
- 3) Use Eco-Friendly LED light bulbs.
- 4) Drive less and Drive smart.
- 5) Protect our forests and Plant more trees.
- 6) Reduce food waste.
- 7) Avoid plastic.
- 8) Family planning
- 9) Save energy

10) Power our home with renewable energy.

We must know one thing, that if environment gets disturbed then living beings are going to suffer heavily.

“ GO GREEN BEFORE THE GREEN GOES...”

Poem written by student

आज वो भी एक जवान है

आज वो भी एक जवान है
जो कोई देश या दुनियां की सरहद पर नहीं,
लेकिन देश के अस्पतालो में लड़ रहा है।
आज वो भी एक जवान है
जो सरहद पर नहीं,लेकिन सड़कों पे पहेय दे रहा है।
आज वो भी एक जवान है
जो देश को साफ सथुरा रख रहा है।
आज वो भी एक जवान है
जो देश में हर दिन मातासामान पहुंचा रहा है।
आज वो भी एक जवान है
जो इस महारोग की दवा ढूंढने में रात दिन जुटा रहा है।
आज वो भी एक जवान है
जो भूखे को भोजन पहुंचा रहा है।
आज वो भी एक जवान है
जो बिना रुके बिजल और पानी हर घर पहुंचा रहा है।
आज वो भी एक जवान है
जो घर पर रहकर अपना कर्तव्य निभा रहा है।
आज वो भी एक जवान है
जो देश को बचाने सरहद पर हर दिन लड़ता रहा है।
(लोकडाउन काल के..)
- यश कोंट्राक्टर

Yash Contractor
Semester-2 ,
M.E. (Electrical)

Details of HV/EHV lines in Gujarat

Sr. No.	Name of the line/Equipment
01	400 kV Choraniya - Hadala
02	400 kV Hadala - Jetpur
03	400/220 kV 315 MVA ICT - 1 Hadala
04	400/220 kV 315 MVA ICT - 2 Hadala
05	220 kV Morbi - Hadala line No. 1
06	400 kV Vadavi Dehgam line No. - 1
07	400 kV Vadavi Dehgam line No. - 2
08	400/220 kV 315 MVA ICT - 1 Vadavi
09	400/220 kV 315 MVA ICT - 2 Vadavi
10	220 kV Hadala - Nyara 1
11	220 kV Hadala - Nyara 2
12	220 kV Mota-Chikhali line no.1
13	220 kV Mota-Chikhali line no.2
14	220 kV Nanikhakhar- Adani line no.2
15	400 kV Asoj -Amreli line In at chorania
16	400 kV Asoj -Amreli line LO at chorania
17	220 kV Panandhro - Anjar line - 2 LILO at 220 kV Kukma. (Kukma - Anjar)
18	220 kV Panandhro - Anjar line - 2 LILO at 220 kV Kukma. (Kukma - KLTPS)
19	220 kV Shivilakha - Morbi line no.2
20	220 kV N' Khakhar - APL Line No. 1
21	220 kV Bala - Choraniya Line No. 1 & 2
22	220 kV Sanodar - Motipaneli Line No. 1
23	220 kV Sanodar - Motipaneli Line No. 2
24	220 kV N' Khakhar - Sindhodi Line NO. 1
25	220 kV N' Khakhar - Sindhodi Line NO. 2
26	220 kV N' Khakhar - Suthari -1
27	220 kV N' Khakhar - Suthari -2
28	400 kV Adani -Sami -Dehgam-1
29	400 kV Adani -Sami -Dehgam-2
30	220 kV Shivilakha - Vandhiya Line No. 1
31	220 kV Shivilakha - Vandhiya Line No. 2

Sr. No.	Name of the line/Equipment
32	220 kV Bala - Adalsar Line
33	220 kV Bala - Dhanki Line
34	220 kV Bala - Rajpar Line
35	220 kV Bala - Dudhrej Line
36	220 kV Rajpar - Dudhrej Line
37	220 kV N' Khakhar - CGPL Line
38	220 kV Panandhro – Anjar line - 1 LILO at 220 kV Kukma. (Kukma - Anjar)
39	220 kV Panandhro – Anjar line - 1 LILO at 220 kV Kukma. (Kukma - KLTPS)
40	220 kV Deoder – Anjar line LILO at 220 kV Shivilakha
41	220 kV SLPP – Gavasad Line No. 3
42	220 kV SLPP – Gavasad Line No. 4
43	220 kV APL – Tapar line No.1
44	220 kV APL – Tapar line No.2
45	132 kV Dahod – Godhra Line No.2
46	220 kV Salejada –Bhat Line 1
47	220 kV Salejada –Bhat Line 2
48	220 kV Viramgam –Bhat Line 1
49	220 kV Morbi - Tappar
50	220 kV Tappar - Hadala
51	220 kV Viramgam –Bhat Line 2
52	220 kV Viramgam –Bhat Line 1 & 2
53	220 kV Kasor - Vartej LI at Botad
54	220 kV Kasor - Vartej LO at Botad
55	220 kV Kansari Tharad line-1 LI at Agathala
56	220 kV Kansari Tharad line-1 LO at Agathala
57	220 kV Tapar – Varsana Line-3
58	220 kV Tapar – Varsana Line-4
59	400/220 kV 315 MVA ICT - 1 Varshana
60	400 kV Hadala – Varsana line
61	220 kV GSEG –KIM line-2 LI at Mora(L&T)

Sr. No.	Name of the line/Equipment
62	220 kV GSEG –KIM line-2 LO at Mora(L&T)
63	220 kV Wanakbori – Ranasan line LI at 220 kV Kapadvanj
64	220 kV Wanakbori – Ranasan line LOat 220 kV Kapadvanj
65	400 kV APL – Varsana line
66	400 kV APL– Hadala line
67	400/220 kV 315 MVA ICT - 2 Varshana
68	400/132 kV, 315MVA ICT-1 Pirana(T)
69	400/132 kV, 315MVA ICT-2 Pirana(T)
70	400 kV Sugan – Pirana(T) line-1
71	400 kV Sugan – Pirana(T) line-2
72	400 kV Dehgam– Pirana(PG) line-1
73	400 kV Dehgam– Pirana(PG) line-2
74	400/220 V, 315MVA ICT-1 Pirana(PG)
75	400 kV Pirana(T) –Pirana(PG) line-1
76	400 kV Pirana(T) –Pirana(PG) line-2
77	220 kV Kim - Kosamba
78	220 kV Kosamba - Zagadia line No. 1
79	220 kV Utran –Kosamba line-1
80	220 kV Kosamba - Zagadia line No. 1
81	220 kV Kosamba - Zagadia line No. 3
82	220 kV Bhat - Pirana (PG) - 1
83	220 kV Ukai –Vav line no. 2 Lilo at Mota
84	400/220 kV 315 MVA ICT 1 Kosamba
85	400 kV Hadala - Vadinar Line - 1
86	400 kV Hadala - Vadinar Line - 2
87	220 kV Bhat - Pirana (PG) - 2
88	400 kV Vadavi Choraniya line No. - 2
89	80 MVAR Bus Reactor at 400 kV Soja
90	50 MVAR Bus Reactor at 400 kV Varsana
91	125 MVAR Bus reactor at 400 kV Kasor
92	400 kV Vadavi Choraniya line No. - 1

Sr. No.	Name of the line/Equipment
92	220 kV Gondal-Kangashiyali
93	220 kV Rajkot-Kangashiyali
94	220 kV Utran –Kosamba line-2 charged loc no. 50
95	220 kV GSEG - Kosamba Line no. 1
96	220 kV GSEG - Kosamba Line no. 2
97	400 kV Bhachau-Mundra(CGPL)-1
98	400 kV Vadavi bhachau Line No. -1
99	400 kV Bhachau-Mundra(CGPL)-2
100	400 kV Vadavi bhachau Line No. -2
101	400 kV Vadavi Kansari line No. - 1
102	400 kV Vadavi Kansari line No. - 2
103	400 kV Choraniya - Bhachau - Line 1
104	220/132 kV 100MVA TRF AT BOTAD S/S
105	132 kV Dhandhula - Paliyad LI at Botad (132 kV Dhaduka - Botad)
106	133 KV Dhandhula - Paliyad LO at Botad (132 KV Botad - Paliyad)

GTU Results

The results of the students of 4th and 6th semester still awaited due to COVID-19 situation.

The top three students ranking of 8th Semester students according to SPI is as follows

Sr. No.	Name of student	SPI
01	SHUKLA HARSH MANISHBHAI	10.00
02	MISHRA SHUBHAM SANJAY	10.00
03	TUKADIYA MANOJ RAMJIBHAI	10.00

The top three students ranking of 8th semester students according to CPI is as follows

Sr. No.	Name of student	CPI
01	JANI PARTHVI MUKESHBHAI	8.93
02	SHUKLA HARSH MANISHBHAI	8.36
03	GHEDIYA BHAVIKKUMAR MANOJBHAI	8.33

Achievement by Faculties

- Prof. (Dr.) Ketan Badgujar is nominated as member of board of studies in Electrical and Power Electronics Branch at GTU for next three years
- Prof. (Dr.) Tejas Maniar successfully completed his PhD from C.U. Shah University, Surendranagar on topic “ Renewable Power System Improvement by Modified Topology in Power Converter”

Paper published by the faculties

- Prof. (Dr.) Ketan Badgujar published a Research Paper titled “Impact of Geo Magnetically Induced Current on the Power System and its Components” at a conference held at IITRAM, Ahmedabad.
- Prof. Ajit Rathod published a paper in the International Journal for Research in Applied Science and Engineering Technology (IJRASET) with a title of "Sliding Mode Control for Chaotic Oscillations in SMIB Power System" in July 2021.

Expert Lectures/Webinars delivered by Faculties

- Prof. (Dr.) Ketan Badgujar successfully organized a webinar on NBA accreditation on 6th March, 2021 in which Chairman and Member Secretary, NBA, New Delhi, Principal Secretary (Education) Government of Gujarat, Director of Technical Education, Director of Higher Education and more than 1000 faculties from various technical institutes across Gujarat participated in this webinar. Prof. (Dr.) badgujar received special appreciation form Director of Technical Education for organizing this event
- Prof. (Dr.) Ketan Badgujar delivered webinars on diverse topics at GMB Polytechnic-Rajula, GEC-Bharuch, RCTI-Ahmedabad, GP-Palanpur, GEC-Surat, GEC-Rajkot, SSEC-Bhavnagar, GP-Bharuch, GP-Junagadh and Nirma University, Ahmedabad
- Prof. (Dr.) Ketan Badgujar delivered a key note address at an event in L.D. Engineering college, Ahmedabad

Visit and work done at CTE offices

- Prof. (Dr.) Ketan Badgujar visited GP-Ahmedabad, GP-Palanpur, GP-Porbandar and RCTI-Ahmedabad for mock round of NBA
- Prof. (Dr.) Ketan Badgujar contributed for SFR calculation at CTE office level for Degree and Diploma colleges
- Prof. (Dr.) Ketan Badgujar attended accreditation visit at GP, Ahmedabad.