DEPARTMENT OF ELECTRICAL ENGINEERING

INDUSTRIAL VISIT DETAILS - 2022-23

Sr No	Name of Industry	Details	Date	No. of participants
1	Gayatri Industries ,Pune	Power Electronics applications	25-08-2022	60
2	Solar Panel AISSMS COE, Pune	Electrical Installation, Design and Condition Based Monitoring	01-09-2022	68
3	Ghorpadi Diesel Loco shed, Pune	Traction Drives	12-04-2023	49
4	MSEB Rasta Peth,	SF6 Gas Sub station at Bhavani Peth	17-04-2023	32
5	Metro Station, Kothrud, Pune	Garware station	22-02-2023	36
6	KPML , Karad	Electric Motor mfg plant	13-05-2023	24

Head
Electrical Engg Dept
Head
Department of Electrical Engineering
AISSMS College of Engineering, Pune

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Activity Report

Industrial Visit to Gayatri Engineers

25th Aug 2022

Department of Electrical Engineering has organized an Industrial visit for TE Electrical students to Gayatri Engineers,Pune in association with Institute of Engineers, India (IEI), Electrical Chapter on 25 Aug 2022.

The Expert of the session were

1. Sudhanshu Shrikhande,

Gayathri Engineers, Pune

This visit was organized by **Mrs. P. K. Sankala and Dr. A.A. Apte**.

Company Profile:

A Pune based company started in 1998, is headed by **Sudhanshu Shrikhande** and supported by **Mrs. Madhavi Shrikhande.**Started with small Designs in the fields in Power Electronics for reliable products, the organization has attained a level of confidence to build the Power Products to work with a variety of applications Design, Manufacturing, of Electrical and Electronics Power Products.

GAYATRI ENGINEERS

1) Battery chargers- SMPS based and transformer based for gensets, battery vehicles, UPS, Inverters etc.

2) Servo voltage stabilizers - 1 ph - 3ph- for a variety of industrial / medical applications where stability of voltage is important.

3) Engine Cranking rectifiers - For engine testing applications from 50 amp to 3000 amp capacity.

4) On Line UPS, Industrial Inverters, Home UPS, Batteries etc.

5) Battery Tester- For Understanding or finding a faulty battery or a weak battery, in 1 minute.

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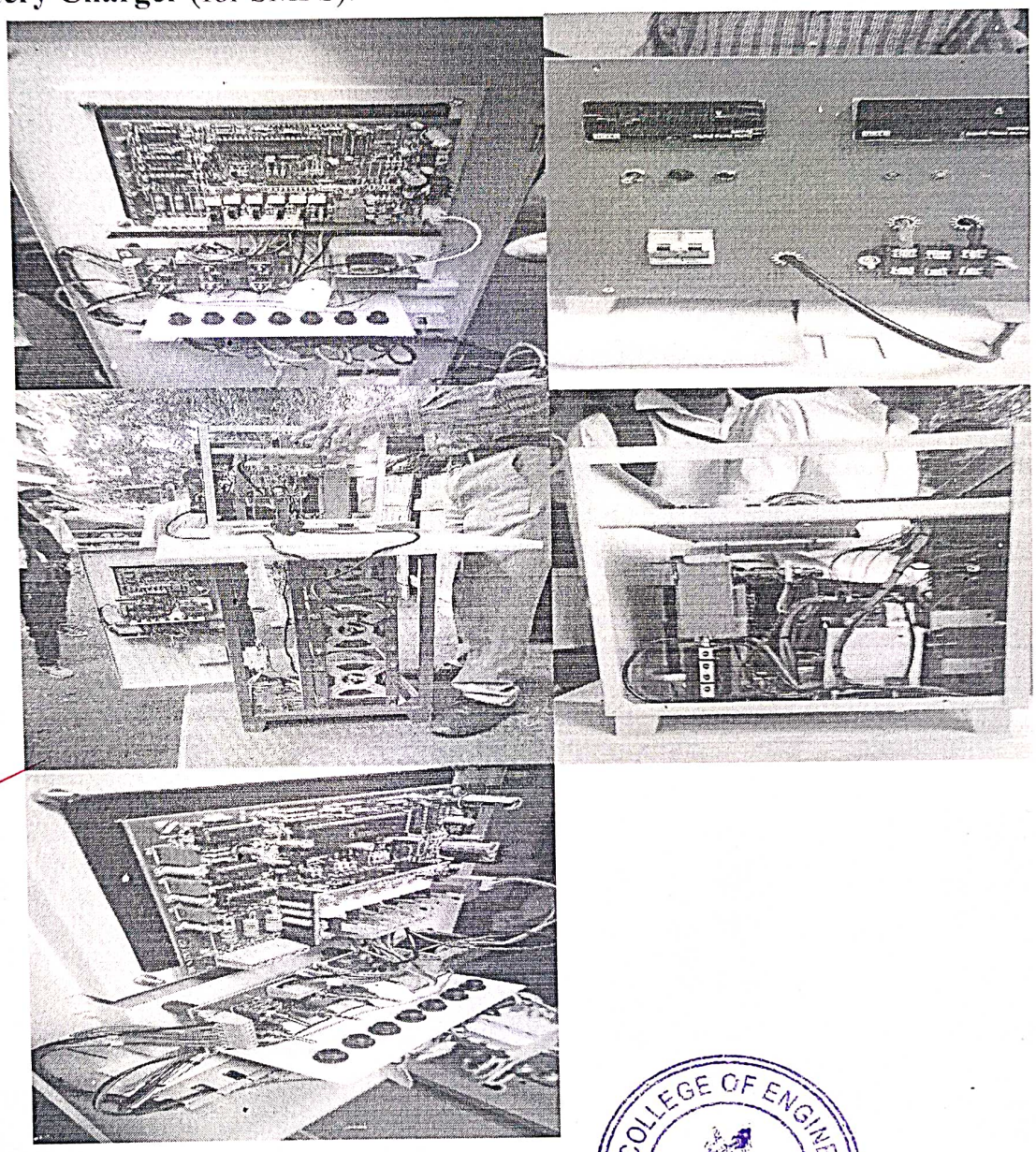
6) Battery Level Indicator - It displays the status of a discharging battery in %. Useful for battery operated vehicles.

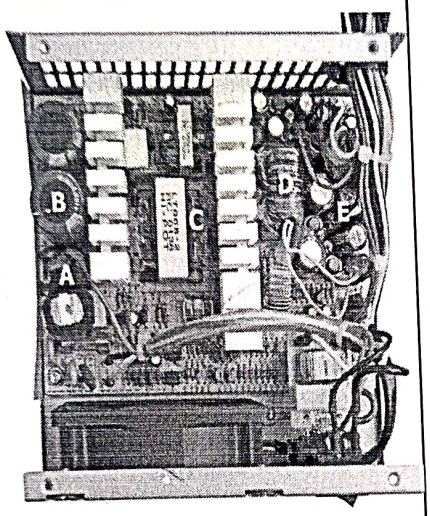
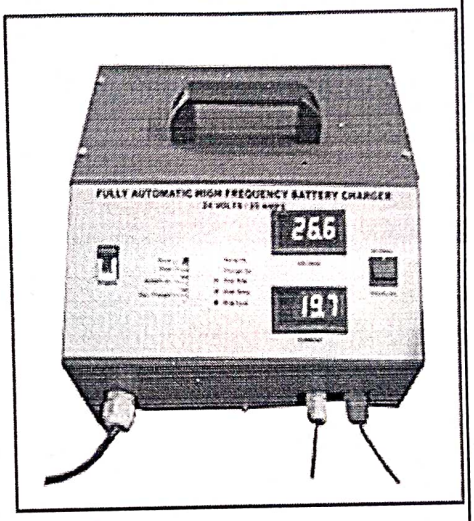
The **main motive** of this industrial visit was to understand more about battery chargers and Voltage stabilizers.

The various equipments discussed were:

1. **Battery Charger** (for SMPS):



Battery chargers are used for SMPS, which are operated on high frequency (100-200KHz). All air-flying vehicles require to carry load, to fly in air as less is the volume/size, less losses are incurred. As SMPS has high operating frequency, volume required is less and efficiency is effectively higher. So it is preferred as it has less volume and less size. The battery charger consisted of a **semi-controlled** (buck) converter (1 SCR and 1 diode were used).

SMPS		**Battery Charger**
100-200 KHz	**Difference (in frequency)**	**50 Hz**
		

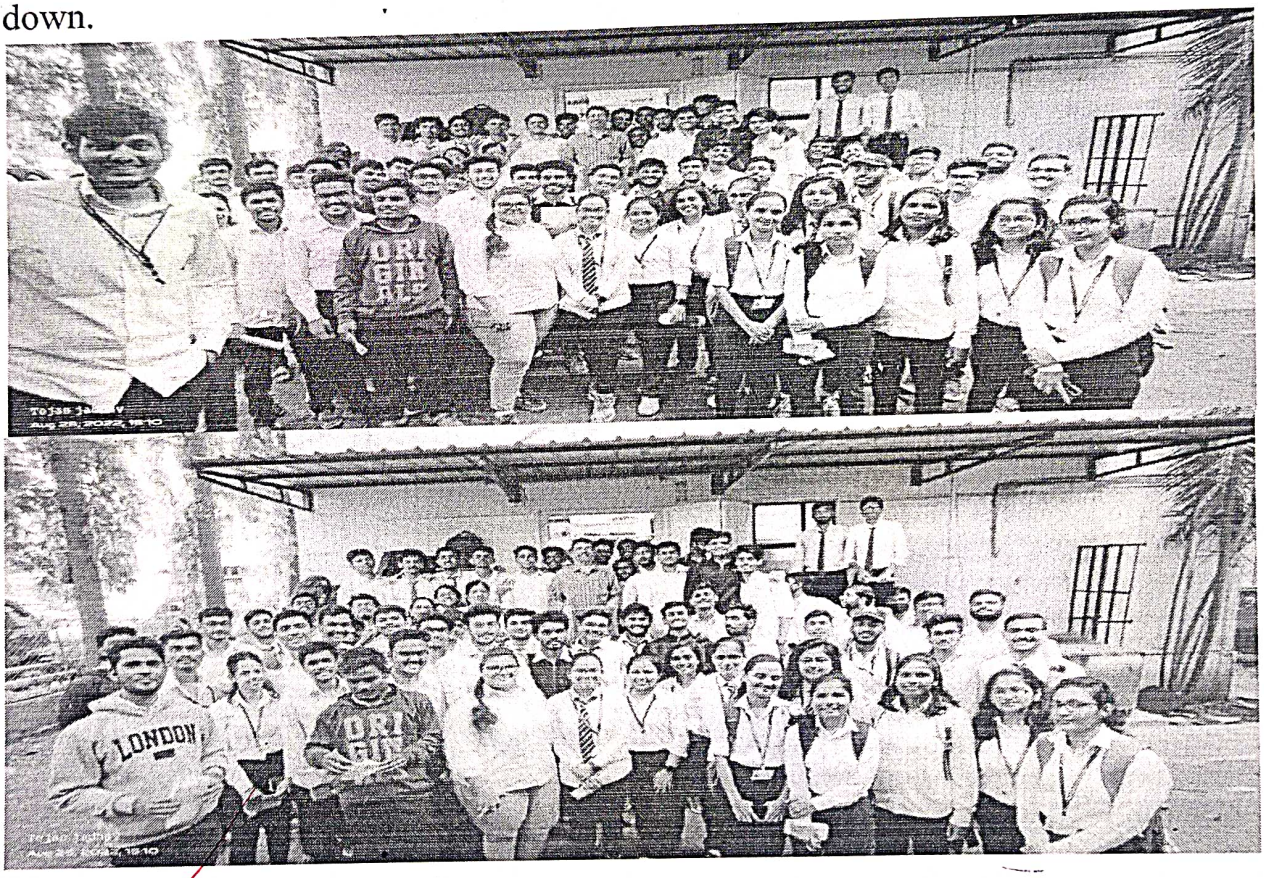
2. **Servo Voltage Stabilizer**:

Voltage stabilizer shown was a 20A device, front side consisted of display while backside had a control card. Bridge converter is connected to LC filters and LC

filter is connected to **bleeder resistor**, bleeder resistors are used as a safety feature to discharge capacitors to safe voltage levels after power is removed. A bleed resistor may be either permanently for cost effectiveness and high reliability or switched across a capacitor for rapid discharge without stagnant dissipation. **A PIC16F887** version of the microcontroller was used on the control card of the voltage stabilizer.

Conclusion :

- Various facets of Battery charger, voltage stabilizer and related devices were studied.
- Operation was understood and specifications of components were noted down.



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9)

Title-Study of advanced metering infrastructure of SOLAR ROOFTOP SYSTEM of AISSMS College of Engineering

Aim :

Detailed Study Of Energy Monitoring System of Solar roof top system of AISSMS COE

Theory:

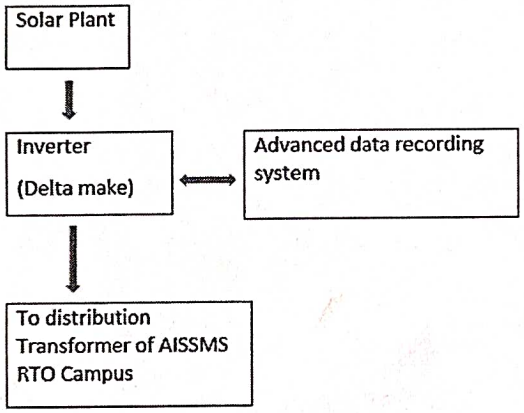
The solar roof top system of AISSMS COE was observed. It operates on net metering mode.

The various parameters are noted down by using advanced metering system available with Delta inverters.

C Good

Roll No 317

Block Diagram:



The total capacity of Roof-top Solar Plant of AISSMS Campus is 300kW. The capacity distribution is as below-

AISSMS COE= 150 kW

AISSMS IOIT= 100 kW

AISSMS Pharmacy College= 50 kW

The system operates with Net-metering mode.The saving of about 30 to 40 % is obtained due to net metering system.

The Solar Rooftop system of AISSMS COE was observed during site visit on 08/11/2023 by SE Electrical Engineeering students.

The AISSSMS COE Rooftop system utilizes 3 inverters.The solar panel gives DC output which is converted to AC by means of inverter unit.

Delta make inverters are used . Each inverter is rated 50 kW. Total 03 Inverters are used at AISSMS COE , hence total inverter capacity is 50 X 03= 150 kW.

The varios parameters related to electrical power are observed on inverter display unit. The snap shots are given in the report.

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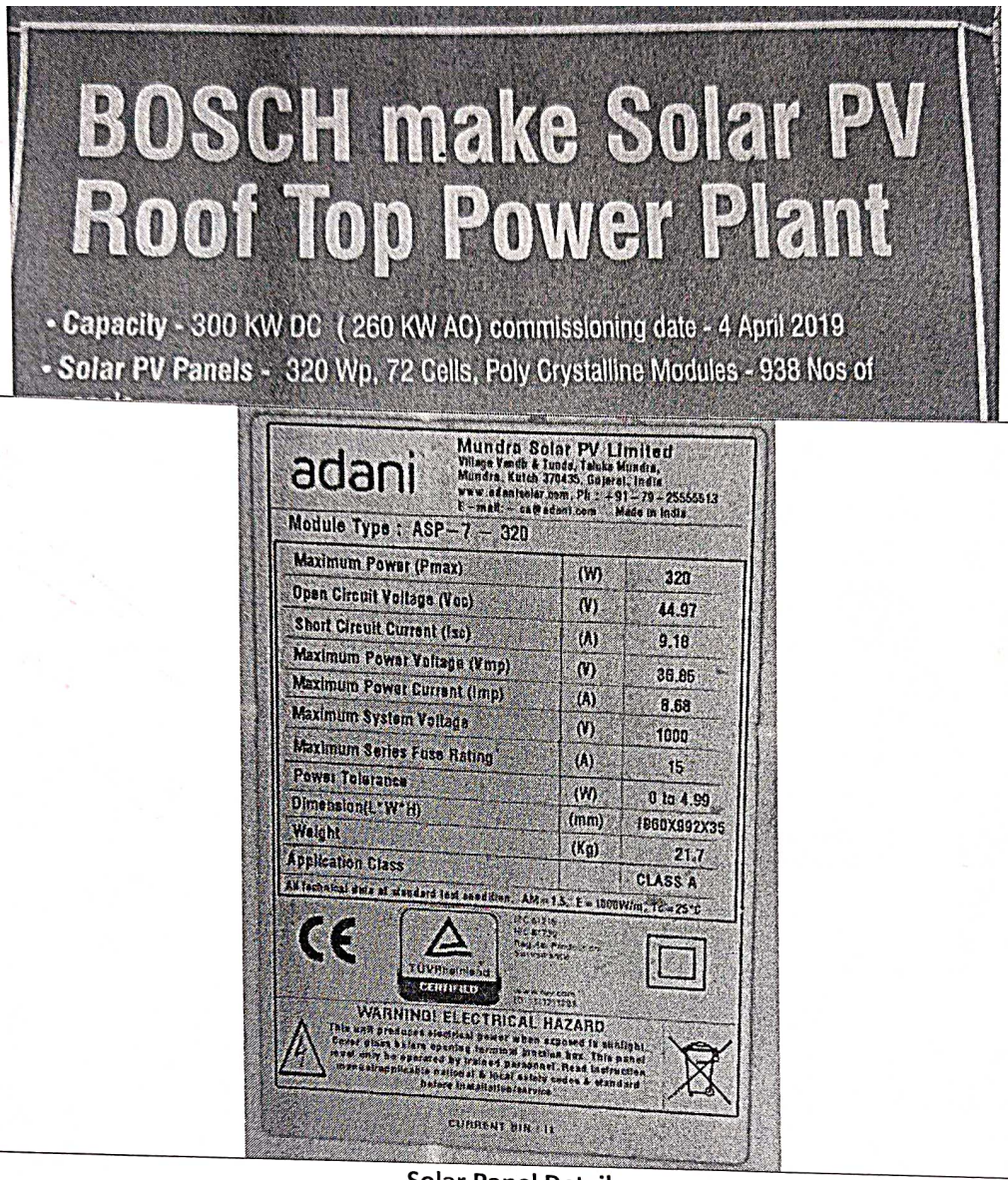
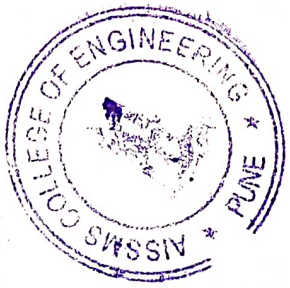
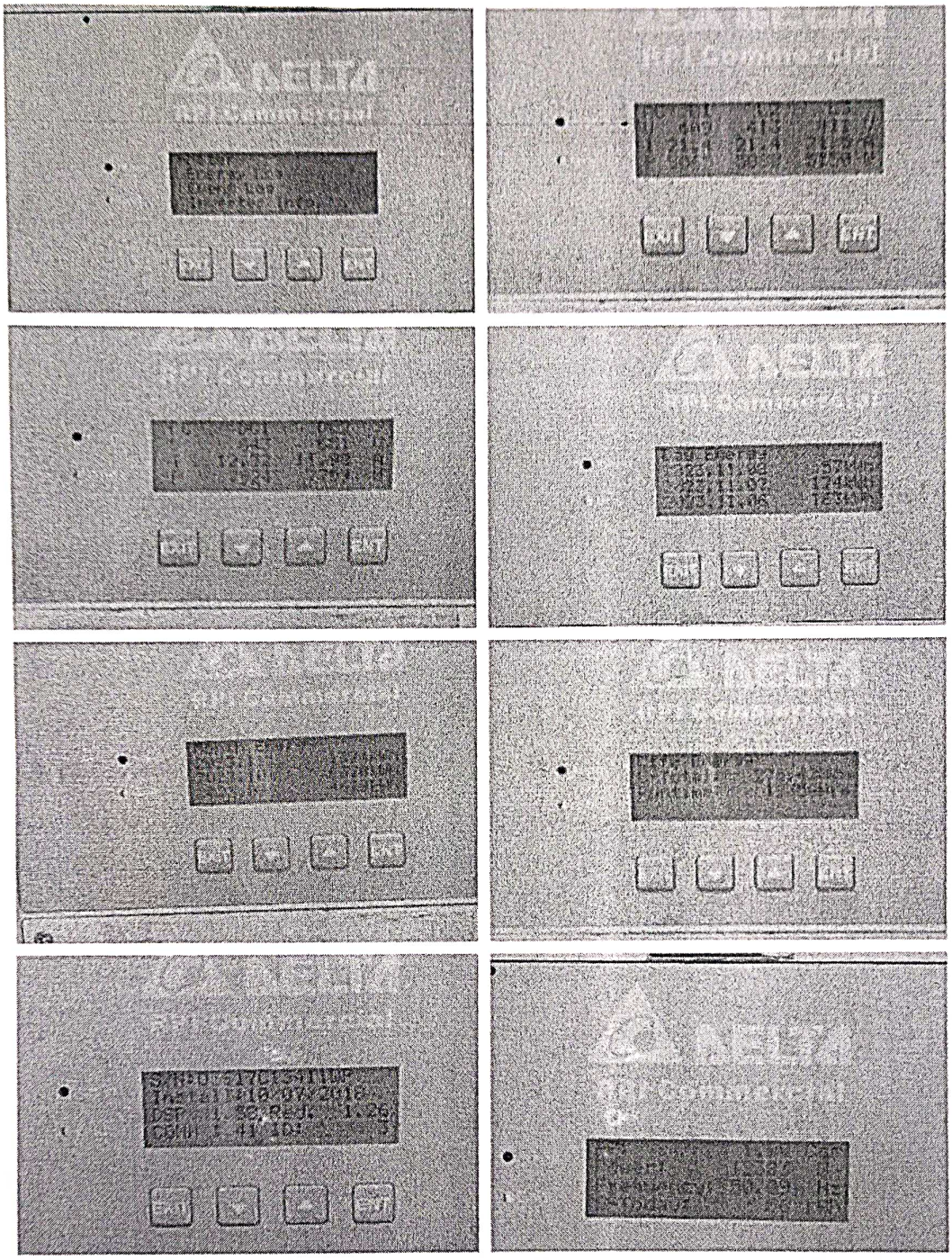


Solar Panel Details





Inverter Display Screenshots showing various parameters

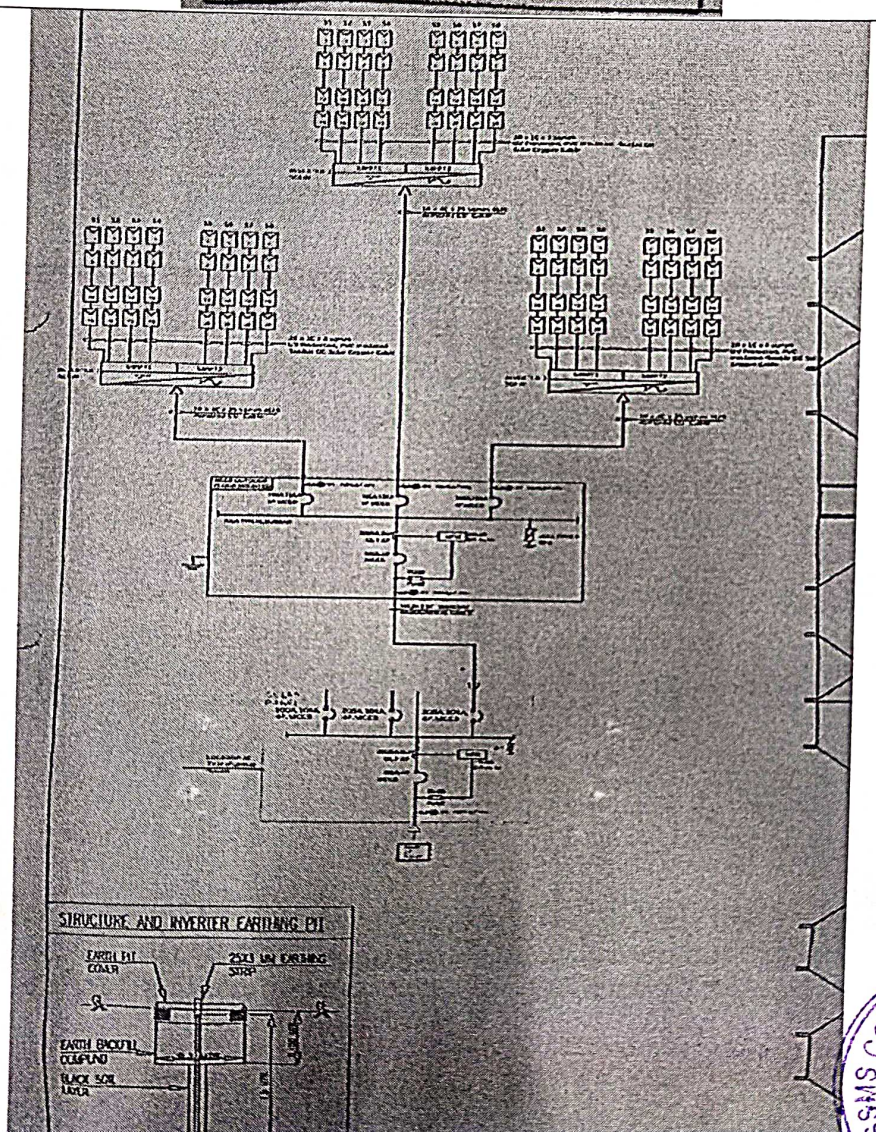
SOLAR POWER PLANT CAPACITY DETAILS:-

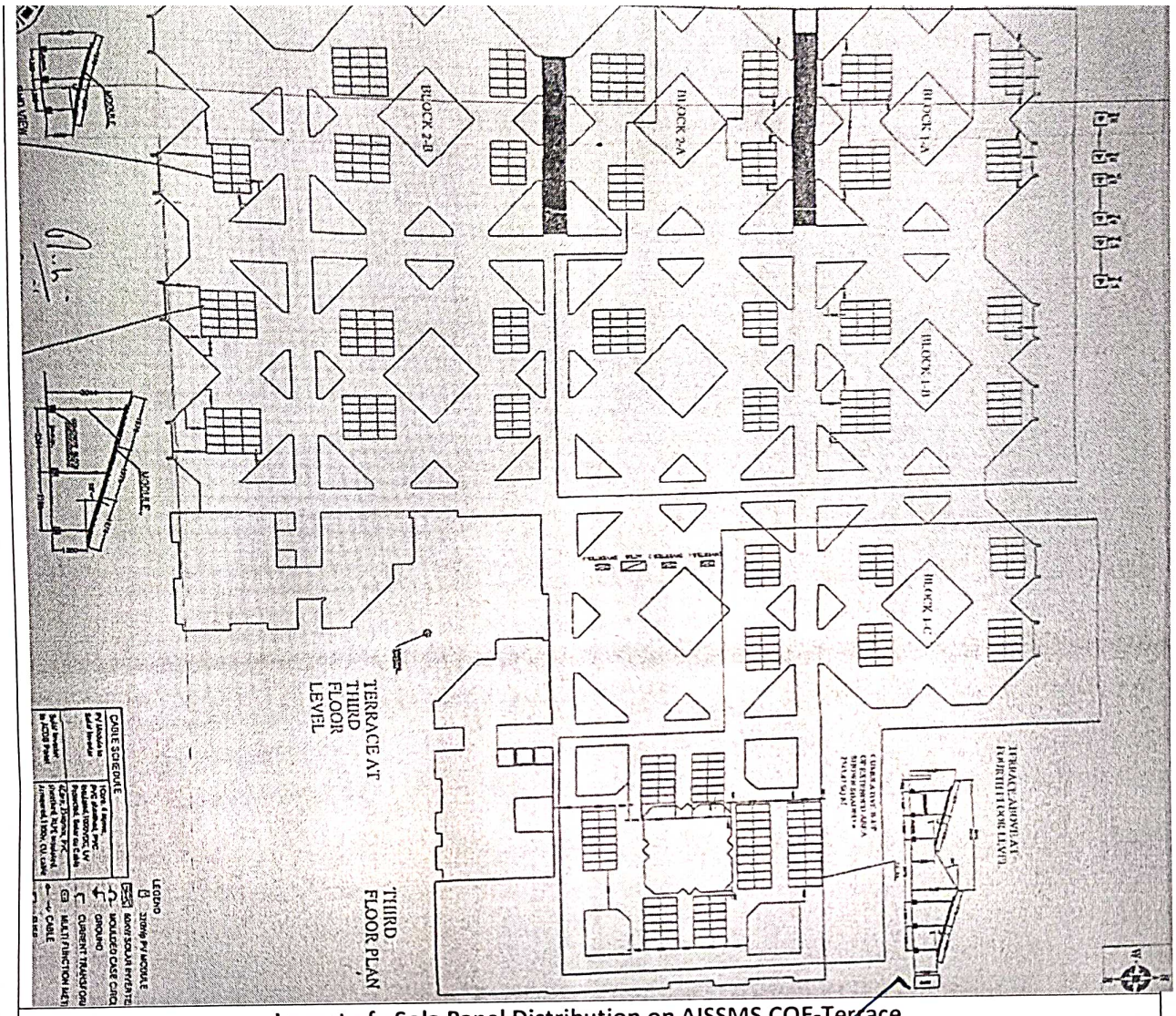
DC SIDE:-

TOTAL MODULES	= 472
MODULE CAP	= 320Wp
TOTAL	= 472*320Wp
	= 151040 Wp
	= 151.04 kWp

AC SIDE:-

INVERTER CAP	= 60KW
TOTAL INVERTERS	=03 Nos.
TOTAL AC CAP	= 50 x 3
	= 150 kW





Layout of –Sola Panel Distribution on AISSMS COE-Terrace

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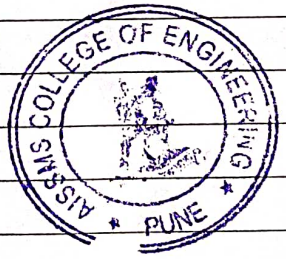
Visit Report

Ghorpadi Diesel Loco shed Pune

Date :- 12th April 2023

Roll No:-20EL302



Rainbow

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Visit Report

12th April2023

Department of Electrical Engineering has organized an industrial visit at Ghorpadi Diesel Loco shed Pune for BE Electrical students in association with Institute of Engineers, India (IEI), Electrical Chapter on 12th April 2023 from 9.30 am onwards.

Faculties Mrs. P K Sankala, Mrs. S Vadi had accompanied the students for the industrial visit.

The main motive of this industrial visit was to understand the traction motors and their control used at the Loco shed.

The various components discussed were:

1. Working of Electric Locomotive
2. Different types of drives
3. Traction maintenance
4. Types of motors used in traction Drives
5. Assembly of Bogie Section
6. Braking Methods

➢ **Working of Electric Locomotive :**
25 kV overhead AC supply is stepped down with the main transformer in the locomotive and fed to a front end (line) twin 4-quadrant line converter where AC is converted to DC through Pulse Width Modulation (PWM) thus achieve unity power factor. This supply is linked with an input side converter through DC link which is a reservoir of energy. Drive converter (VVVF Converter) converts DC supply into 3 phase which is then fed to 3 phase traction motors. Gate turn off (GTO) thyristors are used in converter/inverter. The output of Drive converter (inverter) is Variable Voltage Variable Frequency (VVVF) supply which helps in controlling the starting and running torques of three-phase traction motors to suite traffic requirements.

➢ **Different types of drives :**

- Steam Engine Drive - A steam engine drive uses a steam engine for driving the machines such as trains, trams, etc.
- Diesel Engine Drive - When a direct internal combustion engine or diesel engine is used for driving the machines, it is known as diesel engine drive.
- Electric Drive - An electric drive draws its power by means of electric motors which are fed from overhead distribution system. Therefore, the electric motors which are used for driving a machine are said to be electric drives.

➢ Traction maintenance:
There are two types of maintenance –
1. Preventive
2. Breakdown

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- Preventive Maintenance for diesel locomotive :

Table 24.6

Type of schedule	*km covered by WP/WG*	*km covered by YP/YG*
Schedule I	1600	950–1100
Schedule II	Every month	–
Schedule III	24,000	20,000
Schedule IV	48,000	40,000

- Breakdown Maintenance for electric locomotive :

Table 24.7

Frequency	*Code*	*Time period alloted for completion*	*Nature of attention*
Weekly/trip (within 1500 km)	Trip	1 hr	Weekly or trip inspection
15 days	Fortnightly	1 to 2 hrs	Fortnight inspection
Monthly	IA	2 hrs	Incidental inspection
Two months	IB	8 hrs	Complete/partial inspection
Four months	IC	8 hrs	Complete inspection
Every third IC	AOH	16 hrs	Annual inspection
At 300,000 km or after 3 years	IDH	15 days	General inspection or intermediate overhauling
At 600,000 km or after 6 years	POH	30 days	Through overhauling or periodical overhauling

➢ **Types of motors used in traction drives:**

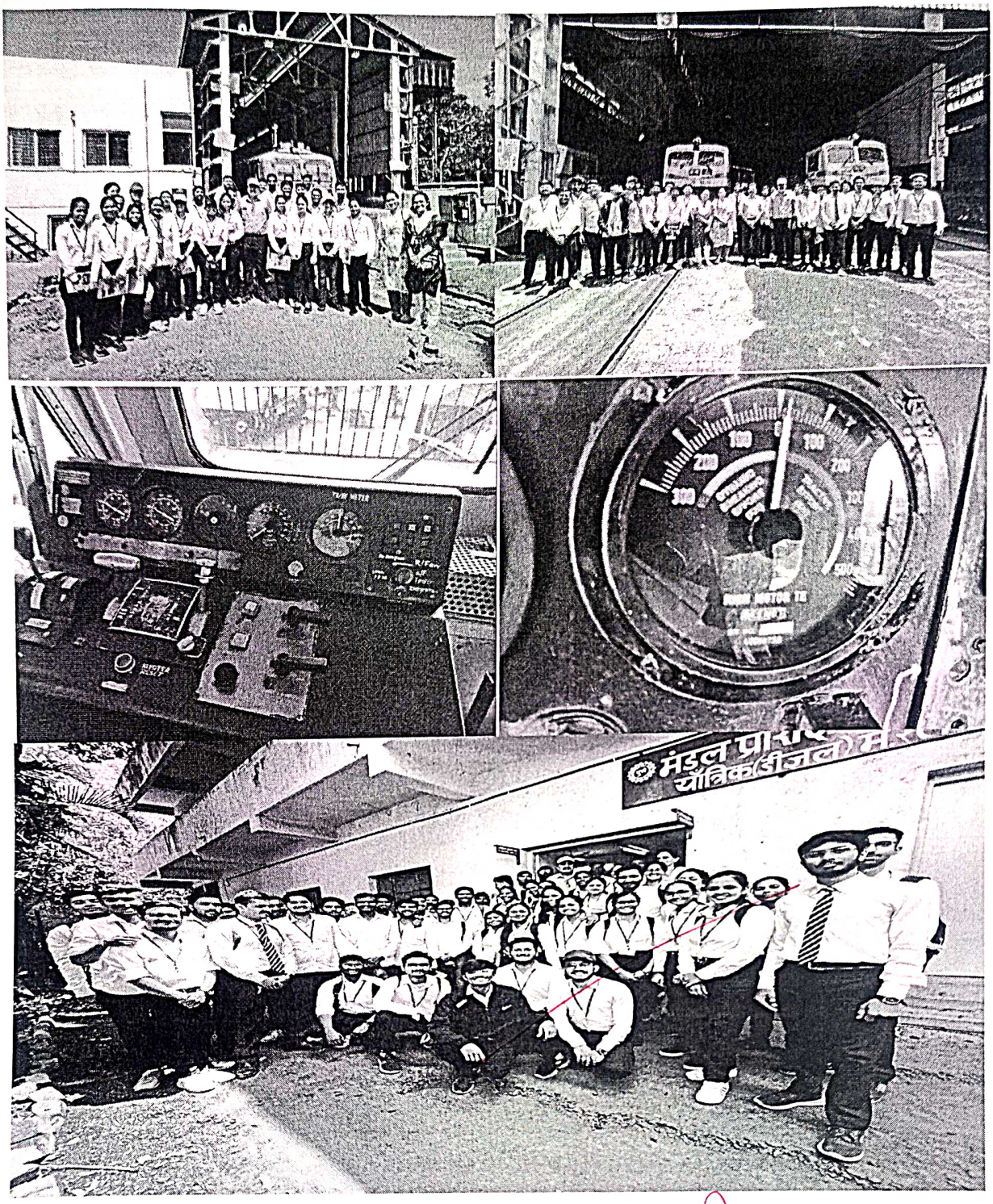
On mainline locomotives, WAP-1, WAP-4, WAM-4, WAg-5/6/7 and WCAM-1/2/3 all use DC series motor as their traction motors. These locos constitute a huge chunk of IR's locos (easily above 70%) WAP-5/7 and WAG-9 have three phase induction motors as their Traction motors. Amongst locals, the older DC locals (obviously) have DC traction motors, whereas the newer Siemens and BHEL rake use three phase induction motors
Amongst Diesel locos, the locomotives that are usually called alcos (WDM-2/3A/3D/3F, WDG-3A WDP-1/3A) have DC traction motors while the EMD's (WDP-4/4B/4D and WDG-4/4D) have three phase induction motors.

➢ **Assembly of Bogie Section:**

Major and minor repairs of diesel locomotives are carried out. Shed is certified with ISO 45001:2018, ISO 9001:2015 and ISO 14001:2015. The shed is divided into Light Repair Section, Heavy Repair Section, Heavy Repair (Mechanical), Heavy Repair (Electrical), Under Truck Section, Machine Shop and Training Centre.
Electric locomotive shed construction work is in progress for maintenance of 50 electric locomotives. Presently IA, IB schedule work of 05 Kalyan base locomotives is being done at Diesel Loco Shed, Pune.

➢ **Braking Method:**

122 locomotives have Computerized Control Braking (CCB) system. A conventional electric train braking system uses dynamic braking, where the kinetic energy of the train is dissipated as waste, mainly in the form of heat. When regenerative braking is employed, the current in the electric motors is reversed, slowing down the train. At the same time, the electro motors generate electricity to be returned to the power distribution system. This generated electricity can be used to power other trains within the network or can be used to offset power demands of other loads



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17/5/23

Head
Department of Electrical Engineering
AISSMS College of Engineering, Pune

Rajdhani
DATE / /

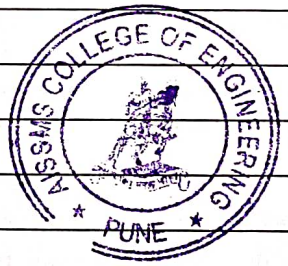
Visit Report

Name - Neha Vijay Jagadale.

Roll No. - 20E1308.

Batch - B.

Location - GIS, Rastapeth.



Visit Report

17th April 2023

Department of Electrical Engineering has organized an industrial visit at MSETCL 132 KV GIS Rasta Peth, Pune for BE Electrical students on 17th April 2023. Faculties Prof. Mrs.V. N. Tarange and Prof Mr. R. S. Shinde had accompanied the students for the industrial visit. The visit has been started at 11 am and ended at 2 pm at Gas Insulated Substation. The main motive of this industrial visit was to understand the construction, working and components of the GIS.

GIS is mainly divided into two parts as:

1. Indoor GIS
2. Outdoor Conventional Substation

This GIS substation is bipolar substation in which stepped down 132 KV one line is coming from Parvati hills and second line is 220 KV coming from Magarpatta This GIS substation fulfills the demand of East Pune area starting ahead from Shivajinagar.

The various components discussed were:

1. Transformers

A transformer is an inductive electrical device for changing the voltage of alternating current. A transformer consists of two magnetically coupled coils. Alternating current in one (called the "primary") creates a changing magnetic field which induces a current in the second coil (the "secondary"). A core made of iron or ferrite generally connects the two coils, but higher frequency devices can work without a ferrous core. Here total four transformers are used in which two transformers are rated as 25 MVA, 132/11 KV and another two transformers are rated as 50 MVA, 132/22 KV. Each of the transformers is provided with 6 feeders that goes out for further distribution purposes in areas like Rasta Peth, Mandai, Neharu road, Sasoon Hospital, KEM Hospital, etc. The parts of transformers discussed are as follows:

(a) Buchholz Relay:

A Buchholz relay is a safety device mounted on (some) oil-filled power transformers and reactors, equipped with an external overhead oil reservoir called a "conservator". Buchholz relays are used as a protective device, as they are sensitive to the effects of dielectric failure that can occur inside the equipment they protect. Buchholz relays are a type of gas detection relay. It is mechanically actuated. Whenever there will be a minor internal fault in the transformer such as an insulation fault between turns, breakdown of core of the transformer, core heating, the insulating transformer oil will be decomposed in different hydrocarbon gases, CO2 and CO. The gases produced due to the decomposition of transformer insulating oil will accumulate in the upper part of the Buchholz container which causes a fall of the oil level in it.

(b) Silica Gel Breather:

Silica gel is an adsorbent that helps in absorbing the moisture, humidity, odor etc, from the products and helps in maintaining their effectiveness. Silica gel is used in breather transformers for controlling the level of moisture and prevents it from entering the equipment. They are mainly useful in protecting the transformer oil from the damaging effects of moisture.

(c) Conservator Tank:

The Conservator Tank of a transformer is defined simply as a cylindrical tank mounted on the roof of the transformer main tank. It is used to provide enough space for the oil in the transformer to spread after heating. When the transformer is loaded and when the ambient temperature rises, make the volume of oil inside the transformer increase. A conservator tank of the transformer supplies adequate space to this expanded transformer oil. It also is designed as a reservoir for transformer insulating oil.

(d) Magnetic Oil Gauge:

The MOG (Magnetic Oil Gauge) is a device by which we can supervise the level of liquid/oil inside the tank or conservator of power transformer and also gives us an alert low oil level indication with making mercury switch. It is connected at the bottom of the conservator tank.

(e) Lightning Arrester:

Lightning Arrester is used to limit the rise in voltage when a communications or power line is struck by lightning or is near to a lightning strike. During normal operating conditions lightning arrester acts as isolator and during lightning stroke it diverts the lighting surges to ground.

(f) Transformer windings:

There are two windings in the transformer as primary and secondary winding. These windings are made up of copper material. Transformer windings consist of paper-insulated, current carrying conductors wound around sections of the core; a winding lead is an insulated conductor that connects a winding to another winding, to a tap changer, or to an exit terminal (bushing). To withstand operational conditions, windings and leads must be properly insulated, supported and cooled.

(g) Transformer core:

A transformer core is a static device that transmits power from one source to another through electromagnetic induction. These are pieces of magnetic material with a high magnetic permeability, which is used to guide magnetic fields in transformers. Transformer cores are generally made up of Silicon Steel Stampings to reduce hysteresis and eddy current losses.

(h) Bushings:

A transformer bushing is an insulating structure that facilitates the passage of an energized, current-carrying conductor through the grounded tank of the transformer. Here tan delta factor is taking into consideration and also IR/IC component value is checked. If this ratio is high then it will be harmful for the transformers.

(i) Pressure Release Valve:

Pressure Release Valve, used to maintain the pressure inside transformer tank constant. Pressure referred to air pressure which changes due to oil level, oil degradation, etc. faults. It has aluminum foil that opens up to release excess pressure built up across the transformer.

(j) Oil Surge Relay:

OSR operates when a sudden surge in flow of oil is observed in tank. This can happen due to sudden faults of high amplitude.

(k) Winding Temperature Relay:

WTR continuously monitors the winding temperatures by means of temperature sensors and actuates if temperature above limit is observed across transformer windings.

2. Relays

(a) Earth Fault Relay:

Earth Fault Relay is used in electrical installations with high earth impedance. It detects small stray voltages on the metal enclosures of electrical equipment. The result is to interrupt the circuit if a dangerous voltage is detected. The EFR is protected against tripping from transients and prevents shock.

(b) Reverse Power Flow Relay:

Reverse power flow relay operates when reverse power flows from the circuit from load to source.

(c) Differential Relay:

The main function of differential relay was to send trip signal to circuit breaker when there is a certain difference current value between primary side and secondary side of the transformer.

(d) Distance Relay:

Provides protection for both incoming-outgoing lines and transformers as well.

(e) REF Relay:

Restricted Earth Fault Relay provides protection from earth faults neutral to earth faults across any of the device within the system.

(f) DC, AC Supervisory Relays:

For monitoring purposes of AC and DC parameters of the system.

(g) ATCS Relay:

Automatic Trip Circuit Supervision Relay, as per name it governs the status of trip circuit and makes sure it will trip under fault conditions.

(h) Impedance Relay:

This is a voltage restrained over current relay. Operates when the impedance seen from the fault point is less than the relay setting.

(i) Backup Relay:

Operates if main relay system doesn't trip the circuit at the right time. The time of actuation is little higher than the main relays.

All the Relays have IDMT i.e., Inverse Definite Minimum Time characteristics.

3. Circuit Breakers

A circuit breaker is an electrical safety device designed to protect an electrical circuit from damage caused by overcurrent. Its basic function is to interrupt current flow to protect equipment and to prevent the risk of fire.

- **Tripping sequence on occurrence of fault:**

1. At 90mSec, circuit breaker at distribution point.
2. At 110mSec, circuit breaker at feeder.
3. At 350mSec, circuit breaker on LV side of substation.
4. At 450mSec, circuit breaker on HV side of substation.

4. Battery Room:

To provide supply for auxiliaries and relay operating units, DC supply is needed. This requirement is fulfilled by 110 units of 2 volt reach batteries connected in series. These Lead– Acid batteries can provide an uninterrupted supply of maximum 30A load for 12 hours straight. The battery temperature, battery water level is checked weekly as part of preventive maintenance. They are charged with separately installed Float-Cum-Boast chargers.

5. Protective Equipments:

Other protective equipments like CT's and PT's are used as a protective equipments.

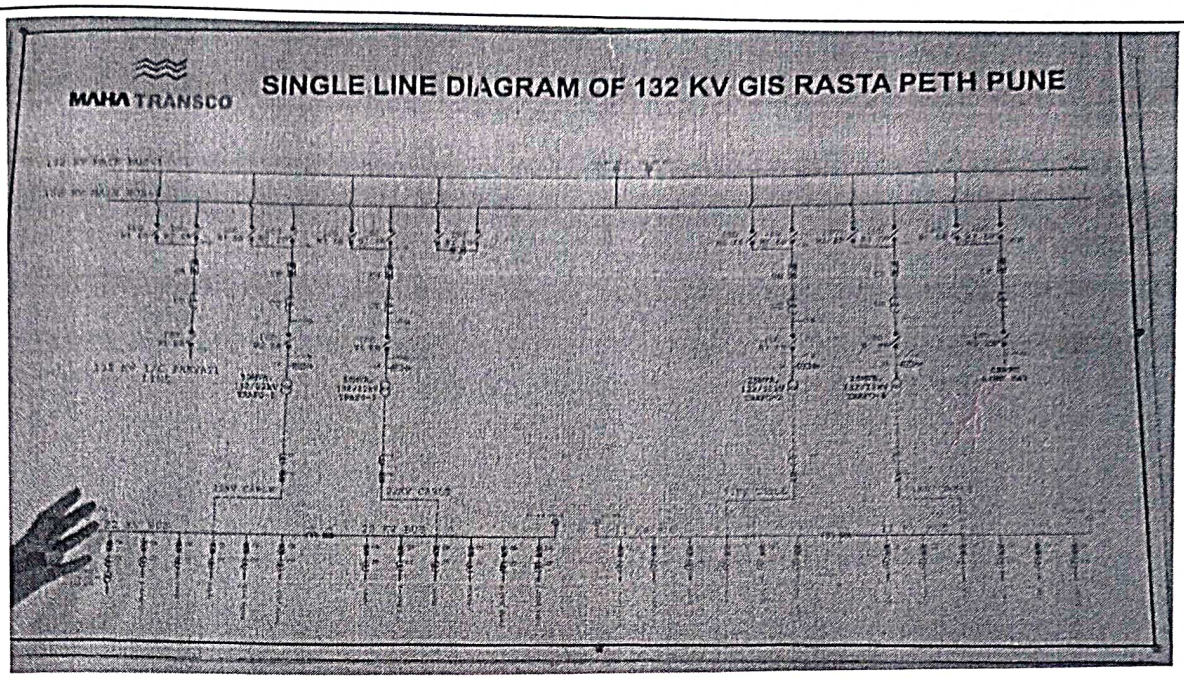
➢ Indoor GIS Substation:

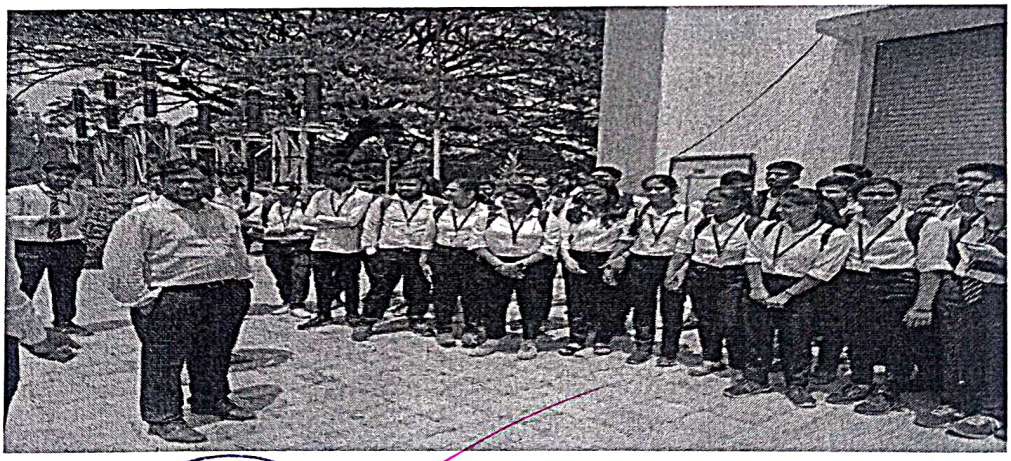
As it is a GIS, only 4 transformers are set up outside in open air whereas the rest of the components like circuit breakers, relays, isolators, current transformers, potential transformers are situated in-house and completely set up in a SF6 gas insulated chambers, the reason of location being extremely crowdy and situated at the heart of the city. Apart from above components being indoor, two separate rooms are there for housing Relay Units and feeder Sections. Control over the operation is done both via SCADA system and manually.

The space required for GIS Substation is 10 times more compact than conventional substation. The distance between the two phases in GIS is 8cm and pressure maintained inside is 6.5 bar. The SF6 gas is compressed. Pressure inside the chambers is monitored by SCADA system. SF6 gas is Colourless, odourless and chemically stable. It is 5 times heavier than air. It can resistant temperature up to 500 °C. It also has excellent dielectric properties and it is non-inflammable. SF6 gas has outstanding arc quenching properties.

Safety should be taken while maintenance of GIS is carried out. PPE kits should be wear by maintenance persons. Pure SF6 is not that much harmful but the by-product gases produced by decomposition of SF6 gas are very harmful like SOF2, SO2F2, SOF4, S2F10, SO2, HF, and solid byproducts include aluminum fluoride, tungsten fluoride.

➢ Single Line Diagram:





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AISSMS College of Engineering, Pune

➢ **Conclusion:**

From the visit we are able to understand the construction, working and various components of GIS. Also the information about switchgear and protection system used and the methods used for testing the proper working of GIS or outdoor substation.

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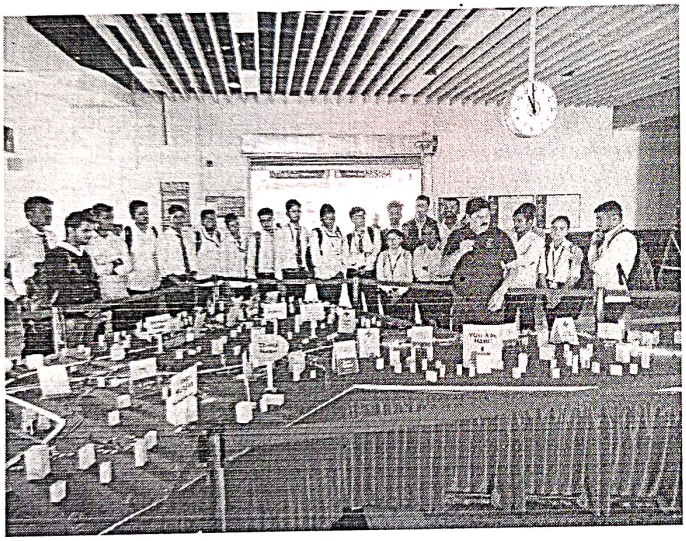
Activity Report

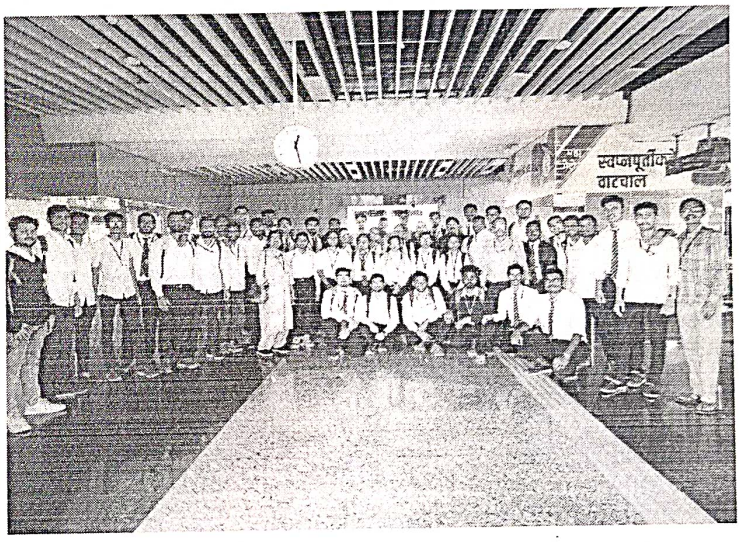
Industry Visit

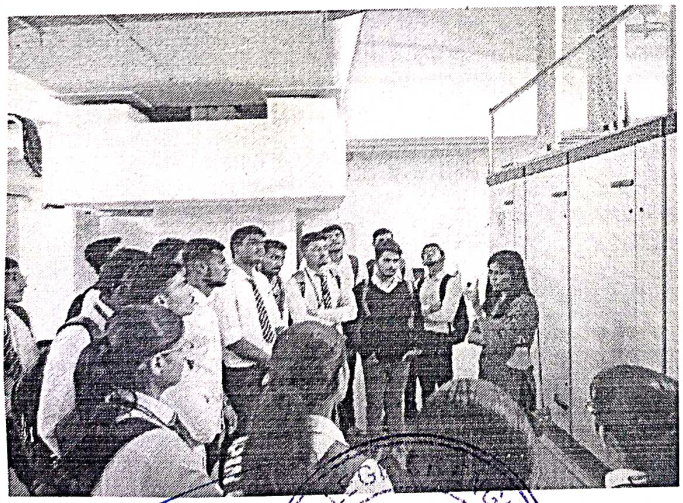
22th Feb 2023

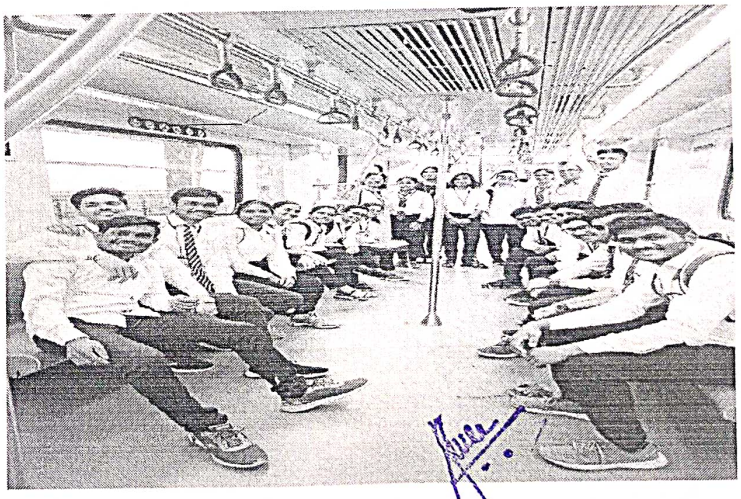
Department of Electrical Engineering has organized Industry Visit at Maha Metro Pune Garware Station for TE Electrical students on 22th Feb 2023. Students. Mr.Manoj Kumar Daniel amd Ms.Gauri were the experts from Maha Metro. They have given information and demonstration on Metro routes in Pune, safety features observed. Students visited various electrical systems and substation at Garwre station. Students were benifitted by actually seeing the systems they learnt in theory.

Glimpses of the Session:









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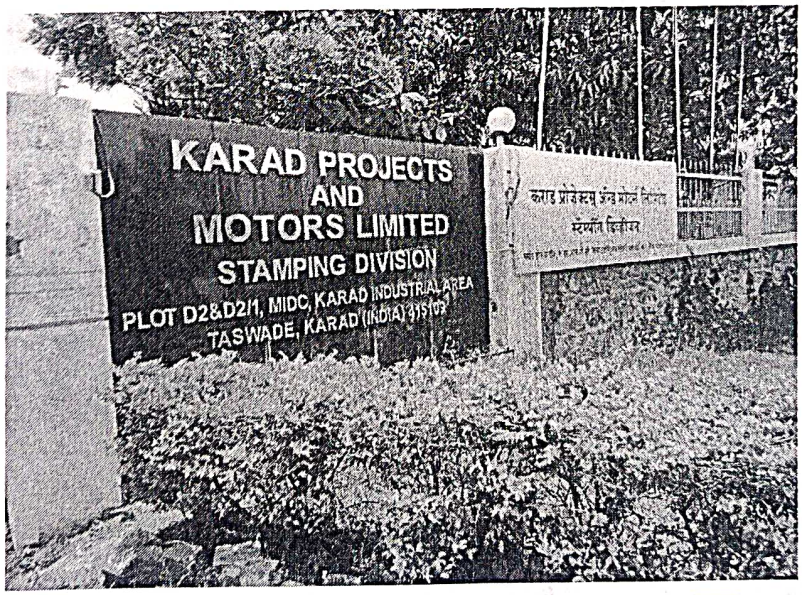
INDUSTRIAL VISIT REPORT ON "KARAD PROJECTS AND MOTORS LIMITED"

Date and time: 10.00 AM,13/05/2023

Venue: PLOT D2 & D2M, MIDC Karad Industrial Area, Taswade, Karad, Maharashtra 415109

Faculty name: Prof. V.V. Kulkarni.

Class: TE Electrical



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CONTENTS

➢ EVENT DESCRIPTION

A visit was planned for the course "Computer Aided Design of Electrical Machines" in that students were able to see Motor manufacturing company with expertise in manufacturing of Stampings, Stators, Rotors, AC rotating machines, Aluminium Die-cast Connecting Rods and Pump assemblies.

➢ INTRODUCTION

KARAD PROJECTS AND MOTORS LIMITED (KPML) is a Motor manufacturing company with expertise in manufacturing of Stampings, Stators, Rotors, AC rotating machines, Aluminium Die-cast Connecting Rods and Pump assemblies. KPML manufactures energy efficient motors for various applications . In the year 2013, Hematic Motors Private Limited was amalgamated with Kirloskar Constructions and Engineers Limited. Further the name of Kirloskar Constructions and Engineers Limited, has been changed as KARAD PROJECTS AND MOTORS LIMITED (KPML).

This company is a wholly owned subsidiary of Kirloskar Brothers Limited (KBL). KBL is a world class pump manufacturing company with expertise in engineering and manufacture of systems for fluid management. Established in 1888 and incorporated in 1920, KBL is the only Pump manufacturing company in India and ninth in the world to be accredited with the N and NPT certification by American Society of Mechanical Engineers (ASME).

KPML has three manufacturing divisions located at Karad Maharashtra State (India) named as:

- Motor Division (erstwhile Hematic Motors Pvt. Ltd incorporated in 1973)
- Stamping Division (erstwhile Pressmatic Electro Stampings Pvt. Ltd. incorporated in 1981)
- Component Division (erstwhile Quadromatic Engineering Pvt. Ltd. incorporated in 1982)

➢ WORKING CYCLE

- The very first step in working cycle is material purchasing which is done after getting the order from buyer. This is done by purchase and planning department.
- After purchasing of the material is done the quality inspection of the material is carried out by quality department.
- If the material is OK then it is carry forwarded to store department and if it is NOT OK then it is sent back to the supplier.
- After the quality checking is done the production procedure is started. As yesterday I got to know about the stepwise manufacturing procedure which is carried out in production.
- After production is completed it is sent to FG i.e Finished Good sector.
- Then packing of the product is done and it is sent to sales and marketing department.
- In this way starting from Purchase and planning department then quality department then store department after that production department and last sales and marketing department the working cycle is completed.
- All the employees information is carried out by HRM department and information about the profit and loss of the company is carried out by the finance and account department.

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➢ **Processes carried out for motor manufacturing:**

❖Wound stator process:-

- Raw material inspection
- Slitting
- Progressive stamping
- Welding
- Annealing
- Stator auto winding
- Ultrasonic cleaning and drying furnace
- Quality inspection and testing facilities
- Tool design and maintenance

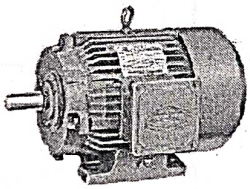
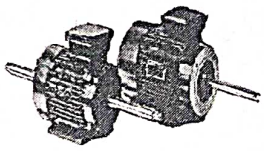
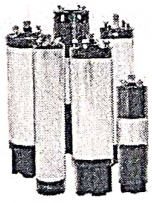
❖Die-Cast rotor process:-

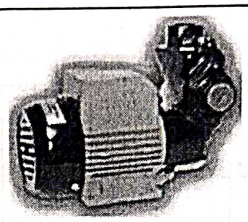
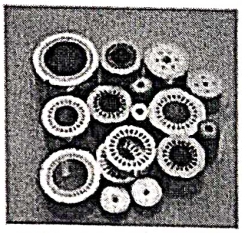
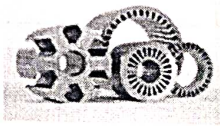
- Steam bluing annealing furnaces
- Die-casting
- Rotor machining

❖Motor Assembly:-

- Rotor pressing
- Rotor turning
- Rotor balancing
- Stator pressing
- Motor assembly
- Motor testing
- Motor painting
- Motor final assembly
- Motor packing

➢ **Products with their specifications which are manufactured in KPML:**

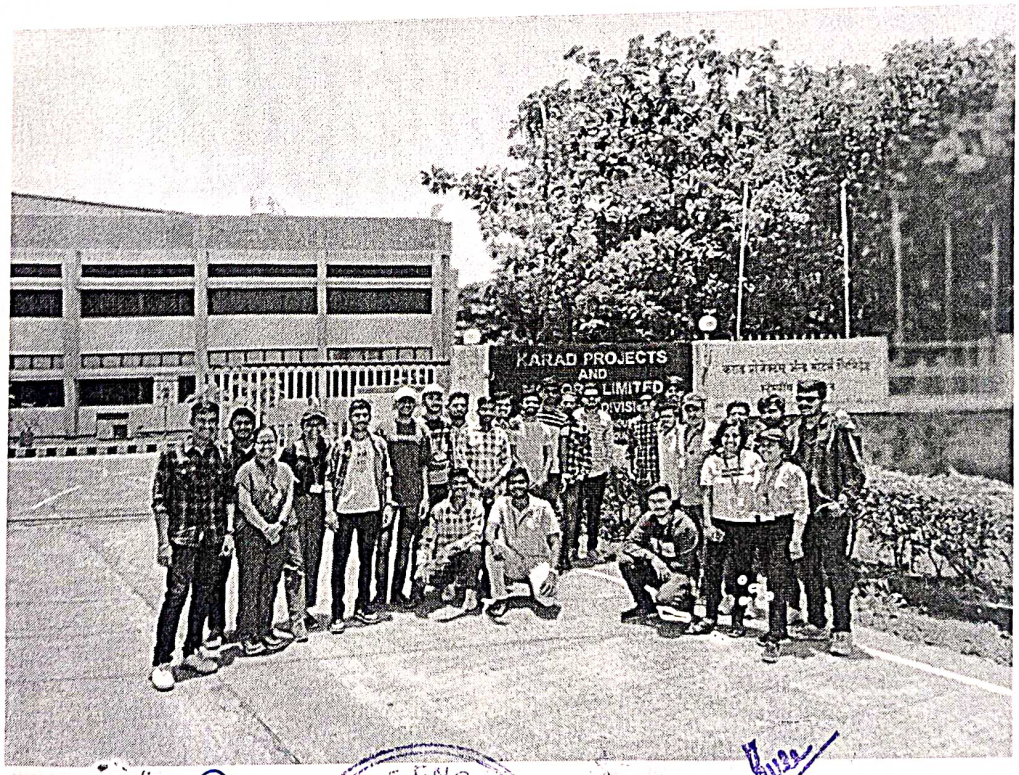
Sr. no.	Products	Range/Specifications	Picture
1	Standard motors	0.55kw to 315 kw, 2P, 4P, 6P efficiency class IE, IE3, IE4	
2	Special motors	Frame 80 to 355 frame, as per customer specifications, such as elevator/escalator/ door motor etc.	
3	Submersible motors	Water filled & oil filled, 0.37 kw to 18.5 kw, with available in 1phase & 3phase, size 3" to 6"	

Sr. no.	Products	Range/Specifications	Picture
4	Mini pumps	0.75kw, 1phase	
5	Electrical stampings	Die range 12mm to 500mm, thickness range 0.35mm to 1.2mm	
6	Core packs	OD 15mm to 26omm Length 30mm to 470mm	

CONCLUSION

The design phase focuses on determining the motor specifications, such as power rating, speed, and efficiency, while considering the intended application. The winding process involves carefully winding copper coils around the stator and rotor to create the electromagnetic field necessary for motor operation. The assembly phase involves assembling the stator, rotor, bearings, and other components to create a complete motor unit.

The manufacturing of induction motors is a vital process that combines engineering principles, precision manufacturing techniques, and stringent quality control measures. The end result is the production of efficient and durable motors that power a wide range of industrial and commercial applications



V.V. Kulkarni
Incharge

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