



Sarvajani University

Sarvajani College of Engineering &  
Technology  
Electronics & Communication Engineering  
Department

B.Tech, III Year, Semester-5  
E&C Engineering  
Academic Year 2023-24

A Report on  
Industry Visit

WAAREE INDUSTRY, Surat

Date : 25/10/2023

## Details of Visit

**Type:** Industry Visit

**Platform:** Physical on location Contact Mode

**Name of Industry:** Waaree Industry Ltd, Chikhli

**Schedule:** 25<sup>th</sup> October, 2023; 9:00 AM to 7:30 PM

**No. of Students Visited:** 42

**Faculty for Visit:** Dr. Ketki C. Pathak & Mr. Ashwin Rathod



## About industry:



- Waaree Energies Ltd. is the flagship company of Waaree Group, founded in 1989 with headquarters in Mumbai, India. Waaree Energy is today one of the largest vertically integrated new energy companies. It has India's largest Solar panel manufacturing capacity of 12GW at its plants in Chikhli, Surat and Umbergaon in Gujarat.
- WAAREE Energies Ltd. is India's largest solar manufacturer and a leading provider of solar solutions. It was founded in 1989 as a manufacturer of instrumentation products and later diversified into solar energy in 2007.
- It also offers engineering, procurement and construction (EPC) services, project development, solar rooftop solutions, solar inverters, and solar water pumps.
- In anticipation of an increase in demand, WAAREE Energies is setting up another manufacturing facility at Chikhli in Gujarat, with a proposed addition of 3 GW PV module capacity and 4 GW solar cell capacity. The Chikhli plant is expected to be operational by the end of fiscal 2023.
- WAAREE Energies is also planning to raise Rs 1,350 crore from an initial public offering (IPO) to fund its expansion plans and repay debt. The company has recently raised Rs 1,000 crore in a funding round led by Value Quest Capital, a private equity firm.

## Vision of Company:

Our Vision is to provide high quality and cost-effective sustainable energy solutions across all the markets, reducing carbon foot print - paving way for sustainable energy thereby improving quality of present and future human life.

## Mission of Company:

- By virtue of our commitment to our stakeholders, we strive for continuous.
- Improvement in the quality of our products & services.
- 33 years of Excellence In Service.
- Waaree Energy is today one of the largest vertically integrated new energy companies. It has India's largest Solar panel manufacturing capacity of 12GW at its plants in Chikhli, Surat and Umbergaon in Gujarat and is a top player in EPC Services, Project Development, Solar Rooftop Solutions, Solar Inverter, and Solar Water Pumps.
- It is also an Independent Power Producer. Waaree has a presence in over 388 locations nationally and 20 countries internationally. The company has supplied 6+GW of solar modules and commissioned 1+ GW of solar EPC projects.

## Innovations:

WAAREE Energies is a company that focuses on providing sustainable and innovative solar solutions for various applications. Some of the innovations that the company has made are:

- Solar inverters: These are devices that convert direct current (DC) from solar panels into alternating current (AC) that can be used by appliances or fed into the grid.
- WAAREE Energies offers a range of solar inverters, including string inverters, central inverters, hybrid inverters, and microinverters, with features such as remote monitoring, smart grid support, and high efficiency.
- Lithium-ion batteries: These are rechargeable batteries that store excess solar energy and provide backup power during grid outages or peak demand.
- WAAREE Energies has a production capacity of 400MWh for lithium-ion batteries, which can be used for residential, commercial, and industrial applications.
- Solar water pumps: These are pumps that use solar energy to draw water from wells, rivers, or lakes for irrigation, drinking, or other purposes.
- WAAREE Energies has developed solar water pumps that are easy to install, operate, and maintain, and can work in harsh conditions.
- Solar rooftops: These are solar systems that are installed on the roofs of buildings to generate electricity and reduce dependence on the grid.
- WAAREE Energies provides customized solar rooftop solutions for homes, offices, schools, hospitals, and other establishments, with options such as net metering, battery backup, and hybrid systems.
- Solar EPC services: These are engineering, procurement, and construction services that involve designing, installing, and commissioning solar projects of various sizes and types.
- WAAREE Energies has a subsidiary company, WAAREE Renewables Technology Limited (WRTL), that offers solar EPC services for ground-

mounted, rooftop, floating, and canal-top solar projects, with a track record of 600+ MW of installed capacity.

Firstly, we were invited by the representative and gave the insights of our visit, what all we are going to see and how the flow of visit would be. Then we were given safety methods as it's there main thing.

## Safety Induction

### **Guided by:**

Anant Patel,  
Jignesh Rathod

WAAREE is committed to ensuring the safety, quality, and performance of its products and services. Some of the safety precautions that are maintained at WAAREE are:

- WAAREE products are certified by various national and international standards, such as IEC, BIS, CE, etc<sup>23</sup>. These certifications ensure that the products meet the required specifications and parameters for safe and reliable operation.
- WAAREE provides detailed installation manuals for its solar PV modules, which include guidelines and precautions for unpacking,

handling, storage, mounting, grounding, wiring, and cleaning of the modules <sup>2</sup>. The installation of solar PV modules requires a high degree of skill and should only be performed by a qualified and licensed professional <sup>2</sup>.

- WAAREE recommends the use of a charge controller to prevent the batteries from being overcharged and discharged at night, as the modules do not contain a blocking diode.

- When shipped from the factory 2. A blocking diode is a device that prevents the reverse flow of current from the battery to the module.
- WAAREE advises the users to avoid uneven shade on the module surface, as shaded cells may become hot and cause permanent damage to the module 2. The modules should also be mounted with adequate rear ventilation to allow cooling of the modules 2.
- WAAREE warns the users to not touch the module surface or any exposed wires when the module is exposed to sunlight, as there may be a risk of electric shock 2. The modules should also be kept away from children, animals, and flammable materials.

## SAFETY NEAR SOLAR

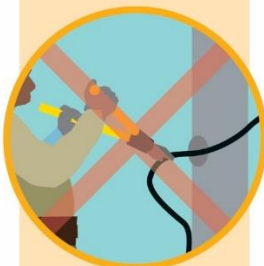
Like any other source of electricity, solar panels can pose potential hazards. Keep these safety tips in mind when you're near solar panels.



Stay at least  
10 feet away  
from the  
installation.



Never walk on  
solar panels.



Never cut any  
wiring to the  
solar panels.

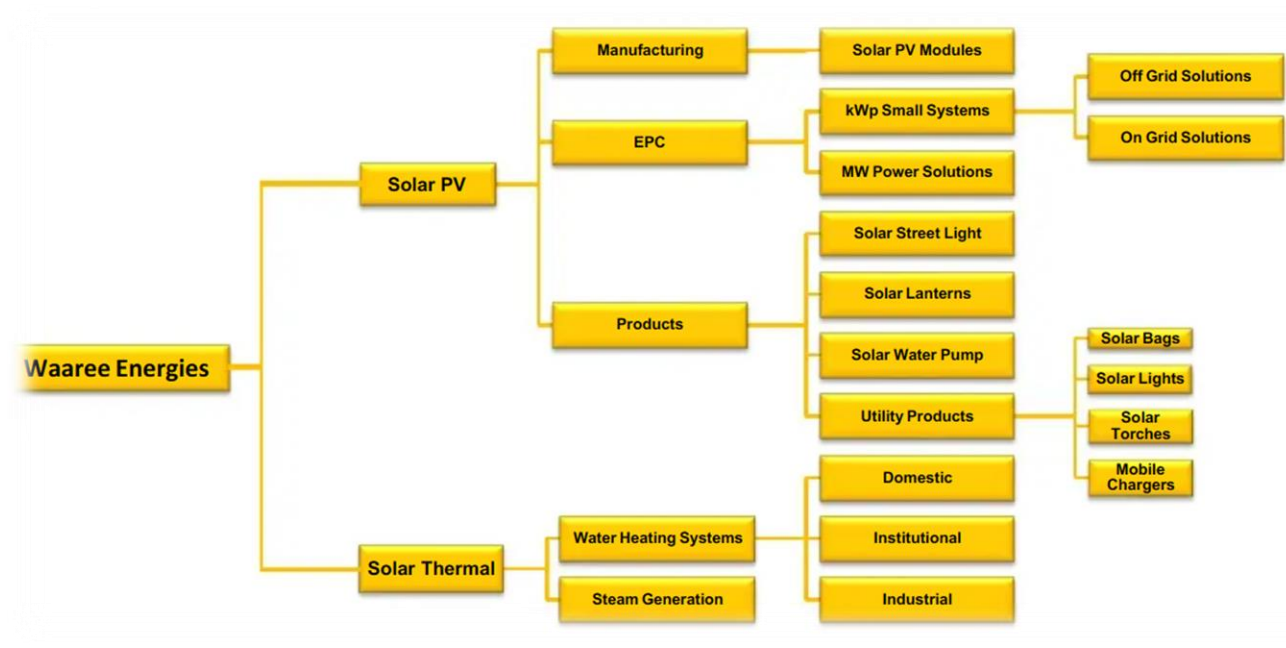


Never touch  
broken or  
damaged solar  
panels.



## Manufacturing Process

(Guided By:  
Arjun Patel)



The following is a brief overview of the manufacturing process of Waaree energy's PV modules, based on the steps you provided. You can find more details and specifications in the official installation manual and the product catalog .

### Automatic Sorting:

- The PV modules are sorted by a fully automated machine that does not require any human intervention.
- The sorting is based on the power and/or current of the modules, which are measured by a high-precision tester.
- The machine can sort both framed and glass-glass modules, and can handle different sizes and types of modules.





### **Sun Simulator Test:**

- The PV modules are tested by a best-in-class AAA sun simulator that simulates the solar irradiance and spectrum under standard test conditions.
- The sun simulator can measure the key electrical parameters of the modules, such as voltage, current, power, fill factor, and efficiency, and generate the I-V and P-V curves for each module.
- The modules can be sorted according to their power and/or current after the sun simulator test, and the test results are printed on a label for each module.
- The sun simulator also has an infrared temperature measurement system that monitors the temperature of the modules during the test.



### **Visual Inspection:**

- The PV modules are visually inspected by a 90° automatic flipping mechanism that allows the inspection of both sides of the modules.
- The visual inspection is adjustable for different module sizes, and can detect any defects or damages on the module surface, such as cracks, scratches, stains, bubbles, or delamination.
- The visual inspection follows the acceptance criteria that are at par with the global standards, and ensures the quality and appearance of the modules.



### **Stringer:**

- The PV cells are soldered by high-speed stringers that have a capacity of 3600 cut cells per hour.
- The stringers are compatible for multi-busbar (MBB) cells, ranging from 5BB to 12BB, and can handle different cell sizes and shapes.
- The stringers use infrared (IR) based soldering that eliminates physical contacts and reduces mechanical stress on the cells, resulting in higher cell efficiency and lower breakage rate.
- The stringers have an auto string pickup feature that eliminates human intervention and improves the accuracy and speed of the string placement.
- The strings are tested by an electroluminescence (EL) test that checks for any micro-cracks or defects on the cells.



### **Pre LAM-Visual Inspection:**

- The PV modules are inspected again before the lamination process by an automatic system that reads the barcode and captures the EL image of each module.
- The pre-LAM visual inspection performs 100% visual and EL inspection of the modules, and verifies that the modules meet the acceptance criteria that are at par with the global standards.
- The pre-LAM visual inspection also checks the alignment and positioning of the strings, the busbar and ribbon quality, and the encapsulation material quality.





### **Lamination:**

- The PV modules are laminated by a double stack laminator that enhances the process reliability and optimizes the process time.
- The laminator uses a vacuum and heating process that bonds the module components together, such as the glass, the cells, the encapsulant, and the back sheet, and creates a durable and weather-resistant module.
- The laminator has an automatic loading and unloading system that reduces the manual handling and increases the productivity of the module manufacturing.



**Outcome of this industrial visit:**

Students have gain the knowledge about renewable energy like solar energy, its benefits and they can also able to apply PCB design knowledge and image processing during the manufacturing process.

## List of students for the visit

Sarvajanik University		
Sarvajanik College of Engineering & Technology		
Electronics & Communication Engineering Department		
B.E. III Year, V Semester, Industrial Visit (25/10/2023)		
Sr. No.	Enrolment No.	Name of the Student
1	ET21BTEC002	KHUSHI BANKA
2	ET21BTEC008	CHAUDHARI GNEYA KAMLESHBHAI
3	ET21BTEC010	DALAL VANSI OJAS
4	ET21BTEC011	DESAI DEVIKA BHAVIN
5	ET21BTEC013	DOMADIYA DRASHTI DIPAKBHAI
6	ET21BTEC015	HARSHIL HIRANBHAI DUMASIA
7	ET21BTEC016	FULWALA DHRUVILKUMAR BIMALKUMAR
8	ET21BTEC017	GANDHI JEET PRAGNESHKUMAR
9	ET21BTEC018	GANDHI NEEL DEVENDRA
10	ET21BTEC019	GOHIL PREET NILESHKUMAR
11	ET21BTEC021	GUJARATHI UMANG SANDEEP
12	ET21BTEC023	JAIN HARSHIT SANDEEP
13	ET21BTEC024	JAIN SAYAM MANOJ
14	ET21BTEC025	JANA ANIRBAN ANAND
15	ET21BTEC026	JARIWALA RAJ NIRAV
16	ET21BTEC027	JHA ADITYANARAYANKUMAR MANOJ
17	ET21BTEC029	JOSHI DEV DIPAK
18	ET21BTEC031	KATARIYA OM KIRITBHAI
19	ET21BTEC032	KATRODIYA SARTHIK BHARATKUMAR
20	ET21BTEC033	KHANPARA NEEL MANSUKHBHAI
21	ET21BTEC034	LOKHANDWALA AARYA PRANAVKUMAR
22	ET21BTEC035	MAJUMDAR NIYATI MANOJ
23	ET21BTEC037	MEVAWALA ALOK GAURANG
24	ET21BTEC038	MOGA DHRUMIL VINODBHAI
25	ET21BTEC039	DEEPAK NAIR
26	ET21BTEC040	VATSA NOTICEWALA
27	ET21BTEC041	PANDIT HARSHITA UMASHANKAR
28	ET21BTEC045	PARMAR PRERNA YOGESHBHAI
29	ET21BTEC049	PATEL PRIYANSHI PIYUSH
30	ET21BTEC050	PATEL SUMITKUMAR ASHOKBHAI
31	ET21BTEC052	RAI ARCHIE AJAYKUMAR
32	ET21BTEC055	PRIYANSH RANDER



33	ET21BTEC057	AKSHAY KANTILAL SANTOKI
34	ET21BTEC059	SAVANI SHRUTI JAYESHBHAI
35	ET21BTEC061	SHAIKH KAMIL MOH NAFEES
36	ET21BTEC062	SWAMI KAVITA DAYAL
37	ET21BTEC063	TEJANI CHAHI UDAY
38	ET21BTEC064	VYAS SHIVANGI YAGNESHKUMAR
39	ET22BTEC901	DEVARSHSINH RATHOD
40	ET22BTEC902	NAIK PRATHAM BIMALKUMAR
41	ET22BTEC802	LIMBACHIYA AARCHI JANAKBHAI
42	ET22BTEC804	SHAIKH MOHAMMAD HUNAIF MOHAMMAD RIZWAN

Edited by:

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Created by:

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Shivangi Y Vyas (ET21BTEC064)