REPORT: INDUSTRIAL VISIT

Christ University Faculty of Engineering
Department of Mechanical & Automobile Engineering
Kumbalagodu, Kengeri, Bangalore-560074

in collaboration with

The Automotive Research Association of India
S. No. 102, Vetal Hills OffPaud Road, Kothrud, Pune - 411038

REPORT ON THE INDUSTRIAL VISIT TO

CATERPILLAR INDIA PVT. LTD. (CIPL)

Industrial Power Systems Division (ISPD)

Hosur, Tamil Nadu, India

Reference:
Mrs Sharon Rally.
HR Department, Caterpillar, Hosur

Date	Student Batch	Faculty In charge
13/11/2017	4th& 3rd Year B.Tech Automobile Engineering	Mr. Sebin Jacob Mr. James Sathya Kumar
14/11/2017	2nd Year B.Tech Automobile Engineering	Mr. Praise Tom Mr. Vivek K S

Caterpillar Inc. is an American corporation which designs, develops, engineers, manufactures, markets and sells machinery, engines, financial products and insurance to customers via a worldwide dealer network. It is the world's largest construction equipment manufacturer.

Caterpillar has been active in India since the 1930s. The company now has different fields of work they focus on:

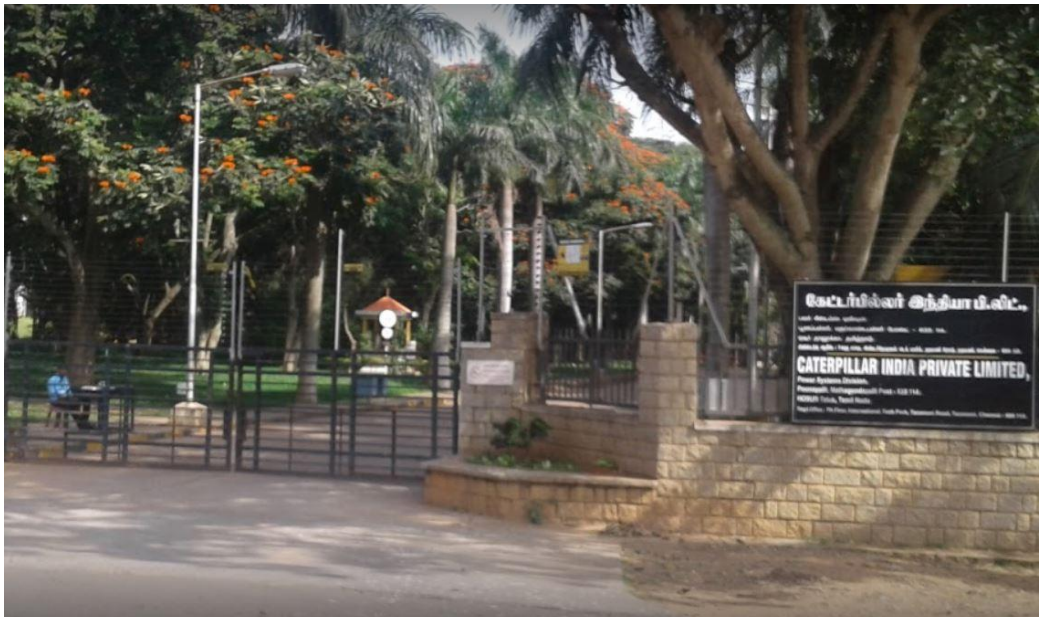
- **Mining and Quarry**
- **Power Generation**
- **Construction**
- **Road works**
- **Petroleum**
- **Rail**

- **Services**
  - **Cat Financial**
  - **Finance Shared Services**
  - **Cat Logistics**
  - **Bucyrus India Private Limited**

- **Distribution**
  - **Cat Dealers**
  - **The Cat Rental Store**

Sequence of Events

- Leaving the college campus for the IPSD facility in Hosur.
- Issuing of ID cards inside the facility
- Brief Introduction about the layout of the facility,
- A presentation by Mr. Balaji on the core values ,history and future of the company
- Safety Briefing
- Tour of the assembly line.
- A small tea break.
- Photographs of the entire class with Mrs. Rally and the accompanying faculty.
- Leaving the facility for college



CIPL, IPSD is situated in Hosur. Previously known as Genset Packaging (GSP) of the Large Power System Division; it was separated from LPSD in June 2012. It packages low cost, high efficiency Diesel Generators from 600 KVA to 2000 KVA of both CAT and FG Wilson Brand, with soundproof enclosures to cater to the local markets.

We were addressed by Mrs. Sharon, part of the HR team of Caterpillar, India. We were introduced to Mr. George who guided us through the safety measures taken up by Caterpillar in order to ensure safety of the staff as well as guests who visit their industry. It was then taken over by Mr. Balaji, Industrial engineer of CIPL, who gave us a presentation on CIPL's history, growth rate, plan of action and their ideas. He manages everything from testing to the finished product.

His slides included goals, missions and values of the company which are as follows:

- Integrity
- Excellence
- Teamwork
- Commitment
- Sustainability

He went on to explain how 5 sectors of the caterpillar play a major role in pushing the company in the LRC (Low Regulated) market. These are

- Construction
- Resources
- Energy and Transportation
- Customer Service
- Consumer

The enterprise strategy of Caterpillar Inc. focuses on solutions to help their customers build a better world and allows them to deliver profitable growth for our shareholders.
With their Values as a foundation, we leverage an information-driven approach — the Operating & Execution Model — to guide their decision-making process and ultimately, position them for continued profitable growth. They are committed to understanding the needs of their customers, and together with their partners, delivering industry-leading products and services that are largely focused in three areas:

- Building upon their core competencies of operational excellence — safety, quality, Lean and competitive cost discipline — to increase their advantage.
- Expanding their offerings to enable customer success through integrated and differentiated solutions.
- Growing their reliance on services with a focus on digital-enabled solutions and aftermarket to increase customer loyalty and further strengthen their relationships with our customers

He explained as a company Caterpillar looks into profitability and sustainable growth. Unlike other companies, what made them different is their approach in terms of the life of their employees. They take employee training, their work-life balance and their growth in the company into account, as it is the employees that put in hours of hard work to make the company stand at the heights it has reached globally.

Caterpillar's main clients is China, Indonesia and other eastern countries along with western ones. Some clients are third party vendors who outsource their products to regions of Africa.
The IPS Division of Caterpillar has 3 base companies under them:

1. CAT2. Perkins 3. F G Wilson

Note: The reason behind not merging the above three is due to customers' affinity to the particular brand. When it is brought under one brand name, there is a possibility of losing the customer who has an affinity towards that company.

IPSD manufacture medium and large generator systems. Large being those with above 7.2L engine and medium being below 7.2L.

He concluded by providing us with the safety instruction and safety equipment.Mr. Balaji was kind enough to assist us and give us a tour of the shop floor of the medium gensets manufacturing unit.

The shop floor consists of sophisticated equipment and technologies, which we got to visualize.

Block 1:

This area consisted of the assembly line of the medium sized generators.There were different assembly stations along the way for different components in order to fix and place to get a fully functioning engine.

IPSD uses a MES system in their assembly line. The Manufacturing Execution System is a software that assists the workers to get their job done efficiently and effectively. A screen shows them what part is coming their way and what are the parts that are linked with that engine since they have a 3-cylinder, 4-cylinder and a 6-cylinder engine being assembled on the same line. Hence it is crucial not to mix up the parts. So, the software assists the workers to avoid confusion and gives a green light and lets them pass the component or part only if the check is complete.

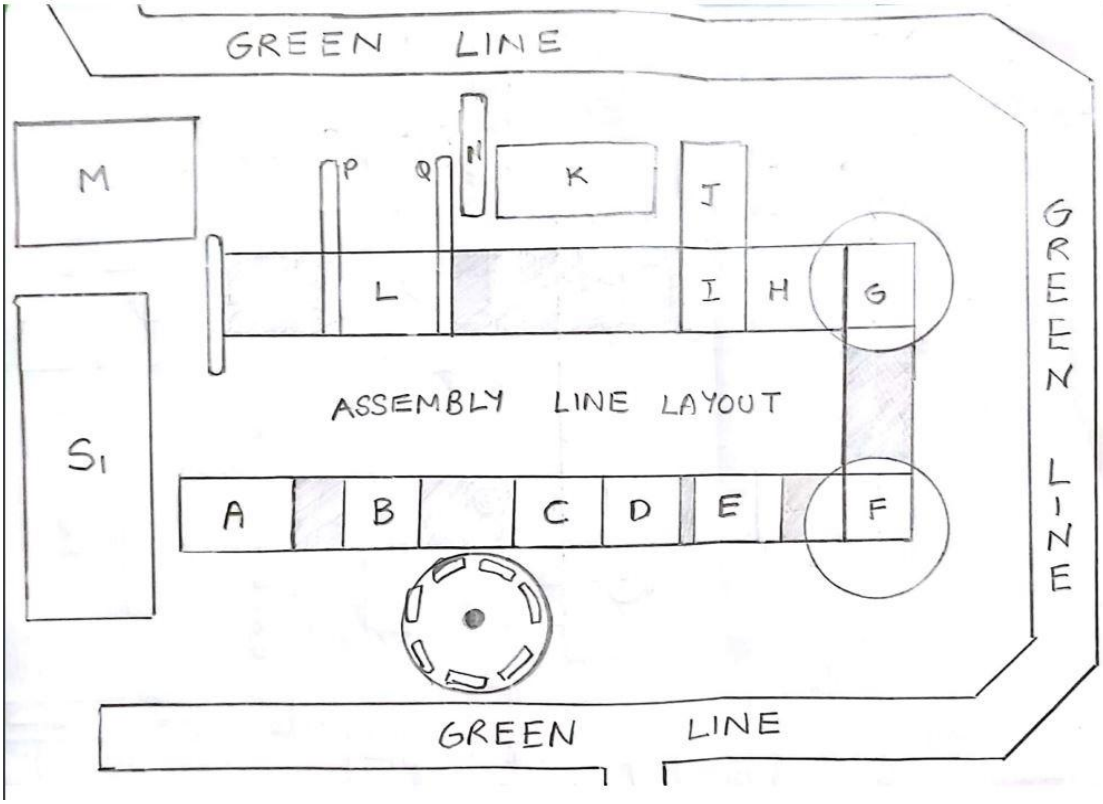


Fig: Layout of Block- 1

As represented in the diagram,

(NOTE: alphabets refer to the corresponding position in figure)

S1 is supermarket one where the components or inventory is kept.

*A:*the cylinder block is placed on the conveyer belt

*B:*the crankshaft is attached to the block

*C:*pistons are taken from the round table and placed onto the cylinder block

*D:*a quality check is done to check whether pistons are attached properly and run smooth along the lining and other minute inspections.

*E:*the fuel injector pump is attached. This assembly station takes the max time of 12 minutes whereas most of the other stations, the change over time is 3-4 minutes. As the FIP is attached, it is sent to the turn tables.

*F & G:*turn tables where the engine block is shifted to another conveyor belt.

*H:*a manual check is done before sending it to the next assembly station.

*J:*a tap system is present here where the cylinder head is assembled. During the delay period of fuel injector pump being attached, the cylinder head is assembled.

*K:*cylinder head units are stored for assembly.

*I:*the MES times the arrival of the cylinder head in such a way that the cylinder head and cylinder block arrive at assembly station (I) at the same time so that it can be fixed together.

*L:*the engine attached with the turbo and exhaust is now filled with lubricants and other fluid to undergo a leak test at this station. The products that fail this test are taken from the extension marked as **"P".**

*M:*this is the rework station at which the failed products of leak test are checked and corrected. After this, it is put back through extension **"Q"** and the leak test is done again.

*N:*this is a board which does Built in Quality check. It follows **RCCA** which is Root Cause Corrective Action. Using this method, they keep track of weekly details of products. Defective product information is divided into:

(i) Found: when defect is found during assembly
(ii) New: when a new defect was found in the product
(iii) Missed: when the next station finds a defect in the product that was missed by the previous quality check unit

Supermarkets are monitored by the logistics dept. and transferred to the assembly line.When the supermarket has a shortage, the warehouse is triggered and items are delivered.

Block 2:

The 2nd stage is for testing and paint job of the engines. The engines after leak tests and quality check will be test in this area for performance.

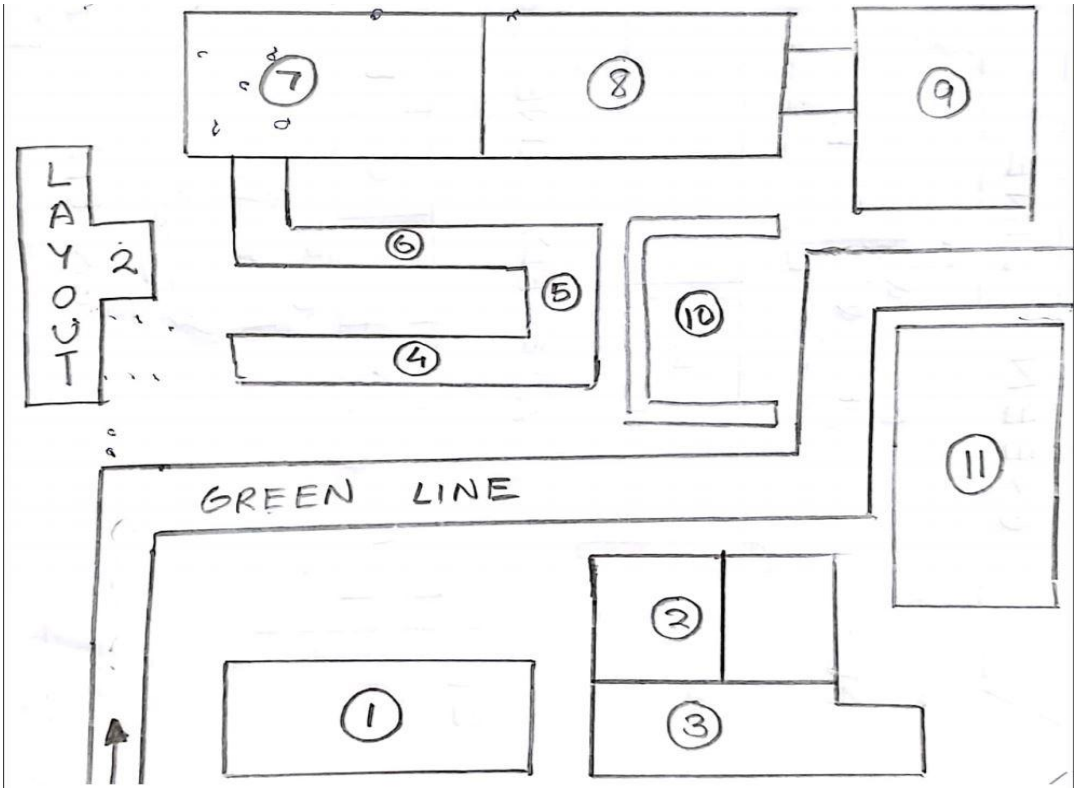


Fig: Layout of Block- 2

As represented in the diagram,

(NOTE: numbering refers to the corresponding position in figure)

1:supermarket 2

2:testing rig: an Eddy Current dynamometer is used for medium engines and Hydraulic dynamometer is used for larger engines. The engine is run on the dynamo for 12 minutes straight out of which for 2 minutes the engine will be run on full load.Engine is also checked for cracks and wear – tear using a diene white light in the dark.

3:this is the room in which the specimen of test is observed. Using the technology, they track the performance and other characteristics based on certain parameters and calculations. If the engine is passes the test, it moves on for the paint job.

4:area where the open ports and valves are sealed and the engine will be washed using a water jet.

5:the engine will now be air dried.

6:areas that need to be covered from paint will be masked or taped and marking will be done.

7:the engine undergoes the paint job where the color is chosen by the customer/client and will be depicted to the assigned employee on a screen. Though all the engines are from Caterpillar, as mentioned earlier, the clients have an affinity to a specific brand. Hence, the engines under CAT is in yellow, blue for Perkins and metallic (no specific color) for customers that want to sell the product as third-party vendors.

8:the engine from the paint shop will be placed in a curing station where the engine is subjected to 60°C for 30 minutes.

9:the engine is now let to dry properly for paint to set for a period of 2- 3 days after which parts like the alternator, fly wheel etc. is assembled. A quality check is done after this process.

11:the complete engine is now stored at this hub where it is arranged in the order of client and brand.

10:**OBEYA ROOM:** this is the open board room like area where the company's statistics is put up. Everything from sales, marketing, defects, growth rate, customer demand, profit, loss, etc. are put up. Weekly meetings of the employees happen here to review and come up with strategies.

Big arrow markings are placed on the board which tells Caterpillar's performance in that week/ month/ year. The arrows are marked with certain colors based on the results and stats:

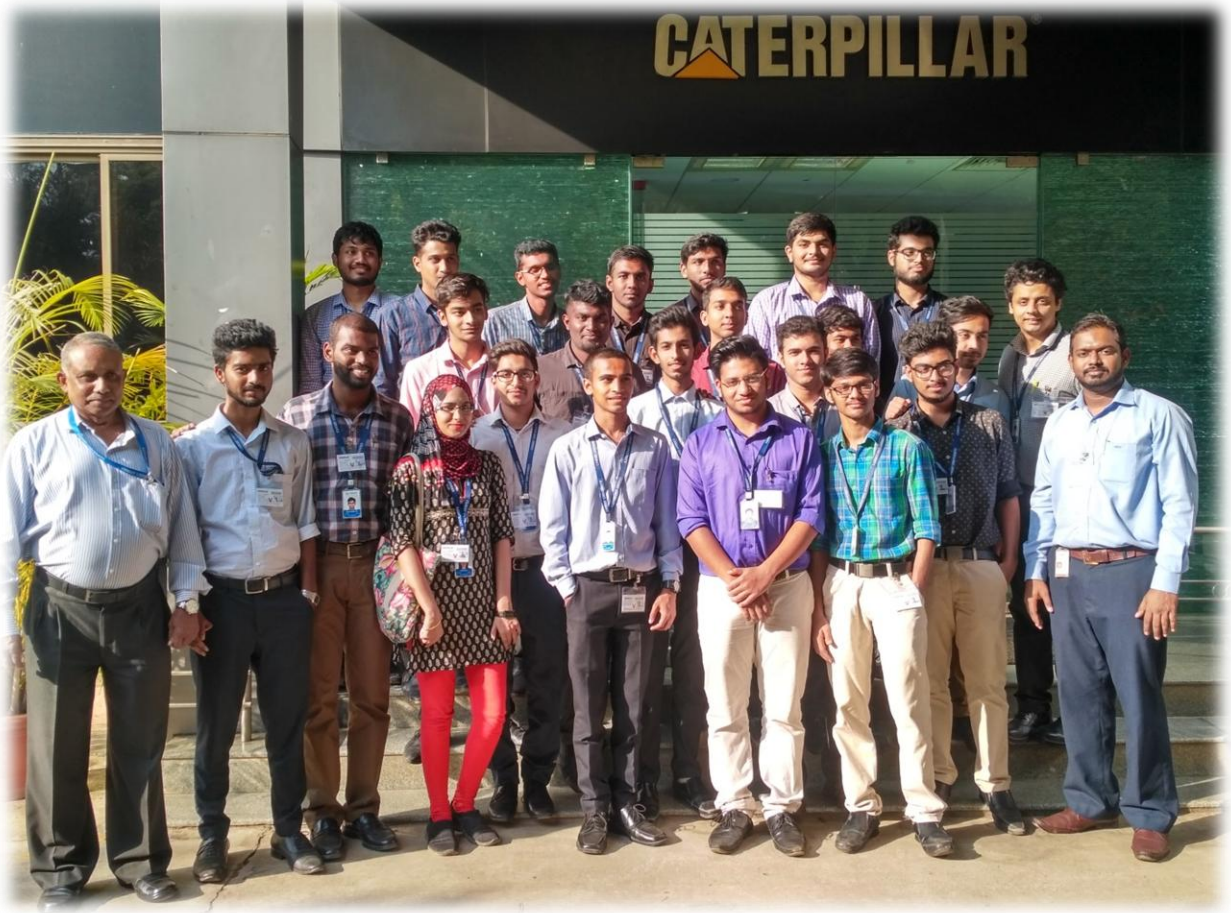
Green: well above target

Yellow: good but haven't reached a larger margin

Red: poor. Improvement and changed in strategy required.

After the tour of the testing and paint shop, we were lead to a unit where they built larger V12 generator engines of 35L. These engines were massive and used unit injection.


CATERPILLAR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