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PRODUCTION REPORT ON MARUTI SUZUKI INDIA LIMITED (GURGAON PLANT)

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CHAPTER 1
INTRODUCTION TO ORGANIZATION

Figure 1.1

1.1 OVERVIEW OF MSIL

Maruti Suzuki India Limited a partial subsidiary of Suzuki Motor Corporation of Japan is India's largest passenger car company, accounting for over 45% of the domestic car market.It was the first company in India to mass-produce and sell more than a million cars. It is largely credited for having brought in an automobile revolution to India. It is the market leader in India and on 17 September 2007, Maruti Udyog Limited was renamed Maruti Suzuki India Limited. The company's headquarters are located in NEW DELHI.

Maruti Udyog Limited (MUL) was established in February 1981, though the actual production commenced in 1983 with the Maruti 800, based on the Suzuki Alto car which at the time was the only modern car available in India, its only competitors the Hindustan Ambassador and Premier

Padmini were both around 25 years out of date at that point. Through 2004, Maruti Suzuki has produced over 5 Million vehicles. Maruti Suzukis are sold in India and several other countries, depending upon export orders. Models similar to Maruti Suzuki's (but not manufactured by Maruti Udyog) are sold by Suzuki Motor Corporation and manufactured in Pakistan and other South Asian countries.Maruti 800, till 2004, was the India's largest selling compact car ever since it was launched in 1983. More than a million units of this car have been sold worldwide so far. Currently Maruti Suzuki Alto tops the sales charts and Maruti Suzuki Swift is the largest selling in A2 segment.

Due to the large number of Maruti 800s sold in the Indian market, the term "Maruti" is commonly used to refer to this compact car model ,Maruti Suzuki has been the leader of the Indian car market for over two decades. Its manufacturing facilities are located at Gurgaon and Manesar in Haryana. It also plans to set up a plant in Gujarat and has acquired 600 acres of land for the same.

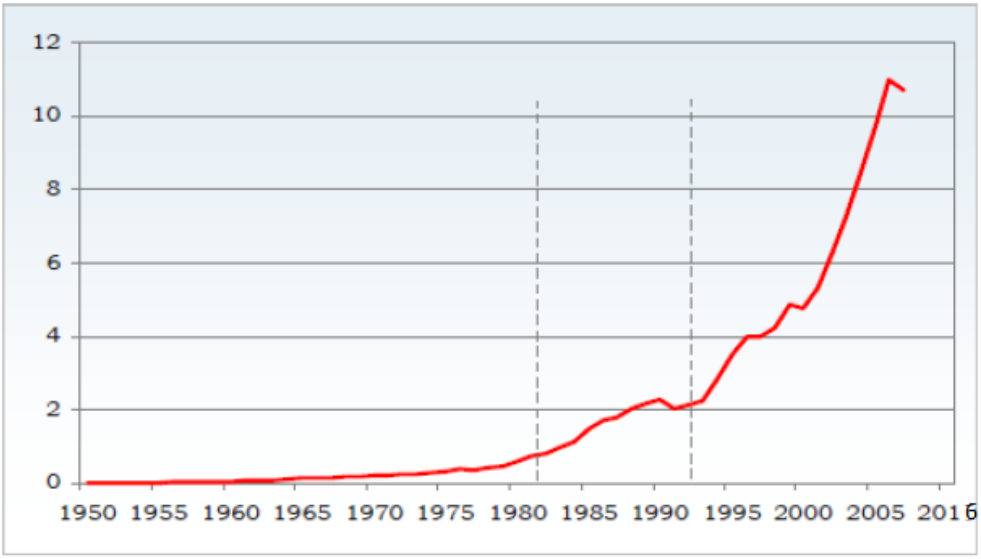

Figure 1.2 Growth over the years

Suzuki Motor Corporation, the parent company, is a global leader in mini and compact cars for three decades. Suzuki's technical superiority lies in its ability to pack power and performance into a compact, lightweight engine that is clean and fuel efficient. Nearly 75,000 people are employed directly by Maruti Suzuki and its partners. It has been rated first in customer satisfaction among all car makers in India from 1999 to 2009 by J D Power Asia Pacific.

1.2 JOINT VENTURE RELATED ISSUES

Maruti Udyog Limited was established in February 1981, though the actual production commenced only in 1983. It started with the Maruti 800, based on the Suzuki Alto kei car which at the time was

the only modern car available in India. Its only competitors were the Hindustan Ambassador and Premier Padmini. Originally, 74% of the company was owned by the Indian government, and 26% by Suzuki of Japan. As of May 2007, the government of India sold its complete share to Indian financial institutions and no longer has any stake in Maruti Udyog.The company is a subsidiary of Suzuki Motor Corporation, Japan, which owns 54.2 per cent of Maruti Suzuki. The rest is owned by public and financial institutions. It is listed on theBombay Stock Exchange and National Stock Exchange in India.

Logo of Maruti Udyog

Figure 1.3

In 1982, a license & Joint Venture Agreement (JVA) was signed between Maruti Udyog Ltd. and Suzuki of Japan. At first, Maruti Suzuki was mainly an importer of cars. In India's closed market, Maruti received the right to import 40,000 fully built-up Suzukis in the first two years, and even after that the early goal was to use only 33% indigenous parts. This upset the local manufacturers considerably. There were also some concerns that the Indian market was too small to absorb the comparatively large production planned by Maruti Suzuki, with the government even considering adjusting the petrol tax and lowering the excise duty in order to boost sales. Finally, in 1983, the Maruti 800 was released. This 796 cc hatchback was based on the SS80 Suzuki Alto and was India’s first affordable car. Initial product plan was 40% saloons, and 60% Maruti Van.Local production commenced in December 1983. In 1984, the Maruti Van with the same three-cylinder engine as the 800 was released and the installed capacity of the plant in Gurgaon reached 40,000 units.

In 1985, the Suzuki Gypsy, a 970 cc 4WD off-road vehicle, was launched. In 1986, the original 800 was replaced by an all-new model of the 796 cc hatchback Suzuki Alto. In 1987, the company started exporting to the West, when a lot of 500 cars were sent to Hungary. By 1988, the capacity of the Gurgaon plant was increased to 100,000 units per annum.By 1991, 65 percent of the components, for all vehicles produced, were indigenized. After liberalization of the Indian economy in 1991, Suzuki increased its stake in Maruti to 50 percent, making the company a 50-50 JV with the Government of India the other stake holder.

Maruti Suzuki is India and Nepal's number one leading automobile manufacturer and the market leader in the car segment, both in terms of volume of vehicles sold and revenue earned. Until, 18.28% of the company was owned by the INDIAN GOVERNMENT, and 54.2% by SUZUKI of Japan. The BJP-led government held an initial public offering of 25% of the company in June 2003.

As of 10 May 2007, Govt. of India sold its complete share to Indian financial institutions. With this, Govt. of India no longer has stake in Maruti Udyog.

New Logo of Maruti Suzuki India Ltd.

Figure 1.4

The success of the joint venture led Suzuki to increase its equity from 26% to 40% in 1987, and to 50% in 1992, and is expected to finish financial year (FY) 2015-2016 with a market share of 47 percent.

1.3 **DIVERSIFICATION OF BUSINESS**

The Company's other services include Maruti Finance, Maruti Insurance, Maruti Genuine Accessories, Maruti Genuine Parts, Maruti Driving School and Maruti Auto card. Its holding company is Suzuki Motor Corporation. The Company's subsidiaries include Maruti Insurance Business Agency Limited, Maruti Insurance Distribution Services Limited, True Value Solutions Limited, Maruti Insurance Agency Network Limited, Maruti Insurance Agency Solutions Limited, Maruti Insurance Agency Services Limited and Maruti Insurance Broker Limited.

- ✓ **Sales and service network**

In 1999, management of Maruti observed that while car companies were moving from products to services, trying to capture more of the total lifetime value of a car, Maruti was just making and selling cars. If a buyer spends Rs 100 on a car during its entire life, one-third of that is spent on its purchase. Another third went into fuel. And the final third went into maintenance. So Maruti decided to take a big share of this final one-third spent onmaintenance. For this they started conducting free service workshops to encourage consumers to come to their service stations. Maruti has increased its authorized service stations to 1567 across 1036 cities. Every regional office is having a separate services and maintenance department which look after the growth of this revenue stream.

- ✓ **Maruti Insurance**

Insurance is a major concern of car owners. Maruti has brought all car insurance needs under one roof. Maruti has tied up with National Insurance Company, Bajaj Allianz, New India Assurance and Royal Sundaram to bring this service for its customers. Maruti Insurance is a hassle-free way for customers to have their cars repaired and claims processed at any Maruti dealer workshop in India.

✓ **Maruti True Value**

It is an initiative to capture used car market. A significant development is MUL's entry into the used car market in 2001, allowing customers to bring their vehicle to a 'Maruti True Value' outlet and exchange it for a new car, by paying the difference. They are offered loyalty discounts in return. This helps them retain the customer. With Maruti True Value customer has a trusted name to entrust in a highly unorganized market and where cheating is rampant and the biggest concern in biggest driver of sale is trust. Maruti has created a system where dealers pick up used cars, recondition them, give them a fresh warranty, and sell them again. All investments for True Value are made by dealers.

Unique advantages

- India's largestcertified used car dealer network
- 340 outlets in 197 cities and growing
- All car related services under one roof
- professionally trained manpower

✓ **N2N Fleet Management**

Car maintenance is a time-consuming process, especially if you own a fleet. Maruti's N2N Fleet Management Solutions for companies, takes care of the A-Z of automobile problems. Services include end-to-end backups/solutions across the vehicle's life: Leasing, Maintenance, Convenience services and Remarketing.

N2N Benefits

- A wide range of cars to choose from- Maruti 800 to VitaraBrezza.
- Tax benefits- Lease rentals can be shown as revenue expenditure.
- N2N maintenance- Saves time and money.
- N2N remarketing- Speedy and efficient resale of the old/existing fleet.

✓ **Maruti Driving School**

The school was the first to introduce advanced driving training simulator for better judgment and concept of route maps for holistic on-road practice. Having started from Bangalore in March 2005, Maruti Driving School has now spread its network throughout the country.

✓ **2-wheelers**

Suzuki also built a two-wheeler facility in India for manufacturing motorcycles and scooters through a joint venture, in which Maruti has 51 per cent stake.

1.4 MANUFACTURING FACILITIES

Maruti Suzuki has two state-of-the-art manufacturing facilities in India. Both manufacturing facilities have a combined production capacity of 1,250,000 vehicles annually.

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Gurgaon Manufacturing Facility

The Gurgaon Manufacturing Facility has three fully integrated manufacturing plants and is spread over 300 acres (1.2 km^2). All three plants have an installed capacity of 350,000 vehicles annually but productivity improvements have enabled it to manufacture 700,000 vehicles annually. The Gurgaon facilities also manufacture 240,000 *K-Series* engines annually. The entire facility is equipped with more than 150 robots, out of which 71 have been developed in-house. The Gurgaon Facilities manufactures the 800,Alto, WagonR, Estilo, Omni, Gypsy, Ritz, Swift and Eeco.

1.5INCREASE IN EXPORTS

Figure 1.5 Exports

In August, 2003 Maruti crossed a milestone of exporting 300,000 vehicles since its first export in 1986. The top ten destination of the cumulative exports have been Netherlands, Italy, Germany, Chile, U.K., Hungary, Nepal, Greece, France and Poland in that order. Maruti has entered some unconventional markets like Angola, Benin, Djibouti, Ethiopia, Morocco, Uganda, Chile, Costa Rica and El Salvador. The Middle-East region has also opened up and is showing good potential for growth. Some markets in this region where Maruti is are Saudi Arabia, Kuwait, Bahrain, Qatar and UAE. The markets outside of Europe that have large quantities, in the current year, are Algeria, Saudi Arabia, Sri Lanka and Bangladesh.

CHAPTER 2

INDUSTRIAL TRAINING WORK UNDERTAKEN

While working with Maruti Suzuki I learnt about following few things which are very helpful for proper functioning of the industry:
Here are the KEY points:

2.1QUALITY POLICY:

Ever since the beginning, Maruti Suzuki has put a great emphasis on QUALITY. Quality not only in its products, but the way it works, the way its customers are treated, etc. This is the hallmark of the company which sells 7 of the 10 most sold vehicles in India every month.

QUALITY SYSTEMS AT MSIL

QUALITY TOOLS
WHAT IS 5S?

SEIRI - PROPER SELECTION

SEITION - ARRANGEMENT

SEISO - CLEANING

SEIKETSO - CLEANLINESS

SHITSUKE - DISCIPLINE

WHAT IS 4 M?

The factory is essentially a mix of man, materials, machines and methods. These should move continuously and effectively to produce a quality product at low cost. The most essential work in quality control is to thoroughly investigate regarding the problems concerning quality, decide suitable counter measures and carry out improvements accordingly.

WHAT IS 4 M?

1) MAN

2) MACHINE

3) MATERIAL

4) METHOD

Also,

The Mission Statement of the Industry is:

- Develop products of superior value by focusing on the customer.
- Establish a refreshing and innovative company through teamwork.
- Strive for individual excellence through continuous improvement

Now,

WHAT IS 3G?

In Japanese Language, 3G is:

GENCHI	ACTUAL PLACE
GENBUTSU	ACTUAL THING
GENJITSU	ACTUALLY

WHAT IS 3K?

In Japanese Language, 3K is:

KIMERAARETA KOTO GA	What has been decided
KIHON DIRI	As per the standard
KICHIN TO MAMORU	Must be followed

Learnings from the industry:

2.2 ENGINE PLANT

MAIN PARTS OF ENGINE

1. CYLINDER BLOCK

Top of the cylinder is covered by separate cast iron piece known as cylinder head. It is bolted on the top of the block. It contain nozzles, valves, rocker arms, tappets etc. The bottom of cylinder head and top of the cylinder block is machined very accurately. So that there are very less changes of gas leakage for sound gas tight joint the holding studs must be distributed as possible around the circumference of each cylinder the combustion chamber is made of cast iron in maruti Suzuki engine plant.

2. CRANK CASE

Crankcase is attached to the bottom face of the cylinder. It acts as the base of the engines. It supports the cranks shaft and camshaft in suitable bearings lower part of the cylinder block together is called the crankcase.

3. CONNECTING ROD

Fig 2.1 Connecting Rod

The connecting rod is the connection between piston and crankshaft. Small end of the connecting rod is connected to the piston pin and big end is connected to the crank pin. The function main function of connecting rod is to convert the liner motion of the piston to rotary motion of crankshaft.

Aluminum alloy is also used for connecting rod. The connecting rod carries the power thrust from piston to crank pin and hence it must be very rigid and as light as possible.

Crankshaft is the first in power transmission. System the reciprocating motion of piston is converting into rotary motion with the help of connecting rod. Crankshaft consists of crank pins, webs

balancing weights and main journals. Big end of connecting rod is connecting to crank pins of crankshaft.

The part of crankshaft inside the main bearing is called the main journals. Balancing weights are provide on the opposite side of crank arms for balancing crankshaft is made of casting of forging of heat created.

4. FLYWHEEL

A flywheel is a heavy steel wheel attached to the near end of the crankshaft. The size of flywheel is depends upon the number of cylinder and general construction of the engine. The flow of power from the engine cylinder is not smooth although the power impulses in a multi cylinder overlap or follow each other to provide a fair fly even flow of power, however additional leveling off power impulses is required.

5. VALVES

Valve is a device to close and open a passage. In motor vehicle, engines valves used for each cylinder and an exhaust valve. Exhaust valve is usually of austenitic stainless steel, which is highly heat &corrosion resistant. Inlet valve is being subject to less heat usually of nickel chromium alloy.

6. CAMSHAFT

A camshaft is simply a shaft on which cams are mounted. The camshaft is mounted on lower part of the camshaft into linear motion of the follower or lifter. A camshaft is responding for opening.

A camshaft has a numbers of cams along the length, two cams for elfish cylinder one to operate inlet valve and other to exhaust valve. In addition, camshaft has an eccentric to operate the fuel pump and gear to drive the ignition distributers and oil pump.

The camshaft is drive by crankshaft by machine gears. The crankshaft gear have twice the as many as on crankshaft gear.

7. OIL PAN OR SUMP

The bottom half of the crankshaft is called oil pan or sump. It is bolted or screwed to lower flange of the main casting and usually made of pressed steel or aluminum. It serves as a reservoir for the storage, cooling and ventilation of engine oil. The oil sump draws oil from the pan and sends it in the engine.

The oil drains off run down into pan. There is a constant circulation of oil between pan and the working parts of the engine.

8. OIL PUMP

It is generally located inside the crankcase below the oil level. The function of oil pump is to supply oil under pressure to the various engine parts are lubricated. We generally use gear type oil pump. It consist of two gear of equal size. One is called driven gear and other is called driving gear.

9. GASKETS

A gasket is placed between the cylinder head and to ensure metallic tight fit joint. The gasket should able to withstand not only high pressure but also extreme temperature.

Following important gaskets are used in automobile engine:

i. Copper—Asbestos Gasket

ii. Steel-- Asbestos Gasket

iii. Steel-- Asbestos –Copper Gasket

iv. Single Steel rigid or Corrugate Gasket

Fig 2.2 Gasket

10. PISTON

Fig 2.3Piston

The piston must possess the following qualities:-

1. Rigid to withstand high pressure.

2. Lightness to reduce the weight of reciprocating masses and so enable to get higher engine speeds.

3. Good heat conductivity.

4. Material should have low co-efficient of expansion.

11. PISTON RING

Piston rings are fitted into the grooves to maintain good seal between the piston and the cylinder wall.

All the parts are assembled and final engine is transported to the car plant in Manesar or the Gurgaon plant.

12. CHASSIS

Fig 2.4 Chassis

The portion without body of vehicle is called chassis. The layout of chassis components:-

I. Frame

II. Power unit

III. Transmission system

IV. Braking system

V. Steering system

2.3 TRANSMISSION PLANT

Company's entire gearboxes along with the differentials (complete transmission) are manufactured in the transmission plant located at Manesar.

GEAR BOX

Its function is to provide the high torque at the starting, hill climbing, accelerating and pulling a load. When a vehicle is starting from rest, hill climbing, accelerating and meeting other resistance, high torque is required, at the drive wheels. Hence, a device must be providing to prevent the engine crankshaft to revolve a relatively high speed, while the wheels turn at slower speed. This obtained by set of gear called a transmission or gear set of enclose in metal box called a gearbox. The vehicle speed is also change with the help of the transmission box keeping the engine speed it with certain limit.

Transmission refers simply to the gearbox that uses gears and gear trains to provide speed and torque conversions from a rotating power source to another device.

Components produced

1) Gears (3 types)

2) Sleeves (3 types)

3) Shafts (2 types)

4) Dog gear

5) Final Gear

Production Capacity: 12 lakh units per annum

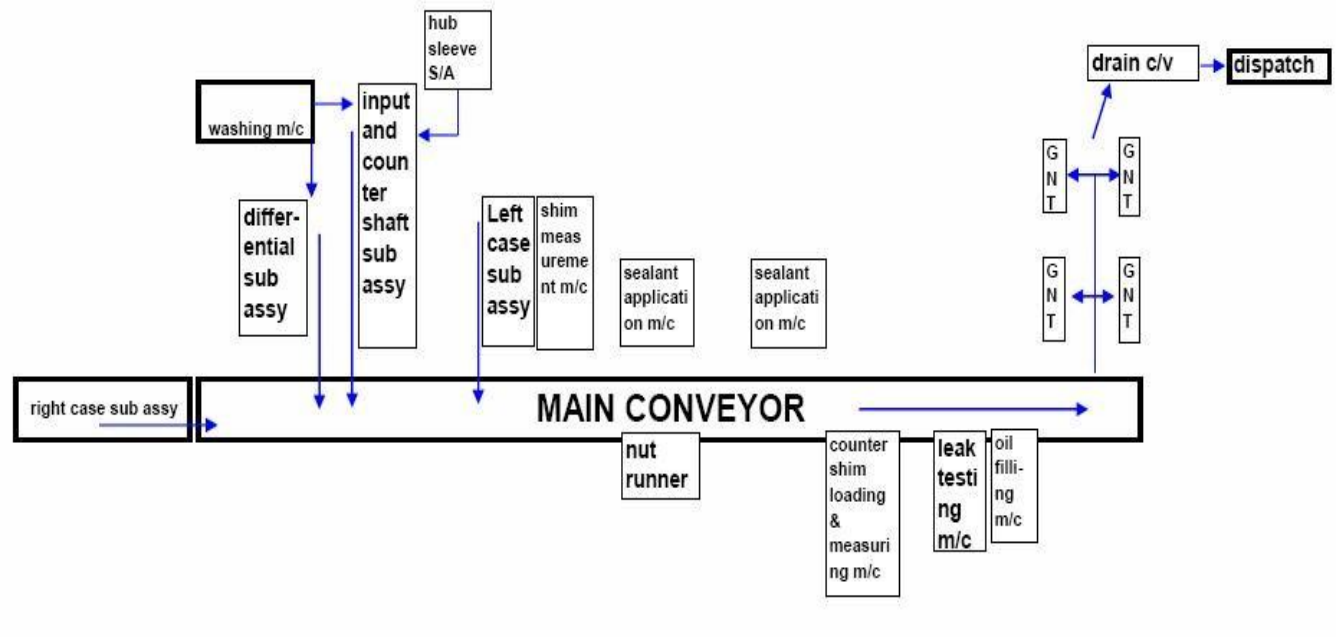

Figure 2.5 Assembly Line

Main assembly line is I-type.

The following sub-assembly lines are there:

i. Right case sub assy.

ii. Left case sub assy.

iii. Input and counter shaft sub assy.

iv. Differential sub assy.

v. Hub sleeve sub assy.

MACHINES IN THE ASSEMBLY LINE:

i. Press Fitting:

The press fitting m/c s of the input and counter shaft sub assembly are of servo-type. In servo press fitting m/c, load as well as the distance moved can be controlled more accurately. The press load applied is different for different gears and bearings. In differential sub assembly, to press fit the taper roller bearing, hydraulic press is used. Press load of 2 ton is used here.

ii. Shim Measurement:

It is used to determine the thickness of shim to be used. Shims are used to prevent axial play which occurs due to machining tolerances. Shims are used at the counter shaft left side and in the differential assembly left side.

iii. Nut Runner:

On TA1 a 13 spindle multi nut runner is present, whereas in TA2 there are 2 nut runners, with 11 and 13 spindles (for running both MF-60 and MF-70). Each nut runner is connected to an individual spindle and transducer (amplifies the torque). As the nut touches the surface a pulse is sent to the controller and a torque of 18-28 N-m is applied.

- **Sealant Application Machine**:

The profile to be travelled by the robotic arm of the sealant application machine is predefined. This is done by defining points on the profile using a teaching pendant. The X-Y axis of the robotic arm is servo controlled whereas the Z-axis is pneumatically controlled.

iv. Air Leak Tester:

An air pressure of 25kPa is applied inside the case. Permissible limit of leak is +/- 20 Pa.

v. Pre Loading Machine:

This is done to prevent the axial play of the counter shaft after the transmission is assembled in a car. A load of 3kN is axially applied on the counter bearing cup and the Input Shaft is rotated at a speed of 80 rpm. The fourth gear is engaged when this test is done.

vi. GNT (Gear Noise Testing):

After assembly of the T/M the gear ratios and noise testing is done in the GNT. The input shaft is coupled with the machine spindle by a clutch and rotated. First T/M is run in neutral, and then it is shifted to reverse. After reverse it is shifted to neutral then 1^{st} 2^{nd} 3^{rd} 4^{th} and 5^{th} gears are engaged (acceleration). Now the gears are engaged in the reverse order. I.e.5 to 1 deceleration).

vii. Pika-Pika System:

PIKA-PIKA system is there for fool proofing the parts' assembly. Sensors are fitted in each station. There is one central controlling unit which is connected to the remote units by Control and Communication (cc) links. For displaying data in the main unit, GOT is there.

When a particular model is running in the line, the PMS server, which is connected to the central processing unit by Ethernet, writes the model data into the PLC. Based on this data, the controlling unit sends signal to the remote stations in each cycle and the lights blinks which show which part is

to be picked. The green light goes off after the sensor senses the operator picking the part. If the operator does not pick up the correct part, alarm comes in the ANDON.

For models in which common parts are fitted, sensors are on the bins. Operator has to pick in each cycle, otherwise, alarm comes.

viii. Conveyor:

Slate type conveyors are used. The productivity of such conveyors is more as compared to the power and free type. If a particular operator does not complete his job in the stipulated time, then the whole conveyor stops. Thus the operator has to complete his job within the assigned time. Moreover, these types of conveyors are more cost effective.

CHAPTER 3

PROJECT WORK

3.1 SPOT CHECK FOR YL8, YAD AND YN4 FUB

Introduction:

The project assigned was **"Spot Check for YL8, YAD & YN4 Front Under Body".** The spot welding line consists of a total of 14 robots, 7 on either side. For every two units of YL8 and YN4, one unit of YAD passes through the line. Purpose of this project was to find out how many spots are applied to each of the models by each of the robots in the line.

Method:

There were two types of spot welding robot systems on the line that were used to apply the spots. These were namely – **MOTOMAN** and **FANUC** systems. Each of these systems had a different type of display activity monitor. Motoman system was simpler i.e. the display showed whenever a spot was applied so the reading could be taken. Fanuc on the other hand, does not show the time or point when the spot is applied, so the line had to be observed with the naked eye to note down when a spot was applied.

The models assigned were given according to their factory designations. They're market names are –

YL8 – Ertiga

YAD – S-Cross

YN4 – Dzire Tour

Out of all the models being manufactured at the facility, the YN4 is the only model that has more manual work required while assembling compared to the other models.

Table 3.1 *Spot Check YL8, YN4 & YAD FUB (i)*

Robot →	**401B**	**402D**	**404H**	**405L**	**407S**	**204C**	**401AF**	**401A**
YL8	6 Spots	21 Spots	25 Spots	23 Spots	17 Spots	31 Spots	16 Spots	6 Spots
YN4	5 Spots	18 Spots	25 Spots	28 Spots	8 Spots	NA	NA	4 Spots
YAD	8 Spots	21 Spots	22 Spots	27 Spots	18 Spots	17 Spots	NA	8 Spots

Table 3.2 *Spot Check YL8, YN4 & YAD FUB (ii)*

Robot →	**402C**	**404G**	**405K**	**405O**	**406P**	**407R**
YL8	21 Spots	22 Spots	22 Spots	13 Spots	30 Spots	18 Spots
YN4	18 Spots	25 Spots	30 Spots	17 Spots	20 Spots	8 Spots
YAD	21 Spots	22 Spots	26 Spots	20 Spots	7 Spots	23 Spots

Table 3.3 *Spot Check YL8, YN4 & YAD FUB (iii)*

Robot →	**203B**	**205F**	**401T**	**403W**	**403AG**	**405Y**	**404J**	**406Q**
YL8	3 Spots	12 Spots	6 Spots	8 Spots	17 Spots	17 Spots	25 Spots	33 Spots
YN4	NA	NA	16 Spots	9 Spots	16 Spots	17 Spots	27 Spots	20 Spots
YAD	4 Spots	11 Spots	16 Spots	2 Spots	14 Spots	20 Spots	24 Spots	7 Spots

Table 3.4 *Spot Check YL8, YN4 & YAD FUB (iv)*

Robot ->	**406Z**	**407AB**	**407AD**	**407AE**	**406AA**	**404I**
YL8	36 Spots	21 Spots	20 Spots	20 Spots	35 Spots	23 Spots
YN4	36 Spots	9 Spots	38 Spots	38 Spots	37 Spots	30 Spots
YAD	26 Spots	13 Spots	21 Spots	23 Spots	26 Spots	24 Spots

Table 3.5 *Spot Check YL8, YN4 & YAD FUB (v)*

Robot ->	**404I**	**403N**	**403X**	**401V**
YL8	23 Spots	19 Spots	7 Spots	6 Spots
YN4	30 Spots	16 Spots	9 Spots	17 Spots
YAD	24 Spots	14 Spots	2 Spots	17 Spots

3.2 YBA SIDE BODY OUTLINE

Introduction:

The project assigned was to draw the **"YBA Side Body Outline"**. The YBA, known as the Vitara Brezzacommercially is Maruti Suzuki's latest vehicle in the market. Revealed at the Auto Expo 2016, the YBA has a compact SUV form made to take on the likes of Ford EcoSport, Renault Duster and Nissan Terrano. It has a 1.4 litre Diesel engine generating 84 BHP.

The Side Body line of the YBA has the issue of only one side being operated and welded upon at a given time. The other side remains unused as it is for the YRA (commercially known as the Ignis) which will be launched during the 3rd quarter of 2016.

The purpose of this project was to obtain an accurate outline of the Side Body line of the YBA including the locations of all the spares, tools and parts to be applied.

Method:

The method used here was simple. The Side Body line of the YBA was first observed and then a rough outline is drawn on paper which is then translated to Microsoft Excel. The Side Body line of the YBA consists of two part, the Right Hand side and the Left Hand side.

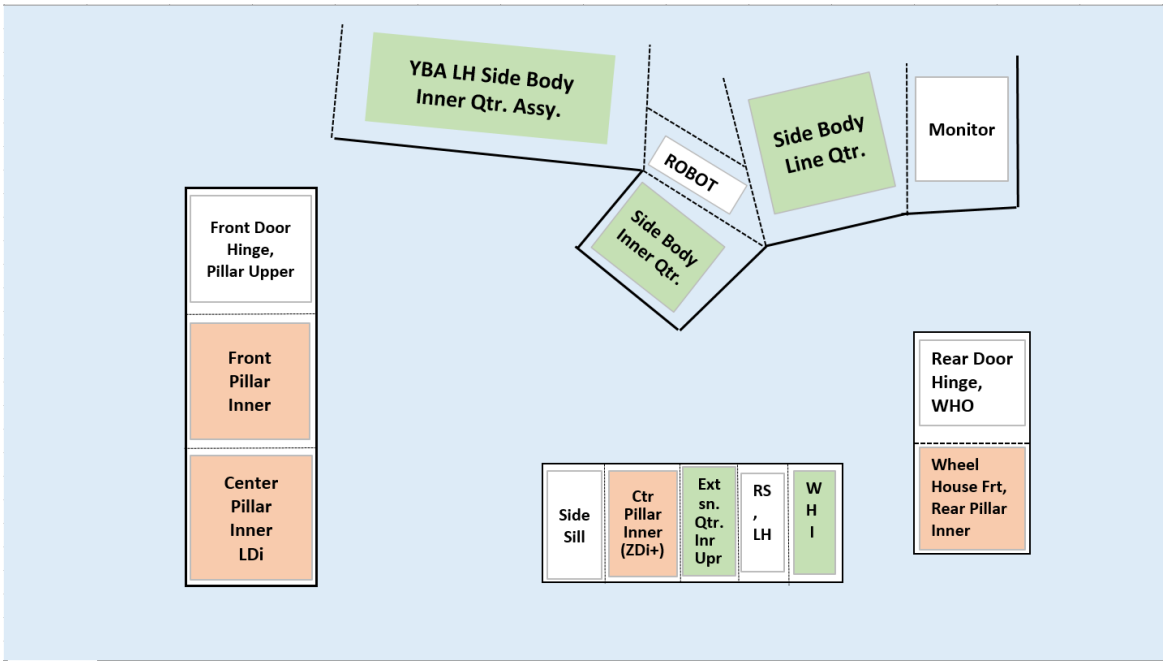

Figure 3.1 *YBA Left Side Body Outline*

Key -
WHI - Wheel Housing Inner
WHO - Wheel Housing Outer
LH - Lamp Housing
RS - Roof Side
Extsn. - Extension

Quarter Component
Inner Component

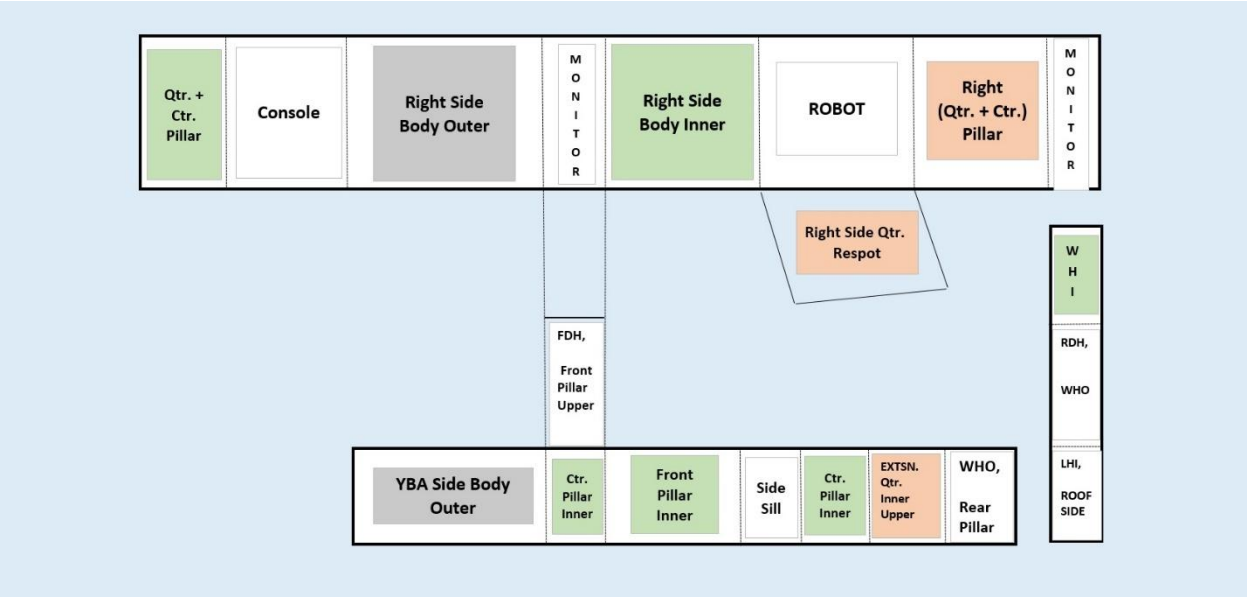

Figure 3.2 *YBA Right Side Body Outline*

Key –
WHI – Wheel Housing Inner
RDH - Rear Door Hinge
WHO - Wheel Housing Outer
FDH - Front Door Hinge
LHI - Lamp Housing Inner

Quarter Component
Inner Component

3.3 SHELF TO LINE TIMES FOR YBA SIDE BODY

Introduction:

This project was a continuation of 3.2 i.e. the YBA side body outline. The purpose of this project was to note down the time taken for the assembly staff member to take the part off the shelf and mount it on the line.

Method:

The approach for this was rather simple. The staff member on the line was observed and the time taken by him to get a part from the shelf to the line was recorded on a stop watch and was noted down accordingly.

Table 3.6 *YBA Shelf to Line times Left Side Body (i)*

Part Name →	**RDH**	**WHO**	**RPI**	**WH Fr.**	**WHI**	**Roof Side**	**Fr. DH**	**Fr. PU**
Time Taken	12 sec	15 sec	15 sec	15 sec	10 sec	16 sec	16 sec	12 sec

Table 3.7 *YBA Shelf to Line times Left Side Body (ii)*

Part Name →	**Ctr. Pillar (Z)**	**Side Sill**	**Ctr. Pillar (L)**	**Fr. Pillar Inr.**
Time Taken	10 sec	14 sec	12 sec	12 sec

Table 3.8 *YBA Shelf to Line times Right Side Body (i)*

Part Name →	**WHI**	**RDH**	**WHO**	**LHI**	**RP**	**Roof Side**	**YBA SBO**	**Ctr. Pillar**
Time Taken	8 sec	16 sec	9 sec	12 sec	14 sec	14 sec	22 sec	5 sec

Table 3.9 *YBA Shelf to Line times Right Side Body (ii)*

Part Name →	**Fr. Pillar Inr**	**Side Sill**	**Fr. DH**	**Fr. Pillar Upr**
Time Taken	26 sec	26 sec	16 sec	16 sec

3.4 SHOP TO LINE TIMES FOR YBA, YE3, YL8 AND YAD

Introduction:

This project was assigned to note down the total time taken for a part of a vehicle to be transferred from storage to the line. This time includes the loading time of the part, travel time (2x) back and forth from shop to line and unloading time at the line.

Each part panel that comes out the press shop is mounted on a pallet and then sent to storage and is retrieved when it is required.

These parts are of many types. They include –

- Doors – Inner and Outer, Left and Right.
- Side Body – Inner and outer, Left and Right
- Hood – Inner and Outer
- Back Door – Inner and Outer
- Roof
- Rear Floor
- Main Floor

These parts can also be of multiple kinds depending on variant of the vehicle. For e.g. VXi&ZXi have different door panels, back door panels, etc.

This project took a long time for completion as there were many chances of errors. The purpose of this project was to get a rough constant time that each part took to get from the press shop to the assembly line.

There were many parameters that could affect these times such as –

- Unavailability of part.
- Traffic at various points in path of travel.
- Staff incompetence or negligence.
- Wrong pallet loaded.

In order to avoid getting errors in the final data, the times for each of the parts were noted multiple times. This was a challenging task in its scale as it required pin-point accuracy in the time noted and required near constant times. Any time noted that didn't follow with the other times noted for the same task had to be taken again.

Method:

The method for this project required 4 time readings.

$T = T1 + T2 + T3 + T4$ (equation no. 3.1)

Where,

T1 = Loading time

T2 = T3 = Travel time

T4 = Unloading time

In the final table presenting the times, T2 and T3 are represented by B and a single quantity is taken twice.

Depending on the no. of panels per pallet and total time taken, we could get a figure for how many trips would be required in total.

Table 3.10 (i) *Shop to Line times for YAD, YL8, YE3 & YBA*

Sl.No.	Model, Parts	Model	Panels/Pallet	Production volume/day	Working hours	No of trips/day	Pallet loading/ unloading (At press) A	Travel time (t) (Press to WS2-3) B=(tX2)	Pallet loading/ unloading (At WS2-3) C	Total time/trip (A+B+C)
1	FDI R	YAD	60	110	16	2	00:35	00:50	00:25	01:50
2	FDO R	YAD	100	110	16	1	00:40	01:10	00:30	02:20
3	FDI L	YAD	60	110	16	2	00:20	00:55	00:25	01:40
4	FDO L	YAD	100	110	16	1	00:40	01:05	00:45	02:30
5	RDRI	YAD	60	110	16	2	01:25	00:50	00:45	03:00
6	RDRO	YAD	100	110	16	1	02:20	01:50	00:55	05:05
7	RDLI	YAD	60	110	16	2	01:25	00:50	00:45	03:00
8	RDLO	YAD	100	110	16	1	02:20	01:50	00:55	05:05
9	HOOD O	YAD	70	110	16	2	03:00	02:10	01:10	06:20
10	HOOD I	YAD	300	110	16	1	03:00	02:10	01:10	06:20
11	FENDER R	YAD	36	110	16	3	01:20	02:20	00:40	04:20
12	FENDER L	YAD	36	110	16	3	01:20	02:20	00:40	04:20
13	BDI	YAD	125	110	16	1	01:00	02:00	00:45	03:45
14	BDO	YAD	40	110	16	3	01:20	01:10	01:00	03:30
15	ROOF	YAD	36	110	16	3	01:30	01:10	01:25	04:05
16	SIDE R	YAD	27	110	16	4	00:40	00:35	00:25	01:40
17	SIDE L	YAD	27	110	16	4	00:40	00:35	00:25	01:40
18	Main Floor	YAD	250	110	16	0	01:15	02:30	01:10	04:55
19	RFR	YAD	60	110	16	2	01:25	02:40	01:15	05:20
20	HOOD I	YL8	500	270	16	0	01:45	01:35	00:55	04:15
21	HOOD O	YL8	70	270	16	3	02:00	01:10	00:40	03:50
22	BDI	YL8	125	270	16	2	01:50	02:00	00:50	04:40
23	BDO	YL8	40	270	16	6	01:50	02:00	00:50	04:40
24	FENDER R	YL8	34	270	16	7	01:20	03:15	01:10	05:45
25	FENDER L	YL8	34	270	16	7	01:20	03:15	01:10	05:45
26	FDRI	YL8	60	270	16	4	02:05	01:45	01:35	05:25
27	FDRO	YL8	100	270	16	3	02:15	01:25	01:30	05:10
28	FDLI	YL8	60	270	16	4	02:05	01:45	01:35	05:25
29	FDLO	YL8	100	270	16	3	02:15	01:25	01:30	05:10
30	RDRI	YL8	60	270	16	4	01:00	00:45	01:05	02:50
31	RDRO	YL8	100	270	16	3	01:25	00:40	01:15	03:20
32	RDLI	YL8	60	270	16	4	01:00	00:45	01:05	02:50
33	RDLO	YL8	100	270	16	3	01:25	00:40	01:15	03:20
34	Main Floor	YL8	200	270	16	1	02:00	01:00	01:00	04:00
35	RFR	YL8	100	270	16	3	02:00	01:00	01:00	04:00
36	Side R	YL8	27	270	16	10	02:40	00:55	00:35	04:10
37	Side L	YL8	27	270	16	10	02:40	00:55	00:35	04:10
38	ROOF	YL8	26	270	16	10	02:35	01:00	00:40	04:15

Table 3.10 (ii) *Shop to Line times for YAD, YL8, YE3 & YBA*

39	Cowl Top	**YE3**	NA	500	16		00:35	00:25	00:25	01:25
40	Roof	**YE3**	NA	500	16		00:20	00:20	00:15	00:55
41	HOOD I	**YE3**	450	500	16	1	00:45	00:40	00:35	02:00
42	HOOD O	**YE3**	100	500	16	5	00:45	00:40	00:35	02:00
43	FDRI	**YE3**	60	500	16	8	01:55	01:00	00:55	03:50
44	FDRO	**YE3**	100	500	16	5	02:00	00:50	01:05	03:55
45	FDLI	**YE3**	60	500	16	8	01:55	01:00	00:55	03:50
46	FDLO	**YE3**	100	500	16	5	02:00	00:50	01:05	03:55
47	RDRI	**YE3**	70	500	16	7	02:00	00:55	01:15	04:10
48	RDRO	**YE3**	100	500	16	5	01:55	01:10	02:00	05:05
49	RDLI	**YE3**	70	500	16	7	02:00	00:55	01:15	04:10
50	RDLO	**YE3**	100	500	16	5	01:55	01:10	02:00	05:05
51	FENDER R	**YE3**	NA	500	16		02:15	00:50	00:45	03:50
52	FENDER L	**YE3**	NA	500	16		02:15	00:50	00:45	03:50
53	BDO	**YE3**	45	500	16	11	02:25	01:30	01:25	05:20
54	BDI	**YE3**	120	500	16	4	02:25	01:30	01:25	05:20
55	Main Floor	**YE3**	80	500	16	6	00:55	01:20	00:25	02:40
56	Qtr Inner R	**YE3**	150	500	16	3	01:15	00:45	00:45	02:45
57	Qtr Inner L	**YE3**	150	500	16	3	01:15	00:45	00:45	02:45
58	RFR	**YE3**	80	500	16	6	01:00	01:10	00:50	03:00
59	HOOD I	**YBA**		450	16		03:50	02:10	01:10	07:10
60	HOOD O	**YBA**		450	16		03:50	02:10	01:10	07:10
61	FDRI	**YBA**		450	16		02:35	01:20	01:00	04:55
62	FDRO	**YBA**		450	16		03:20	01:30	01:00	06:00
63	FDLI	**YBA**		450	16		02:35	01:20	01:00	04:55
64	FDLO	**YBA**		450	16		03:20	01:30	01:00	06:00
65	RDRI	**YBA**		450	16		02:00	02:00	00:55	05:00
66	RDRO	**YBA**		450	16		02:30	01:30	01:00	05:00
67	RDLI	**YBA**		450	16		02:00	02:00	00:55	04:45
68	RDLO	**YBA**		450	16		02:30	01:30	01:00	04:45
69	BDO	**YBA**		450	16		01:50	03:00	01:30	06:20
70	BDI	**YBA**		450	16		01:50	03:00	01:30	06:20
71	RFR	**YBA**		450	16		02:05	01:20	01:45	05:10
72	Fender R	**YBA**		450	16		01:00	01:00	01:00	03:00
73	Fender L	**YBA**		450	16		01:00	01:00	01:00	03:00

CHAPTER 4

RESULTS AND DISCUSSION

Through the projects performed throughout this time under the guidance of my supervisor and mentor at MSIL Gurgaon, Mr. Amit Kr. Sikdar, I've learnt a great many things about factors affecting the productivity division of a large scale automobile company.

From the spot checking project, we can say that -

- The number of spots applied on the body of a car can be reduced or relocated to save time.
- The task can be further automated to improve efficiency.

From the Side Body Outline & Shelf to Line times project, we can say that –

- Efficiency and productivity can be improved by saving time and not letting future launches affect production of current vehicle line.

From Shop to Line time project, we can say that -

- The factors influencing the delivery of a part to assembly line need to be reduced significantly.
- The staff needs to be more orderly in their conduct and respect the task they're handed and perform it sincerely.
- Automation is the future of mass vehicle production, the time taken once the technology is adopted full scale will be significantly lesser than it is today.

CHAPTER 5

CONCLUSION AND FUTURE SCOPE

5.1 CONCLUSION

This training helped me in every way in overall development of my technical as well as theoretical skills. I came to know about the very precise details of Suzuki models. I had a real exposure working with the company.

- This training period increased my skills in field of using productivity as the biggest motivation for completing a task in time i.e. getting a vehicle made in time so the company can meet the market demand.
- It taught me some basics on data collection, data processing and setting up research projects.
- It made me flexible and let me see things and think from different point of view
- Use of skills and knowledge gained in the university
- It was alearning experience for me in the professional environment
- The internship was also good to find out what my strengths and weakness are.

5.2 FUTURE SCOPE

I gained sufficient knowledge for figuring out how productivity can be improved in a company. In the coming years, MSIL faces a great challenge in the form of high demand of new vehicle launches. It'll need to ramp up its production accordingly. With improved staff management and an adoption of higher amount of automation in the production line will greatly improve their work quality, efficiency and what matters the most of all – Customer Satisfaction.

CHAPTER 6

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