ASHOK LEYLAND

30-Sep-19

TO WHOMSOEVER IT MAY CONCERN

This is to certify that

Mr.THEJESH R (4AL16ME088)

B.E (Mech) Student of

Alva's Istitute of Engineering and Technology

has undergone Internship at Ashok Leyland,Hosur-I from 19/08/2019 to 20/09/2019

During the above period he has evinced keen interest in the training and we found his conduct to be good.

ASHOK LEYLAND. HOSUR-1 HRD

G. Ramesh
Senior Manager – HR

ASHOK LEYLAND LIMITED
175, Sipcot Industrial Complex, Hosur - 635 126. India.
t : +91 4344 276631 f : +91 4344 276067
e : reachus@ashokleyland.com
Regd. Office: No. 1, Sardar Patel Road, Guindy, Chennai - 600 032. India.
t : +91 44 2220 6000 f : +91 44 2220 6001
CIN : L34101TN1948PLC000105
www.ashokleyland.com

VISVESVARAYA TECHNOLOGICAL UNIVERSITY

" Jnana Sangama" Belagavi – 590010

INTERNSHIP REPORT ON

"ASHOK LEYLAND LIMITED"

Submitted in partial fulfillment of the requirements for the award of degree

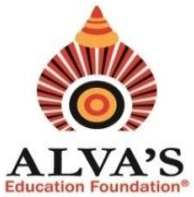
BACHELOR OF ENGINEERING
IN
MECHANICAL ENGINEERING

Submitted By
THEJESH R
4AL16ME088

Under the Guidance of

SOURABH KUMAR

SUPPLY CHAIN DEPARTMENT



DEPARTMENT OF MECHANICAL ENGINEERING
ALVA' S INSTITUTE OF ENGINEERING & TECHNOLOGY
MOODBIDRI – 574 225.

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DEPARTMENT OF MECHANICAL ENGINEERING

CERTIFICATE

This is to certify that Mr. THEJESH R has submitted Internship Report on "ASHOK LEYLAND INDIA LIMITED**"** **for** VII/VIII Semester B.E. in Mechanical Engineering during the academic year 2019-20. The Internship report has been approved as it satisfies the academic requirements in respect of Internship work prescribed for the Bachelor of Engineering Degree.

Internship Coordinator HOD

Acknowledgement

It is my proud privilege and duty to acknowledge the kind help and guidance received from several people in preparation of this report. It would not have been possible to prepare this report in this form without their valuable help, co-operation and guidance.

I express my sincere gratitude to my guide **MR.SAURABH KUMAR,SENIOR OFFICER,** Department of SOURCING AND SUPPLY CHAIN,ASHOK LEYLAND, for guiding me in investigations for this Internship. My numerous discussions with him were extremely helpful. I hold him in esteem for guidance, encouragement and inspiration received from him.

I wish to record my sincere gratitude to this esteemed company and to my beloved **MR.G.RAMESH , Sr.Manager-Training And Development** for his constant support, encouragement, valuable suggestions and guidance throughout the period of this report.

The course on **" SOURCING AND SUPPLY CHAIN"** was very helpful to me in giving the necessary background information and choosing this topic for the Internship

ABOUT THE ORGANIZATION:

Ashok Leyland, flagship of the Hinduja group, is the 2nd largest manufacturer of commercial vehicles in India, the 4th largest manufacturer of buses in the world, and the 10th largest manufacturers of trucks.

Headquartered in Chennai, 9 manufacturing plants gives an international footprint - 7 in India, a bus manufacturing facility in Ras Al Khaimah (UAE), one at Leeds, United Kingdom and a joint venture with the Alteams Group for the manufacture of high-press die-casting extruded aluminum components for the automotive and telecommunications sectors, Ashok Leyland has a well-diversified portfolio across the automobile industry. Ashok Leyland has recently been ranked as 38th best brand in India.

A US $ 4 billion (2017-18) company, and a footprint that extends across 50 countries, we areone of the most fully-integrated manufacturing companies this side of the globe.

Ashok Leyland has a product range from 2.5T GVW (Gross Vehicle Weight) to 49T GTW (Gross Trailer Weight) in trucks, 16 to 80 seater buses, vehicles for defence and special applications, and diesel engines for industrial, genset and marine applications.

Pioneers in the Commercial Vehicle (CV) space, many product concepts have become industry benchmarks and norms.

Ashok Leyland has IATF 16949:2016 Corporate Certification and is also the first CV manufacturer in India to receive the OBD-II (on board diagnostic) certification for BS IV-compliant commercial vehicle engines, SCR (selective catalytic reduction), iEGR (intelligent exhaust gas recirculation) and CNG technologies.

The Company’ s wide-spread customer base is served through an all-India sales and service network, supplemented by close to 3000 touch points.

A global network of over 550 touch points that facilitate on-road service for millions of vehicles. With technology-enabled customer engagement processes and knowledge on the specific applications of the product range, Ashok Leyland sales team are well equipped to fulfill customer’ s needs.

THE PROJECT DETAILS

PROJECT: SOURCING AND SUPPLY CHAIN

CLIENT :

- Indian Army.
- US Army.
- Honduras Armed Forces (HAF).
- Tamilnadu State Transport Corporation (TNSTC).
- Metropolitan Transport Corporation (MTC), Chennai.
- State Express Transport Corporation (SETC), Tamilnadu.
- Kerala State Road Transport Corporation.
- Maharashtra State Road Transport Corporation (MSRTC).
- Andhra Pradesh State Road Transport Corporation (APSRTC).
- Parveen Travels.
- Sharma Transport

PROJECT LOCATION AND AREA:

ASHOK LEYLAND,175,Sipcot Industrial complex, Hosur- 635109,Tamilnadu,India.

INTRODUCTION

The Society of Indian Automobile Manufacturers (SIAM) is a not-for-profit apex national body representing all major vehicle and vehicular engine manufacturers in India. SIAM works towards supporting sustainable development of the Indian Automobile Industry with the vision that India emerges as the destination of choice in the world for design and manufacture of automobiles. It also works towards facilitating enhancement of the competitiveness of the Indian Automobile Industry, reducing cost of vehicles, increasing productivity and achieving global standards of quality.

The early introduction of BS VI fuel gives confidence to the Auto Industry that BS VI Fuel will be available across the country from 1st April 2020, when the Auto Industry will fully migrate to manufacturing only BS VI compliant vehicles on a pan India basis. Availability of BS VI fuel in Delhi from April 2018 also gives an opportunity to the vehicle manufacturers in this region to test and validate the BS VI vehicles being developed by the auto industry so as to be fully ready for the April 2020 deadline.

" Use of BS VI fuel with lower sulphur content may also improve the particulate emissions from the existing fleet of vehicles which are presently plying in the National Capital to some extent. In addition, if the Government also effectively enforces the order to remove old BS II and earlier vintage vehicles from plying in the National Capital, it would greatly reduce the contribution of vehicular pollution in the Region." Dr Firodia added.
Society of Indian Automobile Manufacturers (SIAM) is the apex Industry body representing leading vehicle and vehicular engine manufacturers in India.

The study includes the brief study of the core departments of Ashok Leyland, hosur. Different officials working in different departments have provided very important data in this Report. Every effort has been made to understand the functions and activities of various departments as well as the manufacturing process.

The Chief Competitors of ASHOK LEYLAND are;

- Mahindra
- Volvo
- Tata Motors

ASHOK LEYLAND' S MANUFACTURING PLANTS:

- **The Crown Jewels of *Ashok Leyland*.**
- **The Ennore 'Mother *Plant*', Tamilnadu - Est.**
- **Hosur *Plant* 1, Tamil Nadu - Est.**
- **Bhandara *Plant*, Maharashtra – Est.**
- **Alwar *Plant*,Rajasthan – Est.**
- **Hosur *Plant* 2, Tamil Nadu, Est.**
- **CPPS *Plant*, Tamilnadu, Est.**
- **Ras Al Khaimah *Plant*, UAE, Est.**

TRAINING:

Sourcing and supply chain department believes that quality is the hallmark of any successful venture. Quality Training and Development of sourcing is realized through;

Identifying the training needs within the Organization and designing and Implementing those need based training programs to bring about continuous up gradation of knowledge ,skills and employee attitudes.

VISION AND MISSION

At Ashok Leyland, Corporate Social Responsibility starts with a belief that what you do is important to the society. We place a high value on listening to our communities and strive not just to be a good neighbor, but a global corporate citizen. We operate in ways that honor our values and respect the people, communities and natural environment in which we work and live. Through authentic relationships, we are building better, stronger and more sustainable communities. People, Planet and Profit for all stakeholders especially our customers is at the core of Ashok Leyland which resonates with our Philosophy of ' Aapki Jeet, Hamari Jeet'

The Five AL Values are:

1. International
2. Speedy
3. Value Creator
4. Innovative
5. Ethical

GROWTH MILESTONES OF ASHOK LEYLAND:

1966 – Full air brakes introduced
1967 – Double Decker buses introduced.

1968 – Power steering offered.
1979 – Multi-axle trucks introduced.
1980 – Integral bus with air suspension.
1992 – Self-certification status for defence supplies.
1994 – ISO 9001 Certification
1997 – India' s first CNG powered bus.
1998 – QS 9000 Certification
1999 – CNG (Compressed Natural Gas) introduced.
2000 – Euro-I, Engines/vehicles introduced.
2002 – ISO 14000 Environment Management System Certification.
2002 – Exclusive Machine line – 2 for Hino cylinder.
2003 – E-Comet launched.
2004 – 50,000 mark vehicle produced.

ENGINE TECHNOLOGY

Ashok Leyland was already producing low-emission vehicles. Back in the 1980s and 1990s, Ashok Leyland with various Tamil Nadu Transport Corporation, notably Cholan Roadways Corporation based in Trichripally, experimented with low pollutant emission based on the CNG technology. In 2002 it developed the first hybrid electric vehicle. Ashok Leyland has also launched a mobile emission clinic that operates on highways and at entry points to New Delhi. The clinic checks vehicles for emission levels, recommends remedies and offers tips on maintenance and care. This work will help generate valuable data and garner insight that will guide further development.

Hythane engines.

Ashok Leyland has also developed engines in association with the Australian company Eden Energy. Ashok Leyland successfully developed a 6-cylinder, 6-litre (370 cu in) 92 kW (123 hp) BS-4 engine which uses hythane (H-CNG,) which is a blend of natural gas and around 20% of hydrogen. Hydrogen helps improve the efficiency of the engine but the CNG aspect makes sure that emissions are at a controlled level. A 4-cylinder 4-litre (240 cu in) 63 kW (84 hp) engine is also being developed for H-CNG blend in a joint R&D program with MNRE (Ministry of New and Renewable Energy) and Indian Oil Corporation.

CNG engines

The CNG concept is now in full swing, with more than 5,500 of the technology's vehicles running around Delhi. The company is also already discussing the wide-scale use of hythane engines with the Indian government. Hythane engines may be expected in the near future.

Hybrid technology

Plugin Hybrid Bus

In the Auto Expo 2010 at Delhi, Ashok Leyland launched India's first plug-in CNG hybrid bus, HYBUS. The hybrid bus offered 20– 30% fuel saving over conventional buses powered by internal combustion engine, and were more eco-friendly than regular CNG buses, as a result of its hybrid technology that combined conventional CNG engine with electric propulsion system. The propulsion system was powered by lithium-ion battery.

The other useful features of the bus included ultra-low entry at 390mm with kneeling option, noise-free rear engine, front and rear air suspensions and retractable ramp for wheel-chair entry. Some innovative pedestrian safety concepts were also introduced in the bus, like the sound and light alerts while the bus moves, a camera-assisted reversing aid for the driver and night time highlighters near the tail lights.

Non-plugin Hybrid Bus

At the Delhi Auto Expo 2016, Ashok Leyland introduced an advanced non-plugin version of HYBUS. It is claimed to be India's first non-plugin series hybrid bus. The bus uses ultra-capacitors to store energy, a feature that improves power density and fuel efficiency, because energy is stored electrostatically and does not involve chemical reactions. The ultra-capacitors are claimed to be 4– 5 times more durable than conventional lithium-ion batteries.

HYBUS is powered by an H-Series 6-cylinder diesel (BS IV compliant) engine that is not used to drive the vehicle ahead, but to charge the ultra-capacitors that powers the 150 kW electric motor. Automatic start-stop is used to decrease the overall engine idling time. The bus can restart using the stored energy when the engine is off. The fuel-efficiency of the engine thus increases and NVH (Noise-vibration-harshness) levels decrease.

The buses and trucks are set to feature a new electronic shift-by-wire transmission technology as well as electronic-controlled engine management for greater fuel efficiency. Ashok Leyland focuses on improving fuel efficiency without affecting automotive power, and the vehicles will have a 5% improvement on fuel efficiency. Ashok Leyland is also developing electric batteries and bio-fuel modes.

Electric Technology

In 2016 the company launched the country's first indigenously produced fully electric bus, called Circuit. The bus is a zero-emission vehicle that can run 120km on a single charge, and has an alert system that can signal if the bus is low on power.The bus will be introduced under the National Electric Mobility Plan with an aim of 20% penetration of electric or hybrid vehicles by 2020.

Euro 6 Truck

AT the Delhi Auto Expo 2016, the company showcased its first indigenously produced Euro 6 truck 4940. The truck is powered by the company's flagship range of engine, Neptune, which is an 8l engine that produces 400 hp and 1600Nm of torque. The truck is designed to meet Euro 6 norms.

iEGR

In 2017, the company showcased iEGR (intelligent Exhaust Gas Recirculation) technology for its trucks and buses to meet BS-IV emission standards. The technology also promises other advantages like better fuel efficiency than BS-III trucks, and power transmission up to 400 HP.

iBUS

Ashok Leyland announced iBUS in the beginning of 2008, as part of the future for the country's increasingly traffic-clogged major cities. Its Rs 60-lakh iBus is a feature-filled, low-floor concept bus for the metros revealed during the Auto Expo 2008 in India. This low-floored iBus will have the first of its kind features, including anti-lock braking system, electronic engine management and passenger

infotainment. The executive class has an airline like ambiance with wide LCD screens, reading lights, audio speakers and, for the first time, Internet on the move. A GPS system enables vehicle tracking and display of dynamic route information on LCD screens, which can also support infotainment packages including live data and news. The bus will probably be equipped with an engine from the new Neptune family, which Ashok Leyland also introduced at this exhibition, which is ready for the BS4/Euro 4 emission regulations and can be upgraded to Euro 5.The ibus of Ashok leyland have hybrid technology

H-SERIES ENGINE AND PERFORMANCE

Parameters	Specification	
Engine model	**H Series** 6 cylinder CRS diesel **engine**	
Emission Norms	BS IV with i-EGR	BS IV with SCR
Maximum Power	132 kW (177 HP) @ 2400 rpm	123 kW (165 HP) @ 2400 rpm
Maximum Torque	660 Nm @ 1200 - 1900 rpm	550 Nm @ 1200 - 1800 rpm

P15 ENGINE AND PERFORMANCE

The Ashok Leyland Dost is one of the best small capacity LCV pickups in the segment and is decently powerful as well.It is powered by a 1.5-litre, three-cylinder engine that can churn out a maximum power of 58 bhp at 3,300 rpm, along with a peak torque of 157.7 Nm, which comes between 1,600 and 2,400 rpm. The produced power is channelled to the wheels via a 5-speed manual gearbox with the help of a 215 mm single-plate clutch.

The performance is above par and the 4x4 axle configuration works wonders too. The minivan can go at a top speed of 80 kmph and provides a mileage of around 17 kmpl.

ZD30 ENGINE:

3L *ZD30*DDTI Common Rail Diesel *Engine*(BS3). 2953 cc. 87kw @ 2750 RPM. 320 Nm @1600-2400 RPM. 96 X 102. 280mm Dia, Single Dry Plate.

Ashok Leyland MiTR (or **MiTR**) is a Minibusmanufactured by Ashok Leyland in Joint venturewith Nissan. The vehicle was unveiled in Jan 2014 during the 12th Auto Expo 2014and was launched in Jul 2014.

Variants

Ashok Leyland MiTR comes in one variant.

Specifications

Ashok Leyland MiTR

- **Seating capacity**: 28 (including driver)
- **Displacement**: 2,953 cm3
- **Max Engine power**: 116.67 Bhp
- **Max Torque**: 320 Nm @ 2,400 rpm
- **Wheel base**: 3,700 mm
- **Length**: 7,060 mm
- **Width**: 2,080 mm
- **Height**: 2,630 mm
- **Curb weight**: 4,025 kg
- **Engine**: ZD30 DDTi Common rail,BS III
- **Fuel**:Diesel

MACHINING OPERATIONS OF P15 ENGINE CYLINDER BLOCK AND HEAD:

There are 24 Different types of operations carried out in the machining of cylinder block and 19 different types of operations carried out in the machining of engine head based on milling, boring, drilling, washing, cleaning, tapping, finishing, deburring, leaktest etc.

MACHINING OPERATIONS OF H-SERIES ENGINE CYLINDER BLOCK AND HEAD:

There are 70 different types operations carried out in the machining of cylinder block and 37 different types of operations carried out in the machining of engine head based on, Milling, Boring, Drilling, tapping, washing, cleaning, finishing, deburring, leak test etc.

SOURCING:

Sourcing is a critical activity used at both tactical and strategic levels. It is concerned with what needs to be purchased, why, when and where. The concept is created to help supply chain managers and practitioners to improve, develop and implement strategic sourcing strategies.

- Sourcing is the "location, acquisition and management of all the vital inputs required for an organization to operate. This includes raw materials, component parts, products, labor in all its forms, location and services.
- The sourcing process includes every activity that revolves around identifying and assessing potential suppliers as well as selecting and engaging with an appropriate supplier who offers the best value.
- At the end of the sourcing process, usually a contract is signed or an agreement is reached between the buyer and the supplier on what is to be procured and the terms of contract. Sourcing professionals evaluate the supply market, develop and execute strategy, negotiate terms of contract and finally develop the contractual agreement with the suppliers.

STRATEGIC SOURCING:

Strategic sourcing is a sourcing method that involves applying different strategies while sourcing products or services. Strategies are selected based on real-time circumstances of each acquisition and influenced by factors such as the value of spend, risk in the category and the supply market character. Crowd sourcing, outsourcing, global sourcing, and low cost country sourcing are a few of the many types of sourcing strategies.

Strategic sourcing is an institutional procurement process that continuously improves and re-evaluates the purchasing activities of a company.

SUPPLY CHAIN:

A ***supply chain*** is a system of organizations, people, activities, information, and resources involved in moving a product or service from supplier to customer.

A ***supply chain*** is a network between a company and its suppliers to produce and distribute a specific product, and the ***supply chain*** represents the steps it takes to get the product or service to the customer.

PROCUREMENT PROCESS FLOW:

It's the series of process that are essential to get products or services from requisition to purchase order and invoice approval. While purchasing is the overarching ***process*** of obtaining necessary goods and services on behalf of an organization, Procurement describes the activities involved in obtaining them.

The procurement process flow is the skeletal framework that outlines how purchasing and procurement occurs or is handled within an organization. Generally, the purpose of understanding a procurement process flow is to analyze and improve business practices (in particular, the procurement and purchasing process.

STEPS INVOLVED IN PROCUREMENT PROCESS:

Step 1: Need Recognition

The business must know it needs a new product, whether from internal or external sources. The product may be one that needs to be reordered, or it may be a new item for the company.

Step 2: Specific Need

The right product is critical for the company. Some industries have standards to help determine specifications. Part numbers help identify these for some businesses. Other industries have no point of reference. The company may have ordered the product in the past. If not, then the business must specify the necessary product by using identifiers such as color or weight.

Step 3: Source Options

The business needs to determine where to obtain the product. The company might have an approved vendor list. If not, the business will need to search for a supplier using purchase orders or research a variety of other sources such as magazines, the Internet or sales representatives. The company will qualify the suppliers to determine the best product for the business.

Step 4: Price and Terms

The business will investigate all relevant information to determine the best price and terms for the product. This will depend on if the company needs commodities (readily available products) or specialized materials. Usually the business will look into three suppliers before it makes a final decision.

Step 5: Purchase Order

The purchase order is used to buy materials between a buyer and seller. It specifically defines the price, specifications and terms and conditions of the product or service and any additional obligations.

Step 6: Delivery

The purchase order must be delivered, usually by fax, mail, personally, email or other electronic means. Sometimes the specific delivery method is specified in the purchasing documents. The recipient then acknowledges receipt of the purchase order. Both parties keep a copy on file.

Step 7: Expediting

Expedition of the purchase order addresses the timeliness of the service or materials delivered. It becomes especially important if there are any delays. The issues most often noted include payment dates, delivery times and work completion.

Step 8: Receipt and Inspection of Purchases

Once the sending company delivers the product, the recipient accepts or rejects the items. Acceptance of the items obligates the company to pay for them.

Step 9: Invoice Approval and Payment

Three documents must match when an invoice requests payment - the invoice itself, the receiving document and the original purchase order. The agreement of these documents provides confirmation from both the receiver and supplier. Any discrepancies must be resolved before the recipient pays the bill. Usually, payment is made in the form of cash, check, bank transfers, credit letters or other types of electronic transfers.

Step 10: Record Maintenance

In the case of audits, the company must maintain proper records. These include purchase records to verify any tax information and purchase orders to confirm warranty information. Purchase records reference future purchases as well.

PROCESS FLOW:

MPL Plan Release -MRP Run-Schedule Trigger-SRM Portal-ASN-Gate Entry-GRN-Stock-Assembly-OT-PTS-Customer(external).

MPL-Master Planning
MRP-Material Run On Demand
SCHEDULING-Delivery Date
SRM PORTAL-Supplier Relationship Management
ASN-Advance shipping Note
GRN-Confirming the parts stock
PAYMENT-After GRN only supplier will get paid.

ASHOK LEYLAND' S PROBLEM SOLVIN METHODOLOGY:

1)BASIC PROBLEM SOLVING(BPS)
2)ADVANCE PROBLEM SOLVING(APS)
3)KEIKEN DENO(KKD)
4)DEEP DIVE PROJECT
5)QC STORY
6)POTENTIAL FAILURE MODE EFFECT AND ANALYSIS(PFMEA)

- BPS-Identifying the Problem-observation-Analysis-Action-checking-Standardize-conclusion.Problem solving process through QC Story:
- For further enhancement of analytical capability of managers & supervisors, Basic Problem Solving (BPS) and Advanced Problem Solving (APS) techniques with QC story approach was introduced in the plant.
- Managers and supervisors, who have selected the projects for resolution, undergo 2 days training for BPS and 6 days intensive training on APS in two phases.
- Total 228 Managers have been trained as of FY17 (Covers 68% of the executives). Review by champion, project sponsors, plant head and subject expert is being done.
- Majority of the SGA projects are completed following BPS techniques;complex problems are resolved using APS methodology. The improving trend of the total improvement projects completion.
- The trend of the increase in QC story projects. Recently ALH1 introduced the Task achieving methodology and measures implementation also in addition to problem solving. Going a step ahead, " Deep Dive" project have been started for big problem which is existing across organization in nature and heavy in impact. These initiatives have helped ALH1 in achieving the TEI in improvement activities.
- Internal / External Competition With the objective to promote improvements, teams are encouraged to participate both in internal and external convention. Plant level convention " Mini Improve" and organization level convention " Improve" have been started at ALH1 since FY03. All SGA teams first participate in plant level and then go for AL level convention. In FY16, total 50 teams participated in plant level and 10 teams participated at AL level.
- Top 3 teams were sent to National level (CII, QCFI, etc.) and international level. Education and Training is vital part of human resource development and it is the backbone of the overall development of the company. It is an important function for the alignment of individual growth with the organizational business plans to develop a work force proficient in knowledge, skill & competence. Training is being continuously imparted to all permanent and temporary employees in ALH1.
- Trainers, both internal and external, are identified based on their competency. External trainers include TQM consultants. ALH1 is handling wide variety of

products, the product requirements & quality expectation is varying product to product.

- This requires a high degree of skill to perform the operations. Hence ALH1 developed a unique system of " Job ability development" for associates and role based " competency development" for executives.
- The job ability and competency development are explained With active management support and participation, several TQM training programs have been designed and are organized for the various level of employees.

Seven Basic Tools of Quality:

Basic Tools of Quality (also known as 7 QC Tools) originated in Japan when the country was undergoing major quality revolution and had become a mandatory topic as part of Japanese' s industrial training program. These tools which comprised of simple graphical and statistical techniques were helpful in solving critical quality related issues. These tools were often referred as **Seven Basics Tools of Quality** because these tools could be implemented by any person with very basic training in statistics and were simple to apply to solve quality-related complex issues.

7 QC tools can be applied across any industry starting from product development phase till delivery. 7QC tools even today owns the same popularity and is extensively used in various phases of Six Sigma(DMAIC or DMADV), in continuous improvement process (PDCA cycle) and Lean management (removing wastes from process).

The seven QC tools are:

1)Stratification(Divide and Conquer)
2)Histogram
3)Check Sheet (Tally Sheet)
4)Cause-and-effect diagram(" fishbone" or Ishikawa diagram)
5)Pareto chart(80/20 Rule)
6)Scatter diagram (Shewhart Chart)
7)Control chart

1. Stratification(Divide and Conquer):

Stratification is a method of dividing data into sub– categories and classify data based on group, division, class or levels that helps in deriving meaningful information to understand an existing problem.
The very purpose of stratification is to divide the data and conquer the meaningful information to solve a problem.

Stratified data:(Same data classified by day of the week)

Day	Mon	Tue	Wed	Thu	Fri	Sat	Sun
Frequency - Late in Office	4	2	1	0	0	0	0

Table: Frequency -late in office

2. Histogram

Histogram introduced by **Karl Pearson** is a bar graph representing the frequency distribution on each bars.

The very purpose of Histogram is to study the density of data in any given distribution and understand the factors or data that repeats more often .

Histogram helps in prioritizing factors and identify which are the areas that needs utmost attention immediately.

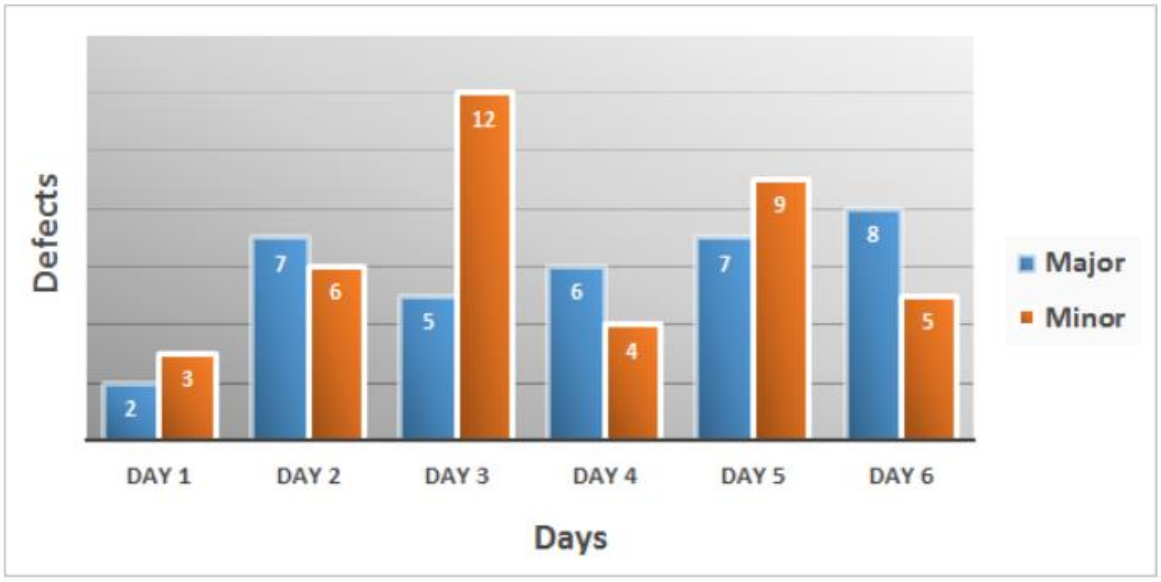

Chart 2.1-(Histogram: Defects Day wise)

3. Check sheet (Tally Sheet)

A check sheet can be metrics, structured table or form for collecting data and analyzing them. When the information collected is quantitative in nature, the check sheet can also be called as **tally sheet**.

The very purpose of checklist is to list down the important checkpoints or events in a tabular/metrics format and keep on updating or marking the status on their occurrence which helps in understanding the progress, defect patterns and even causes for defects.

Defect Types ? (Major/ Minor)	Defects in Supplied Items							Total Count
	Sun	Mon	Tue	Wed	Thu	Fri	Sat	
Rusted Items		𝍸	𝍷		𝍷	𝍸		9
Items with Scratch	𝍸							1
Dirty		𝍸		𝍸𝍸		𝍷		6
Broken/ Cracks			𝍷				𝍸	3
Main Body Dent					𝍸𝍸			3
Missing Components		𝍷		𝍷			𝍸	5
Labelling Error					𝍸	𝍸𝍸		4
Damage in Packaging			𝍷					2
Wrong Item Issued					𝍷		𝍸	3
Film on Parts			𝍸					4
Voids in Casting	𝍸					𝍸	𝍷	4
Incorrect Dimensions			𝍷	𝍸	𝍷			5
Failed to pass the quality test		𝍷				𝍸		3
Total Count	2	9	12	6	10	8	5	52

Table 3.1(Check Sheet: Defect types with their occurrence on day of the week)

4. Cause-and-effect diagram. (“ Fishbone” or Ishikawa diagram)

Cause– and– effect diagram introduced by **Kaoru Ishikawa** helps in identifying the various causes (or factors) leading to an effect (or problem) and also helps in deriving meaningful relationship between them.

The very purpose of this diagram is to identify all root causes behind a problem.

Once a quality related problem is defined, the factors leading to the causal of the problem are identified. We further keep identifying the sub factors leading to the causal of identified factors till we are able to identify the root cause of the problem. As a result we get a diagram with branches and sub branches of causal factors resembling to a fish bone diagram.

In manufacturing industry, to identify the source of variation the causes are usually grouped into below major categories:

- People
- Methods
- Machines
- Material
- Measurements
- Environment

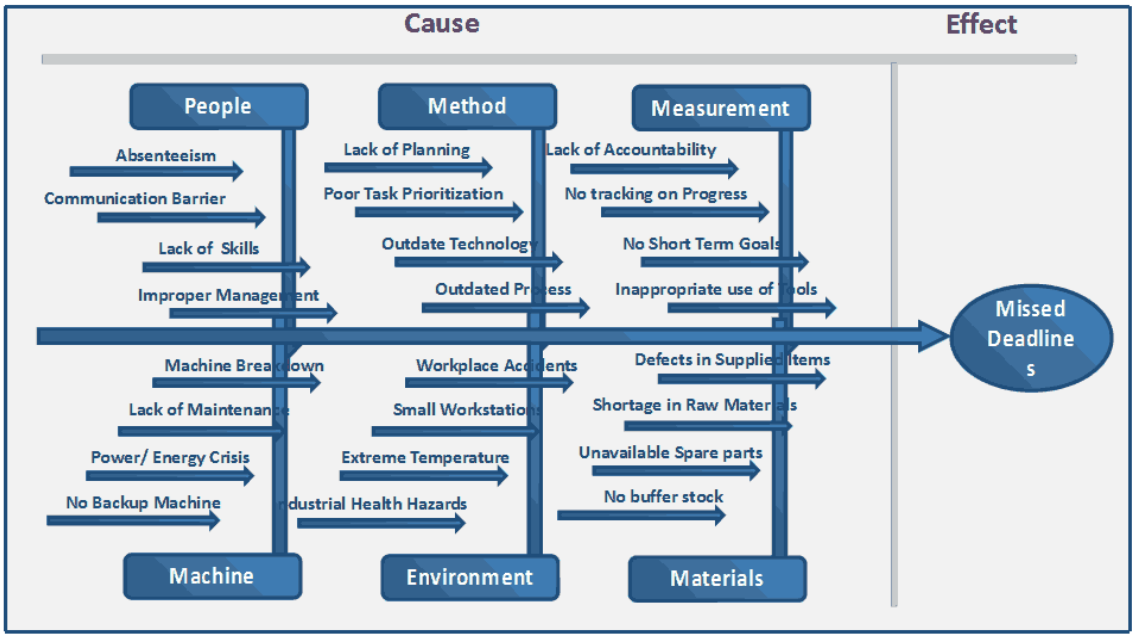

Figure 4.1

(Fishbone Diagram: Missed deadline in manufacturing of product)

5. Pareto chart (80 – 20 Rule)

Pareto chart is named after **Vilfredo Pareto**. Pareto chart revolves around the concept of 80-20 rule which underlines that in any process, 80% of problem or failure is just caused by 20% of few major factors which are often referred as **Vital Few**, whereas remaining 20% of

problem or failure is caused by 80% of many minor factors which are also referred as **Trivial Many**.

The very purpose of Pareto Chart is to highlight the most important factors that is the reason for major cause of problem or failure.

Pareto chart is having bars graphs and line graphs where individual factors are represented by a bar graph in descending order of their impact and the cumulative total is shown by a line graph.

Pareto charts help experts in following ways:

- Distinguish between vital few and trivial many.
- Displays relative importance of causes of a problem.
- Helps to focus on causes that will have the greatest impact when solved.

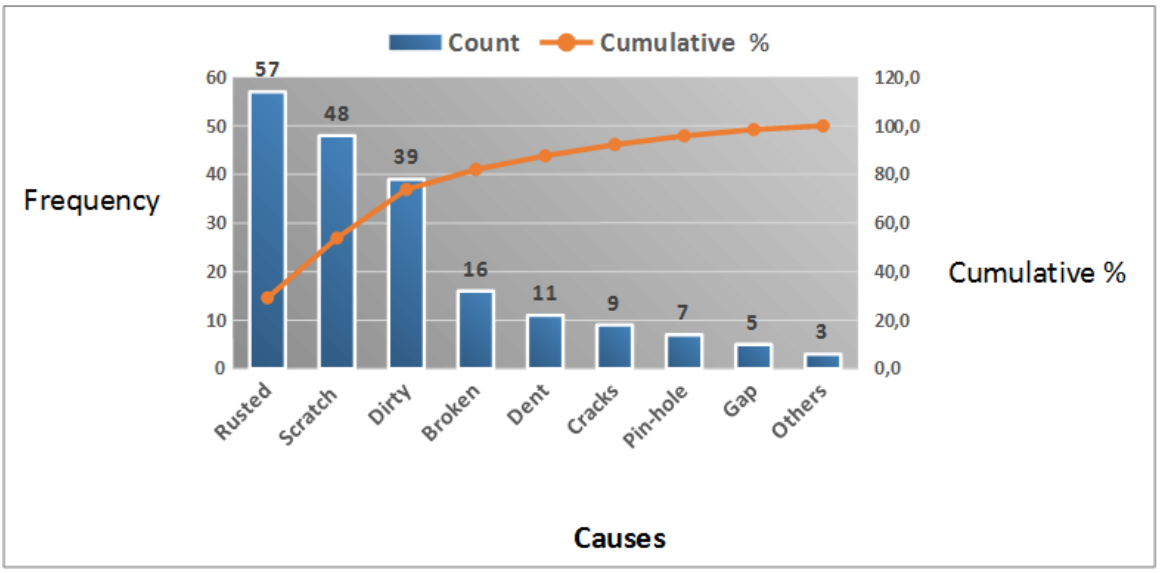

Chart 5.1(Pareto Chart: Causes for defects in supplied items)

6. Scatter diagram

Scatter diagram or scatter plot is basically a statistical tool that depicts dependent variables on Y – Axis and Independent Variable on X – axis plotted as dots on their common intersection points. Joining these dots can highlight any existing relationship among these variables or an equation in format **Y = F(X) + C**, where is **C is an arbitrary constant**.

Very purpose of scatter Diagram is to establish a relationship between problem (overall effect) and causes that are affecting.

The relationship can be linear, curvilinear, exponential, logarithmic, quadratic, polynomial etc. Stronger the correlation, stronger the relationship will hold true. The variables can be positively or negatively related defined by the slope of equation derived from the scatter diagram.

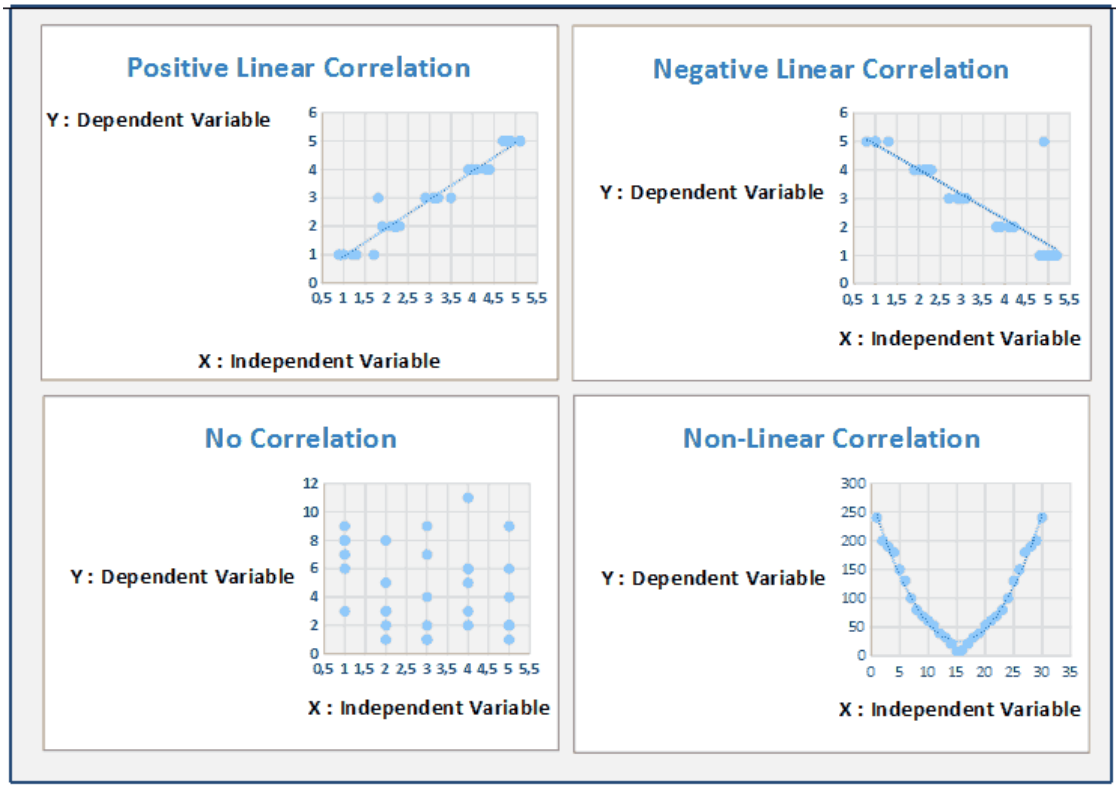

Figure 6.1(Scatter Diagram: Types of correlation in Scatter Plot)

7. Control Chart (Shewhart Chart)

Control chart is also called as **Shewhart Chart** named after **Walter A. Shewhart** is basically a statistical chart which helps in determining if an industrial process is within control and capable to meet the customer defined specification limits.

The very purpose of control chart is to determine if the process is stable and capable within current conditions.

In Control Chart, data are plotted against time in X-axis. Control chart will always have a central line (average or mean), an upper line for the upper control limit and a lower line for the lower control limit. These lines are determined from historical data.

By comparing current data to these lines, experts can draw conclusions about whether the process variation is consistent (in control, affected by common causes of variation) or is unpredictable (out of control, affected by special causes of variation). It helps in differentiating common causes from special cause of variation.

Control charts are very popular and vastly used in Quality Control Techniques, Six Sigma (Control Phase) and also plays an important role in defining process capability and variations in productions. This tool also helps in identifying how well any manufacturing process is in line with respect to customer' s expectation.

Control chart helps in predicting process performance, understand the various production patterns and study how a process changes or shifts from normally specified control limits over a period of time.

CONCLUSION

It was a wonderful learning experience at **THEASHOK LEYLAND** for the time period of one month in the department of **SOURCING AND SUPPLY CHAIN** for the Project to Enhance the Flexibility of Sheet Metal part. I gained a lot of insight regarding almost every aspect of site. I was given exposure in almost all the departments at the site. The friendly welcome from all the employees is appreciating, sharing their experience and giving their peace of wisdom which, they have gained in their long journey of work. I am very much thankful to **THE ASHOK LEYLAND PVT.LTD.** For having given me the opportunity to undertake my internship training. I hope this experience will surely help me in my future and also in shaping my career.