FUNDAMENTAL OF INDUSTRIAL MANAGEMENT

Unit -3 **Problem solving tools and techniques**	• Definition of a problem • Type of problems, classification of problems • Problem solving tools: Cause and effect diagram, Histogram, Pareto charts.

What is a problem?

Consider the following situations:

a) The rejection rate is high at intermediate product testing.
b) The complaint and warranty replacements are high on the final product.
c) Too many people are required to carry out the task.
d) Frequent breakdown of a machine production
e) There is a long queue of customers waiting to be serviced.

The list can go on and on. We would like to take some corrective actions to reduce the recurrences of such occurrences and deviations. We would like to reduce the complaints, improve the productivity, improve safety, reduce high internal rejections etc.

The gap between the current level of performance and what we would like to achieve is termed as **"The Problem".**

Types of problems

Problems are of two types:

a) Chronic: problems which occurs again and again
b) One of its Kind: once it is solved, it is not likely to occur again

Example: A leaking tap is a one of a kind problems. Once it is replaced, the leak stops and not likely to recur. Frequent breakdown of some machines, low productivity of some process, higher rejection at a particular operation, frequent absenting of some operators etc examples of chronic problems. Therefore, the root cause of the problems have to be identified, analysed and eliminated.

Classification of problems:

a) Maintenance type
b) Improvement type

Maintenance type problems: these are those problems which go out of control and have brought back to its old level by taking suitable corrective actions.

Improvement type problems: Improvement is defined as change for the better by change of method or material. Lack of awareness problems is the first barrier to problem solving. Many people are often unaware of or deny the real extent and magnitude of their problems. The

thought that there are no problems in their area is indeed the biggest problem. Under TQM, problem solving is a disciplined systematic and structured process.

Types of Data:
a) Measurable data
b) Attribute Data

Measurable Data: This refers to data or facts that can be measured, that can be quantified. Examples length, breadth, height, weight etc.
Measurable data is also called variable data or continuous data. A measurable data is also called variable data which can take any value in continuous scale even in fractional form.

Attribute Data: Sometimes we cannot measure the data. We can only count them. Example A woman finds that 2 out of 12 oranges got spoiled Attribute data is also called discrete or discontinuous data.

Ways of data collection:
1. Check list: is a simple list of items that are relevant to a specific operation. A very simple example is the list of items that one must carry with him when he goes on tour. Travel tickets, Money, Hotel Reservation details, company letter, Models, Mobile phone, Camera etc.

.2. Data sheet: This is a simple tabular form for recording data. Given below is a partial list of the log book of the maintenance department of the company. This is a basic data sheet.

Maintenance Department		
Date	Breakdon	Duration
21-Jan	central crane	3 hrs: 20 mts
23-Jan	temperature controller	1 hr:10 mts
24-Jan	Hydraulic System	0 hr: 30 mts
25-Jan	conveyer system	1 hr: 10 mts
28-Jan	central crane	0 hr: 40 mts
28-Jan	Electrical failure	1 hr: 20 mts
30-Jan	Heat treatment furnace	2hrs: 00 mts

Problem Solving Tools:

1. Cause and effect diagram:

A cause and effect diagram examine why something happened or might happen by organizing potential causes into smaller categories. It can also be useful for showing relationships

between contributing factors. One of the Seven Basic Tools of Quality, it is often referred to as a fishbone diagram or Ishikawa diagram.

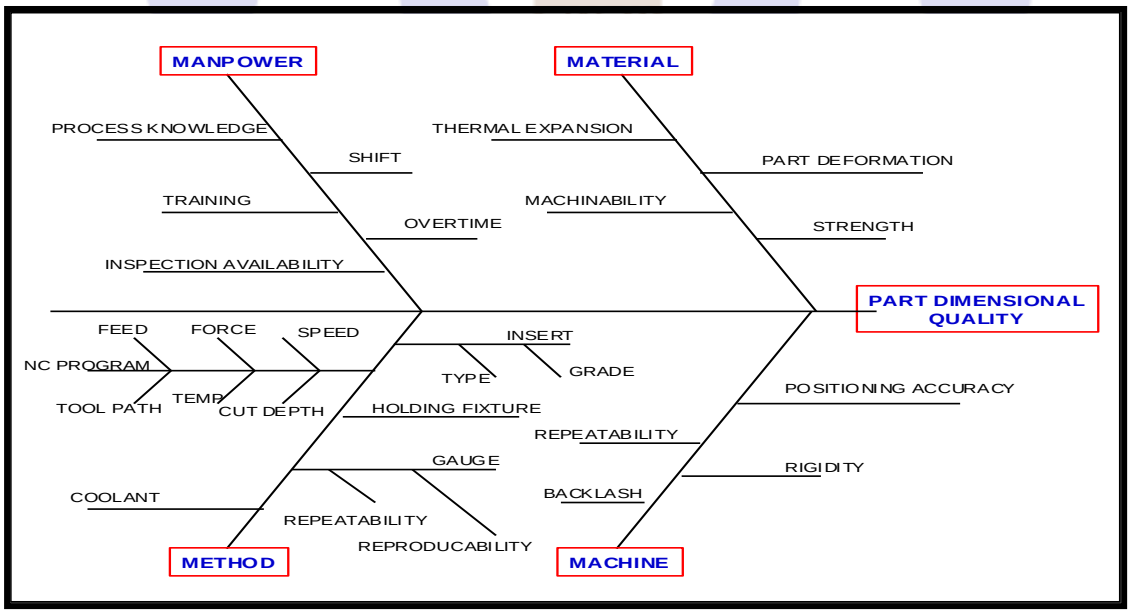
One of the reasons cause & effect diagrams are also called fishbone diagrams is because the completed diagram ends up looking like a fish's skeleton with the fish head to the right of the diagram and the bones branching off behind it to the left.

Method of drawing cause and effect diagram

These are the best and most common practices when creating cause and effect diagrams.

- **Identify the problem.** Define the process or issue to be examined.
- **Brainstorm.** Discuss all possible causes and group them into categories.
- **Draw the backbone.** Once the topic is identified, draw a straight, horizontal line (this is called the spine or backbone) on the page, and on the right side, draw a rectangle at the end. Write a brief description of the problem in the rectangle.
- **Add causes and effects.** Causes are added with lines branching off from the main backbone at an angle. Write the description of the cause at the end of the branch. These are usually one of the main categories discussed above. Details related to the cause or effect may be added as sub-categories branching off further from the main branch. Continue to add branches and a cause or effect until all factors have been documented. The end result should resemble a fish skeleton.
- **Analyze.** Once the diagram has been completed, analyze the information as it has been organized in order to come to a solution and create action items.

In the manufacturing industry, these are referred to as the 6Ms. Example of cause and effect diagram is as follows:



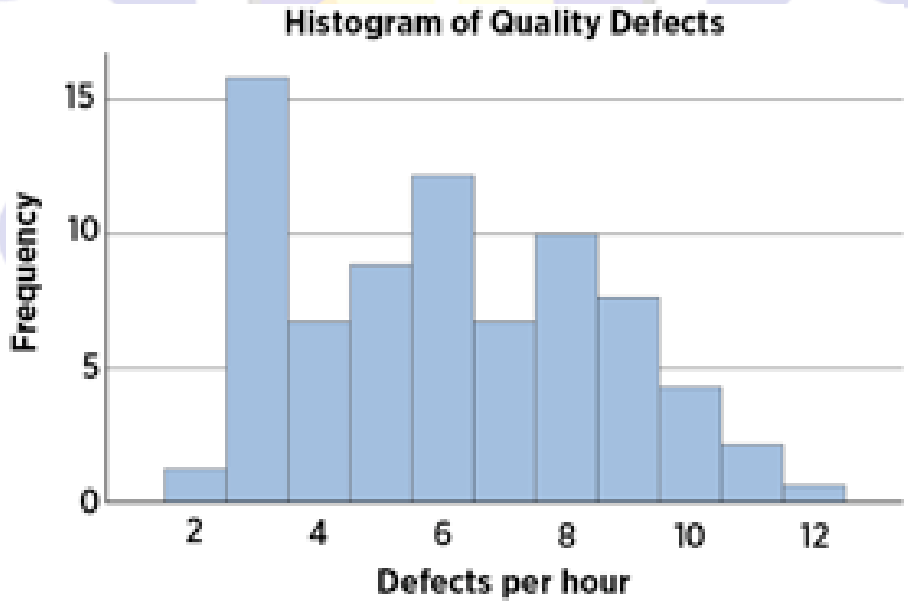
2. Histogram

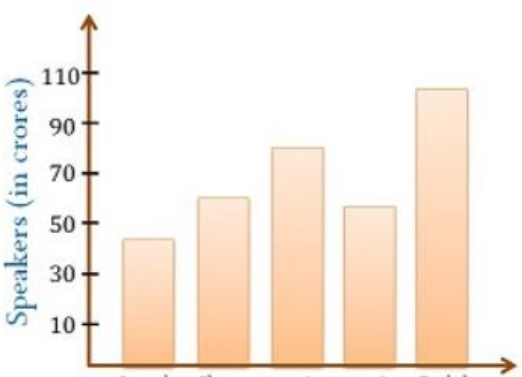
A frequency distribution shows how often each different value in a set of data occurs. A histogram is the most commonly used graph to show frequency distributions. It looks very much like a bar chart, but there are important differences between them. This helpful data collection and analysis tool is considered one of the seven basic quality tools.

WHEN TO USE A HISTOGRAM

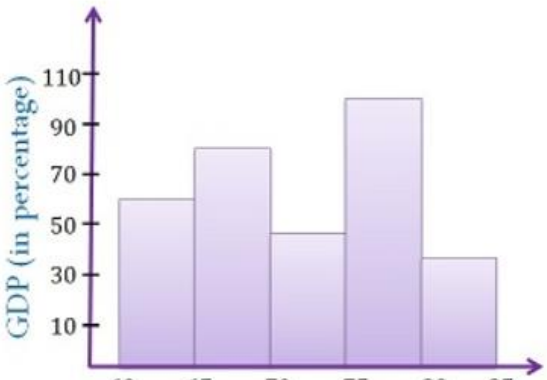
Use a histogram when:

- The data are numerical
- You want to see the shape of the data's distribution, especially when determining whether the output of a process is distributed approximately normally
- Analyzing whether a process can meet the customer's requirements
- Analyzing what the output from a supplier's process looks like
- Seeing whether a process change has occurred from one time period to another
- Determining whether the outputs of two or more processes are different
- You wish to communicate the distribution of data quickly and easily to others





Bar Graph



Histogram

3. Pareto Chart

It is a prioritisation tool. The principle that defects are unequal in frequency leading to identification of vital few & useful many is known as Pareto Principle. The diagram that prioritized the causes and helps to identify the vital few, along with Lorenz Curve is known as Pareto Diagram. It is a compound graph. A Pareto Diagram is a bar chart in which the various factors that contribute to an effect are arranged in a descending order of magnitude/ frequency of occurrence. A cumulative percentage graph is added to this bar graph. Thus it is a compound graph with two vertical axis, one for the causes and another for the cumulative percentage.

Use of Pareto Chart

1) Pareto Diagram to identify the problems that contribute to the company's required goals.
2) Pareto Analysis is widely used to identify root causes of the problem

Exercise

Draw Pareto Diagram
Show the Vital few
Write the conclusion.

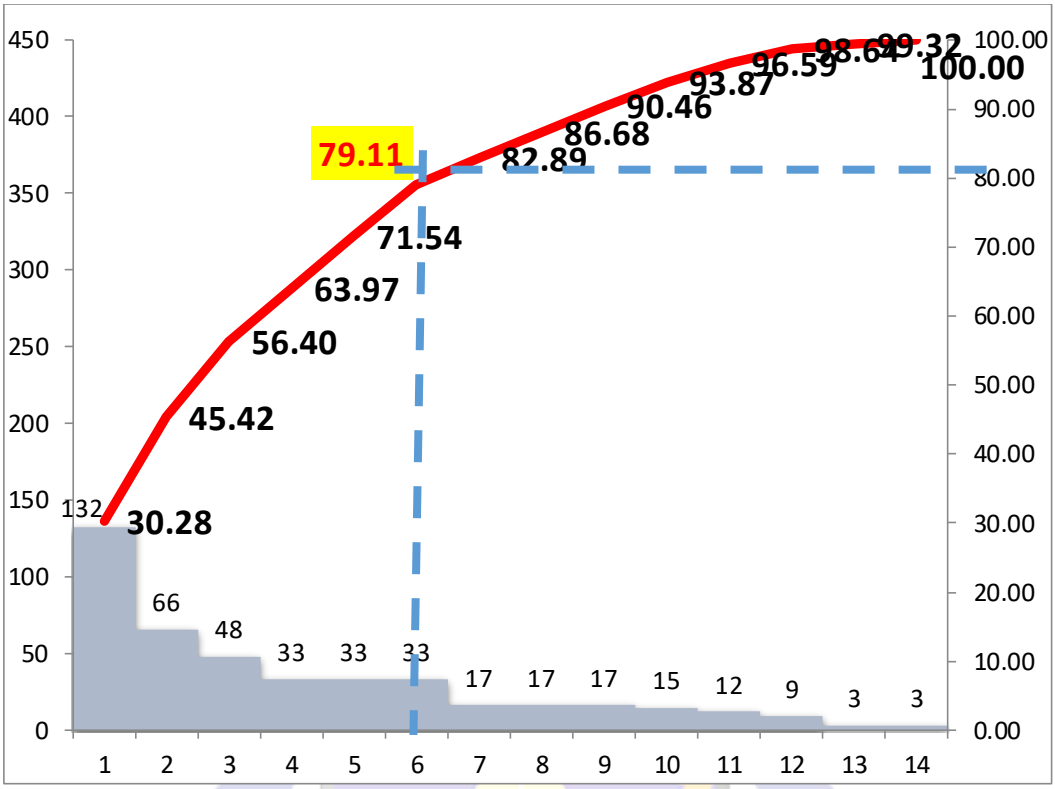
Defects	Bearing seat area crack		Dia 52 unclean	Dia 52 over size	OIL GALERY BLOCK (SUCTION)	OIL GALERY BLOCK (RETURN)	AIR PRESSURE SLOT MISSING	STUD THREAD SLIP	OIL PASSAGE BLOCKED	Others (Noise Etc.)	THREAD SLIP (G.S.RETURN PIN)	THREAD SLIP (DRUM STOP ARM BOLT)	Others (G.S.Hard)	JOINT BOLT THREAD SLIP	Drain bolt Thrd. Slip
No of Defective pieces	17		48	12	33	66	3	132	33	17	17	15	33	9	3

Defects	No of Defective pieces	Percentage	cummulative
STUD THREAD SLIP	132	30.28	30.28
OIL GALERY BLOCK (RETURN)	66	15.140	45.42
Dia 52 unclean	48	10.977	56.40
OIL GALERY BLOCK (SUCTION)	33	7.570	63.97
OIL PASSAGE BLOCKED	33	7.570	71.54
Others (G.S.Hard)	33	7.570	79.11
Bearing seat area crack	17	3.785	82.89
Others (Noise Etc.)	17	3.785	86.68
THREAD SLIP (G.S.RETURN PIN)	17	3.785	90.46
THREAD SLIP (DRUM STOP ARM BOLT)	15	3.407	93.87
Dia 52 over size	12	2.725	96.59
JOINT BOLT THREAD SLIP	9	2.044	98.64
AIR PRESSURE SLOT MISSING	3	0.681	99.32
Drain bolt Thrd. Slip	3	0.681	100.00
Total	436	100	

In this case Vital Few is 79.11

By studding this diagram it is clearly indicated that we have to focus on following defects. After resolving these issues we are able to reduce at least 79 % Defects

Defects	No of Defective pieces
STUD THREAD SLIP	132
OIL GALERY BLOCK (RETURN)	66
Dia 52 unclean	48
OIL GALERY BLOCK (SUCTION)	33
OIL PASSAGE BLOCKED	33
Others (G.S.Hard)	33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