



Introduction to Manufacturing/ Workshop Technology

Students of engineering or technology when they enter Engineering College or a Technical Institution are totally new to Manufacturing/Workshop Technology. While they hear about science at quite an early stage of their schooling and study the subject right from sixth class onwards, they never have a chance to study engineering subject till they enter an Engineering Institution.

As soon as these science students plan their future, they come across the word Engineering and Technology, however hardly any one of them try to distinguish between engineering and technology.

For last so many years I am used to ask new entrants to engineering profession that what they understand about science and how does it differ from engineering and technology ? Though these science passed students have studied science in its different spheres for a number of years; they find it difficult to precisely define it. Some of my new students tried to define science as follows:

1. Science is the study of physical phenomenon
2. Science is the study of material phenomenon
3. Science deals with biological changes
4. Science deals with laws of nature etc.

The above is correct to a good extent and of course included in science; but it is not complete and the essence of science missing. According to me it is as follow.

In science, we study so many hypothesis, theorems, and laws put forth by our learned scientist, science scholars and try to prove them by way of experiments. Thus, studying certain causes and coming to certain conclusions and ultimately establishing “cause and effect relationship”.

So any branch of knowledge where cause and effect relationship can be applied is covered under science. No wonder science covers such varied subjects as Economics, Zoology and Physics. Because half of Mathematics qualifies for this definition of science, Mathematics is half way science and half way art.

Branches of Science

A. Social Science. They deal with various cause and their effect on human behaviours, they include

1. Psychology
2. Sociology
3. Economics
4. Civics (or Political Science).

B. Biological Science. Also called as life science; they deal with life of plants and animals; they include

1. Zoology
2. Botany.

C. Natural Science. Also called as physical science. They deal with various aspects of matter, they include

1. Physics
2. Chemistry
3. Geophysics
4. Mathematics.

Physics. This deals with various form of matter and work and energy relationship. We can say that various natural phenomenon occurring on earth are dealt under this, such as heat energy, sound wave propagation, magnetic effects etc.

Chemistry. It deals with various elements and interaction between them.

Geophysics. It deals with what is happening inside the earth.

Mathematics. A good part of it deals with forces and works as a tool for analysis, of physics and engineering.

The pre-requisite for an engineering student, is that he/she should have passed his/her 10th or 12th examination (for Diploma or Degree in Engineering) with Science and Mathematics or Physics, Chemistry (both taken together as science) and Maths so that he is armed with knowledge of theorems, laws and formulae to go ahead with study of engineering.

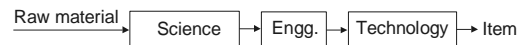
The ultimate aim of the study of science, engineering and technology taken together is to make something for fulfilling the need of the society and its betterment. A science student's curriculum is such that he never thinks to make/produce something, even the various experiments that he carries are not

meant to make any thing, while a technical man is mainly concerned to make and maintain certain things/items.

Science mainly dealing with the state of matter and the changes it is likely to undergo.

Engineering doing the detailed analysis and laying procedure and methods for these changes.

Technology is concerned with the use of definite techniques to shape the raw material. It can be illustrated as follows.



This above discussion and difference can be reinforced with the following examples.

Example 1. Consider making of a window grill of steel.

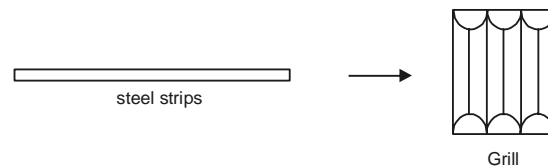


Fig. 1.1. Window grill making.

Physics—It tells us that steel being tough and ductile in nature can be bent if the force applied exceeds a particular range from elastic to plastic.

Engineering—It tells us that for a desired thickness of say 5 mm, a particular shearing and bending force is required. The bent steel in the form of grill will develop stress so it needs stress relieving.

Technology—It tells us that it can only be subjected to arc welding with the help of fixture, gas welding is not sufficiently useful for steels.

Thus it can be summed up as follows:

Physics—Nature of steel metal and its behaviour towards forces.

Chemistry—Steel is chemically active and so protect it against rust.

Engineering—Analysis for shearing and bending force to be applied on steel strips.

Technology—Shearing, bending and welding steel strips to shape them into a grill and grind grill wherever required.

Example 2. Consider making of an electric ceiling fan.

(1) *Physics*—Faraday's laws enable us to know about the electric behaviour of coil and rotation of rotor if magnetised by way of electric energy.

(2) *Engineering*—Prepare detailed analysis of how many laminations and how many coils are required.

(3) *Technology*—Select press machine of desired capacity for getting laminations, assembling the whole thing and bring it into the form of fan.

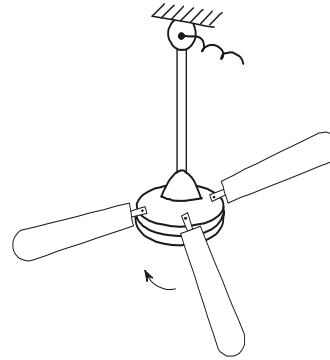


Fig. 1.2. Electric fan.

So now,

Workshop = The place where work is going on materials by men, machines and tools.

Technology = Dealing with study, selection and application of various techniques.

Hence we can conclude that Workshop Technology deals with various aspects of raw materials, its measurement and processing leading to its conversion from raw material to an item.

First year students of Engineering are taught Materials Science and Engineering Drawing along with Workshop Technology. These two subjects have direct bearing on the study of WT/MT.

While Materials Science helps in understanding the inner structure and hence behaviour of materials, Engineering drawing helps to transfer the items details from designer to manufacturer. Engineers speak through drawing. It is the Engineering drawing which connects and co-ordinates various people involved in the process of design, engineering and manufacturing and thus binds them together to achieve a definite goal of production.

EXERCISES

1. Define Science, Engineering and Technology. Distinguish them from each other with the help of suitable examples.

2. Define Workshop Technology. Discuss how it is instrumental in understanding the materials, in the design and manufacture of products.

3. Discuss Engineering drawing as a tool to WT/MT.