

**Factors affecting during materials selected for
Pharmaceutical plant construction**

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Factors Influencing The Selection Of Materials

- A number of equipment are used in the manufacture of pharmaceutical, bulk drugs, antibiotics, biological products etc.
- In addition, several accessories such as containers for processing and packing of finished products are essential.
- A wide variety of material can be utilized for the construction of equipment.
- In the plant improvement is depend on->(1) Design of equipment (2) Selection of material (3)Technique of fabrication.

- The selection of material for the construction of equipment depends on the following properties..

1. Chemical factors
2. Physical factors
3. Economical factors

Mainly 3 factors are affected

- Sub-factors is..

- a) Chemical resistance
- b) Structure strength
- c) Resistance to physical shock
- d) Resistance to thermal shock
- e) Ease of fabrication
- f) Cost
- g) Maintenance

Chemical Factors

- The contents should not alter the properties of the material with which the vessel is made, when these are in contact with each other, the effects may be understood in two ways:-
 - 1) The contents may react and thus get contaminated with the material of the plant.
 - 2) The drugs and chemical may destroy the material of the plant.

Conti..

1)...Product may contaminated by material of equipments and lead to instability, decomposition and physiological effects, it may also affect physical properties of products like appearance and color.

Eg. – presence of traces of heavy metal decompose penicillin

- Stability of vit. Decreased in presence of metallic ions.

- The color of esters will change to pale yellow in presence of iron impurities.

- 2)...the solutions that come into contact with the equipment are generally corrosive in nature.
- In addition, equipment are exposed to extremes of pH, temperature and pressure.
 - As a result, the material gets corroded, losing its strength and durability. So the life of the equipment is reduced.
 - Materials of plants construction assists greatly in providing a plant that will be resistant to attack of acids, alkalis, oxidizing agents etc.

Physical Factors

- I. Strength
- II. Wear properties
- III. Sterilisation
- IV. Cleaning
- V. Mass
- VI. Thermal conductivity
- VII. Thermal expansion
- VIII. Ease of fabrication
- IX. transparency

Strength

- In the compression of tablets, the dies and punches should have sufficient mechanical strength to transmit the applied pressure, otherwise tablets are poorly formed.
- Glass satisfies the property of strength, but is breakable.
- Here, aerosol containers must withstand pressure as high as 960kPa to 1.20 Mpa at 55°C. Tin plate containers can satisfy this condition, while plastic containers can't be used due to its poor mechanical strength.

Wear Properties

- There properties become important, when there is a possibility of friction between the moving parts.
 - Eg. During milling and grinding, the grinding surface wear off and these materials will be incorporated into powder as impurities.
 - Such type of mills should be avoided, when drugs of high purity are required.
 - The risk of contamination is more due to wear of ceramic or iron equipment.

Sterilisation

- In the production of parenterals products, antibiotics and biological, sterilisation is an essential step, which is obtained by autoclaving.
 - E.g. Equipment and vessels are made of S.S, because they can be sterilised easily.

Cleaning

- Smooth and polished surface allow the process of cleaning easily
 - E.g. S.S & Glass are suitable for this purpose.

Mass

- Many times, the equipment should be transported or moved from one place to another. This is possible when the material is light in weight, when other factors are satisfactory.

Thermal conductivity

- In industries some time equipment such as evaporators, dryers, stills and heat exchanger are used, for used good thermal conductivity materials.
 - E.g. iron, glass or graphite tubes are used in the fabrication of heat exchangers, so that effective heat transfer is possible.

Thermal Expansion

- If the material has high coefficient of expansion, the design of plants may be greatly complicated.
- This increases should be able to maintain size and shape of equipment at working temperatures.
- The material should be able to maintain size and shape of equipment at working temperature.

Ease of Fabrication

- During fabrication the material undergoes various process such as casting, welding, forging, etc..

Transparency

- Transparency may be useful property because it permits the visual observation of the changes during a process.
- For this reason, borosilicate glass has been increasingly used in the construction of reactors, fermentors etc...

Economical Factor

- Cost and maintenance of the plant must be economical. The cost is made up of three parts:-
 1. The basic cost of material
 2. The fabrication cost
 3. The scrap value of the plant at the end of its life.
- It can happen that an apparently expensive material will be the most economical in long run.
 - E.g. -: Sub. With better wearing qualities and lower maintenance cost.