

OBJECTIVE

To enable the students to have a thorough knowledge on furnaces used for glass melting, fabrication of glass and the treatments to the final glass article.

OUTCOME

On completion of the course the students are expected to

- Have learnt the different furnaces used for glass melting, their design and operation.
- Have a better understanding on the heating process in tank furnace and the measurement and control of parameters in tank furnace.
- Have studied the fabrication methods of glass flat ware and hollow ware.
- Have a clear understanding on the purpose and process of annealing of glass products.
- Have learnt the different value adding processes done to glass.

UNIT I GLASS MELTING FURNACES

Construction and operation of pot furnace and day tank furnace. Tank furnace – types, design & construction, refractories used. Electric tank furnace – design & operation, electrodes used, electric boosting in tank furnace.

UNIT II OPERATION OF TANK FURNACE

Heating process – temperature distribution, efficiencies, heat balance, thermal insulation & cooling. Measurement and control – temperature, pressure, volume and fuel/air mixture, glass level. Reversal, heating and cooling of glass furnace, hot repairs.

UNIT III FABRICATION PROCESS

Forehearth & Feeder, hand operations, flatware – sheet glass, float glass, plate glass, patterned glass. Hollow ware – press & blow, blow & blow, IS machine, bulbs & tubes.

UNIT IV ANNEALING

Introduction, nature of generation & release of strain, temporary & permanent strain, dependence of strain on cooling rate, detection & measurement of strain, annealing equation, problems in annealing, annealing glass plate, optical glass, ideal annealing cycle.

UNIT V VALUE ADDING PROCESSES IN GLASS

Mirror, chemical vapour deposition, physical vapour deposition process, laminated glass, tempered glass, decorated glasses, vycor & micro porous glass, sealing glass, neutral glass, photosensitive glass, glass ceramic, glass fibers.

TEXT BOOKS

1. Glass Furnaces-Design, Construction & Operation, Wolfgang Trier, Society of Glass Technology, 2000.
2. Volf V.B, Technical Approach to Glass, Elsevier, 1990.

REFERENCES

1. Tooley F.V, Handbook of Glass Manufacture, Vol I&II, Ogden Publishing Co., NY, 1960.
2. Alexis G.Pincus, Melting Furnace Operation in the Glass Industry, Magazines for Industry Inc., NY, 1980.
3. Cummings K, The Technique for Glass Forming, B.T.Batsford Ltd., London, 1980.
4. James E.Shelby, Introduction to Glass Science & Technology, The Royal Society of Chemistry, 1997.