

This course is to be added to existing M.Tech.(Energy) Course

Title : Science and Technology of Steam

Pre- requisites: The Thermo Dynamics and Heat Transfer

Purpose of the Course:

This course has been designed to train manpower capable of handling and working with Boiler Industry. Today large numbers of industries use boilers for various purposes. The boiler works at high pressure and energy consumption needs to be optimized. The fuel for boiler could be non-conventional or Non-Conventional energy. In order to understand the appropriate integration of energy source through a boiler. The various aspects of boilers working need to be understood. The present course provides understanding of science related to the steam formation, steam condensation, the effects of pressure and various thermodynamic related quantities. This will help in generating manpower with critical understanding about use of steam for various purposes such as power generation, cooking etc.

Science and Technology of Steam

Heat Transfer	2 L
1. Properties of steam	
• Why steam	
• Units	3-L
• Quality of steam	
• Wet steam. Dry steam , superheated steam	
• Pressure temperature diagram	
2. Steam generation Equipments	
1.Fire tube boilers	
2.Water tube boilers	6-L Tutorials
3.Waste heat boilers (expandable)	
4.Combination boilers	
Industrial – High pressure Hot Water Boiler	
Power Plant	
Critical pressure	
5.Blow down recovery	
6.Flash steam	

3. Analysis of steam cycles
 - a. Rankin cycle
 - b. Combined cycle 10-L
 - c. Entropy of steam
 - d. Steam power plant cycle and analysis Kalina Cycle
4. Fuels - Industrial fuels
 - Fossil
 - Coal 5-L Ist Sem.
 - Ultimate analysis Proximate
 - Bio Fuel
 - Gasification Bricketing Gassification
5. Steam storage –Accumulators analysis and ability to convert steam (ash 1.) 3-L
6. Indian Boiler Regulations
 1. Boiler mountings
 2. Safety valve –types , sizes 7-L
 3. Piping IBR regulations
 4. Polution & Pollution
 - Water based –
 - Air based
 5. Welding Metallurgy
 - Insulation
7. Piping
 1. Steam piping materials
 2. Piping sizing
 3. Condensate piping
 4. Piping supports 6-L
 5. Piping expansion loops
 6. Stream distribution –header sizing , branch sizing
 7. Pressure drop in Piping
8. Steam Accessories
 - Steam desalination - Shirdi System Study
 - Liquid sludge evaporation
 1. Steam Traps –selection , types etc
 2. Surplus valve 3L
 3. Drain valves
 4. Pressure reduction stations
 - Steam equipments
 1. steam turbines
 2. Steam engines coil heating practicals static dynamic
 3. Deaerator
 4. Steam drum internals 10-L
 5. Steam desupeaters
 6. Steam drums

- Steam Heating
 - Useful materials
 1. Jacket heating
 2. Coil heating 3-L
 3. Shell and tube heat exchangers
 - Steam applications and integration 2-L
 - Boiler water treatment
 - Circulation theory – riser and downcomers , natural and forced circulation ,
Porsullies thereon
 - Solar steam generation (expandable) 5-L
 - Heat/Power generation - Application
 - Steam Injection for enhanced oil recovery 5-6 L
 - Efficient Use of Steam by
 - Payback –
 - Economics
 - Softwares for designing
 1. Clearcater design
 2. Piping, sizing, excel sheet band softwares
 3. Flash steam recovery
 - Practical to plavelop excel sheet band softwares

Books :

Book on Steam Engineering:

Effective Utilization of Steam, Published by Spirax Sarco \$ 19.95