

PMT5J001 FUEL FURNACES AND REFRACTORIES

Module I(12 Hours)

Fuels:

Classification of fuels: Solid, Liquid and Gaseous fuels. Primary and Secondary fuels.

Coal: Rank of coal, Caking, Coking and Non-coking Coals.

Characterisation of Coal: Proximate Analysis, Ultimate Analysis, Calorific value, Caking and Swelling index .Coal washing: Principle of coal washing, Washability curve, Washing efficiency (Yancey and Geer formula and Fraser and Yancey formula) and recovery of clean coal.

Coal blending and its importance in metallurgical industries.

Carbonisation of coal: Metallurgical coke preparation, Testing and properties of coke.

Formed coke, Dry quenching of coke

Use of gaseous fuels: Coke oven gas, Blast furnace gas, Producer gas

Some coal combustion problems

Module II (14 Hours)

Furnaces:

Classification of Furnaces: based on the purpose, based on the type of fuel used, based on the use of waste heat saving appliance, based on draft control system and based on mode of operation of furnace.

Fuel economy of Industrial furnace: factors effecting fuel economy in the furnace.

Waste heat recovery: Recuperators; types(counter flow, parallel flow and heat flow) and availability. Temperature distribution in different types of recuperators, Sankey diagram for non-recuperative and recuperative batch reheating furnace. AMTD and LMTD.Heat transfer and principle of design.

Regenerators: Temperature distribution heat transfer and principles of design.

Module III (14 Hours)

Refractories:

Classification of refractories, Manufacturing, Testing and Properties of heavy and special refractories: Silica, Silicides, Sialon, high alumina, Magnesite, Chrome-magnesite, carbon and insulating refractories. Castables and Ramming masses.

Refractory selection for coke oven, iron Blast furnace, Copper convertor, soaking reheating furnaces, heat treatment and Electric arc furnace.

Books for reference:

1. *Fuels, Furnaces and Refractories* by J.D. Gilchrist.
2. *Refractories manufacture properties and uses* by M.L.Mishra
3. *Refractories manufacture properties and application* by A.R.Chesti
4. *Steel Plant Refractories* by Chester
5. *Refractories* by Norton
6. *Industrial Furnace, Vol -I & II, by Trinks&Mawhinney*