A

REPORT ON

HEAT TRANSFER ANALSYIS OF BLAST FURNANCE REFRACTORY LINING USING COMPUTATIONAL FLUID DYNAMICS

A thesis submitted in the partial fulfilment of the requirement for the award for the degree of

BACHELOR OF TECHNOLOGY

IN

MECHANICAL ENGINEERING

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CERTIFICATE

This is to certify that project report is entitled "HEAT TRANSFER ANALYSIS OF BLAST FURNANCE REFRACTORY LINING USING COMPUTATIONAL FLUID DYNAMICS" was carried out by **K NAGENDRABABU(17811A0330), A BHANU TEJA(17811A0301),G RAJESH(17811A0320), M.V.S.R.C VASANTH NAIDU(17811A0365),N RAMA KRISHNA (17811A0345)** in partial fulfilment of requirements for the award of the degree of bachelor of technology in **"MECHANICAL ENGINEERING"** by Jawaharlal Nehru Technological university , Kakinada During the years 2017-2021.

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ABSTRACT

This thesis gives a systemic study and review of blast furnace cooling stave with refractory lining materials used in the metallurgical industries based on heat transfer analysis. The three-dimensional model of heat transfer of cooling stave with refractory lining in a blast furnace are modelled and analysed with the help of ANSYS software. The model further utilized for the heat transfer analysis of different thickness of lining materials. The Refractory lining material which is used in this analysis are mullite bricks (65% Al_2O_3 & 35% SiO_2) with different stave materials (copper, aluminium and cast iron). We have identified a stave cooler in RSP (Rourkela steel plant) blast furnace -4 in Bosh zone where heat load is maximum for our analysis purpose. The data collected from RSP is used for developing a 3D model of heat transfer analysis of refractory lining with stave cooling. We collected the heat flux data of subjected stave cooler and tabulated for our CFD study. The result is in very close agreement with the actual results obtained from the Rourkela steel plant. Further, in this study refractory lining thickness of the blast furnace is taken as 650 mm from the inner side of the furnace to the stave body by gradually decreasing the refractory lining thickness up to 550 mm. Copper and aluminium is used in place of cast iron as stave material, the factor of safety of the stave material is greatly enhanced due to higher thermal conductivity.