Proceedings of the 5th World Congress on Momentum, Heat and Mass Transfer (MHMT'20)
~~Lisbon, Portugal~~ Virtual Conference – October, 2020
Paper No. ICMFHT 174
DOI: 10.11159/icmfht.174

Detailed CFD Modelling and Simulation for Optimising Gas Flows in a Complex Duct Arrangement

Anupam[1], V Ramachandrarao Maddali[1], Prateek Sharma[1], Anil K popuri[1], Ashutosh Saxena[1], B.N.Mohapatra[1]
[1]National Council for Cement And Building Materials
Ballabgarh, Faridabad, India
anupam@ncbindia.com;

Abstract **-** Computational simulation is known to be used for decades. One such platform known to be available for simulating the fluid dynamics (CFD) was used mostly in the field of Aeronautic, Space, Automotive or Electronics industries owing to its high cost, complexity and the low performance of computers. With the significant increase in computing power and reduction of equipment cost, the use of CFD is easily accessible and is gaining momentum significantly in the cement industry. This paper highlights the recent study done for a cement plant in western India. The plant is suffering severely with the pressurisation in complex ducting arrangement handling the flue gases. The cement plant is designed to produce 9000 tpd clinker from a single kiln with 3 string preheaters. The fan outlets of each string preheater is connected to a common junction duct (PH-junction duct) from which the gases are bifurcated to coal mill, raw mill and directly to the dust collector. The plant is also having another junction duct (Raw mill junction duct) for raw mill fan outlets. These two junction ducts are connected by an Interconnecting duct. The operation team is experiencing huge pressurisation in the PH-junction duct and the interconnecting duct. The pressurization results in gases to come out from the openings in these ducts, which is not a healthy sign as these ducts are under negative pressure. The boundary conditions were measured by a team of process experts. The junction ducts along with its inlet and outlet ducts were modelled and simulated by using SST k-omega turbulent model.
The paper discusses, in detail, the finding of the simulation and the modifications suggested in the complex duct arrangement to solve the pressurization issues in the plant operation.

Keywords**:** PH-Junction duct, Raw mill junction duct, SST k-ω, false air