

## DEVELOPMENT OF PULVERIZED COAL BURNERS FOR HIGH ASH LIGNITES

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Low grade coals are economically attractive sources of power for some developing countries as their reserves are more abundant than those for other fossil fuels. On the other hand, the quality of many lignite sources is very poor due to their high ash and moisture content. Environmental and operational requirements must be met to improve utilization of these resources. Achieving better combustion performance from high-ash lignites in power generation boilers is targeted in a TÜBİTAK (Turkey Scientific and Technological Research Foundation) project.

Numerical simulations of 10 MWth scale pulverized coal swirl burner are performed as a part of this ongoing project. ANSYS Fluent v14.0 code is used for the isothermal and combustion simulations in a single burner low confinement furnace. Due to high ash content, lignite chars have lower reactivity resulting in longer char burnout times. Therefore, the main focus in this study is on the unburned carbon in ash: effects of burner aerodynamics and combustion performances resulting from IFRF Type 1 (low swirl), Type 2 (high swirl) and Type 3 (high swirl with axial jet) flames are evaluated (see figures below for computation examples). The project also involves the development of an instrumented combustion chamber in order to test the designed burners.

Predicted flow patterns indicate that with penetration of primary axial jet into the internal recirculation zone, an elongated region of volatile combustion occurs resulting in higher axial gas velocities and low oxidant concentrations in char particle paths leading to high unburned carbon in ash. Due to the low porosity of high-ash lignite, the required residence times are only obtained using high swirl intensity flame configurations.

