4. Conclusions

The objective of this study is to investigate the effect of isokinetic sampling of the secondary airflow on the energy input to the 600 MW coal-fired boiler. The kinetics of the secondary air pressure drop on combustion temperature was experimentally explored at full load using different sampling methods under stable conditions. The combustion air inlet temperature, pressure, density, and viscosity of coal varied by boiler level. Isokinetic sampling uses laminar flow to conserve energy, while circular venturi measurements focus on momentum and mass conservation. The combustion air expansion and acceleration mainly contributed to the temperature drop, resulting in thermal effects. It can be concluded that the velocity increased with the decrease in pressure during the circular venturi measurements as a result of the restricted airflow affecting the combustion air inlet temperature (reduction), assuming that the density and unit load remain constant. On the other hand, during the isokinetic sampling, the airflow remains laminar, resulting in an insignificant effect on the combustion inlet temperature. Comprehensively evaluating combustion performances (combustion stability, combustion air temperature, combustion air mass flow, coal/air flow ignition), it is concluded that the tangentially fired boilers burning bituminous coal have strong combustion stability and high combustion efficiency. As a result, a more refined secondary air design for tangential boilers will be possible with the insights gained from the study. The decreased pressure on the circular venturi measurement is attributed to the slow measurement of the combustion air and the increased pressure on the isokinetic sampling is attributed to the faster-moving combustion air particles.

Nomenclature

Pv	(C)	Sensed pressure difference
D	(kg/m^2)	Air density
Cp	(kg/m^2)	Pitot tube coefficient
PB	(m/s)	Barometric pressure
T	(m)	Absolute Temperature
P		Atmospheric + static pressure

K	(L^3)	Venturi constant
ρ	(kg/s)	air density
v		air velocity
D	(m^2)	pipe area
Δp		Differential pressure

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