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Experimental Study of Secondary Air Hole of Gas Turbine Combustor

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This paper reports about the relations of secondary air holes and characters of gas turbine combustor.

The experiments were performed on the same form can-type gas turbine combustors ($120^{\phi} \times 430$) with several flame tubes, each of which had different distribution and size in their secondary air holes and had identical opening ratio of secondary air holes.

The characters of each combustor were measured by ventilation and combustion tests.

Comparing the characters of each combustor, the relations between secondary air holes and characters of combuster were cleared.

Results are as follows:

1. The form resistance of combustor is influenced mainly by the collision and vortex motions of the flowing gas in the combustor.
2. The form resistance coefficient K_1 is linear to the two power of secondary air hole diameter.
3. With increase of secondary air hole diameter, the penetration of secondary air increases and rate of collision and vortex motions of flowing gas in the combustor gain its intensity.
4. When the air flow is supplied to the combustion zone with too strong penetration, flame is quenched and the combustion efficiency decreases with increase of air flow rate.
5. When the air flow is supplied to the combustion zone with too weak penetration, inperfect combustion occurs in the center part of flame for lack of air and mixture is over-cooled near the wall of flame tube. So the combustion efficiency is governed by air flow rate.
6. The small secondary air hole makes air flow which flows along the wall of flame tube and does not perform the dilution mixing.
7. A combustor shows different characters with different fuel.
8. Fuel is a large factor to decide the size and the distribution of secondary air holes which ensure a good combustion character.
9. Resistance caused by combustion is large when the combustor has a good characteristic of combustion.

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