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Heat Transfer in Continuous Regenerative (Rotary) Air Preheaters

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SUMMARY

After a brief description of the rotary air preheater, various theoretical investigations into the heat transfer of this type of heater are described, especially those methods based on approximation to contra-flow recuperator theory. The accuracy and limitations of these methods are compared and the effect of storage on the heat transfer is assessed.

In the second half of the paper, the results of an investigation on a scaled model of a rotary air heater are presented and discussed in conjunction with the theory previously given. Values for the heat transfer coefficients and matrix temperatures in the heater are estimated. It is shown that it is possible to extend the data obtained to conditions in industrial installations.

General Introduction - The Air Preheater

The use of preheated air for the combustion processes in boiler practice has long been established and the first land installations employing preheaters were developed over 60 years ago. During the last 30 years, the air preheater has become a standard part of most large boilers and is now accepted as substantially improving their economy.

Preheated air raises the efficiency of the boiler, first, by recovering heat from the fuel gases and returning it to the furnace, and, second, because the resulting increased furnace temperature gives a higher combustion rate, and a lower ash-pit loss, and permits the burning of lower grade coals.

In the rotary or Ljungstrom air preheater[1,14] the heat is transferred by means of mild steel elements set in a rotor which revolves slowly in a casing designed to direct the flue gases axially through one side of the rotor, whilst the air passes in the opposite direction through the other.