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COAL TYPE SELECTION FOR POWER PLANTS THROUGH FUZZY INFERENCE USING COAL AND FLY ASH PROPERTY

Satoru Goto[1], Tomoharu Yamauchi[1], Shinji Katafuchi[1], Toshihiko Furue[2]
Mitsuhiro Sueyoshi[2], Yoshitaka Uchida[2] and Hironori Hatazaki[2]

[1]Department of Advanced Technology Fusion
Saga University
Honjomachi, Saga 840-8502, Japan
goto@cc.saga-u.ac.jp

[2]Research Laboratory
Kyushu Electric Power Co., Inc.
2-1-47, Shiobaru Minami-Ku, Fukuoka 815-8520, Japan

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Abstract. *In this paper, a coal type selection method for a coal fired boiler in a thermal power plant is proposed. Coal combustibility and fly ash fusibility are derived by fuzzy inference using the coal and fly ash properties. Then, combustion state for each coal type is evaluated by the coal combustibility and fly ash fusibility. Applicable coal type is selected by the estimated combustion state. The proposed coal type selection method was applied to the data collected from test furnace and an actual thermal power plant.*
Keywords: Fuzzy inference, Power plant, Coal type, Combustibility, Fusibility

1. **Introduction.** Coal is one of the important energy sources in the world [1] because coal is cost effective compared with other fossil fuels such as oil and LNG, and coal deposits are also larger than other ones. Many researches have been carried out on coal type effect to coal fired power plants. In [2], the performance of a combined cycle pressurised fluidised bed combustion (PFBC) plant has been calculated, using the eclipse process simulator for a wide range of coal properties. In [3], desulphurization features of several coal types were investigated in a demonstration plant PFBC boiler. And [4] provides insight into the ash formation mechanisms and coal characteristics responsible for the formation of fine ash.

Not all kinds of coal types are applicable to the coal fired power plants. Hence, selection of applicable coal type is an important process. Moreover, increase of applicable coal types is preferable for stable supply of coals in Japan because almost all coals are imported from foreign countries. In the present situation, final decision of applicability of coal types has been made by a coal combustion test in a specific test furnace. The coal combustion test is, however, costly and time consuming.

Coal is characterized by many properties such as total calorific value, volatile portions, degree of coalification, chemical compositions of fly ash and so on. These properties are available in advance. Hence, appropriate screening of the coal types by use of coal and fly ash properties in advance of the combustion test is much required. The authors have already proposed a coal type selection method for a coal fired power plant [5]. The previously proposed method takes into account the estimation of applicability evaluation values based on the statistical analysis, and coal type was evaluated by the estimated applicability evaluation values. However, the previously proposed method was based on the results of the coal combustion test in a specific test furnace.