Optymalizacja struktury systemu pomiarowego parowego bloku energetycznego w technologii spalania tlenowego z wykorzystaniem rachunku wyrównawczego

Praca doktorska

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Abstract

In the dissertation an thermodynamic analyzes of Oxy-fuel combustion power unit and optimization of localization of redundant measurement system has been made. As part of the dissertation have been made:

- simulation model of a power unit in oxy-combustion technology,
- mathematical model based on the substance and energy balances for the purpose of reconciliation method,
- computer program which uses a reconciliation method,
- analysis of localization of redundant measurement system in steam power unit.

Developed simulation model of a power unit was used to generate the input measurement data for reconciliation purpose. In the optimization analysis of localization of redundant measurement system used in thermal power unit a propriety of reconciliation method have been used. This propriety of reducing the uncertainty of measurement used in reconciliation process. According to this property a specific location of redundant measurements can be chosen in a measurement system block to achieve the maximum reduction of uncertainty on measurement or the value of the objective function. Due to the strong influence of input data quality for the reconciliation process, energy system simulation model was performed in specialized software *Thermoflex*. Due to the selection of the block structure of a oxygen combustion technology, the model of an oxygen separation and compression of carbon dioxide was performed in a dedicated software for distillation systems *AspenPlus*, and the results were transferred to the simulation model made in the program *Thermoflex*.
Optimization calculations using reconciliation method were made in own computer code.
Objective functions in optimization task were relative uncertainty of the specific consumption of chemical energy of fuel, relative uncertainty of the specific consumption of heat in the turbo-generator and Kullback-Leibler divergence.
Subject considered in dissertation fit in important area of diagnosis and control of power systems. The approach presented in the dissertation enables the optimization analysis of location of redundant measurement system at the stage of power unit design. The approach based on the review of the literature is innovative in terms of domestic and global.

It should also be mentioned that a part of this dissertation has been performed under the Strategic Project "Advanced technologies of energy generation" task 1 " Developing a technology for high efficient zero emission coal blocks integrated with CO2 capture from exhaust gases" and task 2 " Developing a technology of oxyfuel combustion for pulverized fuel and fluidized-bed furnaces integrated with CO2 capture system"