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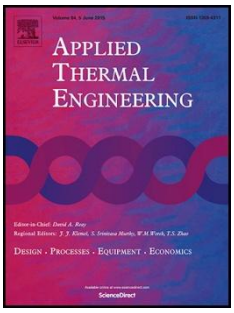

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ACCEPTED MANUSCRIPT

Modeling and optimization of shutdown process of combined cycle gas turbine under limited residual natural gas

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Highlights

1. A novel optimal scheme for shutdown process of CCGT is proposed and proved.
2. Optimizing algorithms are developed based on the scheme.
3. Power generation is found to be more related to the load-off rates.
4. Proposed methodology is proved to be effective in a case study.

Abstract: In this study, the characteristics of the shutdown process of combined cycle gas turbine (CCGT) were studied, and an original model for this process was proposed to allocate gas consumption. Based on the model, optimal shutdown scheme was proposed and proved, and optimizing algorithms were developed. It was firstly found that the total power generation is more relevant with the load-off rates rather than the load-up rates. Assuming residual natural gas volume is 10^5 m^3, the methodology could generate an extra power of 28.41 MW·h and an extra profit of 4.79 million Yuan annually. Continuous correction procedure was included in the algorithms to deal with the deviation between actual residual gas volume and theoretical value. An optimization computer program based on the algorithms was developed using ASP.NET and B/S framework. This program was applied to three CCGTs in a power plant in Hangzhou, Zhejiang,

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