

## Accepted Manuscript

Optimal allocation of surplus gas and suitable capacity for buffer users in steel plant

Jinghui Yang, Jiuju Cai, Wenqiang Sun, Jian Huang

PII: S1359-4311(16)34197-7

DOI: <http://dx.doi.org/10.1016/j.applthermaleng.2016.12.096>

Reference: ATE 9716

To appear in: *Applied Thermal Engineering*

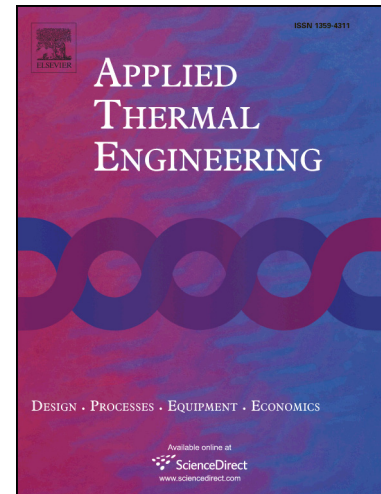
Received Date: 5 April 2016

Revised Date: 13 December 2016

Accepted Date: 18 December 2016

Please cite this article as: J. Yang, J. Cai, W. Sun, J. Huang, Optimal allocation of surplus gas and suitable capacity for buffer users in steel plant, *Applied Thermal Engineering* (2016), doi: <http://dx.doi.org/10.1016/j.applthermaleng.2016.12.096>

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.



## Optimal allocation of surplus gas and suitable capacity for buffer users in steel plant

Jinghui Yang<sup>a,\*</sup>, Jiuju Cai<sup>b</sup>, Wenqiang Sun<sup>a,b,\*</sup>, Jian Huang<sup>a</sup>

a. Department of Thermal Engineering, Northeastern University, Shenyang 110819, Liaoning, China

b. State Environmental Protection Key Laboratory of Eco-Industry, Northeastern University, Shenyang 110819, Liaoning, China

\*Corresponding author: Jinghui Yang, Email: yjh\_820707@126.com; Wenqiang Sun, Email: neu20031542@163.com

**Abstract:** Byproduct gases are an important secondary energy source in the iron and steel industry. A novel mathematical programming model was established in this paper to study the optimal allocation of surplus gas in buffer users in the byproduct gas system, on the basis of which a new method for calculating the suitable capacities of gasholders and boilers was also proposed. The validity and practicability of the model and the design method were tested in an iron and steel enterprise. The results show that gas emissions were controlled, boiler efficiency was improved, and surplus gas-related power generation was increased by approximately  $5 \times 10^4$  kWh in each hour compared with the actual data from the iron and steel enterprise. Finally, fitting curves of the relationship between the designed fuel load of the boiler and the capacity of the gasholder were obtained. Scientific guidance is thus provided for the improvement of buffer users in steel plants in the future.

**Key words:** iron and steel industry; byproduct gas distribution; boiler; gasholder; energy saving; optimization

### Nomenclature

#### Sets

- B set of boilers  
 K set of gasholders  
 G set of byproduct gases (BFG, COG, LDG)  
 $b$  number of boiler ( $b=1, 2, \dots, B$ )  
 $h$  number of G gasholder ( $h=1, 2, \dots, K$ )  
 $t$  time period ( $t=1, 2, \dots, T$ )

#### Parameters

- $HV^G$  heating value of byproduct gas  $G$ , kJ/Nm<sup>3</sup>;  
 $HV_b^{\min}$  minimum heating value demanded in boiler  $b$ , kJ/Nm<sup>3</sup>;  
 $HV_b^{\max}$  maximum heating value demanded in boiler  $b$ , kJ/Nm<sup>3</sup>;  
 $HE_b^{\min}$  minimum heat demanded in boiler  $b$ , kJ;  
 $HE_b^{\max}$  maximum heat demanded in boiler  $b$ , kJ;  
 P means the intersection point of the fitting curves;  
 $R_{\max}$  maximum amount of surplus gas, Nm<sup>3</sup>/h;  
 $R_{\min}$  minimum amount of surplus gas, Nm<sup>3</sup>/h;  
 $R_{\text{AVE}}$  average amount of surplus gas, Nm<sup>3</sup>/h;  
 $R_{\text{SMA}}$  the mean value of  $R_{\min}$  and  $R_{\text{AVE}}$ , Nm<sup>3</sup>/h;  
 $R_{\text{LAR}}$  the mean value of  $R_{\max}$  and  $R_{\text{AVE}}$ , Nm<sup>3</sup>/h;  
 $V_H^G$  upper bound of  $G$  gasholder, Nm<sup>3</sup>;  
 $V_L^G$  lower bound of  $G$  gasholder, Nm<sup>3</sup>;  
 $V_{LL}^G$  minimum capacity of  $G$  gasholder, Nm<sup>3</sup>;  
 $V_{HH}^G$  maximum capacity of  $G$  gasholder, Nm<sup>3</sup>;  
 $V_b^{G,e}$  amount of gas  $G$  needed in boiler  $b$  at its rated state, Nm<sup>3</sup>;  
 $V_{f,t}^G$  amount of surplus gas at time  $t$ , Nm<sup>3</sup>/h;

متن کامل مقاله

دریافت فوری ←

**ISI**Articles

مرجع مقالات تخصصی ایران

- ✓ امکان دانلود نسخه تمام متن مقالات انگلیسی
- ✓ امکان دانلود نسخه ترجمه شده مقالات
- ✓ پذیرش سفارش ترجمه تخصصی
- ✓ امکان جستجو در آرشیو جامعی از صدها موضوع و هزاران مقاله
- ✓ امکان دانلود رایگان ۲ صفحه اول هر مقاله
- ✓ امکان پرداخت اینترنتی با کلیه کارت های عضو شتاب
- ✓ دانلود فوری مقاله پس از پرداخت آنلاین
- ✓ پشتیبانی کامل خرید با بهره مندی از سیستم هوشمند رهگیری سفارشات