Fuel gas operation management practices for reheating furnace in iron and steel industry

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\textbf{A B S T R A C T}

How to evaluate the fuel gas operation (FGO) of various working groups (WGs) and working shifts (WSs) in reheating furnace is still an ambiguous problem. In this paper, a novelty time-series FGO evaluation model was proposed. The strategy mainly included: Firstly, the fuel gas per ton steel (FGTS) was calculated in certain time interval; Secondly, the FGTS time-series data set was formulated in a statistical period; Thirdly, the FGTS time-series data set was divided according to working schedule; Lastly, the FGO evaluation model was established. Case study showed that: i) The fuel gas operation evaluation results of various WGs in different WSs were accorded with normal distribution; ii) For various WGs, A WG performed best, followed by C WG and D WG. The performance of B WG was the worst due to its violent fluctuation of fuel gas operation evaluation results in three WSs; iii) For different WSs, the day WS and swing WS performed well, whereas the performance of night WS was unsatisfactory. Discussion results showed that the improvement of working skills, working responsibility and working passion, which were effective measure to achieve energy saving in terms of operation, should be enhanced through skills training and the reward and punishment system. Generally, this novelty time-series FGO evaluation method could also be applied to other industrial equipment.

\textbf{Keywords:}
Iron industry; Steel Industry; Fuel gas operation (FGO) management; Reheating furnace; FGO evaluation model; Fuel gas per ton steel (FGTS) time-series; Working groups; Working shifts

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Prakse ravnanj z zgorevalnim plinom za ogrevalne peč v železarski in jeklarski industriji

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POVZETEK
Kako ovrednotiti upravljanje različnih delovnih skupin (WG) in delovnih izmen (WS) z zgorevalnim plinom (FGO) za ogrevalno peč je še vedno zahtevna naloga. V tem prispevku je bil predlagan nov model ocenjevanja FGO s časovno vrsto. Strategija je v glavnem vključevala naslednje korake: 1) najprej je bil v določenem časovnem intervalu izračunan porablen zgorevalni plin na tono jelda (FGTS), 2) nato je bil oblikovan nabor podatkov o časovni vrsti FGTS v statističnem obdobju, 3) nabor podatkov o časovni vrsti FGTS je bil razdeljen glede na delovni uruček in 4) bil vzpostavljen model ocenjevanja FGO. Studija primera je pokazala, da: i) so bili rezultati ocenjevanja upravljanja z zgorevalnim plinom različnih delovnih skupin v različnih delovnih izmenah usklajeni z normalno porazdelitvijo; ii) izmed različnih delovnih skupin se je najbolje odrezala delovna skupina A, sledili sta j i C in D. Učinkovitost delovne skupine B je bila najslabša zaradi močnega nihanja rezultatov ocenjevanja upravljanja z zgorevalnim plinom v tretjih delovnih izmenah; iii) pri različnih delovnih izmenah sta se izmenja delovna izmerna in popoldanska delovna izmerna odrezali dobro, medtem ko je bil rezultat nočne delovne izmene nezadovoljiv. Rezultati razprave so pokazali, da je treba za izboljšanje delovnih veščin, delovne odgovornosti in delovne strasti, ki so učinkovit ukrep za doseganje varčevanja z energijo v smislu upravljanja, vpeljati sistem usposabljanja ter sistem nagradevanja in kaznovanja. Na splošno bi lahko predlagano metodo ocenjevanja časovnih vrst FGO, ki je novost, uporabili tudi za drugo industrijsko opremo.

PODATKI O ČLANKU
Ključne besede: Železarska industrija; Jeklarska industrija; Upravljanje z zgorevalnim plinom (FGO); Ogrevalna peč; Model ocenjevanja FGO; Časovna vrsta zgorevalnega plina na tono jelda (FGTS); Delovne skupine; Delovne izmene

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