THE EFFECT OF BRIQUETTE COMPOSITION ON COKING PRESSURE GENERATION

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Introduction

CHALLENGES FOR THE STEEL INDUSTRY

ENVIRONMENTAL POLLUTION

RAW MATERIAL CONSUMPTION
Introduction

CHALLENGES FOR THE STEEL INDUSTRY

DANGEROUS COAL

- High pressures
- Good mechanical strength
- High yields

Operational problems
Shortening of the coke oven life span
Economic loss
Introduction

CHALLENGES FOR THE STEEL INDUSTRY

ENVIRONMENTAL POLLUTION

RAW MATERIAL CONSUMPTION

Biomass
Introduction

- Coking Pressure
  - Coal/Additives Characteristics
  - Heating Rate
  - Particle Size
  - Bulk Density
Background

Effect of sawdust addition on coking pressure produced by two low vol bituminous coals *Journal of Analytical and Applied Pyrolysis* 127 (2017) 369–376
L. Florentino-Madiedo, D. Casal, E. Díaz-Faes, C. Barriocanal

A.M. Fernández, C. Barriocanal, R. Alvarez

The effect of binder (coal tar and pitch) on coking pressure *Fuel* 220 (2018) 810–816
Seiji Nomura
Background

Partial briquetting vs direct addition of biomass in coking blends
M.G. Montiano, E. Díaz-Faes, C. Barriocanal
Fuel 137 (2014) 313–320

R. Loison, P. Foch, A. Boyer,
Coke Quality and Production,
**Objetive**

**INCREASE**
- Bulk density
- Amount of additives
- Coke quality

**DECREASE**
- Coking pressure
- Costs
- CO$_2$ emissions
Experimental methods

BRIQUETTES COMPOSITION

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CHESTNUT SAWDUST (SC) PULVERIZED COAL INJECTION (C) DANGEROUS COKING COAL (A)

Sieving

Mixer

Roll press

TAR (T)

Briquettes (23 g)

Mixing and heating hopper

Hatchway

Roll press
**Experimental methods**

**Permeability of plastic coal layer**

- Furnace
- Coal
- Al oxide
- Thermocouple
- N₂ flow
- Manometer

**Sample mass:** 2 g  
**Size:** < 3 mm  
**Heating rate:** 3 °C/min  
**Final temp.** 800 °C

**Movable wall oven**

- Semi-pilot scale oven (17 kg)
- Initial wall temp.: 1100 °C  
- Final coke temp.: > 1000 °C  
- Coking time: 3.5 hours
**Experimental methods**

**Cold mechanical strength (JIS test)**
- Sample mass: 10 kg
- Size: >20 mm
- Rotations: 150
- DI150/15 index = % > 15 mm
- DI150/5 index = % < 5 mm

**Coke Reactivity Index (CRI)**
- CRI = % weight loss

**Coke Strength after Reaction index (CSR)**
- CSR = % > 9.5 mm

**Sample mass:** 200 g
**Temperature:** 1100°C
**CO₂ flow:** 5 L/min

**Size:** 19-22.4 mm
**Time with CO₂:** 2 h
**Results and discussion**

### Permeability of plastic coal layer

The variation on the pressure curve with binary blends was small, the more relevant change was produced by tar.

Every briquette blends decreased pressure drop. Sawdust caused lower pressure drop than injection coal in briquette blends.

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Results and discussion

Movable wall oven

- Density increased with a 15% or more briquette addition
- Briquettes addition even decreased the pressure of dangerous coal by 50%

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Results and discussion

Comparing with previous studies

The addition of 15% of briquettes (2.25% chestnut sawdust) in the coking blend had similar effects in coking pressure generation than the direct addition of 3% of chestnut sawdust.
The cold mechanical strength presented a slight decrease for briquettes 1, 2 and 4, briquette 1 caused the greatest impairment.

The addition of briquette 3 didn’t caused any impairment in the cold mechanical strength.
Results and discussion

Coke Reactivity Index (CRI)

- The variation in coke quality is small (around 3 points) up to 15% of briquette addition.
- There weren't significant differences between briquettes.
Results and discussion

Coke Reactivity Index (CRI)

Coke Strength after Reaction index (CSR)

Comparing with previous studies

The results were similar to those obtained with the direct addition of 3% of chestnut sawdust.
Conclusions

- Increase of bulk density
- Decrease of coking pressure (50%)
- Good coke quality (CSR > 65)
- Greater amount of additives
- Reduce costs
- Higher range of raw materials

Acknowledgement

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