THE EFFECT OF BRIQUETTE COMPOSITION ON COKING PRESSURE GENERATION

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CSIC
Consejo Superior de Investigaciones Científicas

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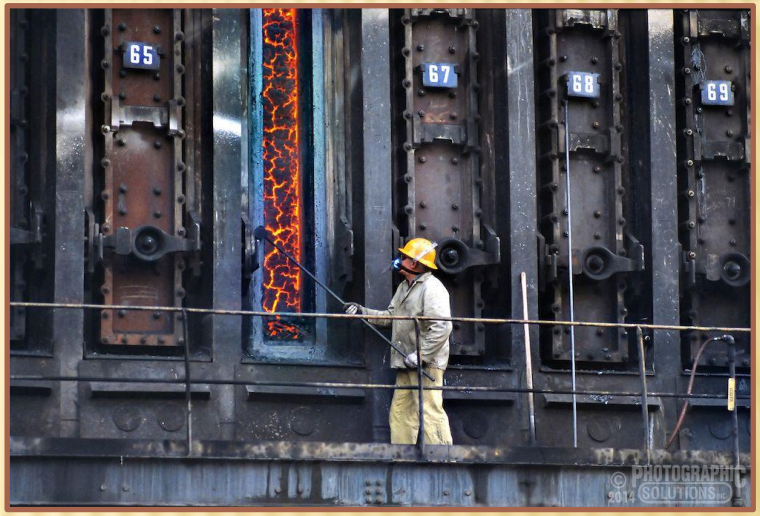
European Commission
Research Fund for Coal & Steel

Introduction

CHALLENGES FOR THE STEEL INDUSTRY

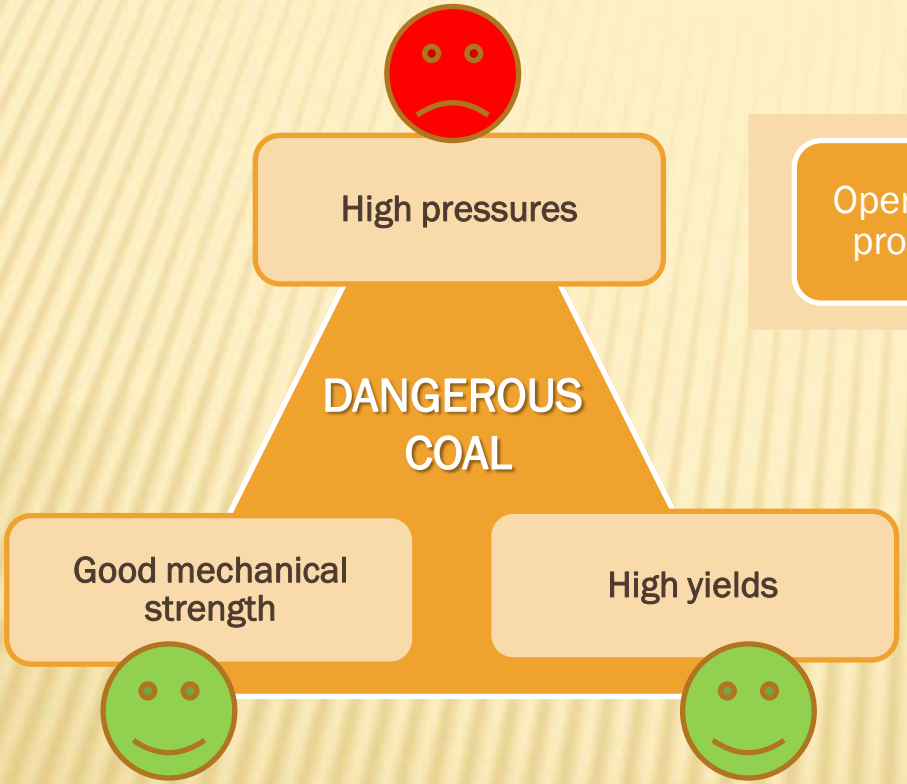
ENVIRONMENTAL POLLUTION

RAW MATERIAL CONSUMPTION



Introduction

CHALLENGES FOR THE STEEL INDUSTRY



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

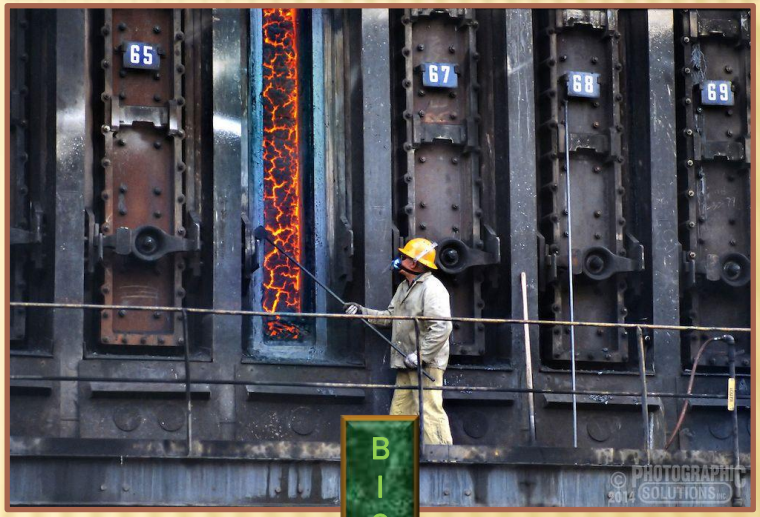
Introduction

CHALLENGES FOR THE STEEL INDUSTRY

ENVIRONMENTAL POLLUTION

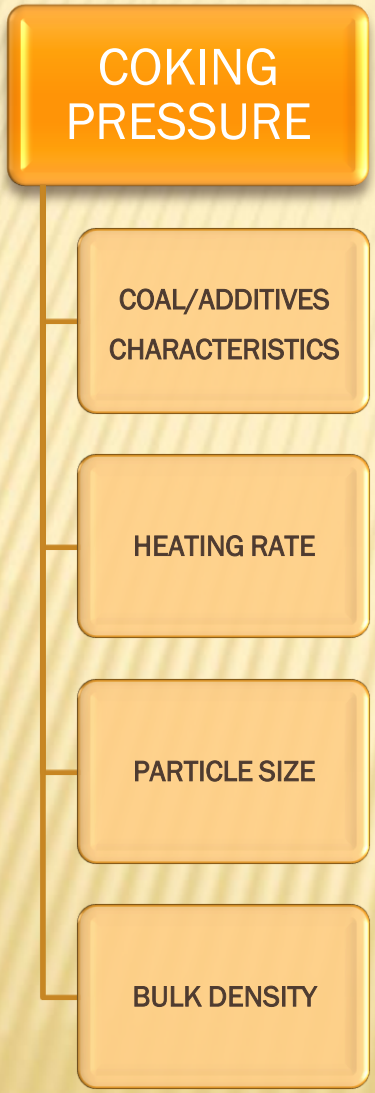
BIOMASS

RAW MATERIAL CONSUMPTION



BIOMASS

Introduction



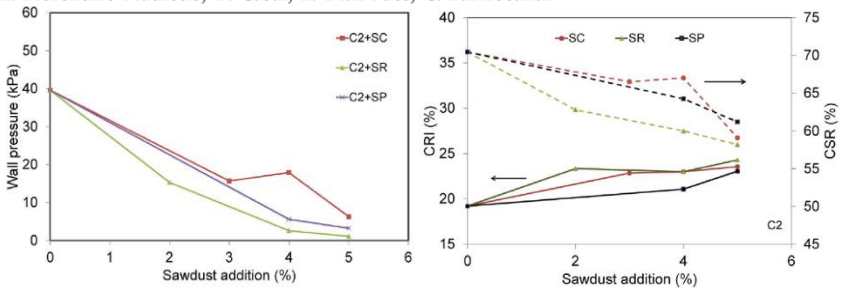
Background

- COKING PRESSURE
- COAL/ADDITIVES CHARACTERISTICS
- HEATING RATE
- PARTICLE SIZE
- BULK DENSITY

Effect of sawdust addition on coking pressure produced by two low vol bituminous coals

Journal of Analytical and Applied Pyrolysis 127 (2017) 369–376

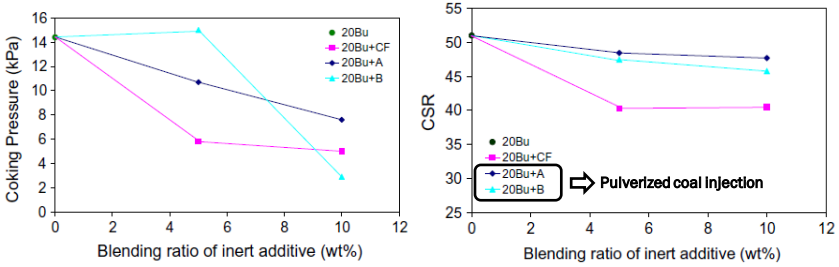
L. Florentino-Madiedo, D. Casal, E. Díaz-Faes, C. Barriocanal*



The effect of additives on coking pressure and coke quality

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

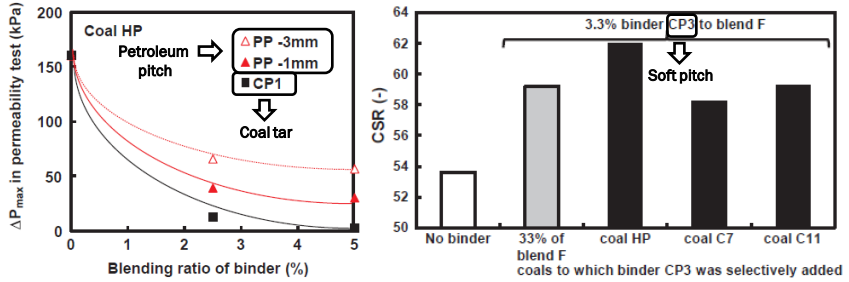
Fuel 95 (2012) 642–647



The effect of binder (coal tar and pitch) on coking pressure

Seiji Nomura

Fuel 220 (2018) 810–816



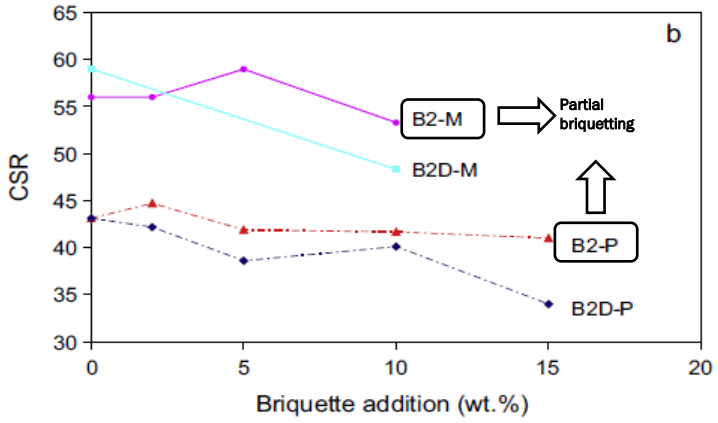
Background

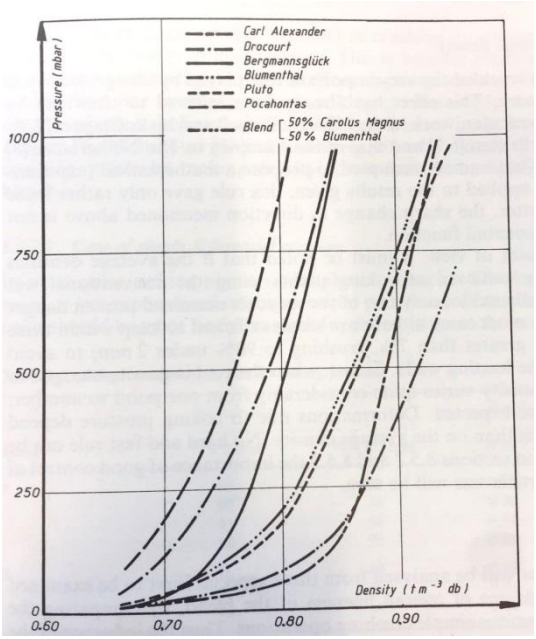
- COKING PRESSURE
  - COAL/ADITIVES CHARACTERISTICS
  - HEATING RATE
  - PARTICLE SIZE
  - **BULK DENSITY**

Partial briquetting vs direct addition of biomass in coking blends

M.G. Montiano, E. Díaz-Faes, C. Barriocanal *

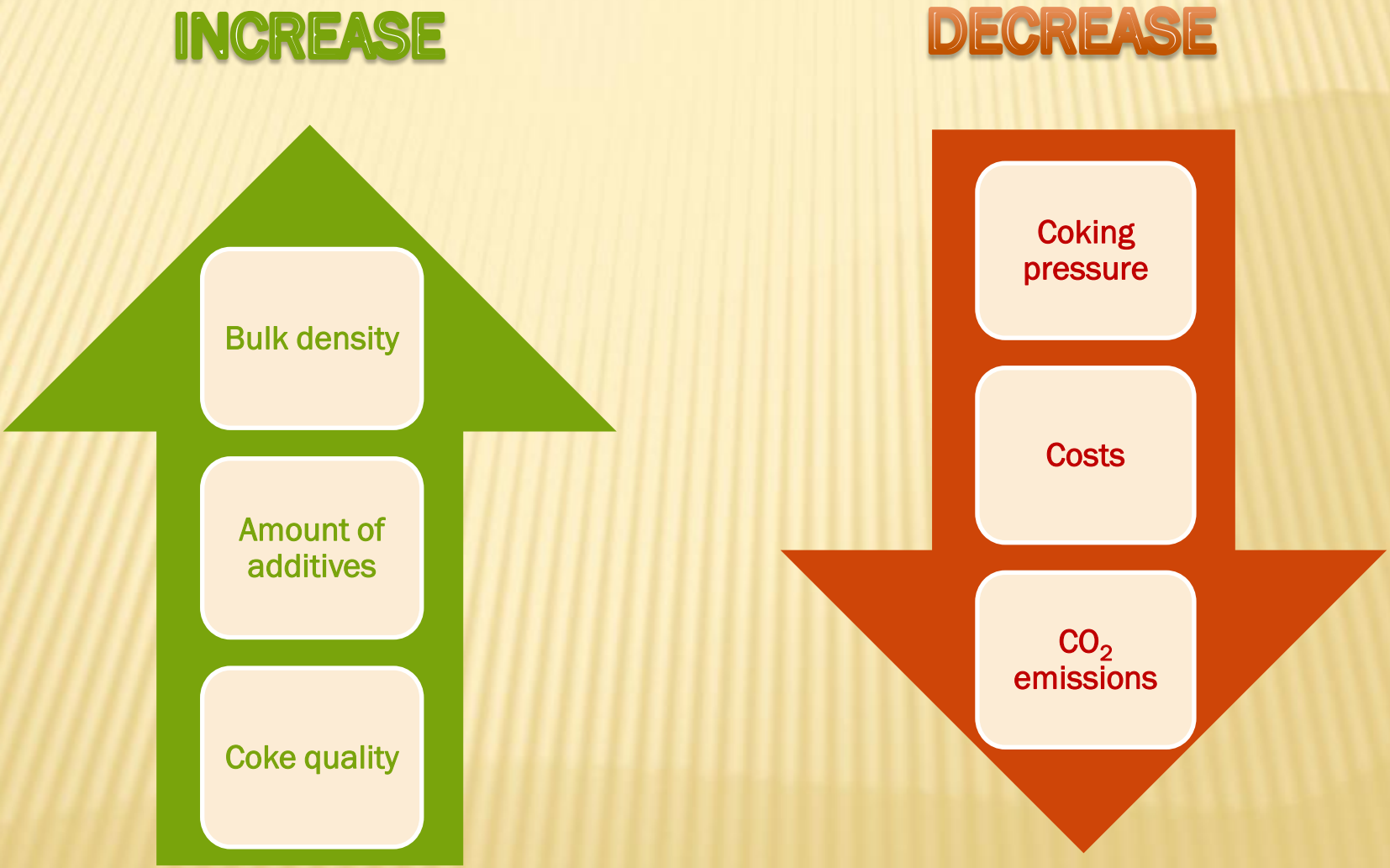
Fuel 137 (2014) 313–320





R. Loison, P. Foch, A. Boyer, Coke Quality and Production, Butterworth, London, 1989.

Objetive


INCREASE
Bulk density
Amount of additives
Coke quality
DECREASE
Coking pressure
Costs
CO_2 emissions

Experimental methods

CHESTNUT SAWDUST (SC)

PULVERIZED COAL INJECTION (C)

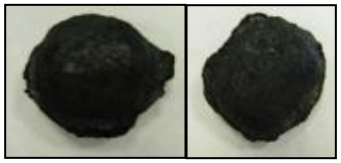
DANGEROUS COKING COAL (A)

Sieving

Mixer

TAR (T)

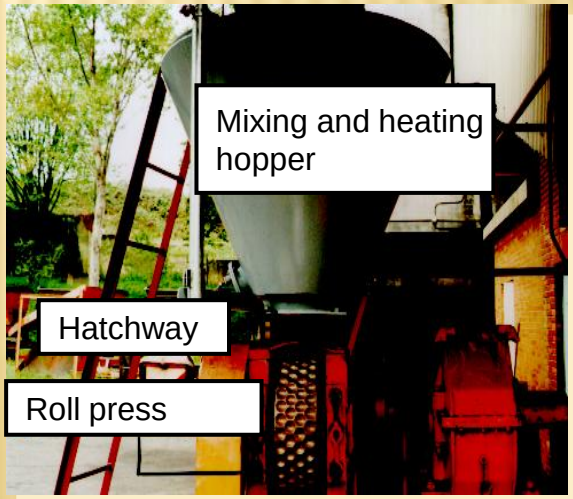
Roll press



Briquettes (23 g)

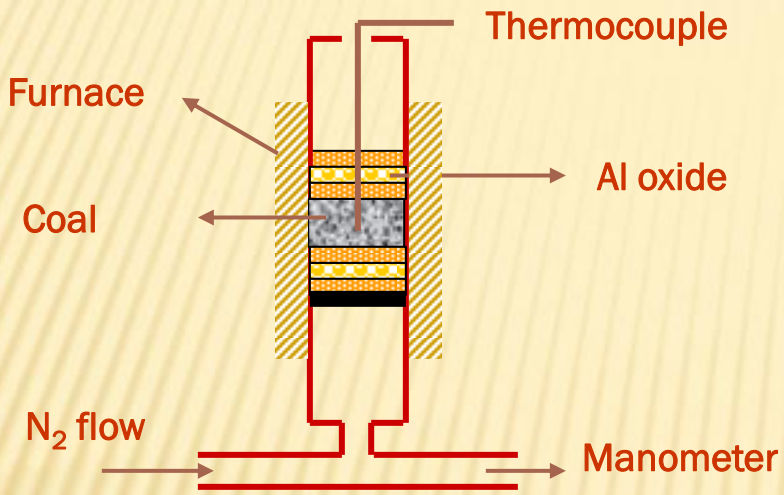
BRIQUETTES COMPOSITION

(%)	B1	B2	B3	B4
T	15	15	15	15
SC	15	15	-	-
C	70	35	42.5	85
A	-	35	42.5	-



Experimental methods

Permeability of plastic coal layer



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

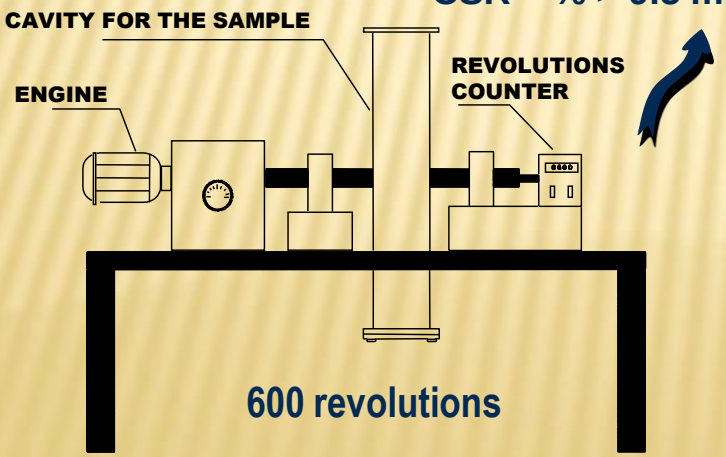
Rotations: 150

DI150/15 index = % > 15 mm

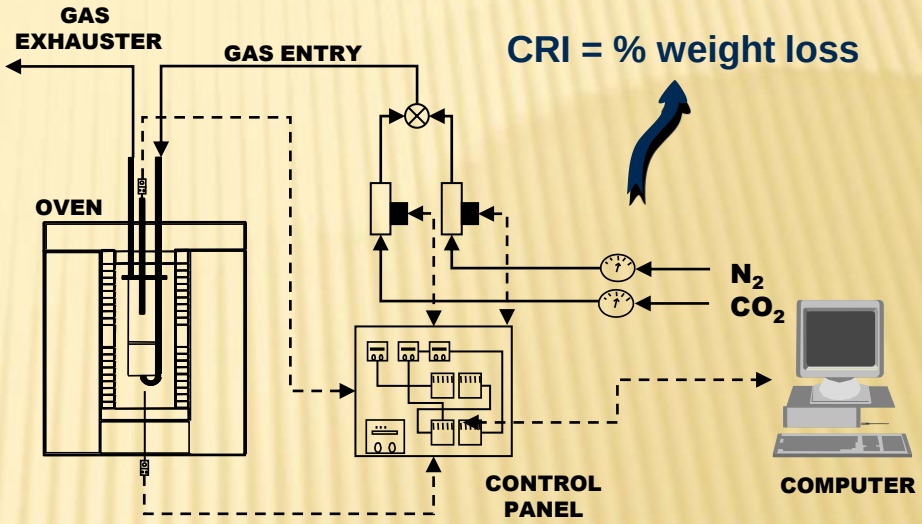
DI150/5 index = % < 5 mm

Coke Strength after Reaction index (CSR)

CSR = % > 9.5 mm



Coke Reactivity Index (CRI)



CRI = % weight loss

Sample mass: 200 g

Temperature: 1100ºC

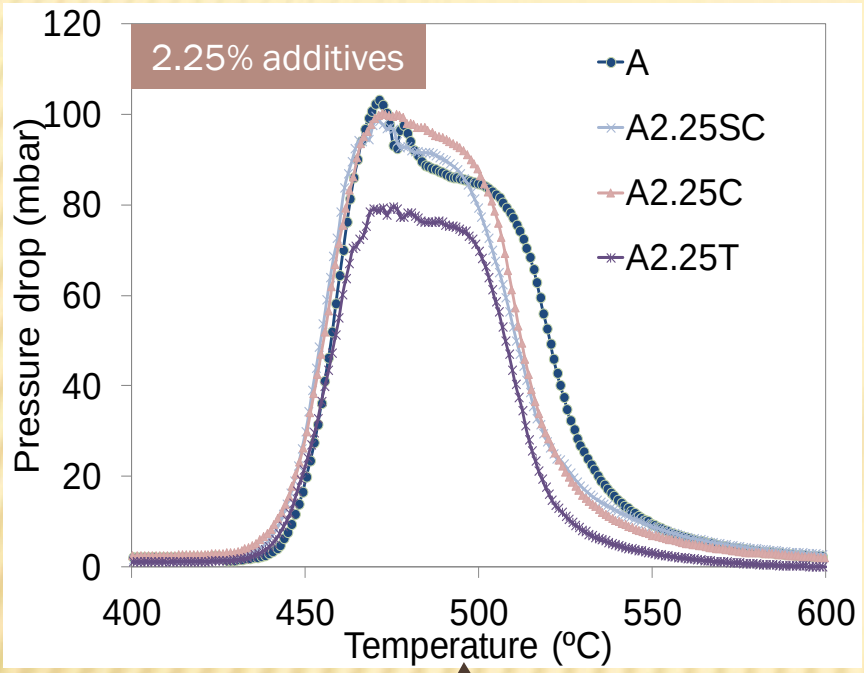
CO_2 flow: 5 L/min

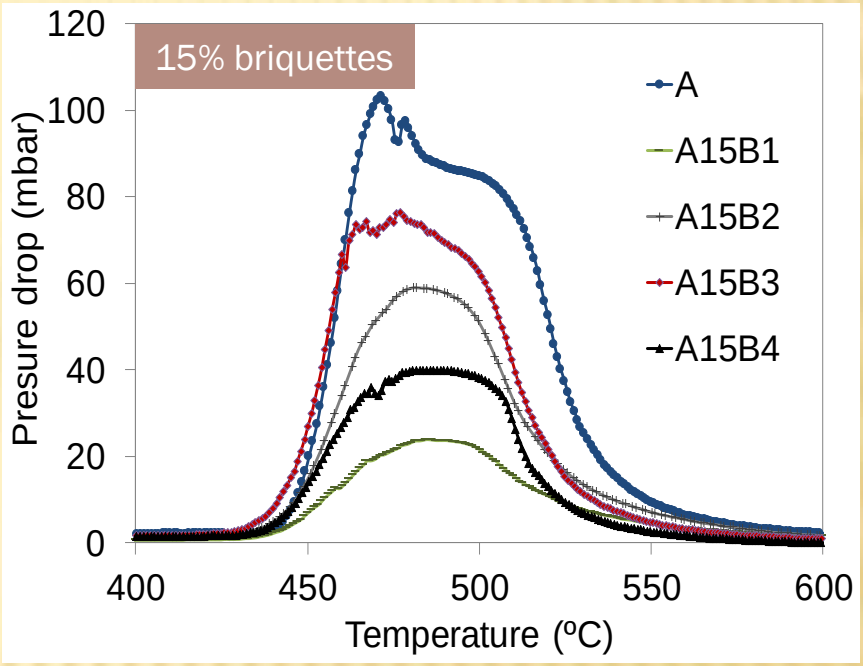
Size: 19-22.4 mm

Time with CO_2: 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.

BRIQUETTES COMPOSITION

	B1	B2	B3	B4
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SC	15	15	-	-
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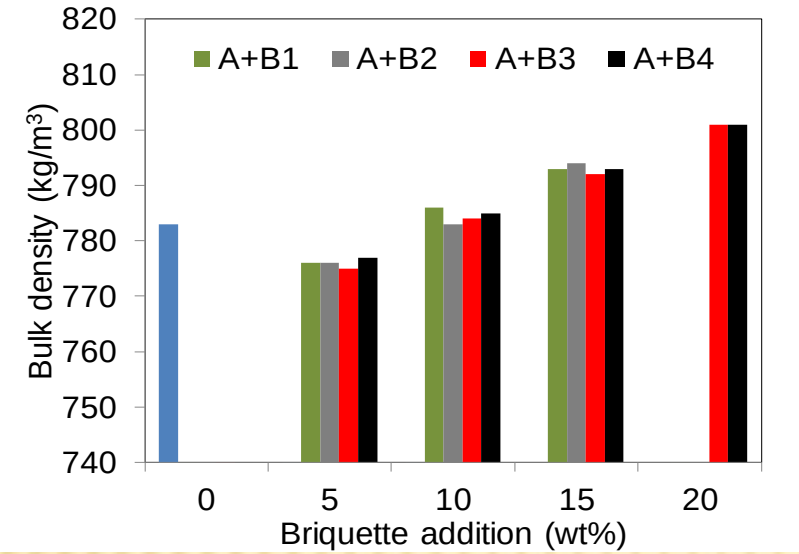
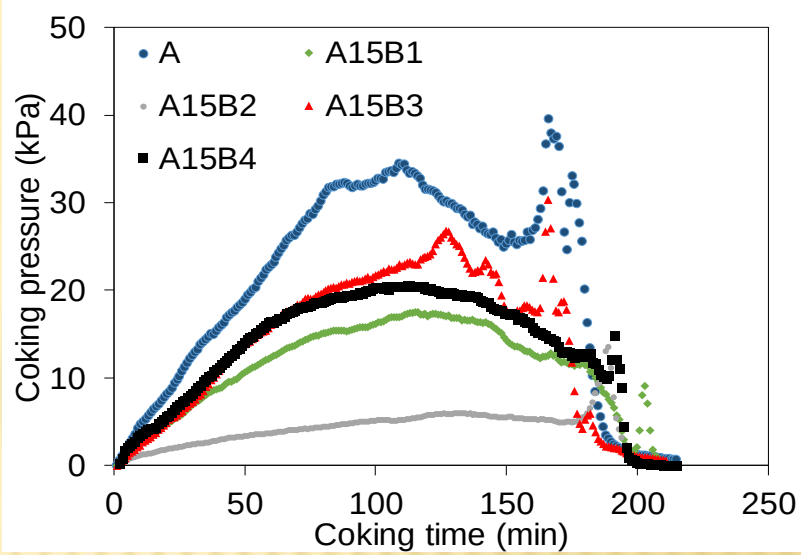
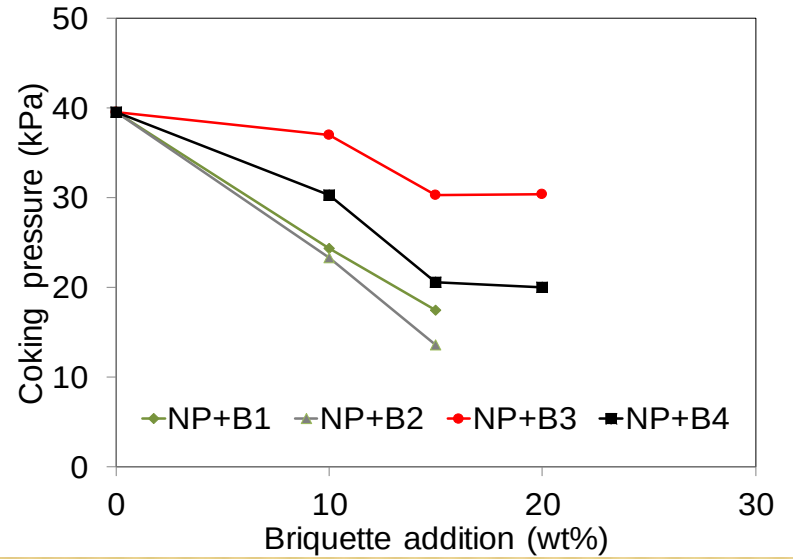
Results and discussion

Movable wall oven







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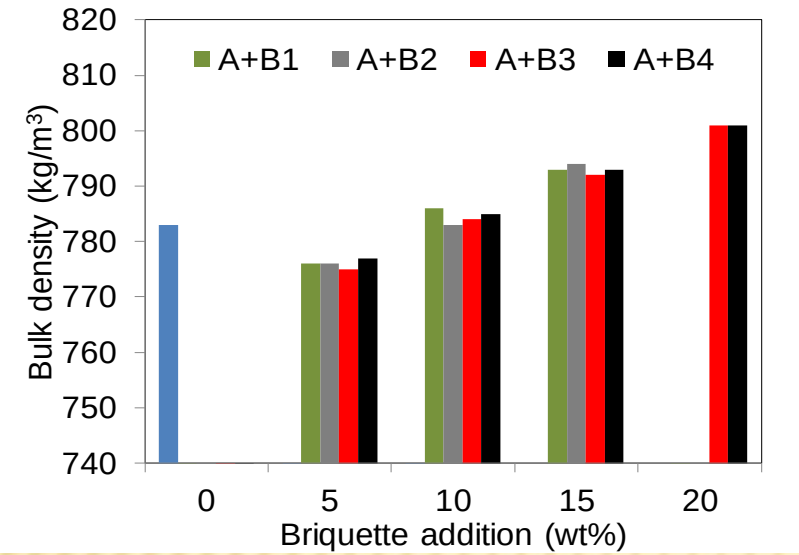
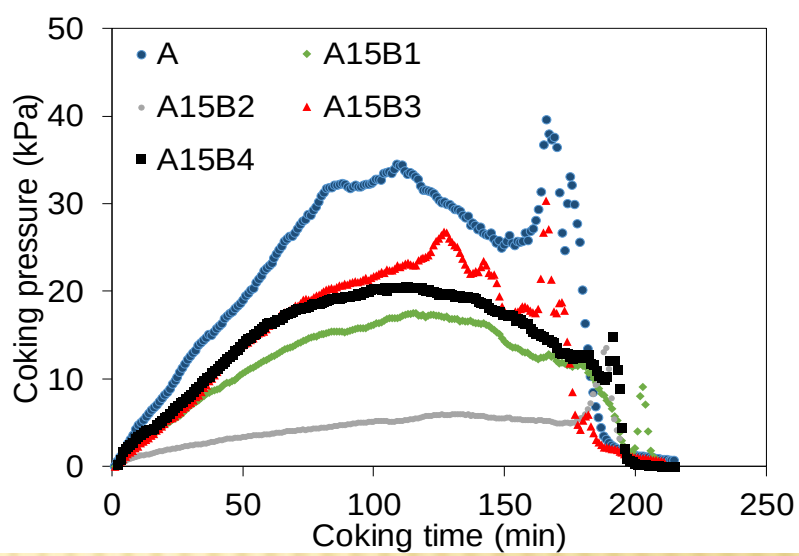
	B1	B2	B3	B4
T	15	15	15	15
SC	15	15	-	-
C	70	35	42.5	85
A	-	35	42.5	-

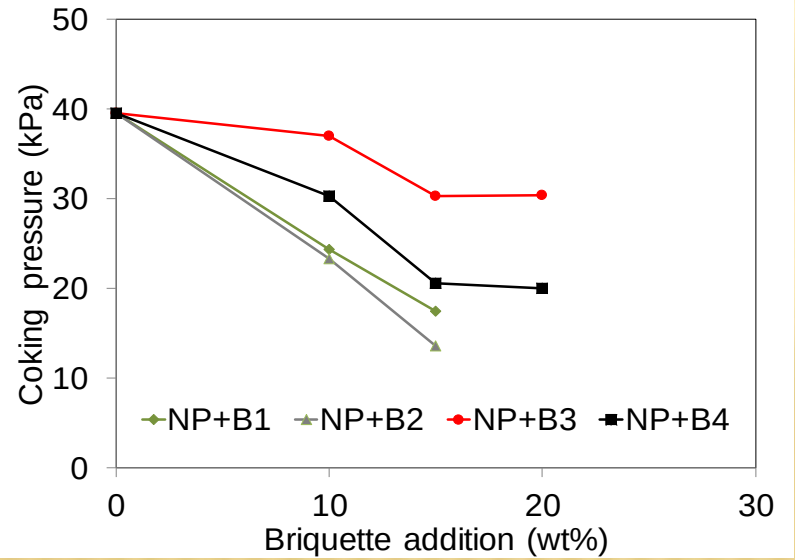
- *Density increased with a 15% or more briquette addition*
- *Briquettes addition even decreased the pressure of dangerous coal by 50%*

Results and discussion

Movable wall oven





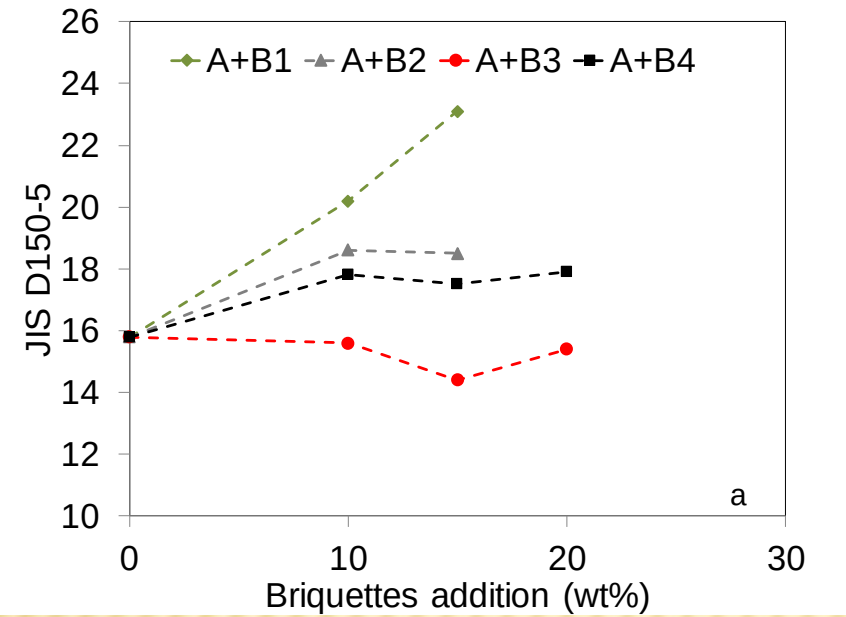


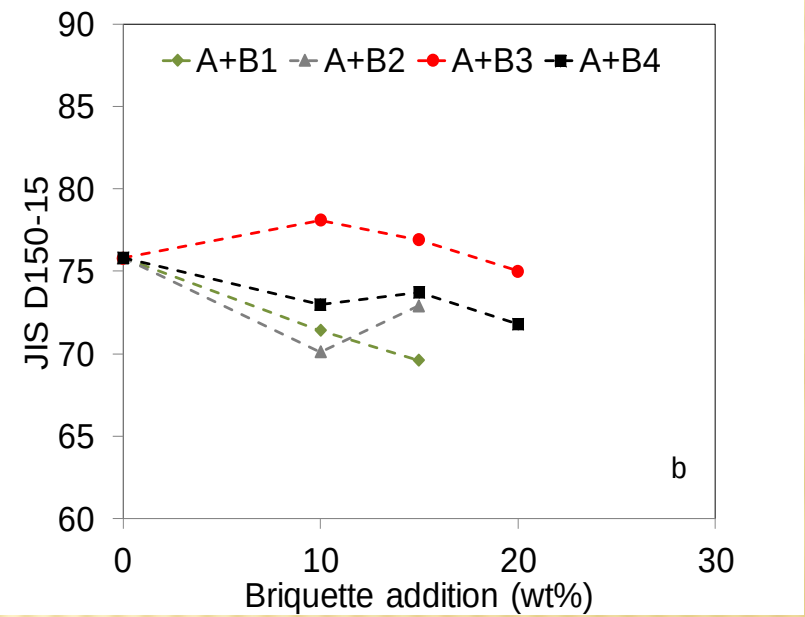
Comparing with previous studies

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.

Results and discussion

Cold mechanical strength (JIS test)





- *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.*

BRIQUETTES COMPOSITION

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Results and discussion

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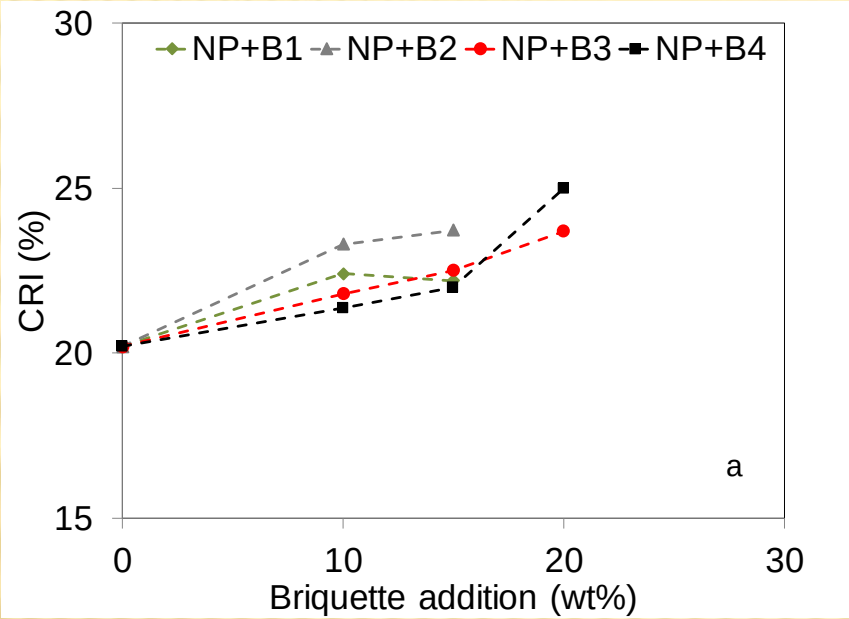
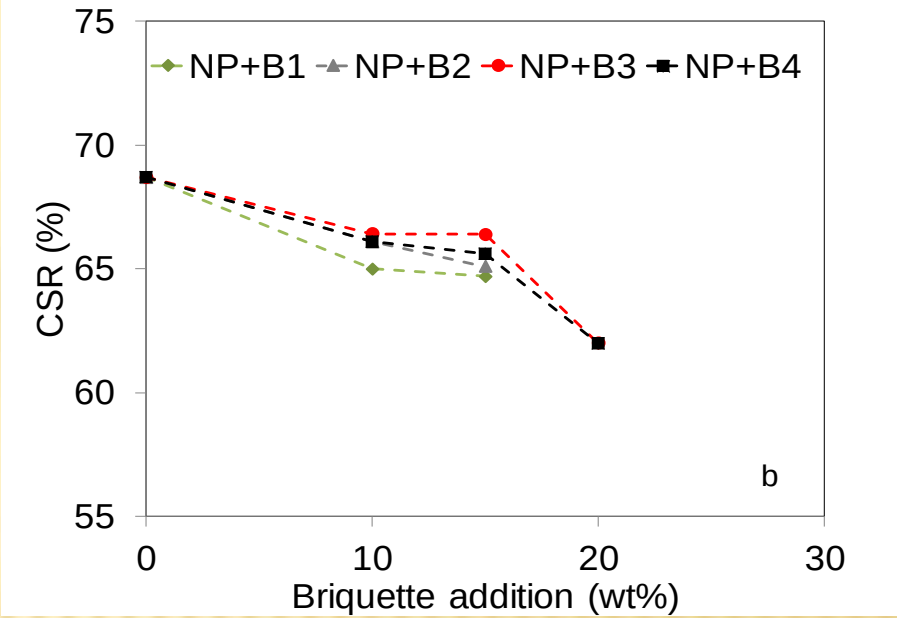


Coke Strength after Reaction index (CSR)



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

BRIQUETTES COMPOSITION

	B1	B2	B3	B4
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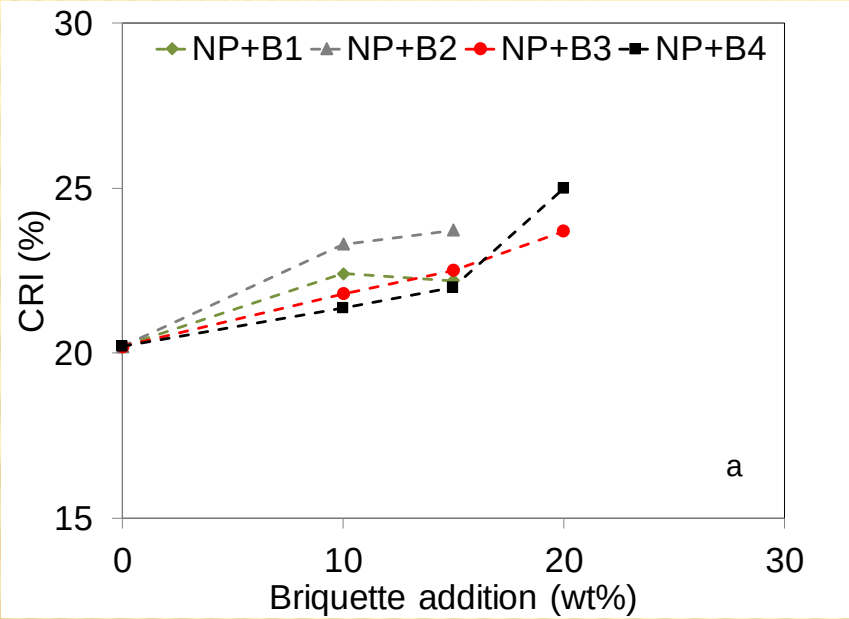
Results and discussion

Coke Reactivity Index (CRI)



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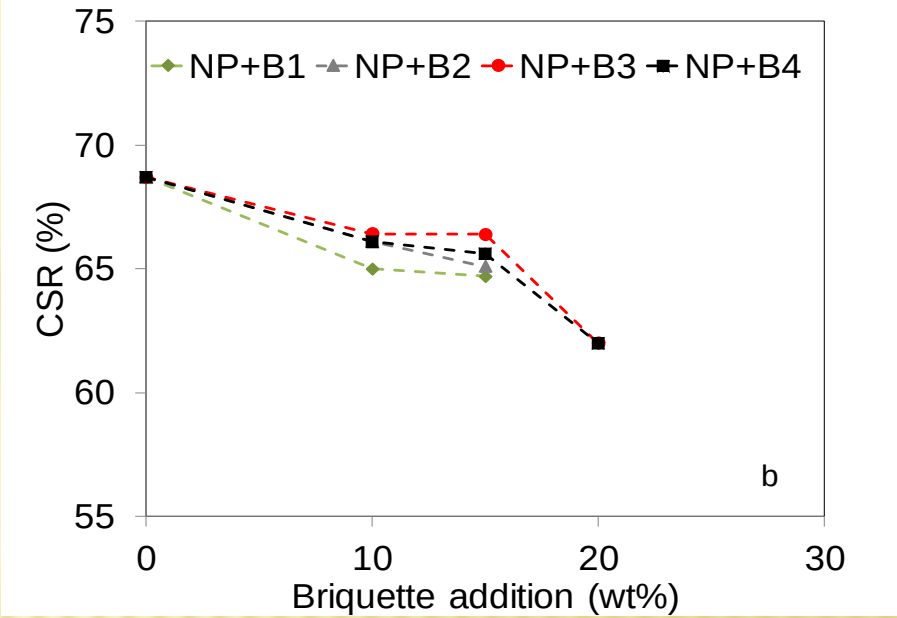

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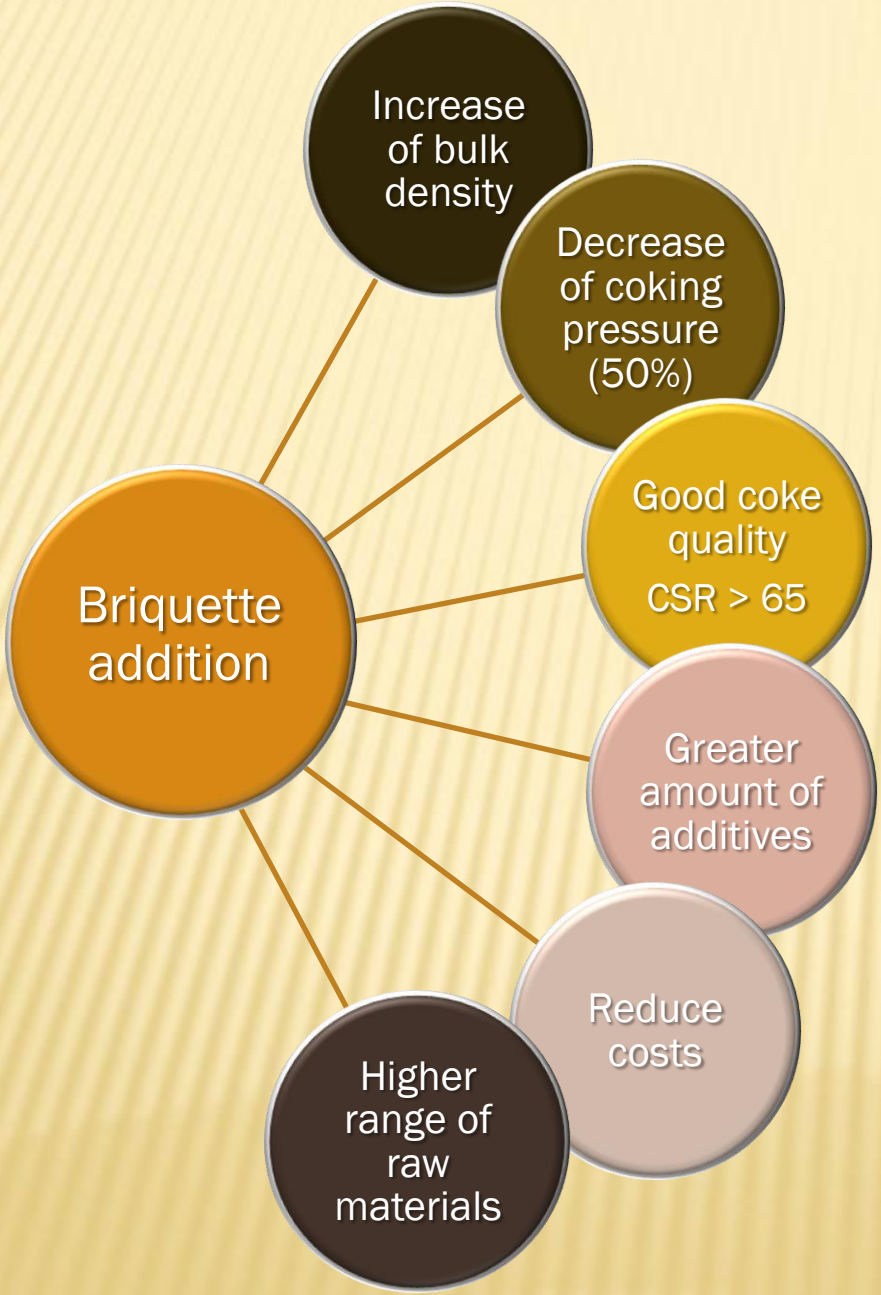
Comparing with previous studies

The results were similar to thous obtained with the direct addition of 3% of chesnut sawdust.

Conclusions



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