

K1-MET

Competence Center for Excellent Technologies in Advanced Metallurgical and Environmental Process Development

Programme: COMET - Competence Centers for Excellent Technologies

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COMET subproject, duration and type of project:

P. 1.4 - Dust Treatment, 07/2015 - 06/2019, multi firm

Briquetting of coking coal blends for use in a coking plant

Briquetting of coking coal blends for use in a coking plant was investigated in cooperation between voestalpine Stahl GmbH and Technical University Bergakademie Freiberg. The results of laboratory tests are a basis for the study on the scale-up of the partial briquetting to an existing coking plant. Through the partial briquetting it is possible to attain a higher productivity of the coking plant. Simultaneously the coking process is more flexible through the partial briquetting with respect to usable coal range and coke quality.



Motivation

Conventionally coking plants use a crushed coking coal blend to produce metallurgical coke. One possibility to raise the bulk density of coal in the coke oven chamber and thereby the productivity is the so called partial briquetting (Fig. 1).

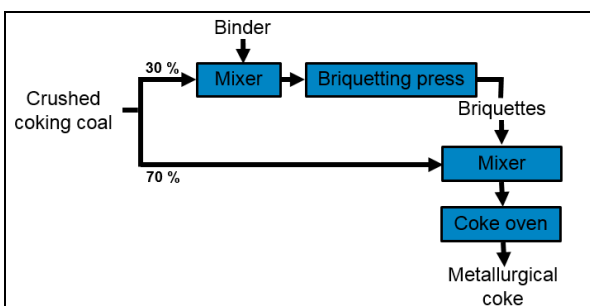


Fig. 1: Process of partial briquetting.

Partial briquetting means that a part (approx. 30 wt-%) of the conventionally used crushed coal blend is mixed with a binder. The mixture of coal and binder is then briquetted to briquettes. The briquettes are mixed with the remaining crushed coal (approx. 70 wt-%) and the mixture will be conventionally coked in the coke oven. The overall bulk density in the coke oven chamber increases using the briquettes which results in a productivity increase. Additionally, it is possible to increase the coke quality or the usable coal range using briquettes. Thus, the partial briquetting process has economic advantages in comparison to the conventional method.

The partial briquetting was used since 1971 in some Japanese coking plants. However, there are little information in literature about the requisite briquetting available. Furthermore, the requirements for coke quality, usable coal range, environmental regulations and the target of briquette use in coking plants had been changed since the seventies.



Laboratory tests and results

To implement partial briquetting in a coking plant, it is necessary to briquette the coking coal blend. To produce coking coal briquettes with sufficient strength a binder is required. The binder is an important economical factor due its investment costs. That's why it is important to use the binder efficiently. Important factors are the amount of binder, the possibility of a pre-treatment of coal (e. g. crushing and drying) and post-treatment of the briquettes (e. g. curing and hardening) as well as the influence of the binder on coking properties and coking process.

The briquetting tests in laboratory are done by using a hydraulic stamp press (Fig. 2).

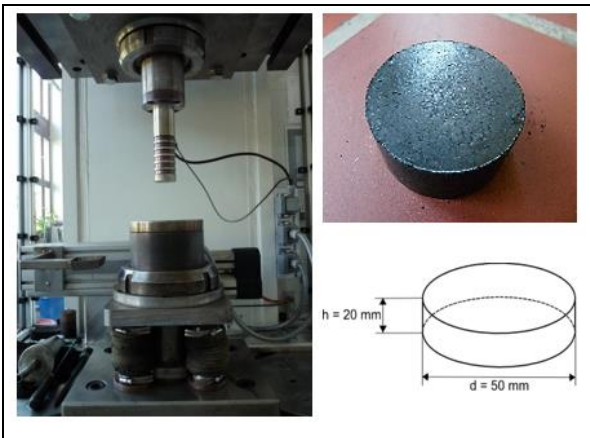


Fig. 2: Laboratory hydraulic stamp press and briquette.

Thus, it is possible to vary systematically material and briquetting parameter. The aim is to investigate the influence of these parameters on briquette strength (e. g. crushing and abrasion strength).

The briquetting of coking coal was successfully investigated with the binder crude tar, which is a by-product at the coking plant, cold swelling starch, which is generally often used as binder and molasses in combination with limestone, which is often used as binder for hard coal briquetting. However, these types of binder need an optimized water content of the coal. Using crude tar, the water content of coal has to be quite low (approx. 2 %) in comparison to the water content by using starch or molasses/limestone (approx. 5 %). The following coking tests showed that the briquettes with crude tar are suitable for coking (increased coke quality) while molasses with limestone briquettes decrease the coke quality.



Impact and effects

The results of the laboratory tests are basis for a further project study on scale-up of the laboratory briquetting to an existing coking plant. The results of the laboratory tests allow to dimension the required dryers, mixers and crushers.

Contact and information

K1-MET project 1.4 - Dust Treatment, Work Package 2: Raw material and residual processing

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