Blast furnace energy storage device

Can a blast furnace be used for internal energy recycling?
For this study, an exemplary blast furnace was selected with a slag production of 1770 t/d slag and respective specific annual heat loss of 1098 TJ/a. Depending on the yield of the heat recovery process, this heat potential could be interesting for internal energy recycling. Three possibilities are discussed later in this work.

What role does a blast furnace play in a steel plant?
The dominant role of the blast furnace in the process route is further brought out when viewed against the energy flows through the steel plant--wherein the off gas energy from the BF powers many of the steps in the value chain, as shown in Fig. 2

Is a blast furnace a promising innovation direction?
This field is also getting actively researched and should be considered promising innovation directionto support. The blast furnace process is particularly suitable to play a part in the energy transition of production of steel starting from iron ore.

Why should we focus on the blast furnace process?
Rationale for focusing on the blast furnace process: BF is the centre of energy useand hence the largest emission source in the steel value chain The world's iron ore resources are characterized by association with non-Fe gangue materials (silica SiO 2,alumina Al 2 O 3).

What is a blast furnace slag (BFS)?
The application of the concept is further shown in the example of blast furnace slag (BFS). The concept (Fig. 2) comprises 5 parts: (1) slag tundish, (2) primary heat exchanger (PHE), (3) secondary heat exchanger (SHE), (4) tertiary heat exchanger (THE), and (5) quaternary heat exchanger (QHE).

How much slag does a blast furnace produce?
Waste heat per industrial sector and temperature level for EU in 2015 [20]For this study,an exemplary blast furnace was selected with a slag production of 1770 t/d slagand respective specific annual heat loss of 1098 TJ/a.

Injection of pulverized coal into a blast furnace can be accelerated and improves production results. This article explains how to do it. ... Steelmaking industry is a large consumer of energy resources, where 70% of expensive ...

With the rapid development of economic and information technology, the challenges related to energy consumption and environmental pollution have recen...

A hot blast stove is a crucial piece of equipment used in blast furnace ironmaking, providing blast air heating. Typically, a blast furnace is equipped with three to four hot blast stoves, which continuously supply the blast

furnace with high-temperature hot air above 1000 °C [1, 2].The flue gas generated from the hot blast stove is a valuable waste heat resource in the ...

BFS (Blast Furnace Slag) constitutes the primary solid co-product of the steel manufacturing process. In the Blast Furnace-Basic Oxygen Furnace process, each ton of crude steel yields approximately 275 kg of BFS [1] om an energy perspective, BFS can be discharged at temperatures up to 1550 °C [2], containing a substantial amount of sensible heat resources.

In this paper, the performance evaluation method for the hot blast generating system is proposed and used to investigate the fuel gas preheating effect on the system"s ...

The checker-work is capable of withstanding elevated temperature as well as storing thermal energy. It provides large heat storage volume as well as a large surface area for heat transfer. Fig 4 Checker brickwork of a blast ...

Metallurgical slags constitute the largest by-product of the high temperature operations involved in the extraction and refining of metals. Slags are comparable to molten lava and are generally rich in silica (SiO 2), alumina (Al 2 O 3), and lime (CaO).Slag is formed from the refining reactions, remaining gangue of the ore, erosion of the furnace refractory, and the ...

Downloadable (with restrictions)! This paper proposes the use of heat storage devices and technologies to convert the unstable heat of gas generated by the iron and steel industry into stable heat, thus realizing the controllable and stable utilization of the gas waste heat. To this end, a 1.05 MW molten salt furnace energy storage experimental system was developed, utilizing a ...

In recent years, as an important technical means for comprehensive energy utilization and energy saving in the blast furnace ironmaking process, the blast furnace top gas residual pressure power generation technology (TRT) is an ...

Electric arc furnaces (EAFs) are used to make steel as an alternative to the energy-intensive blast furnace method [13]. Electrical-arc furnaces (EAFs) heat recycled scrap steel with electricity, resulting in a higher quality steel product. EAFs can reduce emissions by up to 75% when compared to the blast furnace method [8], [14]. Unfortunately ...

The charge material (sinter and pellets) flow and distribution behaviour in the blast furnace overall charging system was investigated using a simplified single lap charging system consisting of a weigh-hopper, conveyor belt, two furnace top material bins and dynamic centring device (DCD) as schematically shown in Fig. 1.

blast furnace with any of their remaining impurities going to the liquid slag. [2] 2. Observation The raw material for pig iron making are iron ore, coke & air. The material & energy balance of the blast furnace & stove. 2.1 Material balance across blast furnace: Table -1: Input Material Material Quantity Iron ore 23,750

kg/h Coke 9,500 kg/h

Per ton of steel 2.5-3.5 t of blast furnace gas is formed. The blast furnace gas still contains caloric value, due to the presence of CO and hydrogen, which is recovered by combustion for energy generation resulting in even higher CO 2 emissions. Then the iron from the BF, also called hot metal or pig iron, is converted to steel in the BOF.

As research on TES methods and heat storage and transfer media deepens, storing excess energy in storage media through the design of TES devices has great potential and value, especially in studying the thermal characteristics of MS storage devices. TES in molten salt furnaces (MSF) and solar energy storage in MS using concentrating solar ...

To solve the bottleneck of mismatch between intermittent slagging and waste heat continuous recovery, this paper discussed the liquid slag storage and temperature control ...

The device consists of a tubular heating furnace, an electronic balance with a measurement accuracy of 0.1 g for real-time recording of coke sample weight loss during the experiment, and an integrated control cabinet ...

Taking the BF ironmaking process of iron and steel enterprises in the Tangshan area of China as an example, the energy consumption per tonne of pig iron production is about 0.54 TCE, of which about 0.37-0.41 TCE is used for the heat demand of blast furnace production, and the remaining energy is converted into chemical energy and pressure ...

However, its physical structure is defined by the rapid used cooling techniques. Both the blast furnace feedstocks and cooling methodology ultimately determine the composition and attributes of the GGBFS produced (El ... making them potentially suitable for various applications such as paper-based electronics and energy storage devices, which ...

Utilizing a molten salt furnace to recover waste heat from blast furnace gas and storing it in high-temperature molten salt represents an innovative solution for steel waste heat recovery systems. In this study, a 1.05 MW spiral coil vertical molten salt furnace thermal energy storage system was constructed.

Due to its reliance on the blast furnace-basic oxygen furnace (BF-BOF) process, a coal-based process [], the steel industry has become one of the main contributors to global CO 2 emissions [] 2020, China"s steel industry ...

The latter is true for heat storage as well--however additional pathways for energy storage and avoiding an energy conversion step for captured heat to be used as heat ...

Within the ironmaking process, the air supply system emerges as the most energy-intensive component. Consequently, reducing the energy consumption of blast furnace air ...

Member of the Thermal Energy Storage Professional Committee of Zhongguancun Energy Storage Industry Technology Alliance ... & Zhu, X. (2021). Research status of centrifugal granulation, physical heat recovery and resource utilization of blast furnace slags. Journal of Analytical and Applied Pyrolysis, 157, 105220. ... Device and Method for ...

In 1979, the top combustion hot blast stoves were applied to the No. 2 blast furnace (with a volume of 1327 m 3) of China Capital Iron and Steel Company, which was the first time that the top combustion hot blast stoves were applied to blast furnaces over 1000 m 3. Top combustion hot blast stoves have been widely used in various blast furnaces ...

An innovative solution combining energy storage technology with the development of chemical energy from blast furnace gases is proposed using an molten salt furnace thermal ...

The Blast Furnace (BF) is a furnace used in the iron-making process. It uses iron ore and limestone as input, metallurgical coal (converted to coke) as a reducing agent, and creates pig iron (also known as crude iron or hot metal) as output. This pig iron can then be used in other furnaces, like the Basic Oxygen Furnace (BOF) or Electric Arc Furnace (EAF), to ...

This paper proposes the use of heat storage devices and technologies to convert the unstable heat of gas generated by the iron and steel industry into stable heat, thus realizing the controllable and stable utilization of the gas waste heat. To this end, a 1.05MW molten salt furnace energy storage experimental system was developed, utilizing a spiral coil type molten ...

In a few years, some "METIVEST" blast furnaces at once received an adaptive cooling system developed by the company (Blast Furnaces 2, 3, 4, and 5 of "MK Zaporizhstal" PJSC, Blast Furnace No. 4 "Ilyich Iron and Steel ...

The steel industry has become one of the major contributors to global CO 2 emissions due to its reliance on the blast furnace-basic oxygen furnace (BF-BOF) process, which is normally a coal-based process [1, 2].Currently, more than 70% of the world"s crude steel output is produced by BF-BOF process [2], which even reach more than 90% in China [3, 4]. ...

Specific energy consumption and CO 2 emissions are very different for each route, and contrasted in Table 1. The BF-BOF process is clearly the most energy intensive one because of the energy needs associated with iron ore reduction in the blast furnace and with the conditioning of the raw materials, iron ore agglomeration and coking processes.

Energy-saving production of high value-added foamed glass ceramic from blast furnace slag and hazardous wastes containing heavy metal ions. ... and energy storage devices (Wang et al., 2022). It is indicated that heavy metal pollution exists all over the country according to the statistical result of the soil and water

pollution situation in ...

Performance and economic analysis of a molten salt furnace thermal energy storage and peaking system coupled with thermal power units for iron and steel gas waste heat recovery. ... It can be utilized for electricity generation through recovery turbine devices installed at the top of blast furnaces [7]. However, ...

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