

# TRT GENERATOR BLAST FURNACE WIND DOWN EXCITATION LOSS



What is a top gas recovery turbine (TRT)? Top gas recovery turbine (TRT) is used to utilize high top pressure for power generation in modern blast furnaces. A failure occurred in the TRT system that led to interruption in operation and reduced power generation. A large increase in vibration of turbine discharge-side bearing was reported prior to the failure.



What is a TRT device in a high-pressure blast furnace? The TRT device is generally installed on the high-pressure blast furnace with a volume greater than or equal to 1000 m<sup>3</sup>. The design range of high-pressure blast furnace top pressure is 0.12~0.25 MPa (manometer pressure), the gas output is 100,000~700,000 m<sup>3</sup>/h, and the main pipe pressure after TRT is generally 0.01~0.02 MPa.



What are the advantages of TRT in a blast furnace? Although the pressure difference is low, the large gas volumes make the recovery economically feasible. The key technology of TRT is to secure the stable and high efficiency operation of the expansion turbine in dusty blast furnace condition, without hampering the BF operation.



What is top pressure recovery turbine unit of blast furnace ironmaking? The top pressure recovery turbine unit of blast furnace ironmaking is an energy-saving equipment for secondary energy recovery and also auxiliary equipment of a blast furnace system. In early blast furnaces with high pressure, there was no recovery of top gas pressure energy.



How to operate a TRT system in a blast furnace? No sophisticated technology is needed for operation and maintenance of TRT system and hence can easily be performed by BF operation and maintenance personnel. Only small amounts of water, nitrogen, etc. are required for operation, which can easily be covered by existing equipment for a blast furnace.

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What is the output power of TRT unit of No 1 blast furnace? The TRT unit of No. 1 blast furnace is a dry-type top pressure recovery turbine plant. The output power of TRT is in range from 5625 kW to 6100 kW. We performed an identification experiment for the TRT under closed loop. The data were collected from the experiment with 1 second sample period.



Top-Gas Recovery Turbine Unit (TRT) is the main auxiliary equipment of a blast furnace (BF). It generates electricity by scavenging pressure and/or thermal energy of the exhaust gas from BF without consuming any fuel. In this process, the energy recovery rate is close to 30%, so TRT is a decent energy-saving facility [1], [2], [3]. Blades and



As a new type of generator, an asynchronized high-voltage generator has the characteristics of an asynchronous generator and high voltage generator. The effect of the loss of an excitation fault for an asynchronized high-voltage generator and its fault diagnosis technique are still in the research stage. Firstly, a finite element model of the asynchronized high-voltage generator considering



common point with the generator that lost excitation (i.e. generators in one power plant). As was presented above in the text, if generator lost excitation it changes into significant consumer of reactive power. If this generator is not shut down, the adjacent generators start increasing the production of reactive power up to the limit when



Blast furnace top gas pressure recovery turbine unit is an energy recovery machine train, and its function is to guide gas into turbine by residual pressure of blast furnace top gas, then gas works due to expanding and the generator is driven to generate power. The TRT-unit can recover 25-30% energy of the blast furnace requirement.

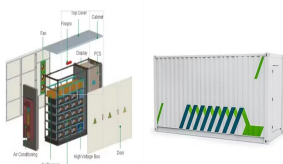
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Loss-Of-Excitation (LOE) condition of a generator may cause severe damages on both generator and the interconnected systems. This paper analyses the behaviours of different LOE protection schemes



Continuous innovation is an important core value of our company. Our company has a group of top technicians in the Boiler Parts, Glass Kiln Waste Heat Boiler, Steam Turbine Parts, Oil Gas Fired Boiler industry and uses the most advanced technology. As one of the leading Blast Furnace Top Gas Recovery Turbine Unit TRT manufacturers and suppliers in China, we ???



Components of Excitation System of a Synchronous Generator. Let's now discuss the individual components of the excitation system of a synchronous generator:. Exciter: The exciter is a small generator that supplies the initial field current to the rotor winding can be either a separate machine called a separate exciter or a self-excited machine called a self ???



2.1 Field Winding Short Circuit. A short circuit on field winding is the most common type of excitation system fault. In field winding short circuit the field voltage literally decline to zero as shown in Fig. 1a. But the field current remains high and it is able to swing when the generator lose synchronism due to self-exciting excitation system is used and field current ???



TRT system is a turbine-generator system based on the principle of generating electrical energy without combustion by utilizing the pressure energy of the gas, as an alternative to reducing the pressure by expanding the blast furnace gas, which is obtained as a by-product as a by-product in the blast furnace, with pressure reducing valves.

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As can be seen from Eqs. (9 and 10) and Fig. 2a, the terminal and internal voltage of the synchronous generator varies with generator field voltage reduction paratively, the q-axis voltage diminishes faster than the other parameters as shown in Fig. 1b and Eq. (). This indicates that the terminal parameters of the generator are composted by the condition of the gird.



Blast Furnace (BF) Gas Top pressure Recovery Turbine (TRT) unit is the most popular energy-saving equipment in iron making process. It is desired to control top pressure of BF precisely ???



power consumption of excitation loss generator considering system stability. The back-up protection has improved the excitation loss detection length to twice less for heavily loaded generators and 16% less for medium and lightly loaded generators. It has also differentiate system failures and excitation loss events successfully.



During the production of hot metal (HM) in the blast furnace, hot air blast is blown into the furnace through the tuyeres. O<sub>2</sub> contained within the hot air blast reacts with carbon (in the form of coke) to produce carbon di-Oxide ???



Gambar 2 Blast furnace dengan TRT dry method (NEDO, Jepang)  
 Gambar 3 Blast furnace dengan TRT wet method (NEDO, Jepang) 1.1.  
 Emisi CO<sub>2</sub> Efek positif yang ditimbulkan akibat dipasangnya TRT pada Blast furnace Plant selain penghematan energi listrik adalah juga penurunan emisi CO<sub>2</sub>. Perhitungan pengurangan emisi CO<sub>2</sub>

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Several loss of excitation protection in generator characteristics and the relay operating characteristic on an R-X diagram are illustrated in Fig. 11.19 (b). As soon on the excitation is lost, the equivalent generator impedance traces a curve from the first quadrant of R-X diagram into a region of the fourth quadrant.



Top pressure Recovery Turbine (TRT) is the energy-saving system that generates electric power using gas exhausted from blast furnaces. TRT greatly contributes to environmental conservation from the viewpoint of reducing CO<sub>2</sub> emissions. As the world's leading manufacturer of TRT, we offer highly reliable, durable, and power-generating products.



Download Citation | On Sep 5, 2022, R. Koster and others published Medium-Speed Wind Turbine Generators with HTS Excitation Winding | Find, read and cite all the research you need on ResearchGate



is concerned with hydro generator loss of excitation protection during normal operation and condenser operation. In addition, it also tests stability of the loss of sources which are directly fed from the generator terminals via a step-down transformer. Today, most excitation systems are ac or static types because of the fast



As shown in Figure 14, based on the works in [54][55] [56], an optimization model for a blast furnace iron-making procedure including blast furnace, TRT, blower and hot blast stove was established

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Loss of Field/Loss of Excitation is one of those hazards to which a generator may be subjected that may not necessarily involve a fault in the synchronous generator. This article covers situations



This system generates electric power by employing the heat and pressure of blast furnace top gas to drive a turbine generator. After the blast furnace gas is used in power generation, it is used as a fuel in iron and steel manufacturing processes. Blast furnace gas (BFG) has a pressure of 0.2-0.236 MPa (2-2.41 kg/cm<sup>2</sup>) and temperature of approx. 200 C at the furnace top. | Fri, ???



Blast furnace (BF) hydrogen-rich smelting has become an important way for low-carbon ironmaking. The coke gasification dissolution loss will be accelerated by H<sub>2</sub>O generated through hydrogen reduction, which is the fundamental reason for the limited injection rate of hydrogen-rich gas in BF. The gasification dissolution loss experiments of coke were ???



Journal of ELECTRICAL ENGINEERING 68(2017), NO 1 55 90? P e (pu) d 180? 0.2 0.6 1.0 1.4 1.8 Mechanical power P m U B = 100 % 80 % 60 % 40 % 0? d(0) Fig.1. Power ??? angle characteristic for



The ratio of TRT power output to volume of blast furnace, the influence of top gas pressure, temperature, working parameters of high pressure valves, pressure drop at VS nozzle on power output of

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the loss of excitation characteristics and phenomena presented here do not differ appreciably from those reported by Concordia,3 Temoshok and Mason some twenty years ago. Loss of Excitation - Tandem Compound Generators GENERATOR LOSS OF EXCITATION CHARACTERISTICS This section presents and discusses in some depth the loss of excitation



Several faults occurred in the TRT excitation system of blast furnace of Han-bao Co.,resulting in trip of the unit.The cause was that vibration of the generating set led to temporary open circuit ???



The protection systems of ship generators enable them to eliminate potential failures that pose a significant threat to the safety of the crew and the use of the ship. However, due to the fact that marine classification societies do not require the protection of generators against the loss of excitation, such protection is only used sporadically. This article presents ???



The Top-pressure Recovery Turbine (TRT) uses the blast furnace gas generated in the iron and steel manufacturing process to push the turbine which drives the generator to generate electricity, and the generated electric energy is supplied to in-plant equipment. In this paper, we investigate the aerodynamic force, centrifugal force, and maximum stress on the ???