Thyssensche Gas - und Wasserwerke
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THYSSEN-GALLOCSY (T.-G.) PROCESS

Applying Oxygen for Total Gasification Solid Fuel or Reduction of Ore in a Blast-Furnace.

The application of oxygen instead of air-blast for the gasification of solid fuel has become economically interesting, since the Linde-Froenkl-process made possible to produce it cheap, if a great quantity is wanted. Lignite has already been gasified on largest scale with oxygen in Winkler-gasproducers. Technical dificulties, especially unsufficient durability of refractory materials at the attained high temperatures, prevented till now similar large plants for non-baking bituminous coal.

The T.-G. process overcomes these difficulties with a trick of the proceeding, namely by the division of the extraordinary vehement combustion with oxygen into two steps, either of which can be easily controlled. In the first step a mixture of oxygen and steam is blown into an entrance-chamber of the producer and therein simultaneously such a quantity of any combustible matter is ignited, that the resulting gas mixture is heated up to the temperature, at which steam and carbonic acid are able to react quickly with hot carbon; in the second step this hot mixture is admitted to the solid fuel in the shaft of the producer with such contents of superfluous oxygen, that the heat attained by the combustion of carbon to carbon-monoxide exactly covers the demand of heat for the decomposition of steam and carbonic acid, the smalting of slack and if desired the reduction of ore. Any excess of temperature, which could destroy the refractory shaft lining is however avoided.

The industrial producer is similar to a blast-furnace. The lower part has several burners, each of which having an entrance-chamber for the above mentioned primary combustion. Preferably auxiliary-gas is ignited therein. If for this purpose no cheap gas or other combustible is available, a part of the produced gas is blown in. By such means no surplus of fuel is consumed, because the products of combustion are reduced in the second step to carbon-monoxide and hydrogen, consuming thereby exactly the heat gained by the combustion in the first step.

After having studied the process during several years in a semi-industrial producer, consuming daily 2 tons of bituminous coal, a producer of industrial scale with complete testing installation has been erected during the last war, using surplus oxygen of a synthetic ammonia plant and producing gas for synthesis of bensine. An existing shaft-furnace 12 m high of 28 cbm contents with an internal diameter of 1.35 m at the burners, was adapted to test the system. With the maximum available quantity of 29,800 nchm with 85.5% oxygen consequently 26,300 nchm pure oxygen a day, the producer consumed 47 t of metallurgical coke thus producing 105,400 nchm gas of 2,600 kcal inferior calorific value, that is 274×10^6 kcal/day.

A three day's test at the equal consumption, using only 4 of the 5 installed burners demonstrated, that the maximum output was not yet reached with the available quantity of oxygen. The producer was in operation during several months and has given full satisfaction in spite of many war events, by which sudden interruption often arrived mostly by destroying conduit pipes or wires, by cutting off steam, oxygen, auxiliary gas, electric current or cooling-water, even sometimes these all together. These repeated interruptions have hindered until now the gasification of a supplied stock of 500 t bituminous coal of the same quality, which had given best results in the small testing plant. The producer itself has never been essentially damaged and can start, if the synthetic ammonia plant is able to supply oxygen again.

Technical Advantages

Continuous working, simple construction, no change of valves during the run, no mechanical device or work except charing fuel and tapping of slack (and iron if desired). Application of approved proceedings and methods of practical operated gas-producers and blast-furnaces.

Highly increased output in comparison with existing plants, highest thermal efficiency on account of low nitrogen contents, total gasification without any loss of combustible in the slack.

Recovery of by-products of the low temperature-distillation type. Immediate adaptability of the output to the consumption places start from cold to full run in 12 hours.

Economical Advantages

Utilization of nearly all available and cheaper combustibles for total gasification, using as an example coal with high contents of ash or not suitable for coke-production, in case of need mixed with ashes in order to prevent caking in the shaft, instead of classified coke or producer-coal.

Cheaper gas for industrial heating and synthetic process.

Production of large quantities of low-temperature tar as by-product of an economical industry.

Suitable Sphere

Production of large quantities of gas, from 100,000 to 1,000,000 cbm/day in a single unit, with low contents of carbonic acid and nitrogen, consequently of high combustion temperature with a calorifique value of 2,700 to 3,100 kcal/ncbm according to the gasified combustible. Especially suitable for the following purpose of

Gas Production:

Heating-Gas for Industrial Plants.

Gas for synthesis of hydrocarbons, securing nearly the theoretical amount of liquid products. Since the waste gas of the synthesis is poor on nitrogen, it can be returned almost totally as auxiliary-gas to the burners. Methane and other not desired hydrocarbons become thereby regenerated to gas for the synthesis.

Gas for Hydration-Process, the change of carbon-monoxide with steam to hydrogen and carbonic acid being performed in the upper part of the shaft.

Gas for the supply of towns and industries, either indirectly by heating coke-ovens, setting free an equivalent quantity of distillation gas to be additionally supplied, or directly by enriching the calorific value by methane, formed by synthetic method from a part of the produced gas.

In Blast-Furnaces used for the reduction of iron ore. The process has the following advantages:

Diminution of the costs of plant and operation: Air heaters not needed, since preheating takes place in the entrance-chambers of the burners; smaller furnaces and blowers an account of low nitrogen contents.

Immediate adaptability to change the heat required by change of ore qualities or moisture or atmospheric conditions.

Increased output of existing blast-furnaces.

Saving of coke for the reduction of ore in consequence of the combustion of blast-furnace-gas and of the diminution of heat-losses.

Most economical use of furnace-gas, since its quality and quantity can be regulated and its use is multiplied on account of the low nitrogen contents.

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