84-128688/21 E36 H09 MAUG 08.10.82
MAN MASCH AUGSBURG-NURNB *EP -108-198-A
03.08.83-EP-107640 (+EP-107640) (16.05.84) C01b-03/36 C10j-03/46

Synthesis gas generation process - uses regenerative heat exchanger between gas reactor exhaust and recycled cold gas inlet

C84-054229 D/S: BE FR GB IT NL

CLAIMED PROCESS

A reactor for synthesis gas prod. is operated whereby the gas produced is purified and some at least is used e.g. for ore redn. and recycled to the reactor to be reduced by carbon. A regenerator is used for heat exchange between hot crude gas leaving the reactor and colder recycle gas entering it.

ADVANTAGE

The regenerator is more resistant than a multitubular heat exchanger to the severe local process conditions, i.e. high temp., corrosive gases and flue dust.

EMBODIMENT

In the regenerator, as used in blast furnace operation and glass mfr., heat is removed from hot gas into one compartment and stored there until released to the colder stream when the compartments are reversed.

PROCESS

A synthesis gas reactor is fed with coal dust, O_2 preheated to 400°C and recycle gas preheated to 1100 (max. 1200)°C. Synthesis gas (e.g. 31.40 vol.% H_2, 48.53% CO, 6.31% CO_2, 13.17% H_2O, 0.60% N_2) leave at 1270°C and 5.0 bar, and is cooled, first in the regenerator and then in a steam generator, to 300°C. The steam raised is used in a turbine driving a compressor for air liquefaction to produce the O_2 needed. The synthesis gas then passes to a filter, a high-temp. convertor and a washer for H_2S and CO_2, and is then compressed to 6 bar.

The compressed, purified synthesis gas is then heated to 920°C in an exhaust gas heater, fuelled by coal dust and crude synthesis gas. The gas comprising e.g. 54.72 vol.% H_2, 36.60% CO, 3.00% CO_2, 5.00% H_2O, 0.69% N_2) then enters the redn. reactor, for reaction with the ore. The gas leaving this reactor at 475°C (comprising e.g. 36.39 vol.% H_2, 23.28% CO, 15.82% CO_2, 22.96% H_2O, 0.72% CH_4, 0.82% N_2) is regenerated at 1100°C and recycled. (16pp 1493MHDwgNo0/1).

(G) ISR: No Search Report. EP-108198-A

E(31-A) H(9-C)

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84-095932/16 E36 H08 (E17) MAUG 00.00.82
MAN MASCH AUGSBURG-NURNB *DE 3237-334-A
08.10.82-DE-237334 (+DE-223702) (12.04.84) C01b-03/02

Synthesis gas generation - comprises regenerative heat exchange between hot synthesis gas leaving reactor and cold recycle gas entering reactor

C84-040778 Add to 3223702.

Parent patent 3223702, discloses a process for running a reactor for synthesis gas generation with subsequent gas processing for re-using a partial stream in the reactor. After gas processing, some reactor waste heat is returned to the recycle gas. A regenerative heat exchange takes place between the hot synthesis gas, leaving the reactor (16) e.g. at 1200-1300°C., and the cold recycle gas entering the reactor (16). The process contains a regenerator (18) for the heat-exchange between the recycle gas and the synthesis gas leaving the reactor (16).

ADVANTAGE

Use of a regenerator prevents long-term damage to the heat-exchanger material by the hot, corrosive synthesis gas and the entrained flue dust.

DETAILS

E(31-A, 31-N5) H(9-C)

Synthesis gas cooled in regenerator (18), e.g. to 750°C, is further cooled, e.g. to 300°C, in a heat-exchanger (19) coupled with a steam generator, freed from flue ash, subjected to a high temp. conversion and gas-scrubbing.

After heating, the synthesis gas is charged to a redn. reactor (17) for partial oxidn. On leaving (17), the gas is heated, e.g. to max. 1200°C, in regenerator (18) and returned to reactor (4) together with preheated O_2, e.g. at 400°C, and C-contg. fuel material, e.g. C dust. After gas-scrubbing, a partial stream of the synthesis gas can be subjected to a low temp. conversion and renewed gas-scrubbing and leaves the cycle as fresh gas for use in further processes, e.g. NH_3 generation, or as heating gas.

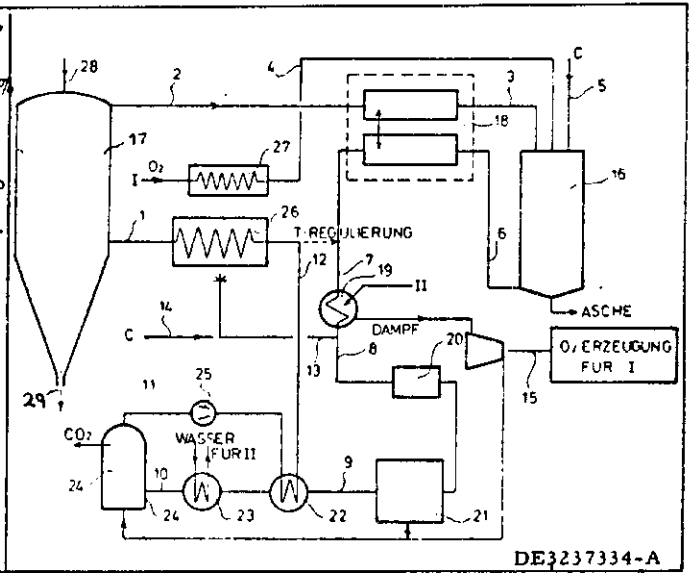
Some steam formed in steam generator (19) is used for O_2 prodn. in reactor (16). N_2, obtd. in O_2-generation, is used as scrubbing gas in CO_2-scrubbing. Recycle gas together with C dust is used for heating the gas stream entering the redn. reactor (17) and the O_2 stream for the reactor (16). The temp. of the synthesis gas stream leaving the regenerator (18) is adjusted by introducing cold redn. gas.

Synthesis gas leaving the reactor (16) contains esp., by

vol., 27-36% H_2, 44-52% CO, 5.6-6.9% CO_2, 11.6-14.7% H_2O, 0-0.1% CH_4 and 0.4-0.8% N_2. The redn. gas, produced by processing the synthesis gas, consists of 49-60% H_2, 33-40 % CO, 2.7-3.3% CO_2, 4.5-5.5% H_2O, 0-0.1% CH_4 and 0.6-0.8% N_2.

APPARATUS

The plant consists of a redn. reactor (17), a device (2) for returning the recycle gas from the redn. reactor (17) to a synthesis gas reactor (16) and reactor (16) for synthesis gas prodn. A device (5) is provided for adding the C-contg. fuel. O_2 is introduced through a device (4) to the mixt. of recycle gas and fuel. Devices (20,21,24,30) are provided for gas processing, (22,26,27) for gas heating, and (19,23) for steam generation with connected O_2 prodn.(16pp200MH DwgNo1 /2).



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