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Catalytic methanation of gas contg. carbon mon oxide, hydrogen - and corbon di:oxide in single reactor with flowing coolant, which is vaporised in outlet zone and superheated in hot spot zone

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Full Patentees: Kernforschungsanlage Julich GmbH; Rheinische Bvaunkohlenwerke AG.

Process for catalytic methanation of a synthesis gas contg. CO, CO_2 and H_2 in a solid catalyst bed, in which the gas passes successively through an inlet zone, a hot spot zone and an outlet zone with falling temp. so the coolant is converted by the heat liberated into superheated steam, is characterised in that the coolant at least in the outlet zone of the bed vaporises at boiling temp. and the vapour formed is superheated in the hot spot zone.

ADVANTAGE

The process is in one step, and enables the catalyst temp. even in the hot spot zone, to be restricted to values which do not harm catalyst stability. E.g. in one embodiment, the max. gas temp. is 650°C. The process is carried out simply in the optimum operating range for the catalyst. The complexity of multi-reactor systems with intercooling is avoided.

COOLING

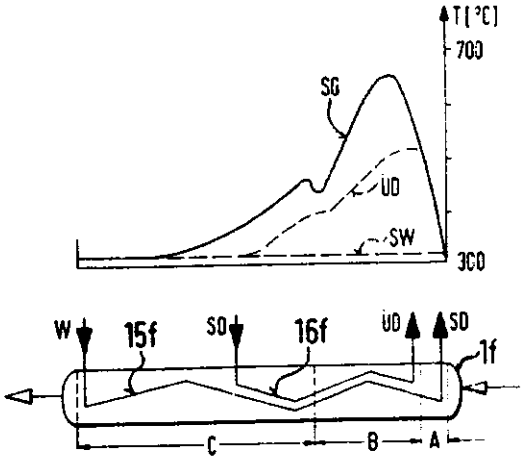
The coolant can be led into the outlet zone at a temp. below its boiling point and passed through the zone counter-currently to the synthesis gas. The steam formed in this zone can be superheated by leading it into the inlet zone and then passing it through inlet and hot spot zones cocurrently with the synthesis gas. Or the hot spot zone as well as the outlet zone can be used for the vaporisation of the coolant.

EMBODIMENT

The evaporator (15f) of the cooling system extends over the outlet zone (C), hot spot zone (B) and inlet zone (A) of the methanation reactor (1f). A separate superheater (16f) overlaps the evaporator (15f) in part of the outlet zone (C) and in the hot spot zone (B). The evaporating coolant (water) may surround the tubes contg. the methanation catalyst particles, while the superheater lines pass down inside these tubes. Steam from the evaporator (SD) is returned to the

reactor in the superheater (SD), both coolant streams running countercurrently to the reactant gas. Temp. curves for boiling water (SW) in the evaporator, superheated steam (UD) in the superheater, and process gas (SG) are shown. The max. process gas temp. is about 650°C.(32pp1492RKMHDwgNo. 8/8).

(G) ISR:- DE2834589; DE2705141; US-431751



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