

34860C/20 H04 (H06) METG 26.10.78  
 METALLGESELLSCHAFT AG \*DT 2846-693  
 26.10.78-DT-846693 (08.05.80) C07c-01/20 C07c-09/14 C07c-31/04

Gasoline hydrocarbon prodn. from synthesis gas - by methanol synthesis, conversion to hydrocarbon(s) and recycle of residual gases

Catalytic prodn. of gasoline hydrocarbons (I; C<sub>5</sub>+) from synthesis gas (consisting mainly of CO and H<sub>2</sub>) comprises first converting the gas to methanol. The entire prod. from methanol synthesis (MS) is then passed to (I) synthesis, the prod. cooled and (I) sepd. The residual gas (mainly C oxides, H<sub>2</sub>, CH<sub>4</sub> and small amts. of 2-4C hydrocarbons) is then recycled to MS with fresh synthesis gas.

Pref. the MS catalyst is held at 200-300°C by indirect cooling with boiling water at 15-90 bar, and the (I)-synthesis is at 250-400°C, maintained by indirect cooling. Pref. the catalyst for MS contains (atom. %) 40-60% Cu, 10-20% V and 20-50% Zn and/or Mn.

ADVANTAGES

The only recycle step necessary is from the exit of the (I) synthesis reactor to the inlet of the MS reactor.

DETAILS

A pref. MS catalyst comprises CuO, ZnO and V<sub>2</sub>O<sub>5</sub>,

H(4-E5).

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activated by redn. with H<sub>2</sub>. In the (I)-synthesis stage, temp. is maintained by cooling with high b.pt. liquids or salt melts; opt. some of the cooling water from MS can be used to cool the coolant from the (I)-synthesis stage with generation of steam at ≥ 100 bar. Synthesis gas is prod. conventionally and esp. contains > 88 vol.% C oxides plus H<sub>2</sub> with vol. ratio H<sub>2</sub>/(2CO + 3 CO<sub>2</sub>) < 1.

EXAMPLE

7.2 Nm<sup>3</sup>/hr. synthesis gas from steam-reforming of natural gas (6.4% CO<sub>2</sub>; 16.2% CO; 74.4% H<sub>2</sub>; 3.0% CH<sub>4</sub>) plus 28.8 Nm<sup>3</sup>/hr recycle gas (2.8% CO<sub>2</sub>; 2.4% CO; 79.8% H<sub>2</sub>; 12.6% CH<sub>4</sub>; 0.6% C<sub>2</sub>H<sub>6</sub>; 1.1% C<sub>3</sub>H<sub>8</sub>; 0.7% C<sub>4</sub>H<sub>10</sub>) were mixed, heated to 250°C and supplied at 58 bar to MS reactor (6). This contained 3 l catalyst and was cooled by boiling water. Vapour collector (7) was supplied with 2.7 kg water at 160°C to generate steam at 40 bar (taken off by line (11)). Reactor effluent (12) was heated to 375°C and passed over zeolite ZSM-5, cooled with salt melt. The vapour collector (17) was supplied with water at 250°C and steam at 100 bar was generated by heat exchange (line 21). Prod. from this stage was cooled to give 0.75 kg/hr (I) (39 wt.%

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paraffins; 15 wt.% naphthenes; 6 wt.% olefins; 40 wt.% aromatics) plus 1.52 kg/hr water. From separator (25), 31.3 m<sup>3</sup>/hr. residual gas was withdrawn; 28.8 m<sup>3</sup> recycled by line (2) and 2.5 m<sup>3</sup> removed.(10pp1251)

