

90-274604/36

H04 (H06)

COUL 11.08.89

COUNCIL SCIE IND RES

*US 4950-821-A

11.08.89-US-392348 (21.08.90) C01c-01

Conversion of natural gas to middle distillates - by converting to synthesis gas which is passed over three catalyst beds to obtain olefin(s) which are then oligomerised

C90-118732

H(4-E5, 4-F2E) N(1-C2, 2-D1, 3-F)

USE/ADVANTAGE

Products are of use as aviation, diesel or cooking fuels and illuminants for kerosene lamps. Middle distillates having low pour points are obtained with high selectivity without consumption of large quantities of hydrogen.

EMBODIMENT

Natural gas is heated in a coil preheater and then desulfurized with zinc oxide catalyst and then satd. with water vapour, mixed with further steam, preheated before passing to reformer furnace tubes, to obtain synthesis gas at 880°C, 275 psig. Heat is recovered and the cooled gas compressed in a three stage compressor to ca. 1360 psig before passing, together with recycle gas, to the first of the three catalyst beds, contained in an adiabatic reactor at 200-300°C. The product from this bed, containing significant quantities of methanol and water, is heat exchanged and passed to the second bed operating at 350-400°C. Effluent from the second bed, consisting of dimethyl ether and methanol, is passed to the third bed containing the silicate salt of lanthanum at 400-450°C.

Natural gas (I) is converted to middle distillates by:

- (a) converting (I) to synthesis gas (II) consisting essentially of CO and H₂;
- (b) contacting (II) with a series of three catalyst beds, comprising:
 - (A) a mixture of Cu, Zn and Al oxides in the first bed;
 - (B) an oxide of Al in the second bed; and
 - (C) the silicate salt of a rare earth metal in the third bed;
 thus forming olefinic hydrocarbons (III) mixed with an aq. phase;
- (c) separating (III) from the aq. phase and converting (III) into oligomers (IV) boiling in the middle distillate ranges by contact with a solid oligomerisation catalyst; and
- (d) converting (IV) into middle distillates by mixing with hydrogen and contacting with a hydrogenation catalyst.

US 4950821-A+

The product from the third bed comprises hydrocarbons, mainly ethylene, propylene and butenes, and water and the mixt. is separated, compressed to 800 psig and passed to a fixed bed adiabatic reactor operating at 100-300°C, 1-50 atmos., and containing an oligomerisation catalyst comprising silica and tungstic oxide, prepd. by the method of Indian Patent No. 160,756. The oligomers produced are stabilised by passing with hydrogen over a catalyst consisting of oxides of Ni and W or alumina, operating at 200-400°C, 20-50 atmos. (5pp1644SLDwgNo0/0).