

88-163285/24 E36 H04 BRPE 10.12.86
 BRITISH PETROLEUM PLC *EP -271-299-A
 10.12.86-GB-029497 (15.06.88) B01j-08/06 B01j-19 C01b-03/02
 Appts. and process, for prodn. of synthesis gas - has intermediate
 tube portion contg. reforming catalyst, with combustion zone contg.,
 ignition catalyst overlying reforming catalyst
 C88-072756 R(BE DE FR GB IT NL)

E(31-A1) H(4-C1, 4-E4)

thereby heat the first steam reforming reaction product;
 (d) an autothermal reforming zone defined by the shellside
 of the upper empty portion (iii) of the steam reforming tubes
 and the shell adapted to contain autothermal reforming catalyst
 to effect a second reforming of the first steam reforming
 reaction product and combustion product and thereby produce
 heat for heating by exchange the first steam reforming
 product in the portion (ii) of the steam reforming tubes;
 (e) a heat exchange zone defined by the shellside of the
 intermediate portion (ii) of the steam reforming tubes and the
 shell adapted to contain an inert solid material for supporting
 the autothermal reforming catalyst, for supporting the steam
 reforming tube bundle and for assisting heat transfer between
 the shellside and the tubeside thereby heating gases on the
 tubeside and cooling synthesis gas from the autothermal
 reforming zone; and
 (f) an outlet for synthesis gas exiting from the heat
 exchange zone.

ADVANTAGE

(a) By combining convective steam reforming and

Apparatus for the production of synthesis gas from a gaseous
 hydrocarbon feed comprises
 (a) an outer shell;
 (b) a first inlet at the bottom of the shell for the intro-
 duction of preheated gaseous hydrocarbon feed, steam and
 optionally CO₂, a steam reforming zone comprising a number of
 tubes together forming a bundle extending upwardly from a
 tubesheet communicating with the first inlet, the tubes on
 their tubeside defining three portions (i) a lower empty
 portion, (ii) an intermediate portion to contain reforming
 catalyst to effect a first steam reforming reaction, and (iii) an
 upper empty portion;
 (c) a combustion zone comprising an oxygen mixer or
 mixer/burner located in the topmost region of the shell
 communicating with a second inlet for combustion of hydro-
 carbon fed therethrough to produce hot combustion gases and

EP-271299-A*

autothermal reforming into a single shell in a manner which eliminates external transfer piping, costs and heat losses can be reduced;

(b) heat transfer is improved by the presence of packing on the shellside as well as on the tubeside of the tube bundle;

(c) true countercurrent heat transfer is achievable;

(d) a low pressure differential is achievable across the tube walls, particularly at the hot end of the tube bundle; and

(e) the solid inert material holds the tubes in position radially without significant restraining axial movement due to thermal expansion.

EMBODIMENTS

The outer shell is lined internally with a refractory material. The outer shell is provided with a cooling jacket. The combustion of hydrocarbons in the combustion zone is assisted by a layer of ignition catalyst on top of the autothermal reforming catalyst.

A portion of the inert solid material of the heat exchange zone is replaced by a CO shift conversion catalyst to release the exothermic heat of this reaction and thereby increase the temp. of the reactant gases in the steam reforming tube bundle. (8pp1684CGDwgNo0/2).

(E)ISR: No Search Report.