

84-076785/13 H09 L02 SHEL 16.09.82
 SHELL INT RES MIJ BV *DE 3333-187-A
 16.09.82-NL-003582 (22.03.84) C10j-03/46

Fly-ash in synthesis gas, e.g. from coal, is converted to slag - for safer disposal by recycling fly-ash agglomerates to gasifying reactor

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In the mfr. of synthesis gas by partial combustion of an ash-contg. fuel in a vertical reactor, the upflow of synthesis gas is contacted in the reactor with a downflow of cold fly-ash agglomerates. The agglomerates may comprise fly-ash and a binder and be injected to the reactor top or to the gas outlet line. The fuel may be coal, lignite, peat, wood, shale oil or tar sands oil.

ADVANTAGE

Combustion of residual fuel in the recycled fly-ash is completed. The ash material leaves the reactor base as a molten slag contg. less than 1% C, which, when cooled and dumped, does not cause heavy-metals pollution by water leaching, as dumped fly-ash does. Agglomeration of the fly-ash reduces re-entrainment. The slag may be used in road building.

DETAILS

Useful binders for the fly-ash agglomerates are water

glass, bitumen, tar and pitch. The agglomerate dia. is pref 2-30mm for injection to the reactor, or 10-40 mm for injection to the gas outlet line (downstream of the injection point for cold gas or water). Injection may be via a gas lock chamber or a special solids pump. Alternatively, a agglomerates may be formed by extruding a mixt. of fly-ash and bitumen into the reactor.

EMBODIMENT

The ground fuel, O₂ and H₂O are injected near the reactor base. Molten slag leaves by an outlet in the reactor base, and prod. gas, contg. fly-ash, leaves at the top. To the exit gas are injected (a) recycled synthesis gas as coolant, and then (b) fly-ash agglomerates. The gas then passes to a waste heat boiler; then to a venturi washer (I), for cooling with a recycled stream of water with suspended fly-ash; then to a cyclone (II), for removal of most of the fly-ash; and then to a water-wash tower (III), removing the remaining fly-ash, the aq. suspension being recycled to (I). Fly-ash from (II) is mixed with binder in an agglomerator, and the agglomerates, driven by recycled synthesis gas, are injected to the reactor outlet stream

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near the reactor as stream (b). The synthesis gas from (III) is cooled, sepd. and purified. (20pp1492RHDwgNo0/0).