(WO/2004/005428) COAL DRYING AND CHARRING PROCESS

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Applicants: **WESFARMERS PREMIER COAL LIMITED** [AU/AU]; 276 Leach Highway, Myaree WA 6154 (AU) *(All Except US)*.
KELLY, Barry, J. [AU/AU]; (AU) *(US Only)*.
MOFFAT, Grant [AU/AU]; (AU) *(US Only)*.

Inventors: **KELLY, Barry, J.**; (AU).
MOFFAT, Grant; (AU).

Agent: **WATERMARK PATENT & TRADEMARK ATTORNEYS**; Level 21, Allendale Square, 77 St Georges Terrace, Peth WA 6000 (AU) .

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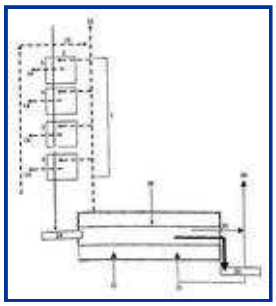
Title: COAL DRYING AND CHARRING PROCESS

Abstract: A process for the treatment of coal feed stream including the steps of a) removing moisture from the coal feed stream by heating to a first predetermined temperature and subsequently b) converting the volatile matter within the coal feed stream to a gas stream product by heating the coal feed stream to a second predetermined temperature c) collecting a gas product stream and d) recovering a substantially moisture free coal char product With volatile matter controlled and pre-determined by the process operator.



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Note: OCR Text

COAL DRYING AND CHARRING PROCESS FIELD OF THE INVENTION The present invention relates to a process for coal drying and charring.

The present invention particularly relates to the production of a coal char and recovery of volatile components of coal.

BACKGROUND OF THE INVENTION One of the major problems with most existing commercial char technologies is the cost-effective upgrading of coal by drying and charring of a coal feed stream. Upgrading of coal is undertaken to remove both the moisture content and the volatile matter content, and subsequently yielding a char product of a nominated specification, and an off gas.

Most existing processes are designed to either (predominantly) dry the coal only (e. g. multiple effect evaporation or Evans-Siemon Thermal Dewatering) and/or char the coal whereby both moisture and volatile matter are driven off together (e. g. Circulating Fluid Bed or Multiple Hearth technologies). Processes that employ the drying and removal of the volatile matter together typically produce gas of reduced quality due to the elevated moisture content. Further the coal char product may have some undesirable properties due to the process employed. Specifically the char product may be particularly friable and consequently prone to break into smaller pieces during transport.

Many attempts to solve the problem have been tried. Two of the more commercially successful solutions are Circulating Fluid Bed (CFB) and Multiple Hearth Furnaces (MHF).

The CFB process has major application in power generation and mineral processing (e. g. alumina calcination, etc.).

The CFB process can also be used to dry coal and/or produce a char product from coal feedstock. The drying of coal and the production of a char product can be done within one CFB, or the processes can be separated and carried-out in multiple CFB units. Either option results in a relatively expensive process (from a capital and operating cost perspective). The CFB process is carried out in an atmosphere where some air or oxygen is present. This results in some of the coal burning during the charring process.

The CFB requires a top size of less than 6-10 mm (depending upon the design configuration). The nature of the CFB fluidization process creates a significant shear/impact effect upon the fluidized particles, thereby resulting in a large breakdown in particle size, with a large quantity of fine material being produced.

The other major commercially available technology is the multiple hearth furnaces (MHF). This technology is available from a number of companies.

This process can also be used to dry coal and/or produce a char product from coal feedstock. The drying of coal and the production of a char product can be done within one MHF, or the processes can be separated and carried-out in multiple MHF units. As with the CFB units, either option results in a relatively expensive process (from a capital and operating cost perspective).

If the coal drying and charring is carried out within one MHF unit, it must be done either in an inert or an oxygen reduced atmosphere to (minimize) combustion of the char product. The process atmosphere can be achieved by operating fuel combustion burners in the lower hearths at a low fire condition (once the MHF has achieved operating temperature (s)), and a slight positive pressure (to minimise the ingress of air/oxygen). The moisture and volatile matter are removed together and the resultant off gas quality is relatively low in terms of the energy content.

The configuration of both the CFB and MHF processes is such that the off gas flowrates are usually substantial, requiring elaborate ductwork configurations.

The high entrained dust loadings in the off gases require significant clean-up in cyclones, electrostatic precipitators and/or bag-houses.

A further disadvantage of the commercial process solutions described is that the elements of the process streams are combined. For example, in the CFB and MHF units the heating fuel (e. g. natural gas or LPG) combustion gases used to dry and/or char the coal feedstock are in direct contact. This also contributes to the degradation of the off gas quality. Further, the product char must be separated from the fuel combustion gases.

Many of the above processes remove the water from the coal by subjecting the coal directly to high temperature. This direct application of excessive heat to the coal can cause the formation of steam or the gasification of volatile matter to form in the middle of coal particles causing the coal to fracture and the generation of combustion leading to oxidation of the char.

In another process the drying and destructive pyrolysis is conducted at above atmospheric pressure. This has the disadvantage of high capital and running costs as well as the complication and operation of such a plant.

Particularly operating a plant at elevated pressures on a continuous basis.

SUMMARY OF THE INVENTION With the above problems in view it is therefore an object of the present invention to provide an improved, controllable process of upgrading coal by the removal of moisture and volatile matter in such a

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THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS: 1. A continuous process for the treatment of a coal feed including the steps of: a) removing moisture from the coal feed stream by heating the said feed to a predetermined temperature; b) converting the volatile matter within the said feed to a gas stream product by indirectly heating the said feed to a second predetermined temperature; c) collecting a gas product stream and; d) recovering a char being substantially moisture free and having volatile matter at a pre-determined level.

2. The process of claim 1, wherein the moisture is removed from the coal in a series of steps prior to being heated to the second predetermined temperature.

3. The process of claim 1, wherein the first predetermined temperature is between 50°C and 150°C 4. The process of claim 1, wherein the first predetermined temperature is between 95°C and 105°C 5. The process of any one of the preceding claims, wherein the atmosphere of the dryer is reducing.

6. The process of any one of the preceding claims, wherein the second predetermined temperature is between 450°C and 850°C.

7. The process of any one of the preceding claims, wherein the second predetermined temperature is between 600°C and 850°C.

8. The process of any one of the preceding claims, wherein the second predetermined temperature is between 700°C and 815°C.

9. The process of any one of the preceding claims, wherein the process is run at substantially atmospheric pressure.

10. The process of any one of the preceding claims, wherein the coal char product has: Moisture 0-0.5% Ash 6-12% Volatile matter 0-20% Carbon Balance 11. The process of any one of the preceding claims, wherein the coal char product has: Moisture 0.1-3. 1 % Ash 8. 7-9.7% Volatile matter 1.6-9. 7% Carbon Balance 12. The process of any one of the preceding claims, wherein the moisture from the drying stage is collected.

13. A process of any one of the preceding claims where the volatile matter is collected separate from the moisture of the drying stage.

14. The process of any one of the preceding claims, wherein the gas product stream has sufficiently low particulate matter so as to allow the gas product stream to be feed to a gas turbine.

15. The process of producing coal char as herein before described with reference to the accompanying description and example.

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