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Water bath wetting device.

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Description

The present invention relates to an apparatus for wetting char and slag discharged under a coal gasification reactor to a water bath located below the reactor. Such an apparatus is known from US-4,425,254.

This known system for quenching slag from a coal gasification reactor typically employs an annular duct perforated with holes for injecting oil therefrom in a random manner to wet slag in a water bath below and sink the slag. The duct is provided with nozzles disposed in two rows in two locations one above the other along two inner circles at the surface of the annular duct. These nozzles are oriented at different angles to the surface of the water bath, these angles being common to the respective rows. The perforated ducts used in this known system have a fixed number of holes each with a fixed diameter and fixed angle of injection for a selected type of coal having specific wetting characteristics.

However, various operating conditions such as the type of coal being gasified can change the wetting characteristics of the unconverted carbon particles of slag and char and therefore the known system requires the replacement of the entire annular duct apparatus for another configuration.

It is an object of the present invention to provide an apparatus for wetting char and slag discharged under a coal gasification reactor to a water bath located below the reactor, which overcomes the above problem and the invention therefore provides a quenching system which is easily adjustable for the different wetting characteristics of different coal types producing characteristic amounts of char and slag would allow more flexibility to operate the coal gasification process under a wider range of operating conditions.

The apparatus according to the present invention therefore is characterized by an adjustable spray mechanism to suit coals of different wetting characteristics, said spray mechanism comprising a separate interchangeable annular conduit; means for installing the said conduit above the said water bath; the said conduit being provided with threaded orifices disposed about the annular conduit; the said orifices having selected replaceable nozzles screwed therein in a single row; and means for injecting water or water and a wetting agent or water and a coagulating agent through the circular conduit.

As already indicated in the above, the present invention relates in particular to an apparatus for wetting char and slag in a water bath below a coal gasification reactor, hereinafter referred to as a gasifier, wherein synthesis gas is generated.

Generation of synthesis gas occurs by partially combusting organic or carbonaceous fuel, such as coal, at relatively high temperatures in the range of 800 to 2000 °C and at a pressure range of from about 1 to 200 bar in the presence of oxygen or oxygen-containing gases in a gasifier. Steam, carbon monoxide, carbon dioxide and oxygen-containing gases including air, oxygen-enriched air, and oxygen are optionally diluted with nitrogen and/or other inert gases.

The combustion may be complete or partial, the object of the combustion process being the production of synthesis gas for power generations.

In the present invention, the ash which is the inorganic, combustible material is separated from the fuel during the combustion of the mineral fuel. Depending on the operating conditions under which combustion takes place, in particular the temperature and the quality of the fuel, the ash is mainly obtained in solid (hereinafter referred to as char) or liquid (hereinafter referred to as slag) condition or in a combination thereof. The char and slag exit the gasifier through a discharge opening, often referred to as a slag tap, and are generally collected in a water bath located below the slag tap of the reactor. In the water bath both char and slag are cooled, the slag is solidified, and char and slag are subsequently discharged.

It is recognized by those skilled in the art that varying operating conditions, such as the temperature, quality, and type of fuel, can cause changes in the char and slag wetting characteristics and quantity. As a result, the conditions for removal the char and slag change.

The present invention relates to wetting the char and slag in the water bath to facilitate separating the char and slag from water. A circular conduit containing water and possibly a wetting agent is provided with threaded ports for changing the nozzle configuration depending on the wetting characteristics of the char and slag.

An advantage of the present invention is the capability of adjusting the wetting of the char and slag in the water bath according to ascertained wetting characteristics of the char and slag.

Although the invention is described hereinafter primarily with reference to particulate coal, the apparatus according to the invention is also suitable for other catalytic or finely divided particulate reactive solids such as those which can be combusted as, for example, lignite, anthracite, bituminous brown coal, soot, petroleum coke and the like. Advantageously, the size of the solid carbonaceous fuel is such that about 90 percent by weight of the fuel has a particle size smaller than No. 6 mesh (A.S.T.M.).

The invention will now be described by way of example in more detail by reference to the accompanying drawings, in which:
Fig. 1 illustrates a sectional view of an apparatus of the invention; 

Fig. 2 illustrates an angle of impingement of a nozzle configuration, applied in the apparatus of Fig. 1; 

Fig. 3 is a cross-section of the nozzle configuration of Fig. 2; 

Fig. 4 is a cross-section of an alternate nozzle configuration; and 

Fig. 5 is a plan view of an advantageous embodiment of a nozzle configuration.

The drawings are of the process flow type in which auxiliary equipment, such as pumps, compressors, cleaning devices, etc. are not shown.

Referring to Fig. 1 an apparatus, such as a conduit 26, for wetting char and slag 11 in a water bath 15 generally includes a nozzle configuration (shown in detail in Fig. 2) to achieve adequate wetting of the char and slag 11. For reason of clarity no specific details of the gasifier have been shown. Factors considered in selecting the configuration include the diameter of the nozzle 12, the force of the water, including possibly a wetting agent injected through the conduit 26 to impinge on the char and slag 11 in the water bath 15, the angle of impingement 14, and the direction of the nozzle 12 with respect to the location of the discharge opening 16 (Fig. 1) of the water bath 15.

Referring to Fig. 3, the diameter of the nozzle 12 should be about 0.6-1.3 cm to yield a velocity of about 3 m per second which will force the char and slag particles to sink while preventing the nozzle 12 from plugging with solids contained in the water recycled to the conduit 26.

The angle of impingement 14 (Fig. 2) of the water and wetting agent from the nozzle 12 with respect to the surface 28 (Fig. 1) of the water bath 15 is advantageously about 30 degrees.

The nozzles 12 are directed inwardly (Fig. 1) towards the discharge opening 16 (Fig. 1) of the water bath 15 to facilitate separation and removal of the char and slag.

It is recognized that various combinations of the above configurations could be used such as nozzles of different diameters and forces, angles of impingement, etc.

The selected configuration is installed, advantageously by screwing each selected nozzle 12 into a threaded orifice 17 as shown in Fig. 3. The threaded orifice 17 provides the capability of replacing the nozzle 12 with another nozzle 18 having a smaller diameter and greater angle of impingement with respect to the horizontal as shown in Fig. 4 to yield a greater force for sinking the char and slag to the bottom of the water bath 15.

At least one fluid, advantageously water, which is recirculated from the water bath 15 and a wetting agent are supplied to the conduit 26 as shown in Fig. 5.

Jets of water are formed in a single row (Fig. 2) with nozzles directed inwardly at an angle of about 30 degrees from the horizontal. The char and slag particles 11 (Fig. 1) which have fallen into the water bath 15 are agitated to set the particles in motion one against the other. To facilitate coagulation, a coagulant can be added to the water supplied to the conduit 26. The char and slag particles agglomerate and sink to the bottom of the water bath 15 and are subsequently removed.

Various modifications of the present invention will become apparent to those skilled in the art from the foregoing description. Such modifications are intended to fall within the scope of the appended claims.

Claims

1. An apparatus for wetting char and slag discharged under a coal gasification reactor to a water bath located below the reactor, characterized by an adjustable spray mechanism to suit coals of different wetting characteristics, said spray mechanism comprising a separate interchangeable annular conduit; means for installing the said conduit above the said water bath; the said conduit being provided with threaded orifices disposed about the annular conduit; the said orifices having selected replaceable nozzles screwed therein in a single row; and means for injecting water or water and a wetting agent or water and a coagulating agent through the circular conduit.

2. The apparatus as claimed in claim 1 characterized in that the circular conduit is provided with differing angles of orifice inclination to vary the angle of spray inclination.

3. The apparatus as claimed in claims 1 or 2 characterized in that the said nozzles are directed inwardly to the water bath surface at an angle of about 30 degrees from the horizontal.

4. The apparatus as claimed in any one of claims 1-3 characterized in that the diameter of the nozzle is 0.6 - 1.3 cm.

Revendications

1. Un dispositif pour mouiller du noir de carbone et des scories déchargés sous un réacteur de gazéification de charbon dans un bain d'eau situé en dessous du réacteur, caractérisé par un mécanisme de pulvérisation réglable pour traiter des charbons ayant des caractéristiques de mouillage différentes, ledit mécanisme de
pulvérisation comprenant un conduit annulaire interchangeable séparé; des moyens pour l'installation dudit conduit au-dessus dudit bain d'eau ; ledit conduit étant pourvu d'orifices filetés disposés autour du conduit annulaire ; lesdits orifices recevant par vissage des buses remplaçables sélectionnées situées dans une seule rangée ; et des moyens pour injecter de l'eau ou bien de l'eau et un agent de mouillage ou bien de l'eau et un agent de coagulation par l'intermédiaire du conduit circulaire.

2. Le dispositif tel que revendiqué dans la revendication 1, caractérisé en ce que le conduit circulaire est pourvu de différents angles d'inclinaison d'orifices pour faire varier l'angle d'inclinaison de pulvérisation.

3. Le dispositif tel que revendiqué dans la revendication 1 ou 2, caractérisé en ce que lesdites buses sont dirigées vers l'intérieur en direction de la surface du bain d'eau selon un angle d'environ 30 degrés par rapport à l'horizontale.

4. Le dispositif tel que revendiqué dans une quelconque des revendications 1 à 3, caractérisé en ce que le diamètre des buses est compris entre 0,6 et 1,3 cm.

Patentansprüche

1. Vorrichtung zum Benetzen von Asche und Schlacke, die unter einem Kohlevergasungsreaktor zu einem unter dem Reaktor angesonderten Wasserbad abgegeben wird, gekennzeichnet durch einen einstellbaren Sprühmechanismus zur Anpassung an Kohlen von unterschiedlichen Benetzungscharakteristiken, wobei der Sprühmechanismus eine getrennte austauschbare ringförmige Leitung, eine Einrichtung zum Installieren der Leitung oberhalb des Wasserbades, wobei die Leitung mit Gewindeöffnungen versehen ist, die rund um die ringförmige Leitung angeordnet sind und in die ausgewählte austauschbare Düsen in einer einzigen Reihe eingeschraubt sind, und eine Einrichtung zum Einspritzen von Wasser oder von Wasser und einem Benetzungsmittel oder von Wasser und einem Kogulierungsmittel über die kreisförmige Leitung aufweist.

2. Vorrichtung nach Anspruch 1, dadurch gekennzeichnet, daß die kreisförmige Leitung mit differierenden Winkeln der Neigung der Öffnungen versehen ist, um den Winkel der Neigung des Sprühstrahles zu ändern.

3. Vorrichtung nach Anspruch 1 oder 2, dadurch gekennzeichnet, daß die Düsen zu der Wasserbadoberfläche in einem Winkel von etwa 30° von der Horizontalen nach innen gerichtet sind.

4. Vorrichtung nach irgendeinem der Ansprüche 1 bis 3, dadurch gekennzeichnet, daß der Durchmesser der Düse 0,6 bis 1,3 cm beträgt.