ABSTRACT

Hot briquettes made from carbonaceous materials are cooled in at least two stages using water vapor as the coolant in the first stage and boiling water as the coolant in the subsequent stage. Water vapor for the first stage is generated by immersing the briquettes leaving the first stage in a water bath whereby the resulting water vapor rises into the first cooling stage.

Apparatus for carrying out the process includes shaft cooler means having continuously operating discharge means, water bath means containing conveyor means and chute means adjacent the conveyor means having spray cooling means associated therewith.

2 Claims, 1 Drawing Figure
PROCESS FOR COOLING HOT BRIQUETTES

BACKGROUND

This invention relates to a process of cooling hot briquettes made of carbonaceous materials in at least two stages, using water vapor in the first stage and water in the subsequent stage.

The invention is particularly applicable to the cooling of briquettes which contain no binder and which consist of or contain coal and are produced by pressing at temperatures of about 400°-540° C. Such hot briquettes may be made, for example, in a process in which fine-grained coke heated to temperatures of 600°-900° C. is mixed with dried caking coal, which can be preheated, if desired, whereby a mixture having a temperature of 400°-540° C. is formed, and the mixture is briquetted by a roll press or an extruder, without intermediate cooling. The hot binderless briquettes, which are usually called hot briquettes, must then be cooled with exclusion of air or in an atmosphere of inert gas or water vapor so that a spontaneous ignition of the briquettes will be avoided. The rate at which the briquettes are cooled must not be excessively high, particularly during the initial cooling period immediately after the briquettes have left the press, if hot briquettes are to be produced which have a very high quality and a very high mechanical strength.

A process is already known in which hot briquettes are cooled in two stages with water vapor in the first stage and with cold water in the second stage. The briquettes are cooled in the first stage from about 390° down to 130° C. at a cooling rate of about 20° C. per minute and in the second stage from about 130° down to 50° C. at a cooling rate of about 8° C. per minute. However, these temperature ranges and the cooling rates maintained therein do not lead to optimum results in the cooling of hot briquettes.

Another process is known in which the hot briquettes must be maintained at the pressing temperature or at a lower temperature for a predetermined period of time, which is calculated by a formula dependent on the temperature of the briquettes and is at least 30 minutes. Besides, the briquettes should be treated while at rest in two shafts, which are filled in alternation and through which no gases or vapors are passed.

SUMMARY

It is an object of the present invention to provide a process for the cooling of hot briquettes with a minimum expenditure and the best results as regards the quality and mechanical strength of the hot briquettes. Besides, the tar fumes which are liberated from the hot briquettes can be collected and disposed of in a very simple manner.

This object is accomplished according to the invention by cooling hot briquettes in a first stage from about 500° C. down to a temperature between about 400° and 450° C. with water vapor flowing countercurrent to the hot briquettes which descend continuously in a shaft cooler. This water vapor is generated in a simple manner by immersing the hot briquettes which leave the first stage in a water bath which assumes a temperature of about 100° C. The heat which is transferred by the hot briquettes to the water bath results in an evaporation of water. The resulting water vapor flows upwardly into the shaft cooler and enables an initially mild cooling of the hot briquettes and a removal of the tar fumes which are evolved.

Apparatus of the invention includes shaft cooler means having continuously operating discharge means, water bath means containing conveyor means, and chute means adjacent said conveyor means having spray cooling means associated therewith.

DESCRIPTION OF THE DRAWING

The present invention will be more fully understood from the following description, taken in conjunction with the accompanying drawing which is a schematic drawing of the apparatus of the invention suitable for carrying out the process thereof.

DESCRIPTION

The hot briquettes which leave the press are charged to a shaft cooler, by means of interposed conveyors, if desired, and travel through the shaft cooler from top to bottom in a column of bulk material. The briquettes are discharged at a controlled rate by discharge valve means disposed at the lower end of the shaft cooler. The residence time of the briquettes in the first stage should be between about 20 and 80 minutes. The briquettes then fall on a chain conveyor, which is positioned in a water bath. The immersion of the hot briquettes in the enclosed water bath results in a formation of water vapor, which rises in the shaft cooler countercurrent to the hot briquettes.

By the countercurrent, the hot briquettes are cooled by about 80° C. whereas the water vapor is heated approximately to the temperature at which the hot briquettes enter the shaft cooler.

As a result of the careful cooling of the hot briquettes in the shaft cooler, the hot briquettes can withstand the sudden cooling in the water bath without a formation of stress cracks. When the thermal shock must be reduced, the chain conveyor in the water bath may be operated at a higher speed and the water bath may be maintained on a lower level so that the hot briquettes are immersed only for a very short time of, for example, 5 to 20 seconds. As a result, the briquettes are less cooled and are maintained at temperatures of 200° C. and more so that less water vapor is formed and the hot briquettes are even more gently cooled in the shaft cooler.

Referring now to the drawing, apparatus of the invention is shown to include a shaft cooler 2 for cooling the hot briquettes in a first stage and a water bath 4 for a continued cooling of the briquettes in a second stage. The hot briquettes coming from the press are charged by a feeder 1 into the shaft cooler 2 from the top. As a closely-packed bulk charge, they slowly descend in the shaft cooler and are discharged at a controlled rate by continuously operating discharge valve means 3. The briquettes then fall into the water bath 4 and are discharged from the same by a chain conveyor 5. Thereafter, they move down a chute 7 downstream of conveyor 5 on which they are finally cooled by means of shower heads 6 of the spray cooling means.

When the hot briquettes enter the water bath 4, water vapors form water vapor, which rises through the shaft cooler countercurrent to the briquettes. The water vapor escaping through the pipe 8 is fed, for example, to a combustion chamber 9 because the vapor contains a considerable amount of tar fumes.
The evaporated water is continually replaced from a water source through conduit 10.

What is claimed is:

1. Process for cooling hot briquettes made of carbonaceous materials in at least two stages using water vapor in the first stage and boiling water in the subsequent stage which comprises generating the water vapor required to cool the hot briquettes in the first cooling stage by immersing the briquettes leaving the first stage in a water bath whereby the resulting water vapor rises into the first cooling stage, said hot briquettes being treated in the first stage for about 20–80 minutes.

2. Process of claim 1 wherein the hot briquettes are immersed in the water bath in the second stage for a short time and are at a temperature of or above 200°C. when leaving said water bath.