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PROCESS FOR SIMULTANEOUS SOLVENT RECOVERY FROM AND GRANULATION OF ASPHALTS

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ABSTRACT OF THE DISCLOSURE

A process for simultaneously separating solvent and asphalt from a solvent deasphalting process and solidifying and comminuting this asphalt by spraying hot liquefied asphalt and solvent into a chamber wherein the temperature and pressure are maintained at a level at which the solvent substantially vaporizes, and the asphalt, thus freed of the solvent, solidifies as small granules. Preferred temperatures are 0°–225° F.; preferred pressures are 0–10 p.s.i.g. The products, asphalt and solvent, are removed from the spray chamber, the asphalt is burned, and the solvent is reused in the solvent deasphalting process.

BACKGROUND OF THE INVENTION

This invention relates to a process for recovering solvent for reuse in a solvent deasphalting process, and also for producing solid, granulated asphalt.

In a conventional solvent deasphalting process, a raffinate is produced which comprises asphalt and some solvent, although the bulk of the solvent is removed with the extract phase. It is of course desirable to recover the solvent from this raffinate for reuse in the deasphalting process. In the past this has been done by heating the raffinate to a temperature of about 400° F. or greater and then flashing it at a low pressure to separate the volatile solvent from the asphalt. The hot, liquefied asphalt is then recovered. Such processes are disclosed in many patents, typical of which is U.S. Patent 2,943,050.

In many cases there is little need for the recovered hot asphalt as a product in its own right. Often it is more desirable to burn the asphalt as fuel or in the presence of a controlled amount of oxygen in a partial oxidation reactor, to produce hydrogen to be supplied to the many hydrogen-consuming processes in a refinery, such as hydrocracking. It is in this context that a serious problem has arisen. It has been found that hot liquefied asphalt, of the type produced by flashing solvent deasphalting raffinates, cannot easily or economically be transported from the flashing and recovery vessel to the combustion vessel unless the two units are in very close proximity. This is because the asphalt, while being pumped through pipes from one unit to the other, cools quite rapidly and solidifies in the pipeline. Heretofore this problem has been partially solved by using steam jacketing to keep the asphalt in the pipelines hot and liquefied. This, however, is an expensive procedure and works satisfactorily only when the asphalt is to be transported over relatively short distances.

It has been known for some time that asphalt can be transported over long distances in a water slurry, if the asphalt is cooled and crushed to small particles called "crumbs," before it is dispersed in the water. If the asphalt crumbs are small enough, and the proper proportion of asphalt to water in a "crumb slurry" is maintained, the crumb slurry may be injected directly into furnaces and burned as fuel without the necessity of separating the asphalt and water. Such a slurry may also be burned in a partial oxidation process to produce hydrogen.

In the past, however, before such a slurry could be formed, it has been necessary to separate solvent from the hot liquid asphalt, and then cool and crush the asphalt in subsequent separate steps. Such a three-step process is obviously expensive and relatively inefficient in its usage of process equipment. It would be very advantageous if a process were available whereby the asphalt and solvent could be separated while simultaneously cooling and comminuting the asphalt. The process of this invention is such a process.

SUMMARY OF THE INVENTION

This invention is a process for simultaneously separating solvent and asphalt from a solvent deasphalting process and solidifying and comminuting said asphalt, which comprises spraying hot liquefied asphalt and solvent into a chamber wherein the temperature and pressure are maintained at a level at which the solvent substantially vaporizes, and the asphalt, thus freed of the solvent, solidifies as small granules. The products so formed, i.e., the solvent and the asphalt granules, are withdrawn from the spray chamber.

DETAILED DESCRIPTION OF THE INVENTION

The process of this invention is best illustrated by an example. A typical liquid raffinate from a solvent deasphalting process, containing 100,000 lbs./hr. of asphalt and 52,000 lbs./hr. of mixed propane-butane solvent, maintained at a temperature of 250° F. and a pressure of 350 p.s.i.g., is sprayed into a chamber which is maintained at 150° F. and essentially atmospheric pressure (2 p.s.i.g.). The raffinate rapidly cools as it is sprayed into the low pressure, low temperature chamber, and the solvent begins to vaporize as the asphalt begins to solidify. The spraying of the raffinate through nozzles, screens, spargers, or other spray apparatus causes a high degree of comminution of the asphalt. Additional comminution occurs when the solvent contained within cooling asphalt granules vaporizes and the expanding vapor breaks the granules apart. All these effects occur, of course, within a very small time interval. The vaporized solvent is withdrawn from the vapor space of the chamber, while the fine particles of cool, solid asphalt settle to the bottom of the chamber from which they are removed and recovered. The solid asphalt "crumbs," as the finely-divided asphalt particles are termed, may, if desired, be dispersed in water to make a burnable slurry or as a means of transporting the asphalt over long distances. The correct proportions of water and asphalt, and the optimum crumb size for a given use are easily determined within limits known to those skilled in the art.

This process of this invention differs from the conventional flashing process for separating solvent from asphalt in a solvent deasphalting process raffinate in that in this process the product of the separation step is a cooled, solid, comminuted asphalt rather than a hot liquid asphalt. The former is immediately ready for slurrying or for some other desired treatment, while the latter must still be cooled and crushed in additional steps before it can be further treated.

The temperature maintained within the spray chamber may be any convenient temperature which is above the temperature at which the solvent vaporizes substantially completely but below the temperature at which the asphalt liquefies. In general this temperature range will be from about 0° F. to about 225° F., although temperatures outside this range may be used in unusual situations where the solvent is very low-boiling and highly volatile or where the asphalt has a very high melting point. The actual operating temperature will usually depend on the solvent used. Where the solvent (e.g., propane) is light and relatively volatile, the temperature can be kept low,

while if the solvent (e.g., hexane) is less volatile, the temperature must be maintained at a higher level to insure essentially complete solvent-asphalt separation.

The pressure maintained in the spray chamber may be any convenient pressure at which adequate vaporization of the solvent takes place at the temperature being maintained. The optimum pressure for a given operation can easily be determined by one skilled in the art. Ordinarily a pressure of approximately atmospheric (e.g., 0–10 p.s.i.g.) will be satisfactory when the light paraffins are being used as solvents.

The solvent used in this process may be any conventional deasphalting solvent. Particularly preferred are the light (C_2–C_6) paraffins or mixtures thereof. However, the solvent must be sufficiently volatile so that it will vaporize sufficiently to permit good solvent-asphalt separation at temperatures below the melting point of the asphalt. Whether or not a given solvent will be satisfactory at the temperature and pressure to be used may be determined from any conventional vapor pressure chart.

The size of the asphalt crumbs produced in this process can be varied by varying the type of spray apparatus used, to get a finer or coarser spray of raffinate, or by varying the concentration of asphalt in the raffinate. Also, at higher differentials of temperature and pressure between the raffinate stream and the spray chamber, the vaporization of the solvent will be more abrupt and violent and the asphalt granules will be more highly fractured.

The solid comminuted asphalt may be removed from the spray chamber by any suitable solids handling means, such as, for example, a screw conveyor, or may be flushed out with water. It may also be picked up by an air or gas stream and transported in a pneumatic conveying system. The solvent, after removal as vapor from the spray vessel, may be condensed and returned to the solvent deasphalting process for reuse.

It is apparent that many widely different embodiments of this invention may be made without departing from the scope and spirit thereof; and, therefore, it is not intended to be limited except as indicated in the appended claims.

I claim:

1. A process for simultaneously separating solvent and asphalt from a solvent deasphalting process and solidifying and comminuting said asphalt, which comprises: spraying the raffinate stream from said solvent deasphalting process, said stream comprising hot liquefied asphalt and solvent, into a chamber wherein the temperature and pressure are maintained at a level at which the solvent substantially vaporizes and the asphalt, thus freed of the solvent, solidifies as small granules; maintaining the pressure in said chamber below the vapor pressure of said solvent; and removing said granules and solvent from said chamber.

2. The process of claim **1** wherein said solvent is a C_2–C_6 paraffin.

3. The process of claim **1** wherein the pressure is maintained in the range of 0–10 p.s.i.g.

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