APPARATUS FOR THE HOMOGENIZATION OF HEAVY OIL OR RESIN OR BITUMEN BEFORE THE PREPARATION OF THE ASPHALT MIX

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Asphalt mix is a material which is used large worldwide for flexible pavements on roads, parking lots, bicycle trails, pavements, airport runways, and others. The asphalt mix is compounded from sorted mineral aggregates, filler and a viscous adhesive (heavy oil, resin, or bitumen), in good proportion as to result in stable and resilient structure for a long period of time.

To obtain better properties of the adhesive in the future asphalt concrete, it is needed an homogenization process to achieve the highest results.

For the preparation of the asphalt mix, worldwide are mainly used heavy oil, resin or bitumen as the adhesives.

Heavy oil

As defined by the U.S. Geological Survey (USGS), heavy oil is a type of crude oil characterized by an asphaltic, dense, viscous nature and its asphaltene content. It also contains impurities such as waxes and carbon residue that must be removed before being refined.

The formation of heavy oil and bitumen, like other forms of petroleum, originated with plant life millions of years ago. When the plants and small organisms (plankton) that fed on them died off, the sediments containing their remains were buried at the bottom of inland seas. In a highly simplified explanation, over time, the heat and pressure converted the carbohydrates into hydrocarbons.

Oil formation usually takes place in very fine-grained sedimentary rocks known as black shales. After oil is formed, continued pressure from overlying rocks causes it

to migrate through permeable rock layers until it becomes trapped in reservoirs of porous rocks such as sandstone or limestone.

According to World Resources Institute, concentrations of remarkable quantities of heavy oil and oil sands are found in Canada and Venezuela. The U.S. Energy Information Administration (EIA) reported in 2001 that the largest reserves of heavy crude oil in the world were located north of the Orinoco river 270-mile long by 40-mile wide Orinoco Belt in eastern Venezuela. The Orinoco Belt in Venezuela is sometimes described as oil sands, but these deposits are non-bituminous, falling instead into the category of heavy or extra-heavy oil due to their lower viscosity. Natural bitumen and extra-heavy oil differ in the degree by which they have been degraded from the original conventional oils by bacteria. Thirty or more countries are known to have reserves.

Heavy oil is asphaltic and contains asphaltenes and resins. It is "heavy" (dense and viscous) due to the high ratio of aromatics and naphthenes to linear alkanes and high amounts of NSO's (nitrogen, sulfur, oxygen and heavy metals). Heavy oil has a higher percentage of compounds with over 60 carbon atoms and hence a high boiling point and molecular weight.

The "heaviness" of heavy oil is primarily the result of a relatively high proportion of a mixed bag of complex, high molecular weight, non-paraffinic compounds and a low proportion of volatile, low molecular weight compounds. Heavy oils typically contain very little paraffin and may or may not contain high levels of asphaltenes.

Resin

Resin is a solid or highly viscous substance of plant or synthetic origin that is typically convertible into polymers. Resins are usually mixtures of organic compounds. Most plant resins are composed of terpenes. Specific components are alpha-pinene, beta-pinene, delta-3 carene, and sabinene, the monocyclic terpenes limonene and terpinolene, and smaller amounts of the tricyclic sesquiterpenes, longifolene, caryophyllene, and delta-cadinene. Some resins also contain a high

proportion of resin acids. Rosins on the other hand are less volatile and consist, inter alia, of diterpenes.

Solidified resin which the volatile terpenes have been removed by distillation is known as rosin. Typical rosin is a transparent or translucent mass, with a vitreous fracture and a faintly yellow or brown color, non-odorous or having only a slight turpentine odor or taste. Rosin is insoluble in water, mostly soluble in alcohol, essential oils, ether, and hot fatty oils. Rosin softens and melts under the influence of heat. Rosin burns with a bright but smoky flame. Rosin consists of a complex mixture of different substances including organic acids named the resin acids. Related to the terpenes, resin acid are oxidized terpenes.

Resin can be natural or manufactured, derived from petroleum, coal tar or plants. Various forms of resin may also be called tar, bitumen or asphalt

Resin was traditionally used to help caulk the seams of wooden sailing vessels (see shipbuilding). Pitch may also be used to waterproof wooden containers and in the making of torches. Petroleum-derived pitch is black in color.

Naturally occurring asphalt/bitumen, a type of resin, is a viscoelastic polymer. This means that even though it seems to be solid at room temperature and can be shattered with a hard impact, it is actually a fluid and will flow over time, but extremely slowly.

Bitumen

Asphalt, also known as bitumen, is a sticky, black, and highly viscous liquid or semi-solid form of petroleum. It may be found in natural deposits or may be a refined product and is classed as a pitch. Bitumen would not flow through a pipeline efficiently, so it is mixed with diluents to be readied for pipeline transportation as diluted bitumen. Diluents are usually natural gas condensate, naphtha or a mix of other light hydrocarbons. Bitumen is a mixture of heavy oil, sand, clay and water. It is separated from the sand and water in a centrifuge prior to dilution for transportation.

The primary use of asphalt is in road construction, where it is used as the adhesive mixed with aggregates to create asphalt concrete. Mainly, it serves its use in paving and roofing applications. 85% of all bitumen used is used as an adhesive in asphalt for roads, runways, parking lots, and foot paths. Gravel and crushed rock are mixed with thick bitumen, holding it together and it is then applied to roadways. 10% of the bitumen used worldwide is used in the roofing industry as its waterproofing qualities help make roofs function well. 5% of bitumen is used for sealing and insulating purposes in various building materials such as carpet tile backing and paint.

Naturally occurring asphalt is sometimes specified by the term "crude bitumen". Its viscosity is similar to that of cold molasses while the material obtained from the fractional distillation of crude oil boiling at 525 °C (977 °F) is sometimes referred to as "refined bitumen".

The components of asphalt include four main classes of compounds:

Naphthene aromatics (naphthalene), consisting of partially hydrogenated polycyclic aromatic compounds;

Polar aromatics, consisting of high molecular weight phenols and carboxylic acids produced by partial oxidation of the material;

Saturated hydrocarbons; the percentage of saturated compounds in asphalt correlates with its softening point;

Asphaltenes, consisting of high molecular weight phenols and heterocyclic compounds.

The naphthene aromatics and polar aromatics are typically the majority components. Most natural bitumens also contain organosulfur compounds, resulting in an overall sulfur content of up to 4%. Nickel and vanadium are found at <10 parts per million, as is typical of some petroleum.

The majority of the asphalt used commercially is obtained from petroleum. Nonetheless, large amounts of asphalt occur in concentrated form in nature. Naturally occurring deposits of bitumen are formed from the remains of

ancient, microscopic algae (diatoms) and other once-living things. These remains were deposited in the mud on the bottom of the ocean or lake where the organisms lived. Under the heat (above 50 °C) and pressure of burial deep in the earth, the remains were transformed into materials such as bitumen, kerogen, or petroleum.

Description of the apparatus

Universal apparatus for the preparation of the uniform blend or emulsion, preferably type - water in oil containing the interconnected systems and the conversion and optimization of hydrodynamic turbulent flow parameters the emulsion components, at least three inputs, of which the inlet for the emulsification in the emulsion and homogenization zone inorganically connected to the tank with an inorganic liquid and located between two inlets for hydrocarbon fluid, associated with a tank for a hydrocarbon liquid, with both said input divide a stream of hydrocarbon fluid, typically in a ratio of 3:2, and systems transformation and optimization of hydrodynamic and turbulent flow parameters hydrocarbon liquid connected with two coaxial conical channels forming zone the liquid hydrocarbon stream output cavitation mechanism, in turn connected to an input of an inorganic component and an emulsion with linear channels for collection and output of the apparatus emulsion.

Figure 1. An example of a 3-D model of the apparatus.

Figure 2. An example of a 3-D model of the apparatus on the opposite view.

Figure 3. An example of a 3-D model of the apparatus with transparent housing.

Figure 4. An example of a 3-D model of the apparatus in cross section.

Figure 5. An example of a 3-D model of the apparatus with transparent housing.

In conclusion

The multicomponent liquids solution or emulsion, preferably a fuel emulsion, having a layered encapsulated internal structure effect bulk dynamic regeneration, comprising a base component liquid organic material is generally a hydrocarbon origin, embedded in its three-dimensional symmetrical structure of liquid material, typically a non-hydrocarbon origin, and generally and mainly in the form of at least two-component aqueous compounds characterized by certain geometric relationships between local micro volumes of the base liquid organic material and implemented in its three-dimensional hierarchical structure of inorganic liquid material,

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