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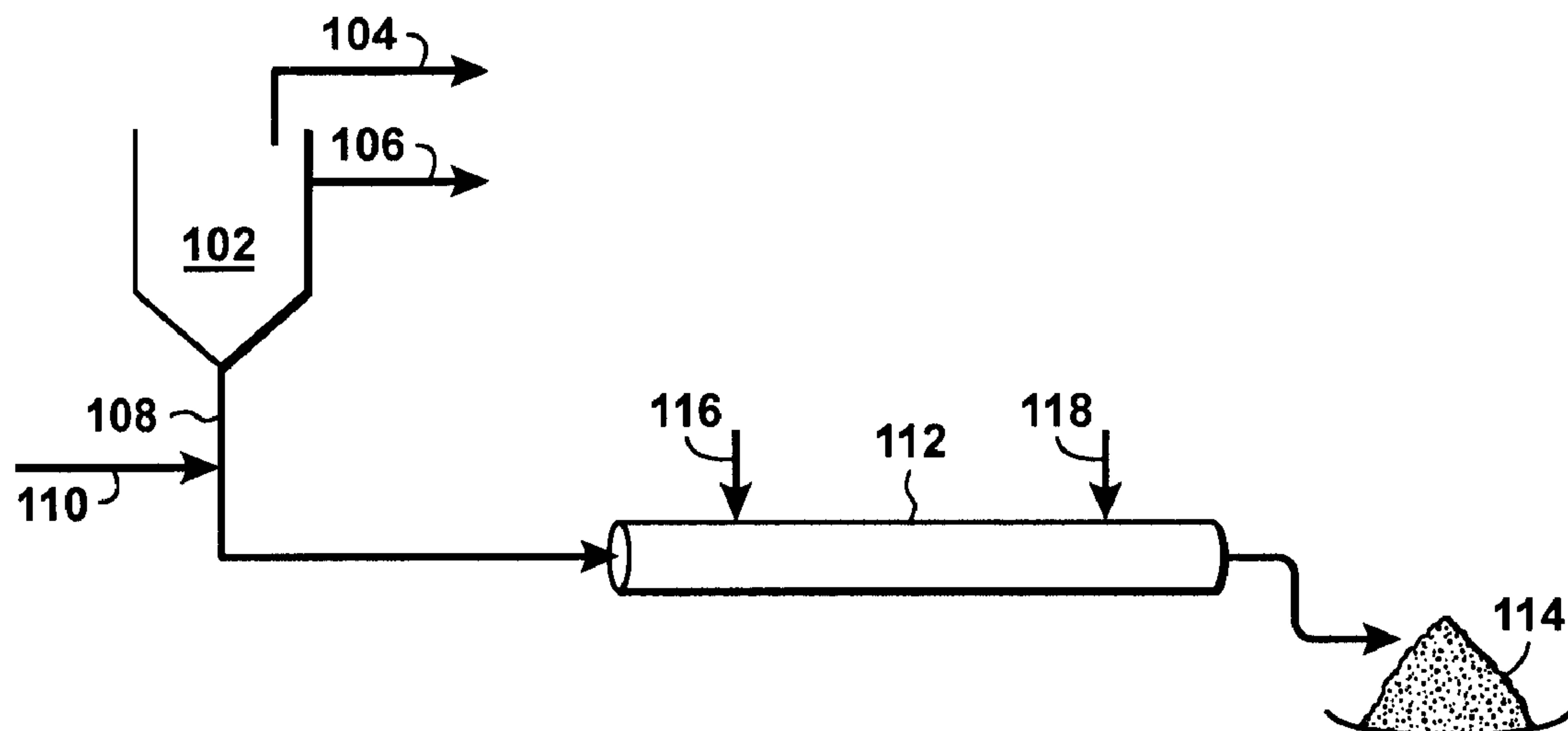
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(54) Titre : UTILISATION DE POLYSACCHARIDE POUR AIDER A LA CAPTURE DE RESIDUS FINS DANS LES
RESIDUS DE SABLES BITUMINEUX

(54) Title: USE OF A POLYSACCHARIDE TO ASSIST FINES CAPTURE IN OIL SAND TAILINGS



(57) Abrégé/Abstract:

A method including providing an oil sand tailings stream and introducing a polysaccharide into the oil sand tailings stream to assist fines capture in a resultant treated oil sand tailings stream.



ABSTRACT

A method including providing an oil sand tailings stream and introducing a polysaccharide into the oil sand tailings stream to assist fines capture in a resultant treated oil sand tailings stream.

USE OF A POLYSACCHARIDE TO ASSIST FINES CAPTURE IN OIL SAND TAILINGS

BACKGROUND

Field of Disclosure

[0001] The disclosure relates generally to the field of oil sand tailings.

Description of Related Art

[0002] This section is intended to introduce various aspects of the art, which may be associated with the present disclosure. This discussion is believed to assist in providing a framework to facilitate a better understanding of particular aspects of the present disclosure. Accordingly, it should be understood that this section should be read in this light, and not necessarily as admissions of prior art.

[0003] Modern society is greatly dependent on the use of hydrocarbon resources for fuels and chemical feedstocks. Hydrocarbons are generally found in subsurface formations that can be termed “reservoirs”. Removing hydrocarbons from the reservoirs depends on numerous physical properties of the subsurface formations, such as the permeability of the rock containing the hydrocarbons, the ability of the hydrocarbons to flow through the subsurface formations, and the proportion of hydrocarbons present, among other things. Easily harvested sources of hydrocarbons are dwindling, leaving less accessible sources to satisfy future energy needs. As the costs of hydrocarbons increase, the less accessible sources become more economically attractive.

[0004] Recently, the harvesting of oil sand to remove heavy oil has become more economical. Hydrocarbon removal from oil sand may be performed by several techniques. For example, a well can be drilled to an oil sand reservoir and steam, hot air, solvents, or a combination thereof, can be injected to release the hydrocarbons. The released hydrocarbons may be collected by wells and brought to the surface.

[0005] In another technique, strip or surface mining may be performed to access the oil sand, which can be treated with water, steam or solvents to extract the heavy oil.

[0006] Oil sand extraction processes are used to liberate and separate bitumen from oil sand so that the bitumen can be further processed to produce synthetic crude oil or mixed with diluent to form “dilbit” and be transported to a refinery plant. Numerous oil sand extraction processes have been developed and commercialized, many of which involve the use of water as a processing medium. Where the oil sand is treated with water, the technique may be referred to as water-based extraction (WBE). WBE is a commonly used process to extract bitumen from mined oil sand.

[0007] One WBE process is the Clark hot water extraction process (the “Clark Process”). This process typically requires that mined oil sand be conditioned for extraction by being crushed to a desired lump size and then combined with hot water and perhaps other agents to form a conditioned slurry of water and crushed oil sand. In the Clark Process, an amount of sodium hydroxide (caustic) may be added to the slurry to increase the slurry pH, which enhances the liberation and separation of bitumen from the oil sand. Other WBE processes may use other temperatures and may include other conditioning agents, which are added to the oil sand slurry, or may operate without conditioning agents. This slurry is first processed in a Primary Separation Cell (PSC), also known as a Primary Separation Vessel (PSV), to extract the bitumen from the slurry.

[0008] In one bitumen extraction process, a water and oil sand slurry is separated into three major streams in the PSC: bitumen froth, middlings, and a PSC underflow (also known as primary separation tailings or coarse sand tailings (CST)).

[0009] Regardless of the type of WBE process employed, the process will typically result in the production of a bitumen froth that requires treatment with a solvent. For example, in the Clark Process, a bitumen froth stream comprises bitumen, solids, and water. Certain processes use naphtha to dilute bitumen froth before separating the product bitumen by centrifugation. These processes are called naphthenic froth treatment (NFT) processes. Other processes use a paraffinic solvent, and are called paraffinic froth treatment (PFT) processes, to produce pipelineable bitumen with low levels of solids and water. In the PFT process, a paraffinic

solvent (for example, a mixture of iso-pentane and n-pentane) is used to dilute the froth before separating the product, diluted bitumen, by gravity. A portion of the asphaltenes in the bitumen is also rejected by design in the PFT process and this rejection is used to achieve reduced solids and water levels. In both the NFT and the PFT processes, the diluted tailings (comprising water, solids and some hydrocarbon) are separated from the diluted product bitumen.

[0010] Solvent is typically recovered from the diluted product bitumen component before the bitumen is delivered to a refining facility for further processing.

[0011] The PFT process may comprise at least three units: Froth Separation Unit (FSU), Solvent Recovery Unit (SRU) and Tailings SRU (TSRU). Mixing of the solvent with the feed bitumen froth may be carried out counter-currently in two stages in separate froth separation units. The bitumen froth comprises bitumen, water, and solids. A typical composition of bitumen froth is about 60 wt. % bitumen, 30 wt. % water, and 10 wt. % solids. The paraffinic solvent is used to dilute the froth before separating the product bitumen by gravity. The foregoing is only an example of a PFT process and the values are provided by way of example only. An example of a PFT process is described in Canadian Patent No. 2,587,166 to Sury.

[0012] From the PSC, the middlings, comprising bitumen and about 10-30 wt. % solids, or about 20-25 wt. % solids, based on the total wt. % of the middlings, is withdrawn and sent to the flotation cells to further recover bitumen. The middlings are processed by bubbling air through the slurry and creating a bitumen froth, which is recycled back to the PSC. Flotation tailings (FT) from the flotation cells, comprising mostly solids and water, are sent for further treatment or disposed in an external tailings area (ETA).

[0013] In ETA tailings ponds, a liquid suspension of oil sand fines in water with a solids content greater than 2 wt. %, but less than the solids content corresponding to the Liquid Limit are called Fluid Fine Tailings (FFT). FFT settle over time to produce Mature Fine Tailings (MFT), having above about 30 wt. % solids.

[0014] It would be desirable to have an alternative method of processing oil sand tailings, for instance (a) coarse sand tailings (CST), (b) a combination of coarse sand tailings (CST) and

thickened fine tailings (TFT), or a combination of coarse sand tailings (CST) and thickened fine tailings (TFT) from a tailings pond.

SUMMARY

[0015] It is an object of the present disclosure to provide an alternative method of processing oil sand tailings, for instance (a) coarse sand tailings (CST), (b) a combination of coarse sand tailings (CST) and thickened fine tailings (TFT), or a combination of coarse sand tailings (CST) and fluid fine tailings (FFT) from a tailings pond.

[0016] According to one aspect, there is provided a method comprising: a) providing an oil sand tailings stream; and b) introducing a polysaccharide into the oil sand tailings stream to assist fines capture in a resultant treated oil sand tailings stream.

[0017] The foregoing has broadly outlined the features of the present disclosure so that the detailed description that follows may be better understood. Additional features will also be described herein.

BRIEF DESCRIPTION OF THE DRAWINGS

[0018] These and other features, aspects and advantages of the disclosure will become apparent from the following description, appending claims and the accompanying drawings, which are briefly described below.

[0019] It should be noted that the figures are merely examples and no limitations on the scope of the present disclosure are intended thereby. Further, the figures are generally not drawn to scale, but are drafted for purposes of convenience and clarity in illustrating various aspects of the disclosure.

[0020] Figure 1 is a flow chart of polysaccharide introduction into coarse sand tailings (CST).

[0021] Figure 2 is a flow chart of polysaccharide introduction into coarse sand tailings (CST) and additional downstream points.

[0022] Figure 3 is a flow chart of polysaccharide introduction into coarse sand tailings (CST), and combination with fluid fine tailings (FFT).

[0023] Figure 4 is a chart showing the chemical dosage required for complete fines capture in a beach for different tailings composition. The two polysaccharides are benchmarked against a polyacrylamide.

[0024] Figure 5 is a chart showing fines capture results with dosage for the same tailings composition.

DETAILED DESCRIPTION

[0025] For the purpose of promoting an understanding of the principles of the disclosure, reference will now be made to the features illustrated in the drawings and specific language will be used to describe the same. It will nevertheless be understood that no limitation of the scope of the disclosure is thereby intended. Any alterations and further modifications, and any further applications of the principles of the disclosure as described herein are contemplated as would normally occur to one skilled in the art to which the disclosure relates. It will be apparent to those skilled in the relevant art that some features that are not relevant to the present disclosure may not be shown in the drawings for the sake of clarity.

[0026] At the outset, for ease of reference, certain terms used in this application and their meaning as used in this context are set forth below. To the extent a term used herein is not defined below, it should be given the broadest definition persons in the pertinent art have given that term as reflected in at least one printed publication or issued patent. Further, the present processes are not limited by the usage of the terms shown below, as all equivalents, synonyms, new developments and terms or processes that serve the same or a similar purpose are considered to be within the scope of the present disclosure.

[0027] Throughout this disclosure, where a range is used, any number between or inclusive of the range is implied.

[0028] A “hydrocarbon” is an organic compound that primarily includes the elements of hydrogen and carbon, although nitrogen, sulfur, oxygen, metals, or any number of other

elements may be present in small amounts. Hydrocarbons generally refer to components found in heavy oil or in oil sand. However, the techniques described are not limited to heavy oils but may also be used with any number of other reservoirs to improve gravity drainage of liquids. Hydrocarbon compounds may be aliphatic or aromatic, and may be straight chained, branched, or partially or fully cyclic.

[0029] “Bitumen” is a naturally occurring heavy oil material. Generally, it is the hydrocarbon component found in oil sand. Bitumen can vary in composition depending upon the degree of loss of more volatile components. It can vary from a very viscous, tar-like, semi-solid material to solid forms. The hydrocarbon types found in bitumen can include aliphatics, aromatics, resins, and asphaltenes. A typical bitumen might be composed of:

19 weight (wt.) % aliphatics (which can range from 5 wt. % - 30 wt. %, or higher);

19 wt. % asphaltenes (which can range from 5 wt. % - 30 wt. %, or higher);

30 wt. % aromatics (which can range from 15 wt. % - 50 wt. %, or higher);

32 wt. % resins (which can range from 15 wt. % - 50 wt. %, or higher); and

some amount of sulfur (which can range in excess of 7 wt. %), based on a weight of the bitumen. In addition, bitumen can contain some water and nitrogen compounds ranging from less than 0.4 wt. % to in excess of 0.7 wt. %, based on a weight of the bitumen. The percentage of the hydrocarbon found in bitumen can vary. The term “heavy oil” includes bitumen as well as lighter materials that may be found in a sand or carbonate reservoir.

[0030] “Heavy oil” includes oils which are classified by the American Petroleum Institute (“API”), as heavy oils, extra heavy oils, or bitumens. The term “heavy oil” includes bitumen. Heavy oil may have a viscosity of about 1,000 centipoise (cP) or more, 10,000 cP or more, 100,000 cP or more, or 1,000,000 cP or more. In general, a heavy oil has an API gravity between 22.3° API (density of 920 kilograms per meter cubed (kg/m^3) or 0.920 grams per centimeter cubed (g/cm^3)) and 10.0° API (density of 1,000 kg/m^3 or 1 g/cm^3). An extra heavy oil, in general, has an API gravity of less than 10.0° API (density greater than 1,000 kg/m^3 or 1 g/cm^3). For example, a source of heavy oil includes oil sand or bituminous sand, which is a combination of clay, sand, water and bitumen. The recovery of heavy oils is based on the viscosity decrease of fluids with increasing temperature or solvent concentration. Once the

viscosity is reduced, the mobilization of fluid by steam, hot water flooding, or gravity is possible. The reduced viscosity makes the drainage or dissolution quicker and therefore directly contributes to the recovery rate.

[0031] “Fine particles” or “fines” are generally defined as those solids having a size of less than 44 microns (μm), that is, material that passes through a 325 mesh (44 micron).

[0032] “Coarse particles” are generally defined as those solids having a size of greater than 44 microns (μm).

[0033] “Clays” are generally defined as those solids having a size of less than 2 microns, but some clays may be larger. Clays may include ceramics like aluminum and silicon oxide species like kaolinite and illite, and they may also include fine particles of other species such as iron oxides and quartzes.

[0034] A “bitumen extract” is generally defined as bitumen that has been extracted from oil sand.

[0035] A “bitumen product stream” or “bitumen product” is generally defined as a high grade bitumen product that may be suitable for transport within pipelines and processing within downstream refineries. A high grade bitumen product stream may have a solids content of less than 1 wt. %, or less than 0.1 wt. %, on a dry bitumen basis.

[0036] The term “solvent” as used in the present disclosure should be understood to mean either a single solvent, or a combination of solvents.

[0037] The terms “approximately,” “about,” “substantially,” and similar terms are intended to have a broad meaning in harmony with the common and accepted usage by those of ordinary skill in the art to which the subject matter of this disclosure pertains. It should be understood by those of skill in the art who review this disclosure that these terms are intended to allow a description of certain features described and claimed without restricting the scope of these features to the precise numeral ranges provided. Accordingly, these terms should be interpreted as indicating that insubstantial or inconsequential modifications or alterations of the subject matter described and are considered to be within the scope of the disclosure.

[0038] The articles “the”, “a” and “an” are not necessarily limited to mean only one, but rather are inclusive and open ended so as to include, optionally, multiple such elements.

[0039] “At least one,” in reference to a list of one or more entities should be understood to mean at least one entity selected from any one or more of the entity in the list of entities, but not necessarily including at least one of each and every entity specifically listed within the list of entities and not excluding any combinations of entities in the list of entities. This definition also allows that entities may optionally be present other than the entities specifically identified within the list of entities to which the phrase “at least one” refers, whether related or unrelated to those entities specifically identified. Thus, as a non-limiting example, “at least one of A and B” (or, equivalently, “at least one of A or B,” or, equivalently “at least one of A and/or B”) may refer, to at least one, optionally including more than one, A, with no B present (and optionally including entities other than B); to at least one, optionally including more than one, B, with no A present (and optionally including entities other than A); to at least one, optionally including more than one, A, and at least one, optionally including more than one, B (and optionally including other entities). In other words, the phrases “at least one,” “one or more,” and “and/or” are open-ended expressions that are both conjunctive and disjunctive in operation. For example, each of the expressions “at least one of A, B and C,” “at least one of A, B, or C,” “one or more of A, B, and C,” “one or more of A, B, or C” and “A, B, and/or C” may mean A alone, B alone, C alone, A and B together, A and C together, B and C together, A, B and C together, and optionally any of the above in combination with at least one other entity.

[0040] A method may comprise: a) providing an oil sand tailings stream; and b) introducing a polysaccharide into the oil sand tailings stream to assist fines capture in a resultant treated oil sand tailings stream.

[0041] “Fines capture” means a ratio of mass of fines in all tailings deposits, excluding fluid fine tailings to the mass of fines in the oil sand tailings stream, that is, the component of fines in the oil sand tailings stream that does not form fluid tailings.

[0042] The oil sand tailings stream may be any suitable tailings stream stemming from oil sand. Examples include, but are not limited to, coarse sand tailings (also known as primary separation tailings and CST), middlings, fine tailings (FT), froth separation tailings, tailings

solvent recovery unit (TSRU) tailings, fluid fine tailings (FFT), mature fine tailings (MFT), thickened fine tailings (TFT), centrifuged tailings, hydrocycloned tailings, or a combination thereof. The oil sand tailings stream may stem from aqueous based extraction. The oil sand tailings stream may comprise 0.5 – 50 wt. % fines, 30 – 75 wt.% solids, and less than 1 wt. % bitumen. The oil sand tailings stream may comprise 0.5 – 15 wt. % fines and 50 – 75 wt.% solids, and have a sand to fines ratio (SFR) of at least 5:1. The oil sand tailings stream may be coarse sand tailings (CST) from a bottom of a primary separation cell (PSC), a combination of coarse sand tailings from a bottom of a primary separation cell (PSC) and thickened fine tailings (TFT), or a combination of coarse sand tailings from a bottom of a primary separation cell (PSC) and fluid fine tailings (FFT) from a tailings pond.

[0043] The polysaccharide may comprise a galactomannan such as guar gum, a cellulose such as carboxymethyl cellulose or a starch.

[0044] The polysaccharide may comprise two or more polysaccharides combined prior to their introduction.

[0045] The polysaccharide may be introduced into the oil sand tailings stream prior to, during, or at, a tailings disposal area, or a combination thereof.

[0046] The polysaccharide may comprise a first polysaccharide and a second polysaccharide, wherein the first polysaccharide is introduced into the oil sand tailings stream at one point prior to, during, or at, a tailings disposal area, and wherein a second polysaccharide is introduced into the oil sand tailings stream at another point prior to, during, or at, the tailings disposal area.

[0047] A flocculent or a coagulant may be added upstream or downstream of the polysaccharide introduction.

[0048] The amount of polysaccharide introduced per tonne of the oil sand tailings stream may be 1-2000 g, 50-500 g, or 10-200 g.

[0049] A fines content of the oil sand tailings stream may be measured, upstream or downstream of the polysaccharide introduction, and a dosage of the polysaccharide may be selected on this basis. A fines content and density of the oil sand tailings stream may be

measured and a dosage of the polysaccharide may be selected on the basis of a ratio of fines to fines + water (FOFW). The dosage of the polysaccharide may be further based on achieving a predetermined rate of fines capture in the resultant treated oil sand tailings stream.

[0050] The use of the polysaccharide may be for introducing into an oil sand tailings stream, to assist fines capture in a resultant treated oil sand tailings stream, for modifying a rheology of the oil sand tailings stream to assist in fines capture in a coarse sand fraction, for modifying wettability of the oil sand tailings stream, for stabilizing the oil sand tailings stream for slowing sand settling to thereby increase sand and fines aggregation together, or for dispersing fines to speed settling of intermediate particles sized between 20 and 100 microns. The use of the polysaccharide may be for introducing upstream of a primary separation cell (PSC) to aid bitumen fines separation, for introducing into a middling stream from a primary separation cell (PSC) to aid bitumen fines separation in flotation, for introducing into a bottom of a water capped oil sand tailings pond to promote growth of micro-organisms, or for introducing into a bottom of a water capped oil sand tailings pond to promote growth of micro-organisms for dewatering of fluid tailings and ultimate consolidation, promoting a healthy aquatic ecosystem, sequestering fines at the bottom of the pond to mitigate fines suspension, or a combination thereof. The use of the polysaccharide may be for introducing into a primary separation cell (PSC), for instance into the bottom cone of the PSC, or into the CST line exiting the PSC. The polysaccharide may increase the capture of fine particles in the void space of the tailings stream upon deposition onto a beach. The “beach” refers to sand deposits both above and below the pond level but excluding fluid tailings. The polysaccharide may reduce FFT formation by enhancing the normal capture of fine particles on the beach.

[0051] With reference to Figure 1, a primary separation cell (PSC) (102) has three exit streams, namely a froth (104) for passing to froth treatment, middlings (106), and coarse sand tailings (CST) (108). A polysaccharide (110) may be introduced into the CST (108). The combination of CST (108) and polysaccharide (110) may be transported by pipeline (112) to a tailing disposal area (114). Additional polysaccharide (116) and (118) may be added at different points during transport, as illustrated. The polysaccharides (110, 116, 118) may be

the same or different. Alternatively, a flocculent or coagulant may be added in place of or in addition to the polysaccharide (118).

[0052] With reference to Figure 2, a primary separation cell (PSC) (202) has three exit streams, namely a froth (204) for passing to froth treatment, middlings (206), and coarse sand tailings (CST) (208). The middlings (206) may be passed to a flotation vessel (250) producing a flotation overflow (252) and flotation tailings (254). The flotation tailings (254) may be passed to a thickener (256) producing thickened flotation tailings (TFT) (258). A polysaccharide (210) may be introduced into the CST (208). The TFT (258) may be added to the combination of CST (208) and the polysaccharide (210) and the resultant stream transported by pipeline (212) to a tailing disposal area (214). Additional polysaccharide (216) and (218) may be added at different points during transport, as illustrated. The polysaccharides (210, 216, 218) may be the same or different. Alternatively, a flocculent or coagulant may be added in place of or in addition to the polysaccharide (218).

[0053] With reference to Figure 3, a primary separation cell (PSC) (302) has three exit streams, namely a froth (304) for passing to froth treatment, middlings (306), and coarse sand tailings (CST) (308). A polysaccharide (310) may be introduced into the CST (308). Fluid fine tailings (FFT) (360) from a tailings pond may be added to the combination of CST (308) and polysaccharide (310). The combination of CST (308), polysaccharide (310), and FFT (360) may be transported by pipeline (312) to a tailing disposal area (314). Additional polysaccharide (316) and (318) may be added at different points during transport, as illustrated. The polysaccharides (310, 316, 318) may be the same or different. Alternatively, a flocculent or coagulant may be added in place of or in addition to the polysaccharide (318).

[0054] By introducing the polysaccharide upstream of the tailings deposition area, fines may be captured within pore spaces of the CST prior to subjecting the tailings to turbulent flow conditions.

[0055] The polysaccharide may have a biodegradation rate such that it will be consumed within one year or two years, for instance by oil consuming bacterial microbes or “bugs”.

[0056] Without intending to be bound by theory or making any promise, the following is provided as possible mechanisms of action. The polysaccharide may stabilize the oil sand tailings stream so that sand settles less rapidly, allow sand and fines to aggregate together. The polysaccharide may disperse fines so that intermediate particles sized between 20 and 100 microns settle more quickly.

Experimental

[0057] The polysaccharides application was tested using a Jar test procedure where a known composition of tailings was mixed in a 1 L graduated cylinder and allowed to settle undisturbed for 48 hours. The slurry settled into three layers: a top supernatant layer, primarily water, an intermediate layer, primarily fines and a bottom layer, primarily sand. The proportion of the fines in the slurry which report to the bottom layer represents the captured fines, which in the field would not be available to form fluid fine tailings (FFT). Different chemicals were evaluated on the basis of their ability to capture fines in the bottom layer of the cylinder. Results showed the polysaccharides can capture fines in the bottom layer from tailings samples of varying fines and solids contents.

[0058] Figure 4 shows the chemical dosage required for complete fines capture in a beach for different tailings composition. The two polysaccharides are benchmarked against polyacrylamides and the results show comparable performance. Figure 5 shows fines capture results with dosage for the same tailings composition.

[0059] The scope of the claims should not be limited by particular embodiments set forth herein, but should be construed in a manner consistent with the specification as a whole.

CLAIMS:

1. A method comprising:
 - a) providing an oil sand tailings stream; and
 - b) introducing a polysaccharide into the oil sand tailings stream to assist fines capture in a resultant treated oil sand tailings stream.
2. The method of claim 1, wherein the polysaccharide comprises a galactomannan.
3. The method of claim 1, wherein the polysaccharide comprises guar gum.
4. The method of claim 1, wherein the polysaccharide comprises cellulose or a starch.
5. The method of claim 1, wherein the polysaccharide comprises carboxymethyl cellulose or dextrin.
6. The method of any one of claims 1 to 5, wherein the oil sand tailings stream comprises 0.5 – 50 wt. % fines, 30 – 75 wt.% solids, and less than 1 wt. % bitumen.
7. The method of any one of claims 1 to 5, wherein the oil sand tailings stream comprises 0.5 – 15 wt. % fines and 50 – 75 wt.% solids, and has a sand to fines ratio (SFR) of at least 5:1.
8. The method of any one of claims 1 to 7, wherein the oil sand tailings stream is coarse sand tailings from a bottom of a primary separation cell (PSC).
9. The method of any one of claims 1 to 7, wherein the oil sand tailings stream is a combination of coarse sand tailings from a bottom of a primary separation cell (PSC) and thickened fine tailings (TFT).

10. The method of any one of claims 1 to 7, wherein the oil sand tailings stream is a combination of coarse sand tailings from a bottom of a primary separation cell (PSC) and fluid fine tailings (FFT) from a tailings pond.
11. The method of any one of claims 1 to 10, wherein the polysaccharide comprises two or more polysaccharides combined prior to their introduction.
12. The method of any one of claims 1 to 10, wherein the polysaccharide is introduced into the oil sand tailings stream prior to, during, or at, a tailings disposal area, or a combination thereof.
13. The method of any one of claims 1 to 10, wherein the polysaccharide comprise a first polysaccharide and a second polysaccharide, wherein the first polysaccharide is introduced into the oil sand tailings stream at one point prior to, during, or at, a tailings disposal area, and wherein a second polysaccharide is introduced into the oil sand tailings stream at another point prior to, during, or at, the tailings disposal area.
14. The method of any one of claims 1 to 13, further comprising adding a flocculent or a coagulant upstream or downstream of the polysaccharide introduction.
15. The method of any one of claims 1 to 14, wherein 1-1000 g of the polysaccharide is introduced per tonne of the oil sand tailings stream.
16. The method of any one of claims 1 to 14, wherein 50-500 g of the polysaccharide is introduced per tonne of the oil sand tailings stream.
17. The method of any one of claims 1 to 14, wherein 10-100 g of the polysaccharide is introduced per tonne of the oil sand tailings stream.

18. The method of any one of claims 1 to 14, further comprising measuring a fines content of the oil sand tailings stream, upstream or downstream of the polysaccharide introduction, and selecting a dosage of the polysaccharide on this basis.
19. The method of any one of claims 1 to 14, further comprising measuring a fines content and density of the oil sand tailings stream and selecting a dosage of the polysaccharide on the basis of a ratio of fines to fines + water (FOFW).
20. The method of claim 18, wherein the dosage of the polysaccharide is further based on achieving a predetermined rate of fines capture in the resultant treated oil sand tailings stream.
21. A use of a polysaccharide for introducing into an oil sand tailings stream.
22. The use of claim 21 to assist fines capture in a resultant treated oil sand tailings stream.
23. The use of claim 21 for modifying a rheology of the oil sand tailings stream to assist in fines capture in a coarse sand fraction.
24. The use of claim 21 for modifying wettability of the oil sand tailings stream.
25. The use of claim 21 for stabilizing the oil sand tailings stream for slowing sand settling to thereby increase sand and fines aggregation together.
26. The use of claim 21 for dispersing fines to speed settling of intermediate particles sized between 20 and 100 microns.
27. A use of a polysaccharide for introducing upstream of a primary separation cell (PSC) to aid bitumen fines separation.

28. A use a polysaccharide for introducing into a middling stream from a primary separation cell (PSC) to aid bitumen fines separation in flotation.

29. A use of a polysaccharide for introducing into a bottom of a water capped oil sand tailings pond to promote growth of micro-organisms.

30. A use of a polysaccharide for introducing into a bottom of a water capped oil sand tailings pond to promote growth of micro-organisms for dewatering of fluid tailings and ultimate consolidation, promoting a healthy aquatic ecosystem, sequestering fines at the bottom of the pond to mitigate fines suspension, or a combination thereof.

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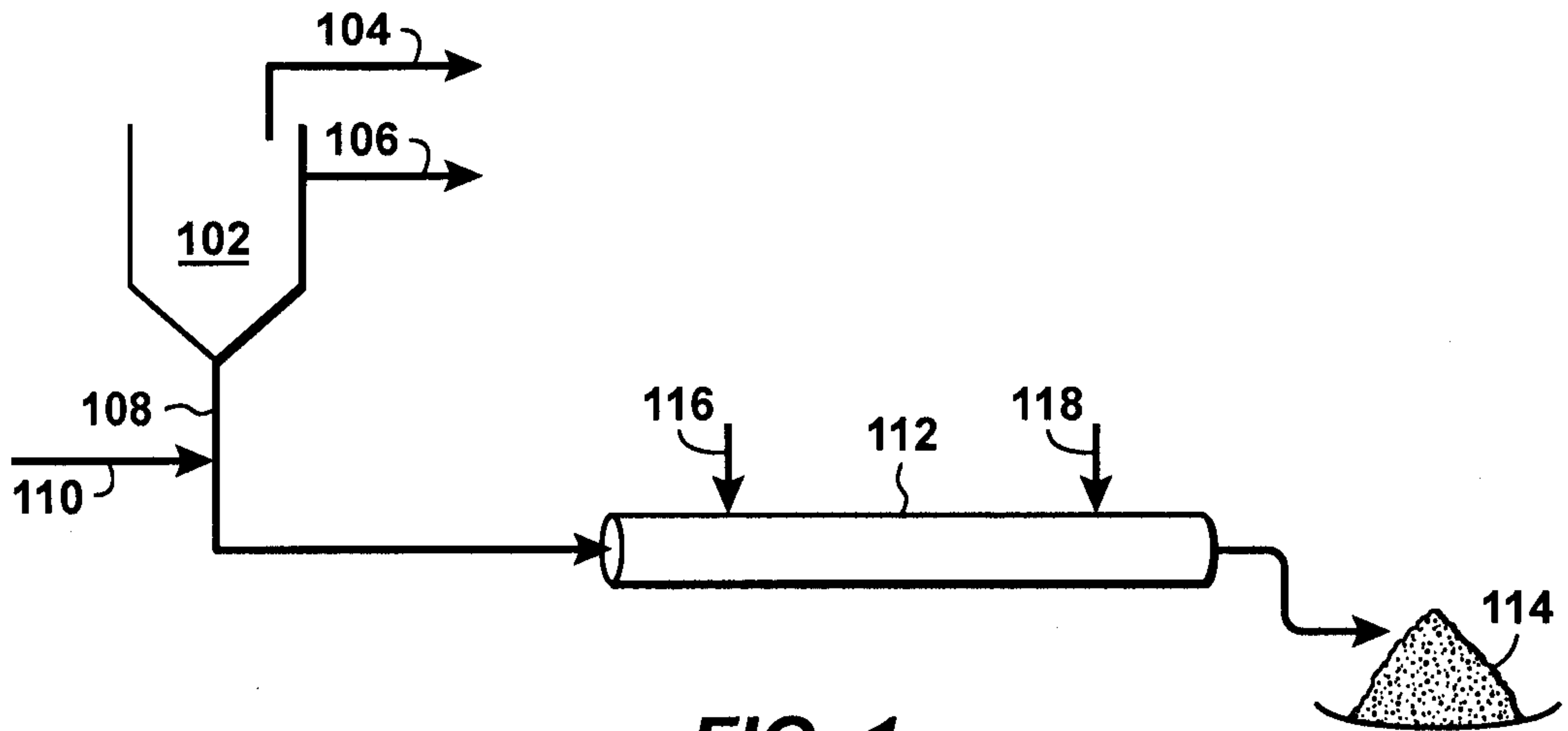


FIG. 1

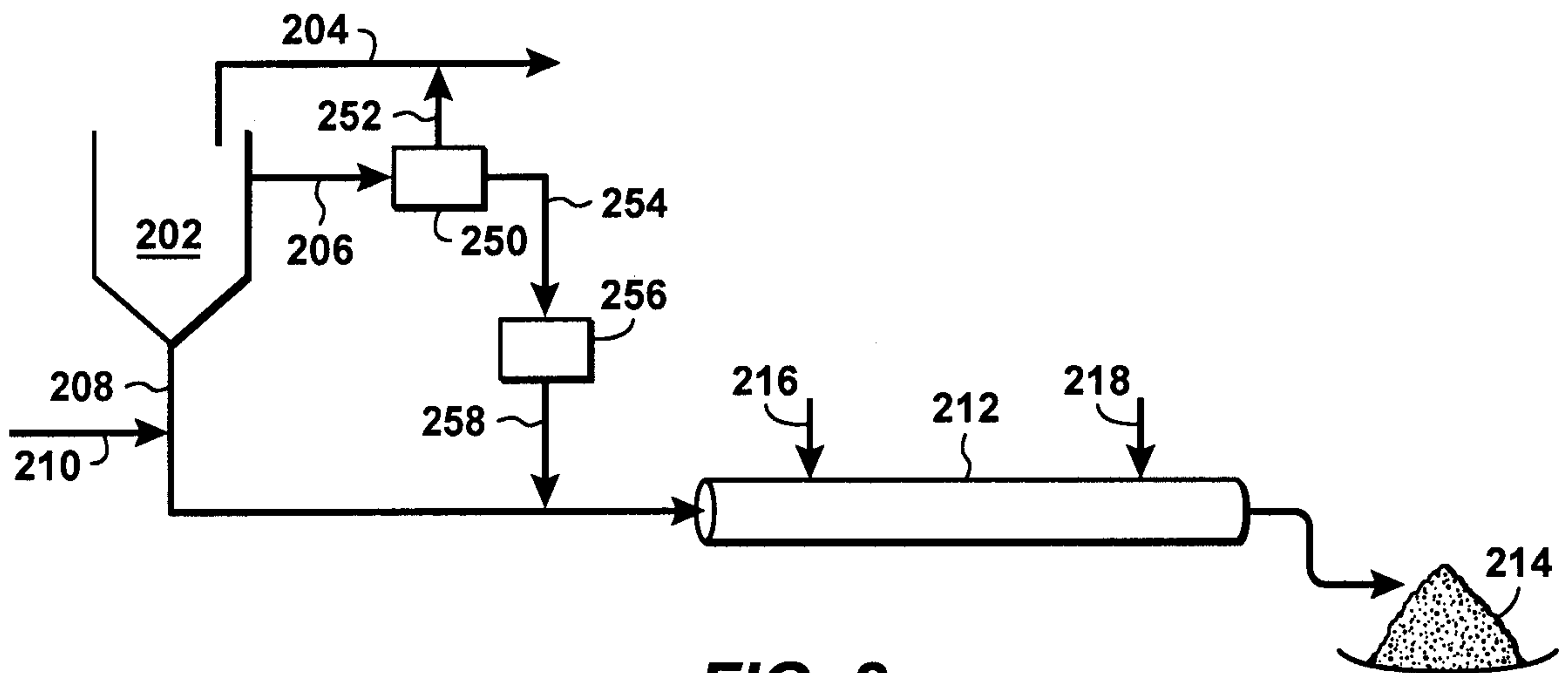


FIG. 2

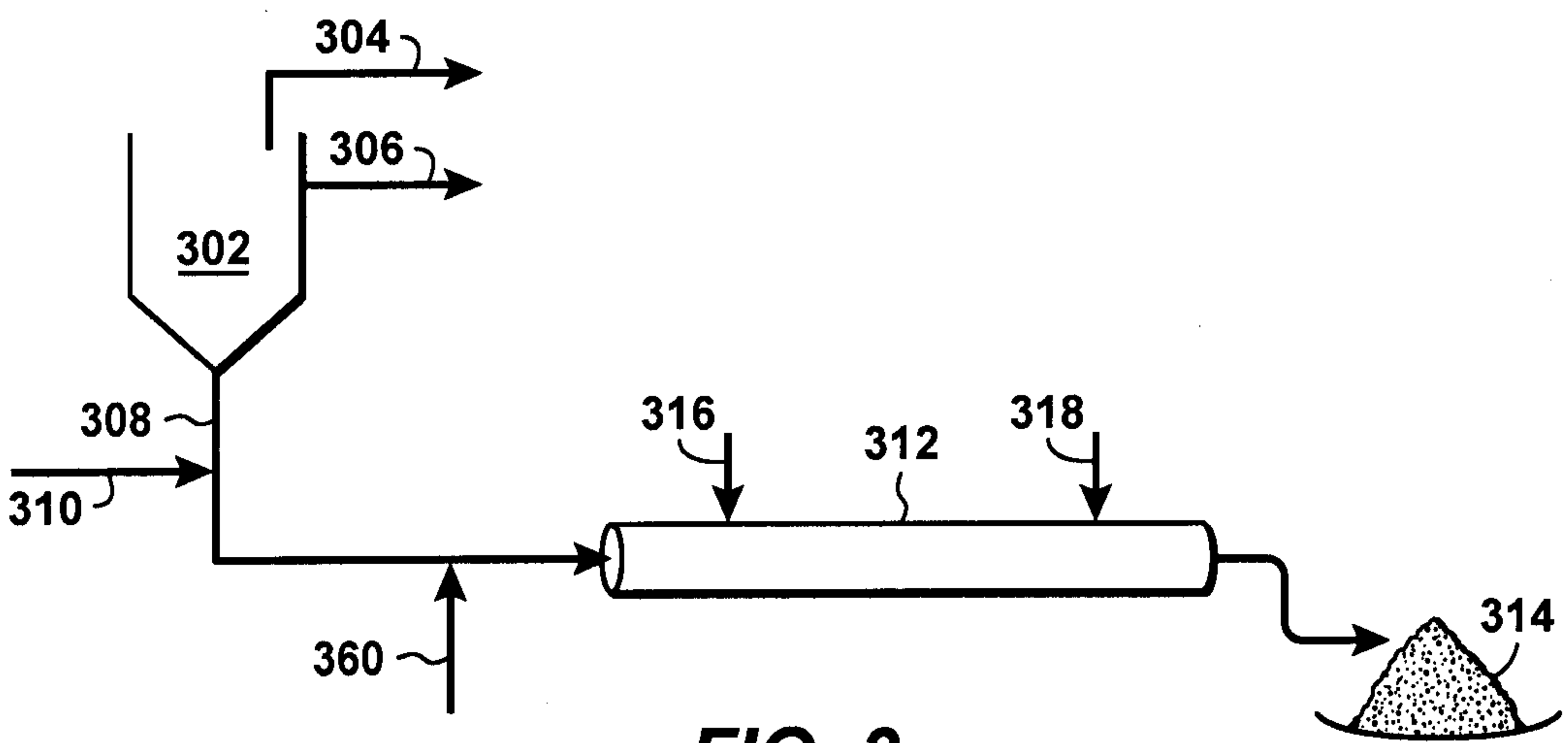


FIG. 3

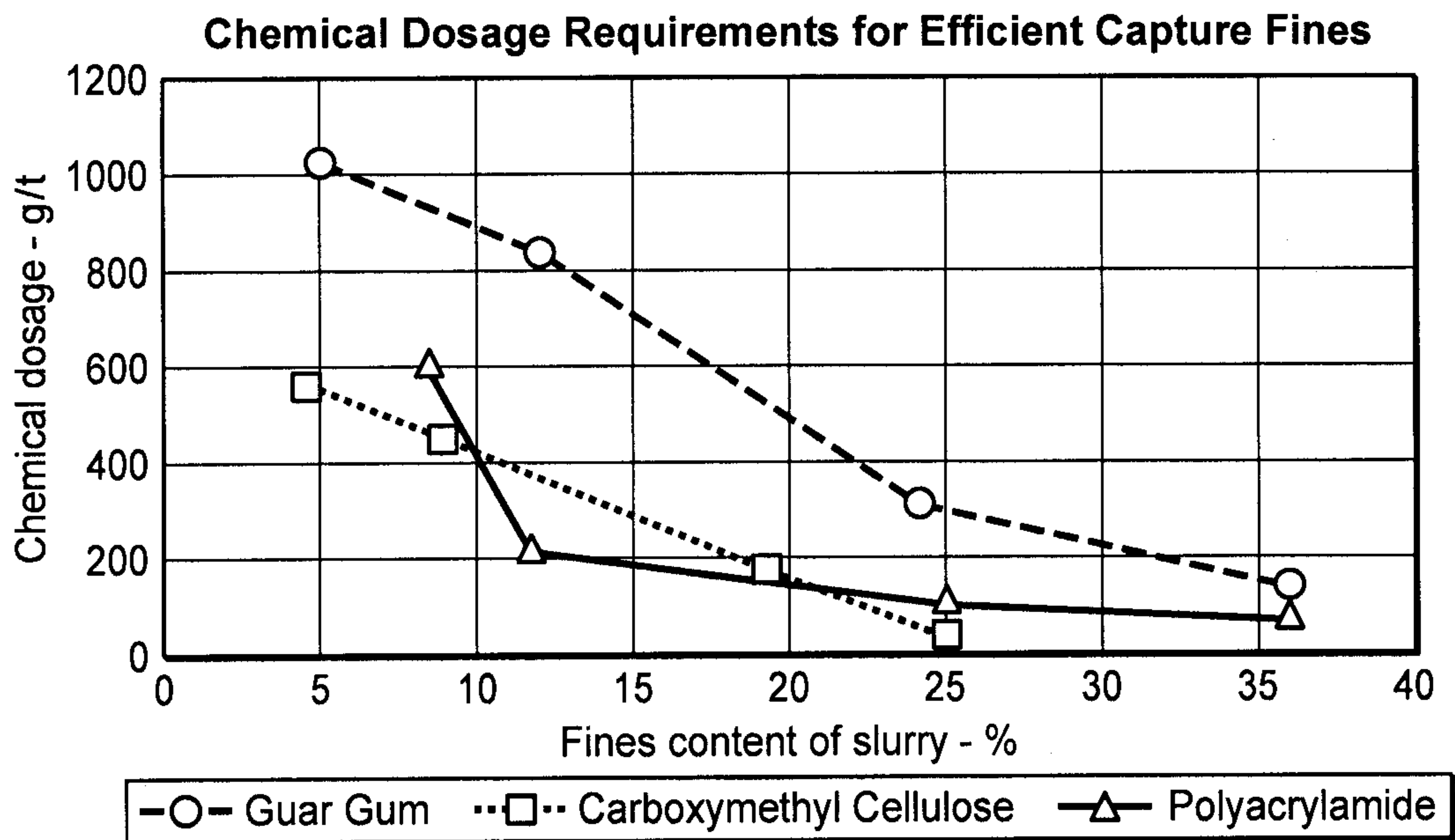


FIG. 4

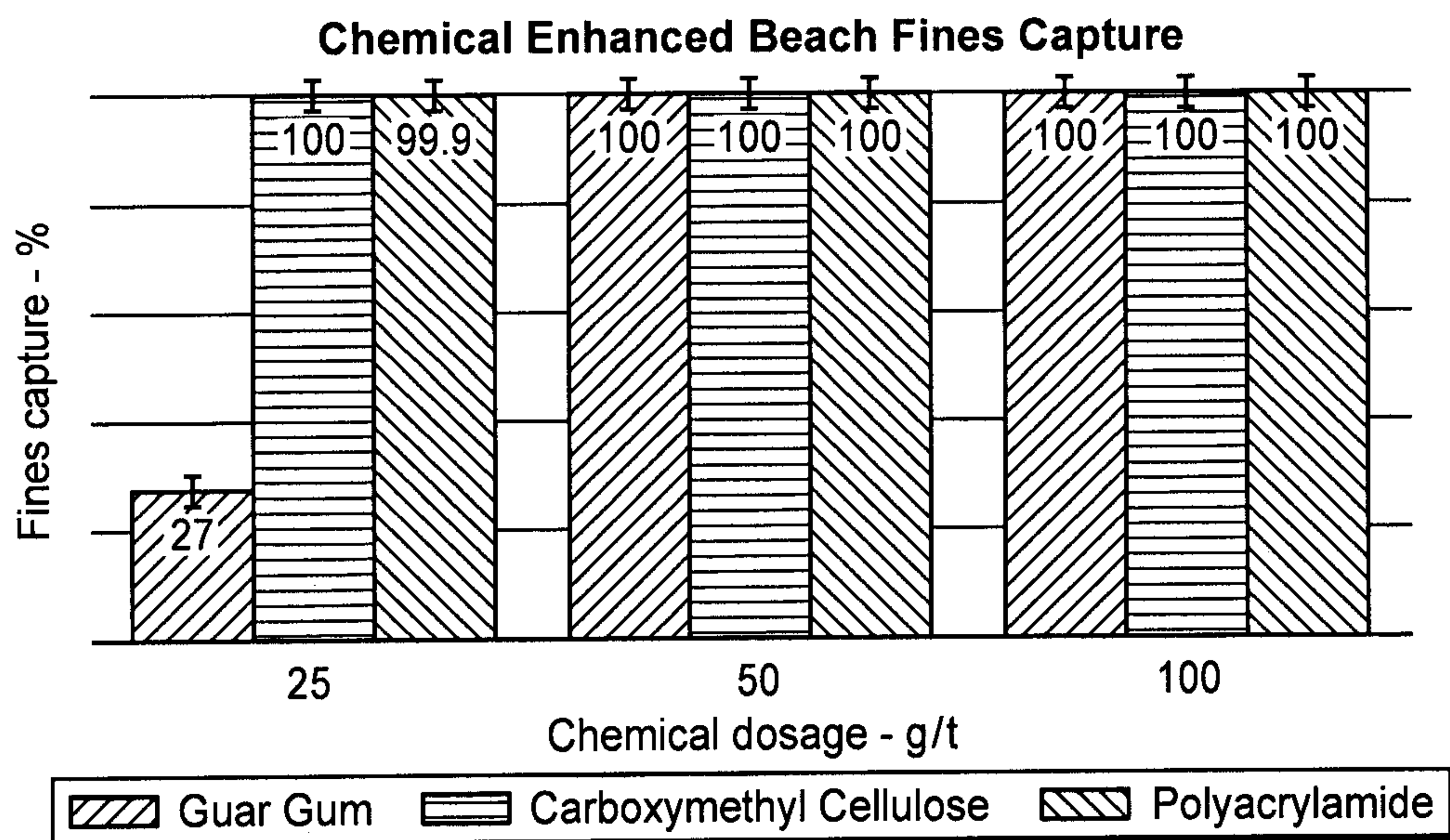


FIG. 5

