

**A SYSTEM AND METHOD THEREOF FOR SCRUBBING AND
CLASSIFICATION OF COARSE AND FINES MATERIALS**

TECHNICAL FIELD

5

The present application generally relates to a field of materials science and mineral engineering, and more particularly, to a system, and a method for complete material sizing solution.

10

BACKGROUND

Present Solid classification system:

Presently for dry or wet classification equipment, such as dry and wet screens are used to classify coarser particles while for finer applications screw/bucket wheel classifiers are employed. In case of dry classification, the number of products that can be produced from a single unit is highly restricted and it also generates dust pollution. Other than this, dry systems are highly inefficient for classifying materials with moisture. both dry and wet screens cannot effectively remove contaminants sticking to the surface of the material while remaining limited to the number of products that can produced by a single unit. In case of screw/bucket wheel classifiers, it cannot be used for classifying coarser particles and are generally used for removing clay from finer particles. This equipment also cannot remove surface contaminants or produce multiple product sizes in single unit.

25

Disadvantage of the present technology:

Presently classification employs the above mentioned equipment in isolation and is limited by sizes of material it can process and number of products it can deliver to the user in a single unit. For example a dry/wet screen or screw classifiers/bucket wheel cuts material at different sizes but the product still contains other foreign objects like silica, clay and alumina and the rejects too contains a large amount of usable material. This material then must be processed by using other systems to recover the usable materials from rejects. The final product from this system still

contains foreign objects sticking to the surface of the material and is not properly cleaned due to absence of any scrubbing and rinsing action. An additional scrubbing system is then required to remove the deleterious objects from the material to maximize its full potential. Also in such system there is no process to recover very fine material and for
5 this the user must install the separate fines recovery systems in order to reprocess the rejects or face a huge wastage of an important natural resource.

In view of the above mentioned drawbacks, there exists a need for an efficient integrated system that provides a facility of scrubbing, hydro-cycloning, rinsing, sizing,
10 dewatering and conveying into a single to classify substance that may include materials and/or minerals.

SUMMARY

15 This summary is provided to introduce concepts related to a system and method thereof for scrubbing and classification of coarse and fines materials, and the concepts are further described below in the detailed description. This summary is not intended to identify essential features of the claimed subject matter nor is it intended for use in determining or limiting the scope of the claimed subject matter.

20

The above-described problems are addressed and a solution is achieved in the present invention by providing a system with a combination of several technologies such as scrubbing, hydro-cycloning, rinsing, sizing, dewatering, conveying, in order to classify material.

25

It is therefore a primary object of the present invention to provide a system, a process and a device for scrubbing and classification of up to five products, both coarse and fine, in a single integrated system for the material and mineral industry while ensuring the overall plant footprint is kept minimum, the utilization of water is
30 maximum, elimination of silica, clay and alumina etc., is done effectively and thereby the user is benefited by lower cost of production. The other object of invention is to

maximize the recoveries by recycling the fine usable particles and restricting wastage of natural resources.

In one aspect of the present invention, the present invention is the first technology that integrates the facility of scrubbing, hydro-cycloning, rinsing, sizing, dewatering and conveying to classify material in upto five sizes in a single integrated compact design. The system allows extraction of graded washed products from different raw materials with substantially reduced surface contaminants such as silica, clay and alumina content for use by various industries. One of the examples of the uses of the invention is to produce upto five different sized materials of enriched high quality iron ore that is used on every day basis for upstream processing on furnaces or Kilns. This invention will considerably improve the cost, productivity and efficiency of steel making. Another example is adding value and enhancing the productivity of industries such as construction where efficient removal of clay and ultra-fines present in the material as the deleterious material can result into lowering of usage of cement significantly and improve overall strength of the concrete.

Accordingly, in one embodiment of the present invention, a system (100) to perform a method for scrubbing and classification of a plurality substance contained in an enclosure is disclosed. The system comprises of an attrition wash box (AWB) (01) fed using the enclosure; thereby a high-pressure suitable quantity of water is added in a mixture tube of the AWB (01) for scrubbing the deleterious from the surface of feed substance. A rinsing screen (02) of a specific deck. At least one an integrated product conveyor for stock piling at least one coarse products, wherein the integrated product conveyor is selected from a product conveyor-1, a product conveyor-2, and a product conveyor-3. A set of primary hydro-cyclone(s) (04) with specified pressure through a slurry pump-1 (05) and a special type of pipeline, wherein the primary hydro-cyclone(s) receives the mixture from a sump-1 (03), the slurry pump-1 (05) and eliminates at least one rejects by removing at least one fine particles as tailings. A split feed box (09) for discharge to at least one portion of a split sizing cum dewatering screen (10). A product conveyor-4 (11) for stock piling a first fine product. A set of secondary hydro-cyclone(s) (14) with a specified pressure through a slurry pump-2 (15) and a special type of

pipeline, wherein the secondary hydro-cyclone(s) (14) receives the mixture from a sump-2 (13), the slurry Pump-2 (15) and eliminates at least one rejects by removing at least one fine particles as tailings. A split sizing cum dewatering screens (10). A product conveyor-5 (12) for stock piling a second fine product, and a programmable logic controlled motor control panel (16) configured to monitor the method performed by the system (100).

In another embodiment of the present invention, a method for scrubbing and classification of a plurality substance contained in an enclosure in a system (100) is disclosed. The method comprises the steps of:

- receiving the substance to an attrition wash box (AWB) (01), thereby scrubbing the substance received;
- discharging the substance from the AWB (01) to a rinsing screen (02), thereby
 - adding a suitable amount of a pressurized water on the on the rinsing screen (02) for classification of at least one size of coarse washed product;
 - dewatering the at least one size of coarse washed product obtained and discharging it; and
 - recovering the at least one size of coarse washed product obtained and providing it to at least one integrated product conveyor for stock piling, wherein the integrated product conveyor is selected from a product conveyor-1, a product conveyor-2, and a product conveyor-3;
- discharging a recovered water from the rinsing screen (02) along with all fine particles obtained to a sump-1 (03) in a slurry form;
- pumping the slurry to a primary hydro-cyclone(s) (04) with a specified pressure through a slurry pump-1 (05);
- obtaining the mixture from the sump-1 (03) and the slurry pump-1 (05) and simultaneously eliminating at least one rejects;
- discharging the fine particles obtained by a primary hydro-cyclone (04) in the slurry form to a split feed box (09);

- dewatering and discharging the fine particles obtained to a split sizing cum dewatering screen (10) for recovering a first fine product;
- dewatering the first fine product obtained and integrating it in a product conveyor-4 (11) for stock piling;
- 5 • discharging a underflow along with fine particles obtained from the split sizing cum dewatering screen (10) to a sump-2 (13) in slurry form for reprocessing;
- pumping the slurry to a secondary hydro-cyclone (14) with a specified pressure through slurry pump-2 (15);
- 10 • obtaining a mixture from the sump-2 (13) and the slurry pump-2 (15) and simultaneously eliminating at least one rejects;
- dewatering and discharging the fine particles obtained to the split sizing cum dewatering screen (10) for recovering a second fine product;
- recovering the second fine product obtained and integrating it in a product conveyor-5 (12) for stock piling;
- 15 • discharging the reject ultrafine particles along with water from the primary hydro cyclone(s) (04) and the secondary hydro cyclone(s) (14).

20 These and other features and advantages will become apparent from the following detailed description of illustrative embodiments thereof, which is to be read in connection with the accompanying drawings.

BRIEF DESCRIPTION OF THE ACCOMPANYING DRAWINGS

25 The detailed description is described with reference to the accompanying figures. In the figures, the left-most digit(s) of a reference number identifies the figure in which the reference number first appears. The same numbers are used throughout the drawings to refer like features and components.

30 Corresponding reference characters indicate corresponding parts throughout the several views. The exemplification set out herein illustrates preferred embodiments of

the invention, in one form, and such exemplification is not to be construed as limiting the scope of the invention in any manner.

Figure 1 illustrates a system along with the method flow of the present invention for scrubbing and classification of various materials showing is shown, in accordance with an embodiment of the present subject matter.

Figure 2 illustrates a method flow of the present invention for scrubbing and classification of various materials shown, in accordance with an embodiment of the present subject matter.

Figure 3 illustrates a plan (top view) of the proposed system (100) is shown, in accordance with an embodiment of the present subject matter.

Figure 4 illustrates an elevation (side view) of the proposed system (100) is shown, in accordance with an embodiment of the present subject matter.

Persons skilled in the art will appreciate that elements in the figures are illustrated for simplicity and clarity and may have not been drawn to scale. For example, the dimensions of some of the elements in the figure may be exaggerated relative to other elements to help to improve understanding of various exemplary embodiments of the present disclosure.

It is to be understood that the attached drawings are for purposes of illustrating the concepts of the invention and may not be to scale.

DETAILED DESCRIPTION

In order to make the aforementioned objectives, technical solutions and advantages of the present application more comprehensible, embodiments are described below with accompanying figures.

The objects, advantages and other novel features of the present invention will be apparent to those skilled in the art from the following detailed description when read in conjunction with the appended claims and accompanying drawings.

5 The terms and words used in the following description and claims are not limited to the bibliographical meanings, but, are merely used by the inventor to enable a clear and consistent understanding of the invention. Accordingly, it should be apparent to those skilled in the art that the following description of exemplary embodiments of the present invention are provided for illustration purpose only and not for the purpose of
10 limiting the invention as defined by the appended claims and their equivalents.

It is to be understood that the singular forms “a,” “an,” and “the” include plural referents unless the context clearly dictates otherwise.

15 By the term “substantially” it is meant that the recited characteristic, parameter, or value need not be achieved exactly, but that deviations or variations, including for example, tolerances, measurement error, measurement accuracy limitations and other factors known to those of skill in the art, may occur in amounts that do not preclude the effect the characteristic was intended to provide.

20

Features that are described and/or illustrated with respect to one embodiment may be used in the same way or in a similar way in one or more other embodiments and/or in combination with or instead of the features of the other embodiments.

25 It should be emphasized that the term “comprises/comprising” when used in this specification is taken to specify the presence of stated features, integers, steps or components but does not preclude the presence or addition of one or more other features, integers, steps, components or groups thereof.

30 The present invention relates to production of graded coarse and fines materials by segregating various sizes of material such as minerals ore, sand and like that containing certain quantity of low graded and deleterious particles, through an integrated

continuous or batch process with high efficiency in order to improve the end product for the customer and lower its cost of production for users in mining, quarries and material recycling industry.

5 The advantage of the invention is that it provides a unique process for rejection of surface contaminants and deleterious particles from the feed by integrated scrubbing and screening process to produce upto five different size of products while continuously reprocessing the rejects to increase overall recoveries and reducing the loss of fines material significantly.

10

 The proposed system and method of the present invention can be extensively used for processing of, but not limited to, mineral ore like Iron, bauxite, manganese, coal, lignite, chromite, silica sand etc. and material like manufactured sand, crusher dust, river sand, frac sand, foundry sand, construction and demolition waste etc. The system is
15 particularly suited to effectively eliminate surface contaminants and deleterious particles from various ores, including lumps, ore fines, mines overburden, or stockpiled ore reserves.

 The present invention is the first technology that integrates the facility of
20 scrubbing, hydro cycloning, rinsing, sizing, dewatering and conveying to classify material in upto five sizes in a single integrated compact design. The system allows extraction of graded washed products from different raw materials with substantially reduced surface contaminants such as silica, clay and alumina content for use by various industries. One of the examples of the uses of the invention is to produce upto five
25 different sized materials of enriched high quality iron ore that is used on every day basis for upstream processing on furnaces or Kilns. This invention will considerably improve the cost, productivity and efficiency of steel making. Another example is adding value and enhancing the productivity of industries such as construction where efficient removal of clay and ultra-fines present in the material as the deleterious material can result into
30 lowering of usage of cement significantly and improve overall strength of the concrete.

Now, preferred embodiments of the present invention will be described in detail with reference to the annexed drawings. In the drawings, the same or similar elements are denoted by the same reference numerals even though they are depicted in different drawings. In the following description, a detailed description of known
5 functions and configurations incorporated herein will be omitted when it may make the subject matter of the present invention unclear.

While illustrative embodiments of the present invention are described below, it will be appreciated that the present invention may be practiced without the specified
10 details, and that numerous implementation-specific decisions may be made to the invention described herein to achieve the developer's specific goals, such as compliance with system-related and business-related constraints, which will vary from one system to other system such a development effort might be complex and time-consuming, it would nevertheless be a routine undertaking for those of ordinary skill in the art having the
15 benefit of this disclosure. For example, selected aspects are shown in block diagram form, rather than in detail, in order to avoid obscuring or unduly limiting the present invention. Such descriptions and representations are used by those skilled in the art to describe and convey the substance of their work to others skilled in the art. The present invention will now be described with reference to the drawings described below.

20 While aspects of described for a system and method thereof for scrubbing and classification of coarse and fines materials is disclosed, and may be implemented in any number of different computing systems, environments, and/or configurations, the embodiments are described in the context of the following exemplary system.

25 It should be emphasized that the term "comprises/comprising" when used in this specification is taken to specify the presence of stated features, integers, steps or components but does not preclude the presence or addition of one or more other features, integers, steps, components or groups thereof.

30 Referring now to figure 1, a system (100) to perform a method for scrubbing and classification of a plurality substance contained in an enclosure is disclosed. The system

comprises of an attrition wash box (AWB) (01) fed using the enclosure; thereby a high-pressure suitable quantity of water is added in a mixture tube of the AWB (01) for scrubbing the deleterious from the surface of feed substance. A rinsing screen (02) of a specific deck. At least one an integrated product conveyor for stock piling at least one

5 coarse products, wherein the integrated product conveyor is selected from a product conveyor-1, a product conveyor-2, and a product conveyor-3. A set of primary hydro-cyclone(s) (04) with specified pressure through a slurry pump-1 (05) and a special type of pipeline, wherein the primary hydro-cyclone(s) receives the mixture from a sump-1 (03), the slurry pump-1 (05) and eliminates at least one rejects by removing at least one

10 fine particles as tailings. A split feed box (09) for discharge to at least one portion of a split sizing cum dewatering screen (10). An product conveyor-4 (11) for stock piling a first fine product. A set of secondary hydro-cyclone(s) (14) with a specified pressure through a slurry pump-2 (15) and a special type of pipeline, wherein the secondary hydro-cyclone(s) (14) receives the mixture from a sump-2 (13), the slurry Pump-2 (15)

15 and eliminates at least one rejects by removing at least one fine particles as tailings. A split sizing cum dewatering screens (10). A product conveyor-5 (12) for stock piling a second fine product, and a programmable logic controlled motor control panel (16) configured to monitor the method performed by the system (100).

20 In one implementation, the rinsing screen may be selected from a group comprising of a single, a double, a triple deck, and combination thereof.

In one implementation, the substance may be a material or a mineral. The material may be selected from a group comprising a manufactured sand, crusher dust,

25 river sand, glass grade sand, frac sand, foundry sand, a construction waste, a demolition waste and a combination thereof. The mineral may be selected from is selected from a group comprising an iron ore, bauxite, a manganese, a coal, a lignite, a chromite, a silica sand, and combination thereof. The iron ore's are obtained from a mining of mineral and material, a mining overburden, a stockpiled reserves, and a combination thereof.

In one implementation, the substances are preferably classified with upto five sizes. The substances preferably have particle size ranging from 0.045 micron to 100 mm.

5 In one embodiment of the present invention, “scrubbing and classification” as used herein means the process used by the device to produce upto five sizes of products while substantially cleaning the surface of the material. The reject particles are then re-processed by the system for further classification operation thus reducing the wastage of material.

10

This present system may have an ability to segregate five sizes of product classified into a wide range of the sizes from 100mm to 0.045mm produced at different stages of the process. For example for iron ore application the device will classify at 0.045mm to 2mm, 2mm to 5mm, 5mm to 18mm, 18mm to 40mm and oversize or as per
15 the requirement of the user.

In an embodiment method / process for classification of various materials and/or mineral with variable sizes is provided. The said system may include, the material and/or mineral to be processed are fed to the attrition wash box (AWB) (01) through
20 typical feeding systems. The high-pressure suitable quantity of water is then added in the mixture tube of AWB for scrubbing the deleterious from the surface of feed material. The intelligent design of AWB box may provide a scrubbing action and the contaminants sticking to surface of the material is dislodged. In AWB, there is no requirement of any additional drive system, and the scrubbing action is achieved by forced rotation and
25 turbulence of material in a closed chamber under a constant force of high-pressure water jets. This scrubbing system will have low maintenance requirement.

Then the scrubbed material from the AWB discharges to the rinsing screen (02) for primary screening of the coarse particles. A suitable pressurized water quantity is
30 then added on the each deck of the rinsing screen for producing cleaner coarse particles. The rinsing screen (02) may be single/double/triple deck subject to the requirement of number of coarse products by the user. Three sizes of classified coarse products are then

delivered to the integrated product conveyor-1 (06), the product conveyor-2 (07), and the product conveyor-3 (08) for stock piling individually.

5 The unclassified finer material from the bottom deck of the rinsing screen along with fine particles (normally minus 5mm) is then discharged to the underlying sump-1 (marked 03) in slurry form.

10 The slurry is pumped to a set of primary hydro-cyclone(s) (04) with specified pressure through slurry pump-1 (05) and special type of pipeline. The primary hydro-cyclone(s) receives the mixture from sump-1 (03), slurry pump-1 (05) and eliminates the rejects by removing fine particles as tailings. The classified particles are simultaneously recovered as a first fine product to the maximum extent.

15 Here the first size of fine product along with water is discharged by the primary hydro-cyclone(s) in a slurry form and fed to the one portion of the split feed box (09) for discharge to the one portion of the split sizing cum dewatering screen (10). The suitable water quantity is then added on this screen through spray bars for washing out any remaining reject particles. This classified first fine product is then simultaneously dewatered and delivered to the product conveyor-4 (11) for stock piling.

20

The underflow of these split sizing cum dewatering screen (10) along with ultra-fine reject particles is then discharged to the underlying sump-2 (13) in slurry form.

25 The slurry is then reprocessed by the system for further recovery of one more product.

30 The slurry is pumped to a set of secondary hydro-cyclone(s) (14) with specified pressure through slurry pump-2 (15) and special type of pipeline for recycling the slurry further to recover the second fine product. The secondary hydro-cyclone(s) receives the mixture from sump-2 (13), slurry pump-2 (15) and eliminates the rejects by removing ultra-fine reject particles as tailings. The classified particles are simultaneously recovered as a second fine product to the maximum extent.

Then the sized useful product along with water is discharged by the secondary hydro-cyclone(s) in a slurry form and fed to the other portion of the Split Feed Box (marked 09) for discharge to the other portion of the split sizing cum dewatering screen (10). The classified final product is then dewatered and delivered to the product conveyor-5 (12) for stock piling.

The waste slurry from the primary and secondary hydro-cyclone(s) (04 and 14) is fed through wear resistant pipe work for any further processing that user may like to perform. A programmable logic controlled motor control panel (16) governs the entire process system as per desired parameters.

The invention is fully pre-assembled, electrically wired with extensive test carried out prior to dispatch from factory ensuring minimal intervention required by installation and commissioning engineers.

Referring now to figure 2, a method for scrubbing and classification of a plurality substance contained in an enclosure in a system (100) is disclosed.

At step 202, the substance to an attrition wash box (AWB) (01) is received. Further, the substance received is scrubbed.

At step 204, the substance from the AWB (01) is discharged to a rinsing screen (02). A suitable amount of pressurized water is added on the rinsing screen (02) for classification of at least one size of coarse washed product. Further, the at least one size of coarse washed product obtained is dewatered and discharged. Furthermore, the at least one size of coarse washed product obtained is recovered and provided to at least one integrated product conveyor for stock piling, wherein the integrated product conveyor is selected from a product conveyor-1, a product conveyor-2, and a product conveyor-3.

At step **206**, the recovered water from the rinsing screen **(02)** along with all fine particles obtained is discharged to a sump-1 **(03)** in a slurry form.

At step **208**, the slurry is pumped to a primary hydro-cyclone(s) **(04)** with a
5 specified pressure through a slurry pump-1 **(05)**.

At step **210**, the mixture from the sump-1 **(03)** and the slurry pump-1 **(05)** is obtained and simultaneously at least one rejects is eliminated.

10 At step **212**, the fine particles obtained by a primary hydro-cyclone **(04)** in the slurry form are discharged to a split feed box **(09)**.

At step **214**, the fine particles obtained to a split sizing cum dewatering screen **(10)** are dewatered and discharged for recovering a first fine product.

15

At step **216**, the first fine product obtained is dewatered and is integrated in a product conveyor-4 **(11)** for stock piling.

At step **218**, an underflow along with fine particles obtained from the split
20 sizing cum dewatering screen **(10)** to a sump-2 **(13)** is discharged in slurry form for reprocessing.

At step **220**, the slurry is pumped to a secondary hydro-cyclone **(14)** with a specified pressure through slurry pump-2 **(15)**.

25

At step **222**, a mixture from the sump-2 **(13)** and the slurry pump-2 **(15)** is obtained and simultaneously at least one rejects is eliminated.

At step **224**, the fine particles obtained to the split sizing cum dewatering
30 screen **(10)** are dewatered and discharged for recovering a second fine product.

At step **226**, the second fine product obtained is recovered and integrated it in a product conveyor-5 (**12**) for stock piling.

At step **228**, the reject ultrafine particles along with water from the primary
5 hydro cyclone(s) (**04**) and the secondary hydro cyclone(s) (**14**) are discharged.

In one implementation, the rinsing screen may be selected from a group comprising of a single, a double, a triple deck, and combination thereof.

10 In one implementation, the substance may be a material or a mineral. The material may be selected from a group comprising a crusher dust, river sand, glass grade sand, foundry sand, a construction waste, a demolition waste and a combination thereof. The mineral may be selected from is selected from a group comprising an iron ore, bauxite, a manganese, a coal, a lignite, a chromite, a silica sand, and combination
15 thereof. The iron ore's are obtained from a mining of mineral and material, a mining overburden, a stockpiled reserves, and a combination thereof.

In one implementation, the substances are preferably classified with upto five sizes. The substances preferably have particle size ranging from 0.045 micron to **100**
20 mm.

Referring now to figure **3**, a plan (top view) of the proposed system (**100**) is shown, in accordance with an embodiment of the present subject matter.

25 Referring now to figure **4**, an elevation (side view) of the proposed system (**100**) is shown, in accordance with an embodiment of the present subject matter.

It is well understood by the person skilled in the art that various components/elements used in the present invention that may include but not limited to the attrition
30 wash box, rinsing screen, sump, hydro-cyclone(s), split feed box, split sizing cum dewatering screen, product conveyor, used in this invention are already known for its use and there is no special modification or alteration done to make it novel. Further, the

simplicity of these components and the simple usage as claimed in the present invention makes the invention more efficient and user friendly. Further, it is also well understood that the plurality substance contained in an enclosure are used in the typical feed systems used in the present invention does not need to be of accurate size and shape as the present technology would allow, but could be manufactured using simple, off-the-shelf parts.

Exemplary embodiments discussed above may provide certain advantages. Though not required to practice aspects of the present invention, these advantages may include:

1. Scrubbing system may isolate contaminants and dislodge such objects sticking on the surface of the material. This is a huge advantage when compared to traditional systems which have no integrated scrubbing facility with the system.
2. Requires phenomenally less space for installation compared to traditional systems of the same capacity that need very large area. The compact nature of the system will allow it to be conveniently used in urban areas, factories, waste management sites, mobile applications, hilly areas etc. It can be also easily attached with upstream processes.
3. Attached with the belt conveyors for making stockpile for all products. This is an extra advantage compared to traditional systems that must install separate material handling system for the products.
4. Phenomenal reduction in power consumption again due to compact design of the system requiring lesser movement of material.
5. Can be completely built and assembled in the factory thus significantly lowering installation time and eliminating the risks associated with site fabrication. Besides longer installation time, the high cost and risk of site fabrication are commonly associated with traditional system.
6. Modular design that can be dismantled easily and shipped worldwide in containers. Most traditional equipment cannot be shipped efficiently. Also modularity helps when the user desires to relocate the plant to a different project site. Again this is difficult with traditional system.

7. Due to standardization of drawings, it requires considerably less time to manufacture the invention. The conventional system are designed as per the requirements of the site and are hence non-standard which results in longer lead time for manufacture.

5 8. Low level civil foundation requirements due to its integrated steel chassis that allows better weight distribution of the components installed on the system. Traditional systems are installed on large civil pedestals that involve high cost and construction time.

10 9. The system is complete with all electrical cabling and programmable logic control panel requiring no site electrical work. This is a huge advantage when compared to traditional systems which must be electrically connected at the project site.

15 Finally, it should be understood that the above embodiments are only used to explain, but not to limit the technical solution of the present application. Despite the detailed description of the present application with reference to above preferred embodiments, it should be understood that various modifications, changes or equivalent replacements can be made by those skilled in the art without departing from the scope of the present application and covered in the claims of the present application.

CLAIMS

1. A method for scrubbing and classification of a plurality substance contained in an enclosure in a system (100), the method comprising the steps of:

5 receiving the substance to an attrition wash box (AWB) (01), thereby scrubbing the substance received;

discharging the scrubbed substance from the AWB (01) to a rinsing screen (02), thereby

10 adding a suitable amount of a pressurized water on the on the rinsing screen (02) for classification of at least one size of coarse washed product;

dewatering the at least one size of coarse washed product obtained and discharging it; and

15 recovering the at least one size of coarse washed product obtained and providing it to at least one integrated product conveyor for stock piling, wherein the integrated product conveyor is selected from a first product conveyor, a second product conveyor, and a third product conveyor;

discharging recovered water from the rinsing screen (02) along with all fine particles obtained to a first sump (03) in a slurry form to form a first slurry;

20 pumping the first slurry to a primary hydro-cyclone(s) (04) with a specified pressure through a first slurry pump (05) and simultaneously eliminating at least one reject from the first slurry;

discharging the fine particles obtained by a primary hydro-cyclone (04) from the first slurry as tailings to a split feed box (09);

25 dewatering and discharging the fine particles obtained from the tailings to a split sizing cum dewatering screen (10) for recovering a first fine product;

dewatering the first fine product obtained and integrating it in a fourth product conveyor (11) for stock piling;

30 discharging an underflow along with fine particles obtained from the split sizing cum dewatering screen (10) to a second sump (13) in slurry form to form a second slurry for reprocessing;

pumping the second slurry to a secondary hydro-cyclone (14) with a specified pressure through a second slurry pump (15) and simultaneously eliminating at least one reject from the second slurry;

dewatering and discharging the fine particles obtained to the split sizing cum dewatering screen (10) for recovering a second fine product;

recovering the second fine product obtained and integrating it in a fifth product conveyor (12) for stock piling;

discharging rejected ultrafine particles along with water from the primary hydro cyclone(s) (04) and the secondary hydro cyclone(s) (14).

10

2. The method as claimed in claim 1, wherein the substance is a material.

3. The method as claimed in claim 2, wherein the material is selected from a group consisting of a manufactured sand, crusher dust, a river sand, a glass grade sand, a frac sand, a foundry sand, a construction waste, a demolition waste and a combination thereof.

15

4. The method as claimed in claim 1, wherein the substance is a mineral.

5. The method as claimed in claim 4, wherein the mineral selected from is selected from a group consisting of an iron ore, a bauxite, a manganese, a coal, a lignite, a chromite, a silica sand, and combination thereof.

20

6. The method as claimed in claim 5, wherein the iron ore are obtained from a mining of mineral and material, a mining overburden, a stockpiled reserves, and a combination thereof.

25

7. The method as claimed in claim 1, wherein the substances are classified with up to five sizes.

30

8. The method as claimed in claim 1 and 7, wherein the substances have particle size ranging from **0.045 mm** to **100 mm**.

9. A system **(100)** to perform a method for scrubbing and classification of a plurality substance contained in an enclosure, the system comprising:

an attrition wash box (AWB) **(01)** fed using the enclosure; thereby a high-pressure suitable quantity of water is added in a mixture tube of the AWB **(01)** for scrubbing the deleterious from the surface of feed substance;

a rinsing screen **(02)** of a specific deck configured to receive the scrubbed substance from the AWB **(01)** and configured to receive a suitable amount of pressurized water to classify at least one size of coarse washed product from the scrubbed substance and to discharge fine particles in a slurry form to form a first slurry;

at least one integrated product conveyor for stock piling the at least one coarse products, wherein the integrated product conveyor is selected from a first product conveyor, a second product conveyor, and a third product conveyor;

a set of primary hydro-cyclone(s) **(04)** configured to receive the first slurry through a first slurry pump **(05)** and a special type of pipeline, wherein the first slurry is pumped into the primary hydro-cyclone(s) **(04)** with a specified pressure such that the primary hydro-cyclone(s) **(04)** eliminates at least one reject from the first slurry by removing at least one fine particle as tailings;

a split feed box **(09)** configured to receive the tailings from the primary hydro-cyclone(s) **(04)** whereby the tailings are dewatered and discharged to a split sizing cum dewatering screen **(10)** that is configured to recover a first fine product from the dewatered tailings and to discharge an underflow along with fine particles in a slurry form to form a second slurry;

a fourth product conveyor **(11)** for stock piling the first fine product;

a set of secondary hydro-cyclone(s) **(14)** configured to receive the second slurry through a second slurry pump **(15)** and a special type of pipeline, wherein the second slurry is pumped into the secondary hydro-cyclone(s) **(14)** with a specified pressure such that the secondary hydro-cyclone(s) **(14)** eliminates at

least one reject from the second slurry by removing at least one fine particle as tailings;

the split sizing cum dewatering screen (10) configured to receive the tailings from the secondary hydro-cyclone(s) (14) whereby the tailings are dewatered to recover a second fine product;

a fifth product conveyor (12) for stock piling the second fine product; and

a programmable logic controlled motor control panel (16) configured to monitor the method performed by the system.

10

10. The system (100) as claimed in claim 9, wherein the rinsing screen is selected from a group consisting of a single, a double, a triple deck, and combination thereof.

11. The system (100) as claimed in claim 9, wherein the substance is a material.

15

12. The system (100) as claimed in claim 11, wherein the material is selected from a group consisting of a crusher dust, a river sand, a glass grade sand, a foundry sand, a construction waste, a demolition waste and a combination thereof.

20

13. The system (100) as claimed in claim 9, wherein the substance is a mineral.

14. The system (100) as claimed in claim 13, wherein the mineral is selected from is selected from a group consisting of an iron ore, a bauxite, a manganese, a coal, a lignite, a chromite, a silica sand, and combination thereof.

25

15. The system (100) as claimed in claim 14, wherein the iron ore are obtained from a mining of mineral and material, a mining overburden, a stockpiled reserves, and a combination thereof.

30

16. The system (100) as claimed in claim 9, wherein the substances are classified with up to five sizes.

17. The system (100) as claimed in claim 9 and 16, wherein the substances have particle size ranging from 0.045 mm to 100 mm.