

**METHOD AND INSTALLATION FOR EXTRACTING
AND PROVIDING IN DESIRED COMPOSITION
GRANULAR MATERIAL SUCH AS SAND**

In respect of ground excavation for extraction of sand it is becoming of increasingly greater importance from an environmental viewpoint to use the extracted sand in the best possible manner.

5 Described in EP-A-0 319 070 is an installation in which, immediately after being sucked up, the sand is separated into fractions and delivered in a particular desired composition for different purposes, for instance for the concrete industry.

10 Such an installation has the problem that when sand or gravel is supplied in determined compositions a quantity of granular material is left over. Such residue is transported away by barge, whereafter this sand is used for instance as construction site filling.

15 The present invention has for its object to provide a method and installation with which the sand can be separated into fractions at the extraction site and discharged as optimally as possible in the desired composition while as little as possible is lost.

20 To this end the present invention provides a method for extracting and providing in desired composition of granular material comprising the following steps of:

- sucking or scooping up granular material;
- separating the granular material into fractions;
- 25 - mixing the granular material into a mixture of the different fractions; and
- adding granular material from a fraction insufficiently available at the extraction location.

30 When sand is extracted at a particular location, knowledge is available relating to the composition of the already extracted sand, on the basis of which assessments

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can be made with respect to the composition of the sand to be extracted in the near future. If it is anticipated that a particular fraction will be extracted to an insufficient extent - this depending on orders placed by end users - this
5 fraction can be supplied to the extraction location, for instance by barge or from bunkers.

The present invention further provides an installation for extracting and providing granular material, for instance sand and gravel, in desired composition,
10 comprising:

- means for sucking or scooping up granular material;
- means for sorting the material into two or more grain size classes;
- means for mixing the material from the classes into
15 a mixture of granular material; and
- means for adding one or more additives to the mixture.

The additives may comprise plastic material for improvement of the properties of concrete.

20 In the case the shortage relates to a fraction of extremely small grain size, this fraction can be prepared on an installation for performing the above stated method by further grinding or reducing in size a fraction of which there is a surplus using a grinding device. For this purpose
25 the present invention provides an installation for extracting and separating into fractions granular material, for instance sand and gravel, in desired composition, comprising:

- means for sucking or scooping up granular material;
- 30 - means for sorting the material into two or more grain size classes;
- means for mixing the granular material from the classes into a mixture of granular material;
- means for grinding the material from the classes
35 with the smallest grain size in order to further reduce the grain size; and
- means for adding the ground material to the mixture.



Further advantages, features and details of the present invention will become apparent in the light of the description of a preferred embodiment thereof wherein reference is made to the annexed drawings, in which:

5 fig. 1 shows a perspective view of a preferred embodiment of an installation for performing a method according to the present invention;

 fig. 2 shows a diagram of the installation of fig. 1; and

10 fig. 3 is a diagram of a device for use in the installation of fig. 2 for determining the content of dry substance in a particular fraction and/or mixture of the sand.

 An installation 1 is provided with floater bodies 3, 15 4 and is displaceable (1') through a lake area L already excavated by this installation 1. A barge B to which the extracted sand of a determined specification is delivered can also be seen in fig. 1.

 An installation 1 (fig. 2) comprises a suction pump 6 20 which sucks up and delivers the sand to a separating means 7 wherein the granular material of a mean diameter between 80 and 180 mm is discharged as gravel via arrow A to a barge S. Using a pump 8 the sand with a grain size smaller than 80 mm is added to separating means 9, 10, 11, 12, 13, 14, and 15, 25 which are only designated schematically, where separation takes place into fractions B, C, D, E, F and G.

 These separating means 9-15 comprise dewatering means, float sand beds, cyclones and the like for the purpose of separating the granular material into particular 30 fractions in effective manner. A similar installation is described in EP-A-0 319 070 of the same applicant. In the present embodiment fractions B-G relate to grain sizes of respectively 8-80 mm, 4-8 mm, 2-4 mm, 0.5-2 mm, 250-500 µm, 100-250 µm. The fraction B is discharged as gravel in a 35 barge T - or in another embodiment - discharged as gravel in barge S.

 The fractions C-G are introduced in the composition desired by the end user after they have been stored in the



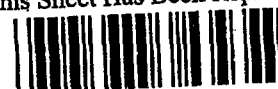
interim. Delivery of the mixture in desired composition is indicated with line H. The feed conveyors (not shown) for the fractions C-G are preferably each provided with devices for determining the quantity of each fraction added to the
5 mixture. A mixture H is well mixed in a mixer 16, details of which are likewise described in EP-A-0 319 070, and delivered to a barge V. After mixing a sample is taken in block 17 in order to check whether the desired composition of the mixture has indeed been obtained and to control
10 automatically or manually the feed of the diverse fractions C-G. Further details hereof are likewise described in the above cited European application.

In the installation according to the present invention it is possible to supply a fraction K from a barge
15 U if such an addition is desired in order to comply with the orders of the end users, while it is thus avoided that extracted sand has to be discharged as so-called filling sand whereof the composition is of less importance. As a result of the supply of fraction K the extracted sand is
20 utilized as optimally as possible.

It will be apparent that the planning with the use of a computer is of the greatest importance in the above stated supply of a fraction or additive. In preference barges requiring the same composition of the mixture are loaded directly one after another. Further efficiency improvements
25 are feasible by loading two barges with a different mixture at substantially the same time.

Installation 1 is further provided with means 20 for adding a fraction of extremely small grain size. This is of
30 relevance for particular applications, especially in the concrete industry and more especially for improving properties of concrete. As indicated with arrow L, a portion of the fraction E is carried via a collecting tank 21 and a conveyor 22 to a grinding device 23, in the present case a
35 ball mill. Via tank 24 and pump 25 the ground fraction is separated in a first cyclone 26. Via collecting tank 27 and pump 28 the small fraction is carried from the first cyclone 26 to a second cyclone 29, wherein a second separation takes

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place until a fraction is obtained at M with a grain size smaller than 125 μ m. This fraction M is placed in a collecting tank 30 in which this fraction M is kept continually in motion using a stirring means 31. Using a special pump 32, such as for instance that in use as concrete pump, this fraction of extremely small diameter is carried from the tank 30 to a pre-mixer 33 where the fraction M is mixed together with the fraction G and added to the mixture H.

Shown in fig. 3 is a device 41 with which the amount of moisture in each fraction or the mixture, and therefore the amount of dry substance, can be measured, which is of course of the greatest importance for end users. The thickness T of a layer of granular material 40 transported on a conveyor 38 is measured using a radiation source 39, for instance for gamma radiation, and a detector 34 for this radiation, and generated to a recording device 35. Using a microwave transmitter 36 and a microwave receiver 37 a measure for the moisture present between transmitter 36 and receiver 37 is also generated to the recording device 35, whereafter the dry substance content is calculated by the recording device 35 using calibration factors stored therein.

Finally, each conveyor for each fraction is preferably provided with both a weighing device for determining the quantity of sand per fraction and a moisture content meter.

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CLAIMS

1. Method for extracting and providing in desired composition of granular material, comprising the following steps of:

- sucking or scooping up granular material;
- 5 - separating the granular material into fractions;
- mixing the granular material into a mixture of the different fractions; and
- adding granular material from a fraction insufficiently available at the extraction location.

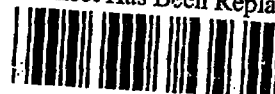
2. Installation for extracting and providing granular material, for instance sand and gravel, in desired composition, comprising:

- means for sucking or scooping up granular material;
- means for sorting the material into two or more
- 15 grain size classes;
- means for mixing the material from the classes into a mixture of granular material; and
- means for adding one or more additives to the mixture.

3. Installation for extracting and providing fractions of granular material, for instance sand and gravel, in desired composition, comprising:

- means for sucking or scooping up granular material;
- means for sorting the material into two or more
- 25 grain size classes;
- means for mixing the material from the classes to a mixture of granular material;
- means for grinding the material from the classes with the smallest grain size in order to further reduce the
- 30 grain size; and
- means for adding the ground material to the mixture.

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4. Installation as claimed in claim 2 or 3, provided with pre-mixing means for mixing the ground material with the granular material from the classes of smallest diameter.

5. Installation as claimed in claim 2, 3 or 4, provided with a collecting tank for the ground material in which is placed a stirring means.

6. Installation as claimed in claim 4 or 5, provided with a pump for pumping the ground material to the pre-drying means.

10 7. Installation as disclosed in the description and/or the figures.

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