

Mobile concrete batching plant and concrete mixing method

Technical Field

5 The invention relates to the field of concrete mixing, more specifically to a mobile concrete batching plant and its concrete mixing method.

Background

10 In the prior arts, CN 1192397A discloses a mixing apparatus for production of concrete, which comprises a container mounted on a platform trailer with wheels for transportation by road, a detachable aggregate selection and storage device and a detachable cement storage device. The container includes a transporting member with a weighing member and a water storage device with a metering member. At sites, the
15 container is placed on the platform for supporting the container, the aggregate selection and storage device and the cement storage device are fixed on the top of the container, and the aggregates metered in-situ by the storage device are fed to the mixing apparatus. Cement metered from the cement storage device and water from the water storage device are also fed to the mixing apparatus, from the bottom of which
20 the concrete obtained is discharged. The weighing member is connected to a central control unit. As long as a required amount of cement has been delivered from the cement storage device to the weighing member, the operator can stop the feeding of cement.

25 The traditional concrete mixing apparatus has the following disadvantages: 1) A certain amount of material will float in air when the concrete mixing apparatus weighs the cement and the aggregates, i.e., a so-called in-air remnant is generated. This in-air remnant has not been considered by the traditional concrete mixing apparatus, and will seriously influence on the weighing accuracy of materials. And when several
30 kinds of materials, such as sand, large-sized stones, small-sized stones or stone powder, are weighed by one single pound cylinder, the error will be accumulated and magnified; and 2) Since the additives are added into the aggregates directly, they will be distributed unevenly, thereby reducing the quality of concrete obtained.

In short, the traditional concrete mixing apparatus cannot ensure a precise feeding of materials according to a preset formulation, and additives cannot be distributed evenly in the concrete product. Therefore, the traditional concrete mixing apparatus cannot provide concrete product of high quality.

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Summary

The invention aims to provide a mobile concrete batching plant, which can precisely feed materials according to a formulation.

According to an embodiment of the invention, a mobile concrete batching plant is provided, comprising: a container body mounted on a draggable trailer frame, within the container body a mixer being arranged. The mixer respectively connects to a cement pound cylinder, a water pound cylinder and an aggregate unit for receiving, weighing and feeding aggregates. The aggregate unit includes a motorized belt conveyor, a belt pound scale mounted on the motorized belt conveyor, and an aggregate storage device. A permanent cement storage device connecting to the cement pound cylinder is mounted on the upper end of the container body. The mobile concrete batching plant is further provided with an additive pound cylinder connecting to the cement pound cylinder, a permanent water storage tank and pumping line connecting to the water pound cylinder, a permanent additive pound cylinder and pumping line connecting to the additive pound cylinder and a central control unit. The central control unit includes a display module, a gate control module and an in-air remnant module.

The in-air remnant module connects to the permanent cement storage device, the permanent water storage tank and pumping line, the permanent additive pound cylinder and pumping line and the aggregate storage device respectively, for determining mass of the in-air remnant respectively generated when the gates of the permanent cement storage device, the permanent water storage tank and pumping line, the permanent additive pound cylinder and pumping line and the aggregate storage device are closed.

The display module connects to the cement pound cylinder, the water pound cylinder, the additive pound cylinder and the belt pound scale respectively, for displaying in a real-time manner the mass of cement, water, additives and aggregates weighed by the cement pound cylinder, the water pound cylinder, the additive pound cylinder and the belt pound scale respectively.

The gate control module respectively connects to the in-air remnant module and the display module in a bi-directional manner. When the display module displays that the mass of cement, water, additive and aggregate weighed is equal to the difference between the mass required by the formulation input by the user and the corresponding mass of the in-air remnant, the gate control module will control to close the corresponding gate of the permanent cement storage device, the permanent water storage tank and pumping line, the permanent additive pound cylinder and pumping line and the aggregate storage device.

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According to an embodiment of the invention, a concrete mixing method of the above mobile concrete batching plant is provided, comprising the following steps:

weighing the required mass of cement, water, additives and aggregates in advance by means of the cement pound cylinder, the water pound cylinder, the additive pound cylinder and the belt pound scale, according to the requirement of concrete formulation;

opening the gate of the additive pound cylinder and adding additives into the water pound cylinder;

delivering the water mixed with additives weighed by the water pound cylinder, the cement weighed by the cement pound cylinder and the aggregates weighed by the belt pound scale into the mixer for mixing; and

discharging the product obtained.

Compared with the prior arts, the invention has the following advantageous effects. With the in-air remnant module, the display module and the gate control module, the weighing accuracy of materials is significantly increased. Therefore, materials can be fed precisely according to formulation so that concrete of high quality can be obtained. With additives mixed into water in advance, additives can be distributed evenly, and thus quality of concrete obtained is increased.

Brief Description of Drawings

5 Fig. 1 schematically shows the structure of the mobile concrete batching plant according to an embodiment of the invention.

 Fig. 2 is the modular block diagram of the central control unit of the mobile concrete batching plant according to an embodiment of the invention.

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 Fig. 3 is the flow chart of concrete mixing method according to an embodiment of the invention.

 Fig. 4 shows an example of the display interface of the display module of the mobile concrete batching plant according to an embodiment of the invention.

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Specific Embodiments of the Invention

20 In the following the invention will be discussed in details with reference to the attached drawings and embodiments so that the objective, technical solution and advantages of the invention are more distinct. It should be understood that the particular embodiments as set forth herewith are intended to be illustrative only, not limiting the scope of the invention in any way.

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 The solution provided by an embodiment of the invention is as follows:

 A mobile concrete batching plant, comprising: a container body mounted on a draggable trailer frame, within the container body a mixer being arranged. The mixer
30 respectively connects to a cement pound cylinder, a water pound cylinder and an aggregate unit for receiving, weighing and feeding aggregates. The aggregate unit includes a motorized belt conveyor, a belt pound scale mounted on the motorized belt conveyor, and an aggregate storage device. A permanent cement storage device connecting to the cement pound cylinder is mounted on the upper end of the container

body. The mobile concrete batching plant is further provided with an additive pound cylinder connecting to the cement pound cylinder, a permanent water storage tank and pumping line connecting to the water pound cylinder, a permanent additive pound cylinder and pumping line connecting to the additive pound cylinder and a central control unit. The central control unit includes a display module, a gate control module and an in-air remnant module.

The in-air remnant module connects to the permanent cement storage device, the permanent water storage tank and pumping line, the permanent additive pound cylinder and pumping line and the aggregate storage device respectively, for determining mass of the in-air remnant respectively generated when the gates of the permanent cement storage device, the permanent water storage tank and pumping line, the permanent additive pound cylinder and pumping line and the aggregate storage device are closed.

The display module connects to the cement pound cylinder, the water pound cylinder, the additive pound cylinder and the belt pound scale respectively, for displaying in a real-time manner the mass of cement, water, additives and aggregates weighed by the cement pound cylinder, the water pound cylinder, the additive pound cylinder and the belt pound scale respectively.

The gate control module respectively connects to the in-air remnant module and the display module in a bi-directional manner. When the display module displays that the mass of cement, water, additive and aggregate weighed is equal to the difference between the mass required by the formulation input by the user and the corresponding mass of the in-air remnant, the gate control module will control to close the corresponding gate of the permanent cement storage device, the permanent water storage tank and pumping line, the permanent additive pound cylinder and pumping line and the aggregate storage device.

A concrete mixing method of the above mobile concrete batching plant, comprising the following steps:

weighing the required mass of cement, water, additives and aggregates in advance by means of the cement pound cylinder, the water pound cylinder, the

additive pound cylinder and the belt pound scale, according to the requirement of concrete formulation;

opening the gate of the additive pound cylinder and adding additives into the water pound cylinder;

- 5 delivering the water mixed with additives weighed by the water pound cylinder, the cement weighed by the cement pound cylinder and the aggregates weighed by the belt pound scale into the mixer for mixing; and
discharging the product obtained.

- 10 With the in-air remnant module, the display module and the gate control module, the weighing accuracy of materials is significantly increased. Therefore, materials can be fed precisely according to formulation so that concrete of high quality can be obtained. With additives mixed into water in advance, additives can be distributed evenly, and thus quality of concrete obtained is increased.

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In the following the invention will be discussed in details with reference to embodiments and the attached drawings.

- Referring to Figs. 1 and 2, the embodiment of the invention provides a mobile
20 concrete batching plant, comprising a container body 7 mounted on a draggable trailer frame 1. Inside the container body 7 a mixer 2 is housed. The mixer 2 respectively connects to a cement pound cylinder 3, a water pound cylinder 13 and an aggregate unit for receiving, weighing and feeding aggregate. The aggregate unit includes a
25 motorized belt conveyor 15, a belt pound scale 4 mounted on the motorized belt conveyor 15, and an aggregate storage device 8. A permanent cement storage device 11 connecting to the cement pound cylinder 3 is mounted on the upper end of the container body 7. The mobile concrete batching plant further comprises an additive
pound cylinder 12 connecting to the cement pound cylinder 3, a permanent water storage tank and pumping line 50 connecting to the water pound cylinder 13, a
30 permanent additive pound cylinder and pumping line 60 connecting to the additive pound cylinder 12, and a central control unit 14.

The central control unit 14 includes a display module 141, a gate control module 143 and an in-air remnant module 142.

The in-air remnant module 142 connects to the permanent cement storage device 11, the permanent water storage tank and pumping line 50, the permanent additive pound cylinder and pumping line 60 and the aggregate storage device 8 respectively, for determining mass of the in-air remnant respectively generated when the gates of the permanent cement storage device 11, the permanent water storage tank and pumping line 50, the permanent additive pound cylinder and pumping line 60 and the aggregate storage device 8 are closed.

In an embodiment of the invention, the display module 141 connects to the cement pound cylinder 3, the water pound cylinder 13, the additive pound cylinder 12 and the belt pound scale 4 respectively, for displaying in a real-time manner the mass of cement, water, additives and aggregates weighed by the cement pound cylinder 3, the water pound cylinder 13, the additive pound cylinder 12 and the belt pound scale 4 respectively.

In an embodiment of the invention, the gate control module 143 respectively connects to the in-air remnant module 142 and the display module 141 in a bi-directional manner. Specifically, when the display module 141 displays that the mass of cement, water, additive and aggregate weighed is equal to the difference between the mass required by the formulation input by the user and the corresponding mass of the in-air remnant, the gate control module 143 will control to close the corresponding gate of the permanent cement storage device 11, the permanent water storage tank and pumping line 50, the permanent additive pound cylinder and pumping line 60 and the aggregate storage device 8.

In the mobile concrete batching plant according to the embodiment of the invention, through arranging the in-air remnant module 142, the display module 141 and the gate control module 143, the accuracy of material weighing is significantly increased. Therefore, the materials can be precisely supplied according to the formulation, so that concrete with high quality can be obtained. With the permanent water storage tank and pumping line 50, an emergency protection measure is provided in the case of unexpected loss of water supply.

In an embodiment of the invention, the mobile concrete batching plant further includes an alarming module 145 connecting to the central control unit 14, for automatically giving an alarm when there is a fault in the batching plant. In this case, the central control unit 14 sends out a command for emergent shutdown.

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In an embodiment of the invention, the mobile concrete batching plant further includes an aggregate weighing error-proofing module 146 connecting to the central control unit 14, for opening the gate associated with the aggregate to be weighed only but locking the gates associated with other aggregates not to be weighed so that incorrect weighting can be avoided. In this case, the belt pound scale 4 weighs all the aggregates in the formulation one by one in sequence.

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In an embodiment of the invention, the mobile concrete batching plant further includes a man-machine interface 147 connecting to the central control unit 14, for inputting the preset concrete formulation and the control parameters of the manufacturing process into the system.

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In an embodiment of the invention, the man-machine interface 147 is a keypad or a touch screen arranged on the display module 141.

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In an embodiment of the invention, more than one wheel 5 is mounted on the lower end of the trailer frame 1, so that the batching plant is movable.

In an embodiment of the invention, the lower end of the draggable trailer frame 1 is further provided with a hook 16 for connecting to a locomotive.

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In an embodiment of the invention, a material outlet 21 is provided at the lower end of the mixer 2. And the aggregate unit includes a motorized belt conveyor 15, a belt pound scale 4 mounted on the motorized belt conveyor 15 and provided with an aggregate discharging end 41, and an aggregate storage device 8.

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An inlet 31 and an outlet 32 are arranged at the upper end and the lower end of the cement pound cylinder 3 respectively.

A water inlet 131 and a water outlet 132 are arranged at the upper end and the lower end of the water pound cylinder 13 respectively.

Material inlets 22 are arranged at the upper end of the mixer 2 for connecting to the discharging end 41, the outlet 32 and the water outlet 132 respectively.

In an embodiment of the invention, the container body 7 is further provided with an air compressor therein. The air compressor is used for air channel layout, control and protection for air-actuated devices, apparatuses and functional components.

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In an embodiment of the invention, the container body 7 is further provided with a rapid switching device for temporary power supply therein for use at emergence.

In an embodiment of the invention, the container body 7 is further provided with a rapid connecting device for outside power supply and a main panel box. They include the cables to a control room electricity cabinet, and the circuit layout, control and protection relating to all actions of open/close and startup/shutdown etc. from the control room electricity cabinet to the electrical equipments, devices, apparatuses and components. With the rapid connecting device for outside power supply and the main panel box, a safety precaution measure is provided in the case of unexpected loss of electricity.

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In an embodiment of the invention, the aggregate storage device includes a lower storage part 81 and a foldable upper storage part 82, which are provided inside and outside the container body 7 respectively and connected with each other.

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In an embodiment of the invention, at the upper end of the belt pound scale 4 an upper port is provided, with which a discharging port provided at the lower end of the lower storage part 81 connects.

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In an embodiment of the invention, at the upper end of the container body 7 there is further provided with a detachable permanent cement storage device 11, the outlet arranged at the lower end of which being connected to the inlet 31 of the cement pound cylinder 3.

In an embodiment of the invention, a distributor 10 is arranged at the upper end of the container body 7.

5 In an embodiment of the invention, the additive pound cylinder 12 is provided with a flow inlet and a flow outlet respectively at the upper end and the lower end thereof, wherein the flow inlet connects with the delivery pipe of the permanent additive pound cylinder and pumping line 60 while the flow outlet connects with the water inlet 131 of the water pound cylinder 13. With the flow outlet of the additive
10 pound cylinder 12 being connected with the water inlet 131 of the water pound cylinder 13, additives can be mixed into water in advance. Therefore, additives can be distributed evenly and quality of concrete obtained is increased.

Referring to Fig. 3, an embodiment of the invention further provides a concrete
15 mixing method of the above mobile concrete batching plant, comprising the following steps:

Step 301: weighing the required mass of cement, water, additives and aggregates in advance according to the requirement of concrete formulation by means of the cement pound cylinder 3, the water pound cylinder 13, the additive pound cylinder 12
20 and the belt pound scale 4;

Step 302: opening the gate of the additive pound cylinder 12 and adding additives into the water pound cylinder 13;

Step 303: delivering the water mixed with additive weighed by the water pound cylinder 13, the cement weighed by the cement pound cylinder 3 and the aggregates
25 weighed by the belt pound scale 4 into the mixer 2 for mixing;

Step 304: discharging the material obtained.

In the embodiment of the invention, additives are mixed with water in advance. Therefore, the additives can be distributed evenly and the quality of concrete is
30 increased.

In the step, the mixed concrete can be directly discharged from the material outlet 21 of the mixer 2.

In an embodiment of the invention, the belt pound scale 4 weighs the aggregates as follows. When a certain kind of aggregate is to be weighed, only the gate associated with the aggregate to be weighed is opened, and the gates associated with other aggregates, which are not to be weighed, are locked so that an incorrect
5 weighting can be avoided, wherein the belt pound scale 4 weighs all the aggregates in the formulation one by one in sequence.

In an embodiment of the invention, the step of weighing the required mass of cement, water, additives and aggregates in advance by means of the cement pound
10 cylinder 3, the water pound cylinder 13, the additive pound cylinder 12 and the belt pound scale 4 specifically includes:

determining mass of the in-air remnant respectively generated when the gates of the permanent cement storage device 11, the permanent water storage tank and pumping line 50, the permanent additive pound cylinder and pumping line 60 and the
15 aggregate storage device 8 are closed;

displaying in a real-time manner mass of cement, water, additives and aggregates respectively weighed by the cement pound cylinder 3, the water pound cylinder 13, the additive pound cylinder 12 and the belt pound scale 4 in a real-time manner; and

when the display module 141 displays that the mass of cement, water, additive
20 and aggregate weighed is equal to the difference between the mass required by the formulation input by the user and the corresponding mass of the in-air remnant, the corresponding gate of the permanent cement storage device 11, the permanent water storage tank and pumping line 50, the permanent additive pound cylinder and pumping line 60 and the aggregate storage device 8 is controlled to be closed.

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In the following each portion of the mobile concrete batching plant will be discussed in details.

A. The portion relating to the aggregate unit

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In an embodiment of the invention, the aggregates include any one of sand, stone and stone powder, or any combination thereof.

The aggregate unit includes a motorized belt conveyor 15, a belt pound scale 4

mounted on the motorized belt conveyor 15, and an aggregate storage device 8.

The belt pound scale 4 is arranged below the aggregate storage device 8, at the rear end of the mixer 2.

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The belt pound scale 4 is provided with an upper port, which connects to an outlet arranged at the lower storage part 81 of the aggregate storage device 8 and thus forms an aggregate receiving end. The belt pound scale 4 is further provided with an aggregate discharging end 41, which connects to one of the inlets 22 of the mixer 2.

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In an embodiment of the invention, the outlet of the aggregate storage device 8 is provided with a gate.

The belt pound scale 4 can load and weigh aggregates, and automatically deliver the aggregates to the mixer 2 by means of the motorized belt conveyor 15.

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In an embodiment of the invention, the belt pound scale 4 is provided a seat-type gravity sensor, a unidirectional pound material trough, a material smoothening and guiding plate, and a dust shield therein.

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The aggregate unit according to the embodiment of the invention has an all-round function of receiving, automatic weighing and automatic delivering.

When aggregates re to be weighed, the user selects a formulation in the central control unit 14, so that the gate of each aggregate storage device 8 is automatically opened according to the respective aggregate amount needed by the formulation selected by the user. The belt pound scale 4 starts to receive each kind of aggregates, and precisely weighs it according to a preset program. The belt pound scale 4 can weigh each single aggregate separately, or weigh several kinds of aggregates together so as to achieve the proportioning of the aggregates. The aggregates weighed will be transported into the mixer 2 for mixing by the belt pound scale 4 within a preset suitable interval. The whole process can be controlled by the central control unit 14. Of course, in some particular cases, the control can be realized in a manual, semi automatic or entire automatic manner.

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In an embodiment of the invention, the aggregate storage device 8 can be divided into several portions as needed, so as to separate different aggregates. For example, it can be divided into four portions for storing four kinds of aggregates; however, this example is not intended to limit the invention. The aggregate storage device 8 includes fixed lower storage parts 81 and foldable upper storage parts 82. The lower storage part 81 is located above the belt pound scale 4 and provided with a normal-close gate at its lower end. The upper storage part 82 can be made of partition plates or separating plates. The lower end of each upper storage part 82 connects to a corresponding lower storage part 81. When the upper storage part 82 is opened, the storage volume of the aggregate storage device 8 is enlarged. During transportation, the upper storage part 82 can be folded so as to save space and enable the transportation convenient.

B. The portion relating to cement

In the embodiments of the invention, they are not limited by using cement; however, other powder materials can be used also.

In the embodiments of the invention, the cement pound cylinder 3, located above the mixer 2, is used to weigh cement. The cement pound cylinder 3 is provided with a gravity sensor and a metering control device.

The cement pound cylinder 3 is provided with an inlet 31 and an outlet 32 respectively at the upper and lower ends thereof. The inlet 31 connects to a detachable permanent cement storage device 11 located at the upper end of the container body 7, while the outlet 32 connects to one of the material inlets 22 located at the upper end of the mixer 2. The permanent cement storage device 11 is a detachable peripheral device, and can be an external cement tank. At the lower end of the permanent cement storage device 11 there is a port, which connects to the mixer 2 via the cement pound cylinder 3. The port is provided with an air-actuated control valve, and the upper end and lower end of the port are connected with flexible pipes. The port is further provided with an air return means, which not only ensures the accuracy of weighing but also is environment-friendly.

When cement is to be weighed, the user selects a formulation in the central control unit 14, so that the gate of the permanent cement storage device 11 is automatically opened according to the formulation selected. The cement pound cylinder 3 receives cement, and precisely weighs it according to a preset program so as to complete the proportioning of cement. The cement weighed will be poured into the mixer 2 by means of the action of potential difference at a preset suitable interval. The whole process can be controlled by the central control unit 14. Of course, in some particular cases, the control can be realized in a manual, semi automatic or entire automatic manner.

C. The portion relating to water

In the embodiments of the invention, the water pound cylinder 13, located above the mixer 2, is used to weigh water. The water pound cylinder 13 is provided with a gravity sensor and a metering control device. The water pound cylinder 13 is further provided with a water inlet 131 and a water outlet 132 respectively at the upper and lower ends thereof. The water inlet 131 connects to the supply pipe of the permanent water storage tank and pumping line 50 via a hose, while the water outlet 132 connects to one of the material inlets 22 located at the upper end of the mixer 2. The water outlet 132 is provided with an air-actuated control valve, and can fill the water weighed into the mixer 2 automatically by means of potential difference.

When water is to be weighed, the user selects a formulation in the central control unit 14, so that water will be automatically supplied to the water pound cylinder 13 through a pipe pump in the supply pipe of the permanent water storage tank. The water pound cylinder 13 receives water, and precisely weighs it according to a preset program. The whole process can be controlled by the central control unit 14. Of course, in some particular cases, the control can be realized in a manual, semi automatic or entire automatic manner.

D. The portion relating to additives

In the embodiments of the invention, the additive pound cylinder 12, located

above the water pound cylinder 13, is used to weigh additives. The additive pound cylinder 12 is provided with a gravity sensor and a metering control device. The additive pound cylinder 12 is further provided with a flow inlet connecting to the permanent additive pound cylinder and pumping line, and a flow outlet connecting to the water inlet 131 of the water pound cylinder 13. The flow outlet is provided with an air-actuated control valve, and can supply the additives weighed into the water pound cylinder 13 automatically by means of potential difference.

When additives are to be weighed, the user selects a formulation in the central control unit 14, so that additives will be automatically supplied to the additive pound cylinder 12 through a special pipe pump in the permanent additive storage tank and pumping line. The additive pound cylinder 12 receives additives, and precisely weighs them according to a preset program. Then, the additives weighed will be automatically fed to the water pound cylinder 13 by means of potential difference, and then fed to the mixer 2 along with water. Compared with the conventional means of adding additives into aggregates directly, in the invention additives are added into water in advance and then mixed with the aggregates in the mixer 2, thus achieving a more even distribution of additives. The whole process can be controlled by the central control unit 14. Of course, in some particular cases, the control can be realized in a manual, semi automatic or entire automatic manner.

In some special applications, the amount and kind of additives can be selected based on the weather condition of the current construction site, or of course can be selected and set by the central control unit 14 automatically.

E. The portion relating to the mixer

At the upper end of the mixer 2 there are provided with a plurality of material inlets 22 correspondingly connecting with the aggregate discharging port 41 associated with the belt pound scale 4, the outlet 32 of the cement pound cylinder 3, and the water outlet 132 of the water pound cylinder 13.

A material outlet 21 is provided at the lower end of the mixer 2, and can be a hydraulic valve in a particular case for discharging concrete product already mixed in

the mixer 2 for use. The concrete mixer carries out mixing and stirring of materials of concrete. The whole mixing process can be controlled by the central control unit 14 according to the formulation and circumstances. Of course, in some particular cases, the control can be realized in a manual, semi automatic or entire automatic manner.

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F. The portion relating to aggregate supply and automatic distributing unit

The mobile concrete batching plant according an embodiment of the invention further includes an aggregate supply and automatic distributing unit, which comprises
10 a supporting base, a motor, a gear box, a rotating shaft, and a positioning member for automatically selecting a storage location, such as sensor, limiter and receiving chute.

The positions of ports for aggregates are respectively adapted to the kinds of the outside aggregate devices. With sensor, control unit of limiter and interlock device, an
15 accurate and reliable distribution of aggregates during supply can be ensured. Several kinds of aggregates can be transported by one single transporter, and each aggregate can be transported to a corresponding aggregate storage device without errors.

In an embodiment of the invention, transportation of aggregates can be realized
20 by belt conveyor and/or bucket elevator, which can be selected according to the situations in sites and at surroundings for convenience. Of course, in some particular cases, the control can be realized in a manual, semi automatic or entire automatic manner.

25 G. The portion relating to the central control unit

In an embodiment of the invention, the central control unit 14 includes:

an in-air remnant module 142, which determines mass of the in-air remnant respectively generated when the gates of the permanent cement storage device 11, the
30 permanent water storage tank and pumping line 50, the permanent additive pound cylinder and pumping line 60 and the aggregate storage device 8 are closed;

a display module 141, which displays in a real-time manner of the mass of cement, water, additive and aggregate respectively weighed by the cement pound cylinder 3, the water pound cylinder 13, the additive pound cylinder 12 and the belt

pound scale 4 respectively. Fig. 4 shows the interface of the display module 141, which includes a display area for the belt pound scale, a display area for the cement pound cylinder, a display area for the water pound cylinder, and a display area for the additive pound cylinder, all of them displaying the weighing data. The arrangement of the four display areas is not limited to that shown in Fig. 4, but can be adjusted as needed in particular cases; and

a gate control module 143, which will, when the display module 141 displays that the mass of cement, water, additives and aggregates weighed is equal to the difference between the mass required by the formulation input by the user and the corresponding mass of the in-air remnant, close the respective gates of the permanent cement storage device 11, the permanent water storage tank and pumping line 50, the permanent additive pound cylinder and pumping line 60 and the aggregate storage device 8.

In an embodiment of the invention, the central control unit 14 further includes a computer, a worktable, and a man-machine conversation and wireless communication device. All function circuits of the mobile concrete batching plant of the invention are integrated in the central control unit 14. All buttons and lamps of the worktable are indicated by dynamic flow diagrams, so that the operation of the mobile concrete batching plant is easily visible. An automatic operation and control can be achieved by the computer at the same time. The central control unit 14 pre-stores therein a plurality of manufacturing processes and a plurality of formulations for each material, and also provides the functions of user-defined record, statistics, backup, report form generating and printing for the whole manufacturing process. The central control unit 14 can also have the functions of automatic alarm at failure and shutdown at emergency, on-line standby power supply, remote online failure diagnosis and central monitoring. The central control unit 14 can be further provided with a rapid switching device for temporary power supply.

The mobile concrete batching plant of the invention can be operated by manual, semi automatic or fully automatic operations as needed. These operations involve formulation selection, operating mode option, dosing option settings; the administration authority settings; displaying and reminding permanent material amount; options and settings of process of material weighing, distributing and

delivering, mixing etc.; repeated cycles of one single period, every period or one and the same period of concrete manufacturing, or several cycles of different periods thereof. In the condition that materials can be sufficiently supplied in time, the mobile concrete batching plant can be operated around the clock.

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H. The portion relating to the trailer frame

The trailer frame 1 is made of steel frame rods/beams with high strength and light weight, forming a container-type main space for housing different devices or components. The arrangement of devices and functional components in the main space is reasonable, compact and also meets related requirements. Outer walls of the container are movable. At the front end of the trailer frame 1 there is provided with standard dragging pan/connecting hooks and relating brakes etc., so that the trailer frame 1 can be dragged by a trailer or trailer head. At the destination site, the trailer frame 1 can be supported by movable legs or fixing supports so as to meet the height requirement and safety standard. After connecting with peripheral equipments and water/electricity supplies, a concrete automatic batching plant meeting the in-situ requirement can be formed rapidly.

I. The portion relating to weighing

In specific cases, the respective mass of the in-air remnant of cement, water, additives and aggregates generated when the corresponding gates of different storage devices such as the permanent cement storage device 11, the permanent water storage tank and pumping line 50, the permanent additive pound cylinder and pumping line 60 and the aggregate storage device 8 are closed can be determined by relationship of the following factors relative to time by means of actual measures and statistical measures. The factors include, for example, the size and open degree of different gates, mass of different kinds of materials, dispersion or density of falling materials, the in-air distance of falling materials, and accumulated state of fallen materials.

For example, in the formulation for concrete, mass of cement required is 0.5 ton. If, for a certain kind and mass of cement and a certain permanent cement storage device, the mass of the in-air remnant generated when the gate associated therewith is

closed is 0.06 ton, the gate can be closed when the mass weighed by the cement pound cylinder 3 is 0.44 ton; in this case, the sum of 0.44 ton weighed by the cement pound cylinder 3 and 0.06 ton as the mass of the in-air remnant generated when the gate associated therewith is closed is 0.5 ton, the required mass of cement for this
5 formulation. Similarly, this method applies to water, additive and aggregate also.

The weighing procedure is as follows:

regulating the pound cylinders, setting a weighing value and resetting;

the gate control module 143 opens the gates of the permanent cement storage
10 device 11, the permanent water storage tank and pumping line 50, the permanent additive pound cylinder and pumping line 60 and the aggregate storage device 8, allowing cement, water, additives and aggregates flowing into the cement pound cylinder 3, the water pound cylinder 13, the additive pound cylinder 12 and the belt pound scale 4 respectively in a continuous manner, the value of mass of cement, water,
15 additives and aggregates being transmitted to the display module 141 of the central control unit 14 for display via pressure sensors mounted in each pound cylinders;

when the display module 141 displays that the mass of cement, water, additives and aggregates weighed is equal to the difference between the mass required by the formulation input by the user and the corresponding mass of the in-air remnant, the
20 gate control module 143 closes the gates of the permanent cement storage device 11, the permanent water storage tank and pumping line 50, the permanent additive pound cylinder and pumping line 60 and the aggregate storage device 8, thus terminating the feeding of material.

25 **J. The portion relating to distributing materials**

The technical solution associated with the material distributing method and the distributor 10 provided by an embodiment of the invention are as follows:

30 In an embodiment of the invention, the classified transportation and resupply of four different aggregates is achieved by a rotatable chute. All the four aggregates can be fed into the chute by means of one single transportation device. With PLCs and sensing locators, the feeding actions for different materials can be in order and the rotatable chute can be suitably positioned. Therefore, the material type in the

aggregate storage devices, the feeding system and the positions of chute can be in a manner of one-to-one correspondence. An interlock relationship thereamong is achieved. No incorrect feeding or supplying will be occurred.

5 In an embodiment of the invention, a method for avoiding errors in weighing is provided. That is, when a certain aggregate is weighed, other aggregates cannot be weighed or distributed. For example, when the first kind of material is weighed, only the gate of the storage device for the first kind of material is opened while other gates are locked; when another kind of material is weighed, only the gate of the storage
10 device for the another kind of material is opened while other gates are locked. In this way, it is ensured that material weighting is precise.

 While the invention has been described in conjunction with the preferred embodiments outlined above, it is evident that the foregoing is not intended to limit
15 the invention. Any alternatives, modifications and variations without departing from the spirit and scope of the invention should be fallen within the protection scope of the invention.

CLAIMS

1. A mobile concrete batching plant, comprising: a container body (7) mounted on a draggable trailer frame (1), within the container body (7) a mixer (2) being arranged, wherein the mixer (2) respectively connects to a cement pound cylinder (3),
5 a water pound cylinder (13) and an aggregate unit for receiving, weighing and feeding aggregates, the aggregate unit including a motorized belt conveyor (15), a belt pound scale (4) mounted on the motorized belt conveyor (15), and an aggregate storage device (8), and wherein a permanent cement storage device (11) connecting to the
10 cement pound cylinder (3) is mounted on the upper end of the container body (7),

characterized in that, further comprising an additive pound cylinder (12) connecting to the cement pound cylinder (3), a permanent water storage tank and pumping line (50) connecting to the water pound cylinder (13), a permanent additive pound cylinder and pumping line (60) connecting to the additive pound cylinder (12),
15 and a central control unit (14), which includes a display module (141), a gate control module (143) and an in-air remnant module (142); and

wherein the in-air remnant module (142) connects to the permanent cement storage device (11), the permanent water storage tank and pumping line (50), the permanent additive pound cylinder and pumping line (60) and the aggregate storage
20 device (8) respectively, for determining mass of the in-air remnant respectively generated when the gates of the permanent cement storage device (11), the permanent water storage tank and pumping line (50), the permanent additive pound cylinder and pumping line (60) and the aggregate storage device (8) are closed

25 2. The mobile concrete batching plant according to claim 1, characterized in that, the display module (141) connects to the cement pound cylinder (3), the water pound cylinder (13), the additive pound cylinder (12) and the belt pound scale (4) respectively, for displaying in a real-time manner the mass of cement, water, additives and aggregates weighed by the cement pound cylinder (3), the water pound cylinder
30 (13), the additive pound cylinder (12) and the belt pound scale (4) respectively.

3. The mobile concrete batching plant according to claim 2, characterized in that, the gate control module (143) respectively connects to the in-air remnant module (142) and the display module (141) in a bi-directional manner, and when the display module

(141) displays that the mass of cement, water, additive and aggregate weighed is equal to the difference between the mass required by the formulation input by the user and the corresponding mass of the in-air remnant, the gate control module (143) will control to close the corresponding gate of the permanent cement storage device (11),
5 the permanent water storage tank and pumping line (50), the permanent additive pound cylinder and pumping line (60) and the aggregate storage device (8).

4. The mobile concrete batching plant according to claim 3, characterized in that, the mixer (2) is provided with a material outlet (21) at the lower end thereof, and the
10 belt pound scale (4) is further provided with an aggregate discharging end (41).

5. The mobile concrete batching plant according to claim 4, characterized in that, an inlet (31) and an outlet (32) are arranged at the upper end and the lower end of the cement pound cylinder (3) respectively;

15 a water inlet (131) and a water outlet (132) are arranged at the upper end and the lower end of the water pound cylinder (13) respectively; and

material inlets (22) are arranged at the upper end of the mixer (2) for connecting to the aggregate discharging end (41), the outlet (32) and the water outlet (132) respectively.

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6. The mobile concrete batching plant according to claim 5, characterized in that, the aggregate storage device includes a lower storage part (81) and a foldable upper storage part (82), which are provided inside and outside the container body (7) respectively and connected with each other.

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7. The mobile concrete batching plant according to claim 6, characterized in that, at the upper end of the belt pound scale (4) an upper port is provided, with which a discharging port provided at the lower end of the lower storage part (81) connects.

30 8. The mobile concrete batching plant according to claim 7, characterized in that, at the lower end of the permanent cement storage device (11) there is provided with an outlet which is connected to the inlet (31) of the cement pound cylinder (3).

9. The mobile concrete batching plant according to claim 1, characterized in that,

a distributor (10) is mounted on the upper end of the container body (7).

10. The mobile concrete batching plant according to any one of claims 2 to 8, characterized in that, the additive pound cylinder (12) is provided with a flow inlet and a flow outlet respectively at the upper end and the lower end thereof, wherein the flow inlet connects with the delivery pipe of the permanent additive pound cylinder and pumping line (60) while the flow outlet connects with the water inlet (131) of the water pound cylinder (13).

11. A concrete mixing method of the mobile concrete batching plant according to claim 1, comprising the following steps:

weighing the required mass of cement, water, additives and aggregates in advance according to the requirement of concrete formulation by means of the cement pound cylinder (3), the water pound cylinder (13), the additive pound cylinder (12) and the belt pound scale (4);

opening the gate of the additive pound cylinder (12) and adding additives into the water pound cylinder (13);

delivering the water mixed with additive weighed by the water pound cylinder (13), the cement weighed by the cement pound cylinder (3) and the aggregates weighed by the belt pound scale (4) into the mixer (2) for mixing;

discharging the material obtained.

12. The concrete mixing method according to claim 11, characterized in that, weighing the required mass of cement, water, additives and aggregates in advance according to the requirement of concrete formulation by means of the cement pound cylinder (3), the water pound cylinder (13), the additive pound cylinder (12) and the belt pound scale (4) specifically comprises:

determining mass of the in-air remnant respectively generated when the gates of the permanent cement storage device (11), the permanent water storage tank and pumping line (50), the permanent additive pound cylinder and pumping line (60) and the aggregate storage device (8) are closed;

displaying in a real-time manner mass of cement, water, additives and aggregates respectively weighed by the cement pound cylinder (3), the water pound cylinder (13), the additive pound cylinder (12) and the belt pound scale (4); and

when the display module (141) displays that the mass of cement, water, additive and aggregate weighed is equal to the difference between the mass required by the formulation input by the user and the corresponding mass of the in-air remnant, the corresponding gate of the permanent cement storage device (11), the permanent water storage tank and pumping line (50), the permanent additive pound cylinder and pumping line (60) and the aggregate storage device (8) is controlled to be closed.