

MINI BATCH PLANT

STANDARD OPERATIONAL
PROCEDURE

DOCUMENT VERSION

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This document is valid for the following versions of the product:

Item	Mini Batch Plant	Operating System
Version	Mini Viking	Phoenix PLC

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1.1 PURPOSE

COBOD'S mini-batch plant is an on-site concrete producer solution that allows COBOD customers to produce 3D printable concrete while locally sourcing raw materials. This document provides a step-by-step guide on the operation of COBOD's mini-batch plant.

1.2 SCOPE

The operation of COBOD'S mini-batch plant includes the roles and responsibilities of operators, required tools and the environmental, health and safety. The Key Performance Indicators are defined. The implementation procedure can be defined in the following steps: a) Setting up COBOD's Mini Batch Plant, b) Operation and c) Cleaning and Shutting down the system. These steps are discussed in detail.

This document is intended for the operation of COBOD'S mini-batch plant.

This document is focused strictly on the operation of the COBOD's mini batch plant and does not include material issues or any issues caused by the 3D printing procedure. A description of the material's selection and 3D concrete printing process can be found elsewhere.

This document should be used in parallel with the SOP documents of the COBOD's guide to D.Fab and materials delivery system (pump and hose) and BOD 2 printer.

1.3 APPLICABILITY

This document provides all the literature of the operation of COBOD's mini batch plant but is not intended to replace the training session. This document supports the Level 1 and 2 training provided by COBOD and should be used in parallel with the online and on-site training.

1.4 DEFINITIONS

Recipe – Concrete mix components proportions.

Wattmeter – Water adjustment.

Mixer Load – Torque capacity of the mixer arms.

Hopper – Hopper for Sand & Gravel on the Batch Plant

Silo – Cement or extenders Silo, saving material from moisture and environmental conditions.

1.5 ROLES AND RESPONSIBILITIES

It is the responsibility of the COBOD materials engineer to provide guidelines and training to the material operator. The material operator is responsible for the operation of COBOD's material delivery system (MDS), including the COBOD's mini batch plant, COBOD's piston pump, and the troubleshooting. It is the responsibility of the on-site material engineer to share the relevant information with the COBOD materials engineer. It is the responsibility of the COBOD materials engineer to provide recommendations on the operation of COBOD's material delivery system (MDS), including the COBOD's mini batch plant, COBOD's piston pump, and the troubleshooting.

1.6 TOOLS AND EQUIPMENT

The following tools are required:

- ▶ General concrete handling tools: buckets, scoopers, trowels, spades, and shovels.
- ▶ Waste management: big bags, waste concrete container/bin
- ▶ Slump test tools
- ▶ Shear vane, sold by COBOD
- ▶ Moisture content test: pan, stove, scale accurate to 1 g up to 5 kg, wood spatula.

1.7 ENVIRONMENTAL, HEALTH AND SAFETY (EHS)

Waste concrete and run-off water should be discarded correctly – according to local building regulations. All hazardous substances should be discarded in a safe manner.

Cement based products, like concrete or mortar, can cause serious skin problems such as dermatitis and burns. Therefore, workers should be protected against exposure to cement-based products.

Hearing and safety glasses protection is strongly recommended for pumping equipment operator. Gloves, trousers and long-sleeve shirts should be worn when handling concrete. A hardhat and safety shoes are recommended. A N95 mask is recommended for cement handling.

 Body protection	 Protective helmet	 Protective gloves	 Safety footwear	 Protect the respiratory tracts: mask (Category II)
 Eye protection	 Hearing protection	 Read the use and maintenance manual before working	 Maintenance performed only by qualified personnel	 Lifting points

Figure 1: Recommended personal protective equipment.

1.8 INDEPENDENT COMPONENTS

- ▶ Cement/Extenders Silo
- ▶ Chemical pumps
- ▶ High pressure water cleaner
- ▶ Materials (Sand, gravel, and cement)

2. KEY PERFORMANCE INDICATORS

The following key performance indicators are relevant for Concrete Production:

1. *Pumpability* – The mix can be transported from the mixer to extrusion.
2. *Open time* – The mix remains pumpable for an adequate amount of time after mixing, allowing for homogeneous placement.
3. *Consistency* – Consecutive mixes have consistent properties in terms of workability, and pumpability.
4. *Cleaning time* – The time it takes to clean the batch plant system.

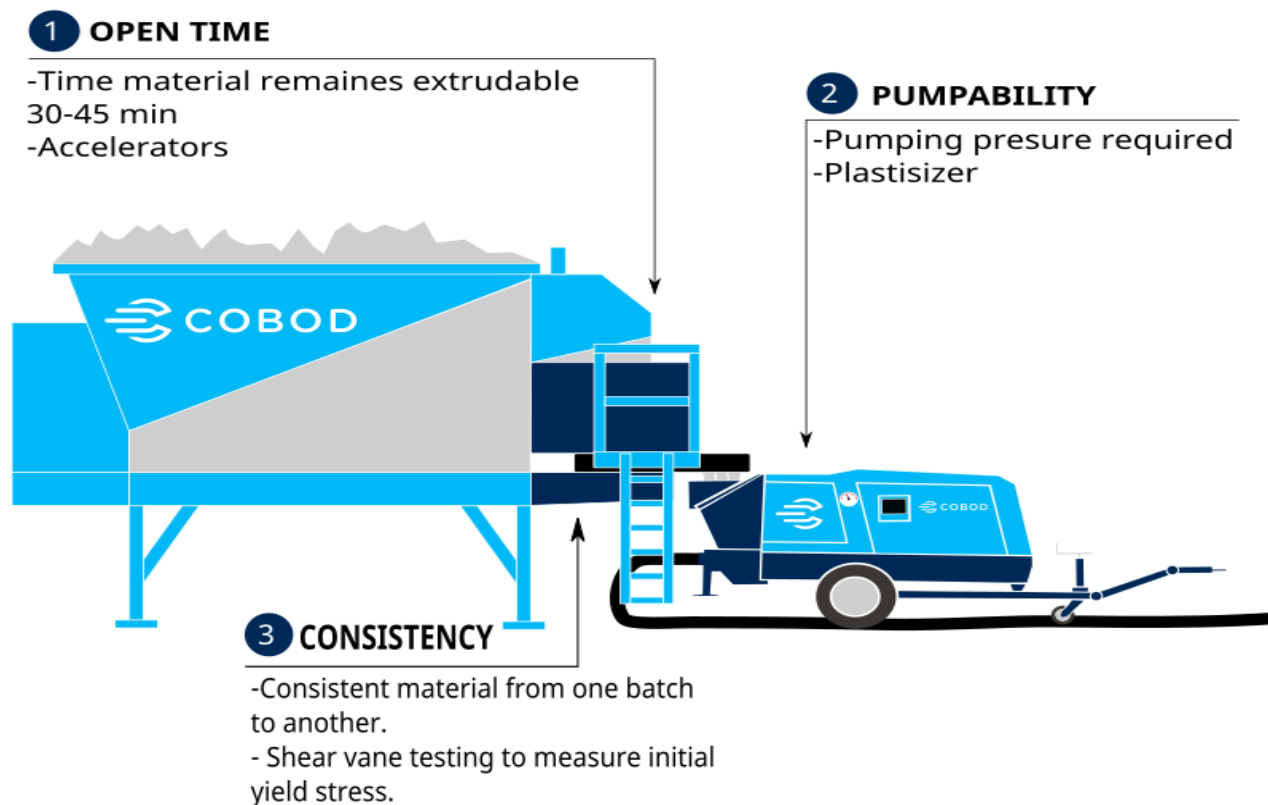


Figure 2: COBOD's Mini Batch Plant & Piston pump – Materials KPI's

3. SYSTEM OVERVIEW

3.1 BATCH PLANT TECHNICAL SPECIFICATIONS



Figure 3: COBOD's Mini Batch Plant

Description	Unit	Value
Volume (gross/net)	L	500/300
Capacity	m ³ /h	3-5
Belt speed	m/s	0.4
Motor output, mixer motor	kW	7.5
Motor output, feed belt	kW	1.5
Mixing arms/side skrabers	pcs.	4/1
Weighting accuracy	%	+/- 0.5
Dosing accuracy	%	+/- 3
Recipes	no.	50
Aggregate hopper	m ³	2 x 2.4
Enlarged silo sides	m ³	2 x 1.5
Total silo capacity w. enlarged sides	m ³	2 x 3.9
Water tank	L	250
Water pressure	bar	2
Dimensions (W x H x L)	m	2.3 x 2.5 x 5.2
Weight	kg	3000
Power supply, current	A/KVA	25/18
Power supply, voltage	V	3 x 400V, PE
Frequency	Hz	50
Maximum voltage fluctuation	%	+/- 10
Required bed plate flatness	°C	5
Operating system	-	Phoenix PLC

3.2 COBOD SILO TECHNICAL SPECIFICATIONS



Figure 4: COBOD's Cement Silo

Description	Unit	Value
Volume (gross/net)	m ³	3
Capacity (Ø139)	m ³ /h	12
Engine power	kW	2.2
Vibrator	pc.	1
Butterfly valve	DN	250
Dimensions (W x D x H)	mm	2245 x 2040 x 2041
Dimensions assembled in the highest position (W x D x H)	mm	2245 x 2040 x 3750
Weight	kg	900
Power supply	A	16

4. PROCEDURE



Figure 5: COBOD's Mini Batch Plant

COBOD's mini batch plant is built on a steel frame, it comprises an agitator pan mixer resting on 3 load cells, hopper, with 2 compartments, feed belts, water tank, dosing equipment for maximum 2 chemical substances, and a control unit with a batching computer.

4.1 INSTALLATION

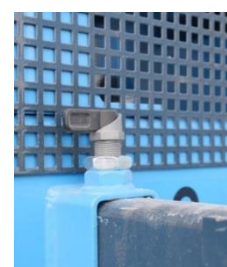
Using a **Boom Loader** or a **Crane** lift the batch plant and place the supporting legs and lock the pawl. Place the bracing on the supporting legs. Swap or invert the bracing legs until all 4 elements are installed

The machine must not be fixed to the ground in any other ways.

The area around the equipment should be leveled, and easily accessible to allow for easy transport of materials to and from the batch plant. Supports (steel frame and supporting legs) should never stand on soft/yielding ground. In this case use road plates under the supporting legs.

When setting up the Mini Batch Plant, lower the supporting legs until the plant is horizontal. Then turn the handles on the supporting legs, one more full turn to ensure that they are firmly in contact with the ground.

Note: the ground conditions can change with changes in the weather and/or if the plant handles large quantities of material. In this case,



check that the set-up is stable before and during the production of concrete.

Adjusting supporting legs:

Counterclockwise = UP

Clockwise = DOWN

Tip: Adjust the leg heights to ensure that water inside the mixer flows towards the gate and out.

When the machine is set up as described, it is time to connect the power.

- Insert the CE connector on the right side of the control cabinet
- Remember to use the cord, where the plugin is intended for minimum 3x400V NPE 20A.
- Protect the cable from any potential breakage

You can now switch on the mixing computer on the right side of the control cabinet.



Connect water on the opposite side of the control cabinet. The mini batch plant is supplied with a hose pipe Ø25mm. If the mixing plant may be exposed to frost when it is not mixing, open both ½" ball valves so that water cannot freeze inside the flow meter and valve.

The water supply is provided with an electric valve outside (on the water tank) and a pressure sensor outside of the tank at the bottom. The valve opens and closes for refilling the water.



Ensure **Chemical pumps** are primed before use or when the chemical pump was running dry. The error "Pipe empty" may appear on the flow meter. The following parts are required:

- 2x Standard 1/2" threaded male to 1/2" slip-over male connection.
- Approximately 50 cm of 1/2" hose (short hose).

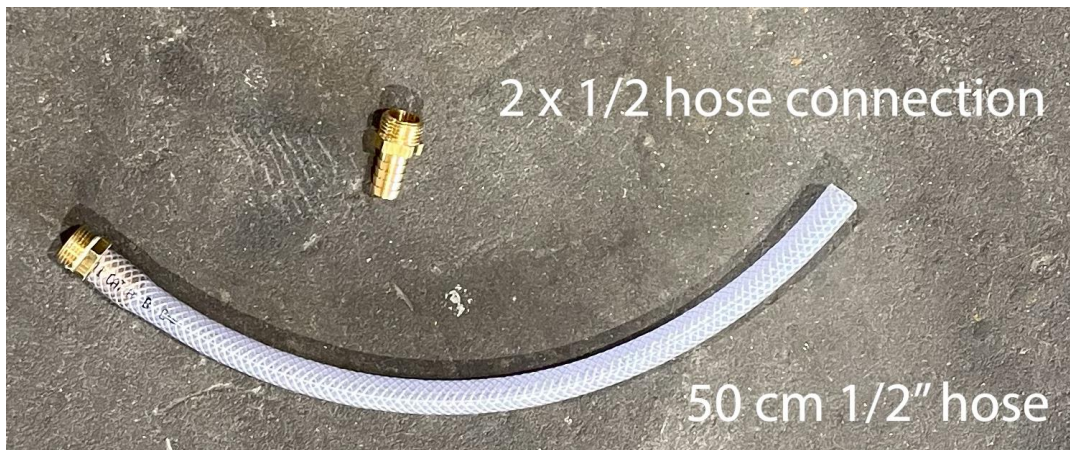


Figure 6: Parts required for priming the chemical pumps.

Priming should be done with the following procedure:

1. Remove the filter from the end of the chemical pump hose.
2. Connect the short hose to the end of the chemical pump hose.
3. Connect the other end of the short hose to the regular 2 bar pressure water outlet of the high-pressure pump.
4. Open the water valve slowly.
5. Monitor the flow meter to see if water passes.
6. Listen to know if water is entering the mixer.
7. The pump is now primed with water.
8. Disconnect the short hose from the chemical pump hose and insert the filter.
9. Insert the inlet into the admixture and pump manually until the admixture reaches the mixer.

4.2 COBOD'S MINI BATCH PLANT OPERATION

4.2.1 OPERATING CYCLE

Sand and gravel from the hoppers are dosed via feed belts into the pan mixer. The quantity added is registered continually on the batching computer by the means of electronic load cells, on which the pan mixer rests. Water is then pumped from the water tank, through a flow meter, up into the pan mixer. Hereafter, cement is added via an auger, which doses from a cement silo. Any admixtures are pumped into the pan mixer. When the set batching cycle is complete, the discharge gate under the pan mixer opens, and the mixed concrete runs out onto the COBOD's piston pump. Every step of the process is controlled and registered by the batching computer.

Documentation for each batch cycle can be printed automatically.

The COBOD batching plants are designed to mix concrete in an agitator pan mixer with dosing tolerance under normal conditions of within +/- 3 %.

The plants are suitable for production of controlled/certified concrete.

4.2.2 CONTROL MANUAL

This section describes COBOD's mini batch plant control system.

Turn on computer

Turn the power knob to turn on the computer.

After turning on the network, the blue button lights up **"Emergency stop / reset"** - this button controls the safety circuit. This button shows the contacts from **"Emergency Stop"** and the sensors that control the mixer lid.

Note: the blue button will not go out if there is a gap in the safety circuit and then this problem must be fixed.

Buttons

1. Stop / Off / Deactivate



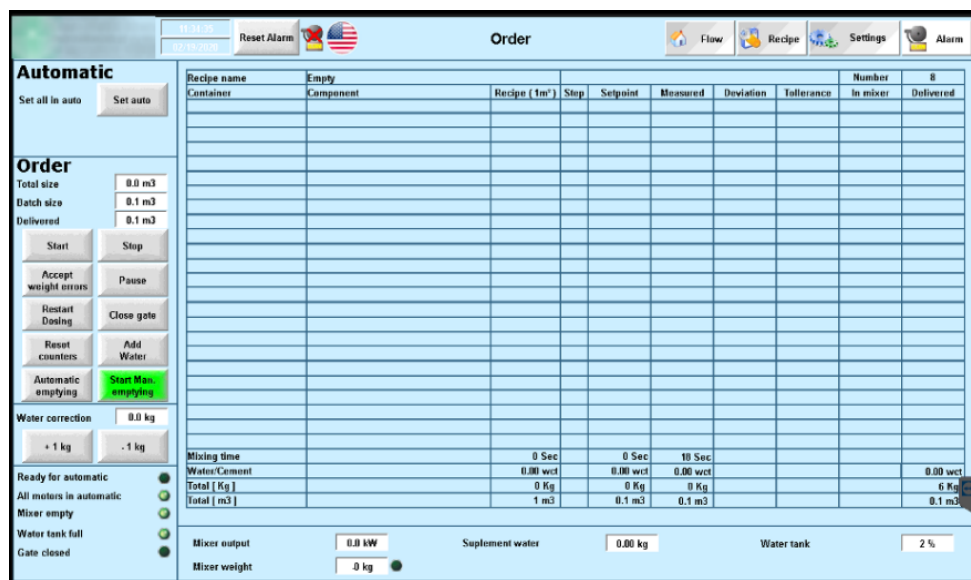
2. Started / On / Activated



3. Pause



Main Screen



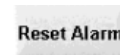
Recipe name	Empty	Recipe (1m³)	Step	Setpoint	Measured	Deviation	Tolerance	Number	8
Container	Component							In mixer	Delivered

Mixing time	0 Sec	0 Sec	10 Sec	
Water/Cement	0.00 wct	0.00 wct	0.00 wct	0.00 wct
Total [Kg]	0 Kg	0 Kg	0 Kg	6 Kg
Total [m³]	1 m³	0.1 m³	0.1 m³	0.1 m³

Main screen allows you to monitor the production process and the remaining mixing time.

Menu at the top of the screen:

«Reset Alarm» - it allows you to reset the error after removing the cause.



«Flag» - this button allows you to select / change the language of the program.



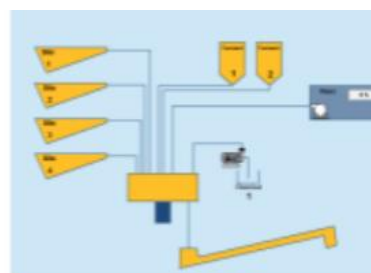
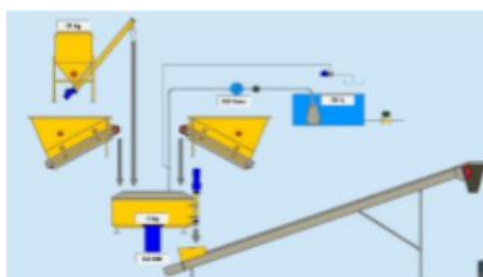
«Flow» - this button has 3 screen position options:



1. General picture of the installation, which in case of error or malfunction will show the location of the alarm.



2. Current picture of the components of this unit and the current dosing process is displayed.



«Recipe» Allows you to create a new recipe and load already saved one.



«Settings» Allows you to enter the main menu of all settings.



«Alarm» Informs us of an error and will blink red.

By pressing this button, you can see where the error occurred.



Automatic:

«**Set auto**» - when this mode is set, the cement scale and the dosage of water will be performed automatically.

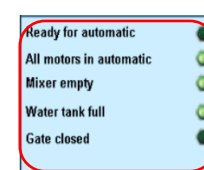
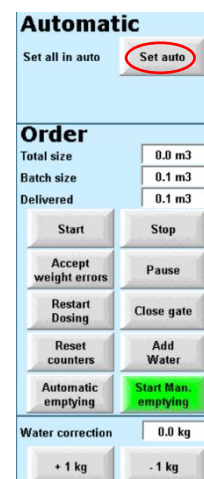
Note: When you press the «Set auto» we should pay attention to the fact that all the indicators at the bottom of the screen lit up in **green** - that tells us about the readiness for work.

Order:

«**Total size**» - in this window we set the total volume at m³ (how much total concrete we need to produce).

«**Batch size**» - selection of one batch volume (0.1 m³, 0.15 m³, 0.2 m³ etc.)

«**Delivered**» - Amount batch volume delivered since the last reset.



Buttons:

Start and Stop - Start and stop of the order.

Pause - Pause and interrupt the weighing.

Accept weight errors - Will flash yellow when the volume of the component has exceeded the preset value, considering the error. If agreed, press the button to accept errors and continue weighing.

Restart dosing - Will flash yellow if one of the components has not reached the set value. Press the button to confirm the error and continue dosing the component.

Close gate - When you press this button while unloading the batch, it will turn green and close the gate. When you press the button again, the gate opens again.

Reset counters - Resets / clears the total number of shipped kneading.

Add water - Add a dosage of water.

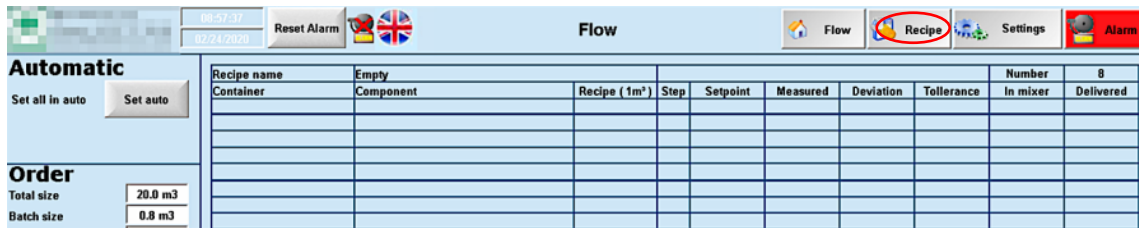
Automatic emptying - when you press this button, automatic batch unloading is activated. The shutter will open automatically when the mixing time is over.

Start manual emptying - When you click on this button, we can start manual unloading of the batch.

«**+1 kg**» and «**-1 kg**» - These buttons allow us to increase or decrease the dosage of water.

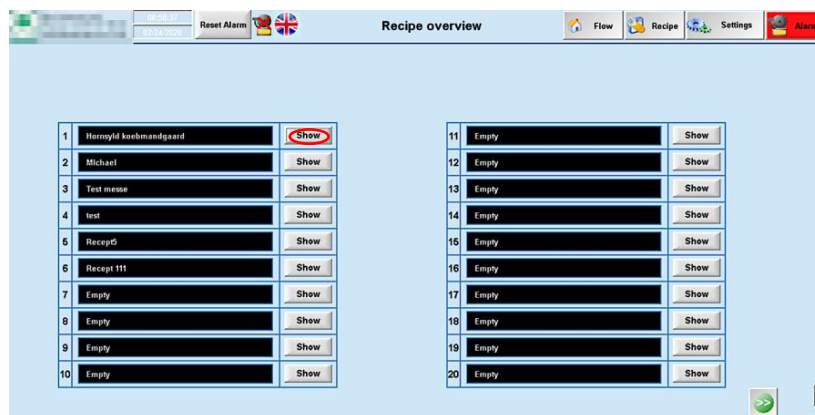
4.2.3 CREATE BATCH RECIPE

On the **"Home screen"** in the menu, select the button **"Recipe"**



The screenshot shows the Home screen with a top navigation bar containing 'Flow', 'Recipe' (circled in red), 'Settings', and 'Alarm'. Below the navigation bar, there are sections for 'Automatic' (with 'Set all in auto' and 'Set auto' buttons) and 'Order' (with 'Total size' and 'Batch size' fields). A table with columns for 'Recipe name', 'Empty', 'Component', 'Recipe (1m³)', 'Step', 'Setpoint', 'Measured', 'Deviation', 'Tolerance', 'Number In mixer', and 'Delivered' is visible.

The following window opens, select an empty cell, click the **"Show"** button



The screenshot shows the 'Recipe overview' window with two columns of recipe entries. The first column contains entries like 'Hermyld kaskemangard', 'Michael', 'Test mass', 'test', 'Receipt', 'Receipt 111', and several 'Empty' cells. The second column contains 'Empty' cells. Each entry has a 'Show' button next to it. The 'Show' button for the first 'Empty' cell in the first column is circled in red.

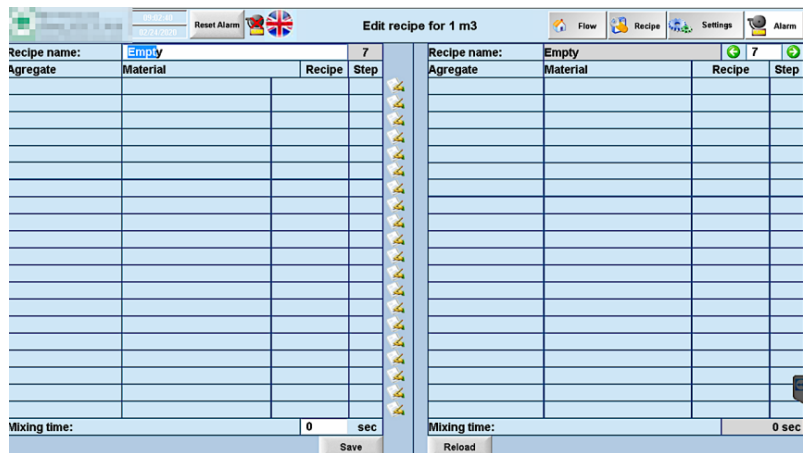
The following window will open, press the **"Edit"** button



The screenshot shows the 'Recipe overview' window with a table for editing a recipe. The table has columns for 'Recipe name', 'Empty', 'Material', 'Recipe', and 'Step'. The 'Edit' button at the bottom right is circled in red.

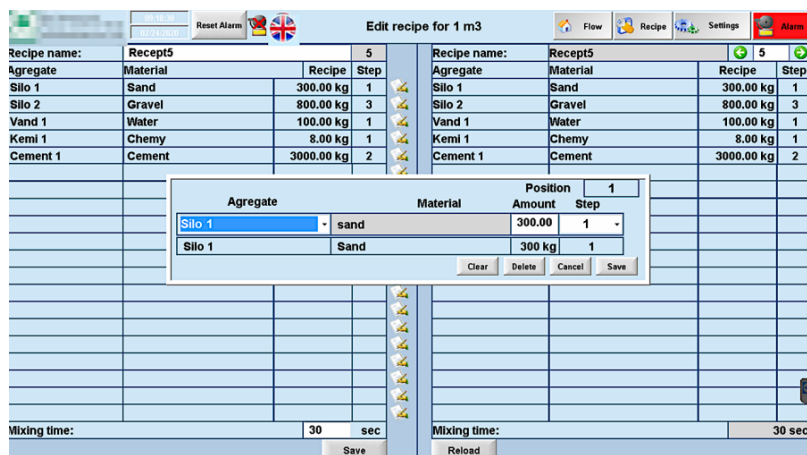
The following window opens in which you must click on the pencil icon to enter each recipe component separately.

First enter the **"Recipe Name"**. Recipe numbering will be created automatically.



The screenshot shows the 'Edit recipe for 1 m3' window. The 'Recipe name' is 'Empty'. The 'Aggregate' column is empty. The 'Material' column is empty. The 'Recipe' column is empty. The 'Step' column is empty. The 'Mixing time' is 0 sec. The 'Save' button is visible.

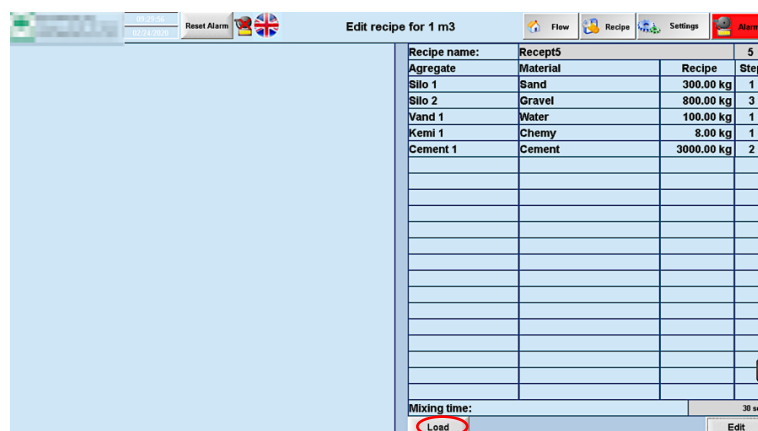
Input recipe "**Components**", "**Steps**" (the order of receipt of the components that should enter the mixer), and "**Mixing Time**". Press Save.



The screenshot shows the 'Edit recipe for 1 m3' window with a populated recipe. The 'Recipe name' is 'Recept5'. The 'Aggregate' column contains: Silo 1 (Sand, 300.00 kg, Step 1), Silo 2 (Gravel, 800.00 kg, Step 3), Vand 1 (Water, 100.00 kg, Step 1), Kemi 1 (Chemy, 8.00 kg, Step 1), and Cement 1 (Cement, 3000.00 kg, Step 2). The 'Mixing time' is 30 sec. A modal dialog is open for adding a new component, showing 'Silo 1' and 'Sand' with a quantity of 300.00 kg and Step 1.

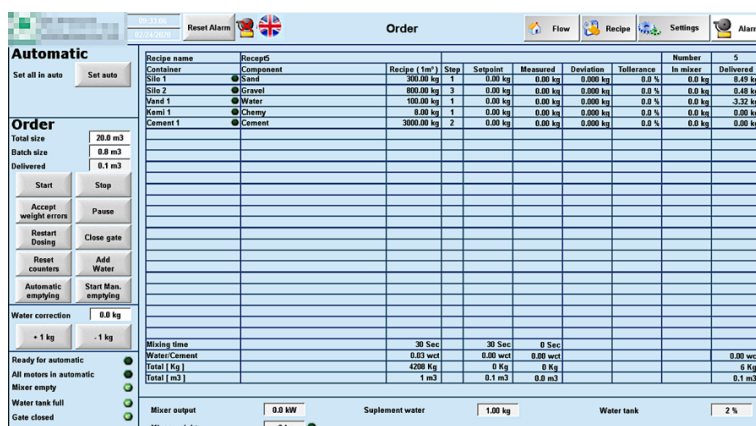
Note: when creating a recipe, we select only the silo number with the component and set the required quantity per 1 m³.

After Clicking "**Save**" the following window will appear.



The screenshot shows the 'Edit recipe for 1 m3' window with the final recipe. The 'Recipe name' is 'Recept5'. The 'Aggregate' column contains: Silo 1 (Sand, 300.00 kg, Step 1), Silo 2 (Gravel, 800.00 kg, Step 3), Vand 1 (Water, 100.00 kg, Step 1), Kemi 1 (Chemy, 8.00 kg, Step 1), and Cement 1 (Cement, 3000.00 kg, Step 2). The 'Mixing time' is 30 sec. The 'Load' button is circled in red.

Click on **"Load"** button, the following window will appear, check recipe been added to the main screen.



4.2.4 GET TO WORK

1. Select / Download the required recipe.



2. The mixer lid must be closed and the safety control ("Emergency stop / reset" button) must be switched off.
3. There should be no error messages on the screen.
4. All silo must contain material for at least 1 batch.
5. The recipe cannot include non-existent components / aggregates, for example, 300 kg "Cement-3", but silo cement 3 does not exist.
6. The recipe should be written per 1 m³, but the batch may be of a different volume.
7. Input current should be OK. (min. 380 V, 50-60 Hz. at maximum load of the mixer).
8. Mixer lid must be closed and adjusted if an alarm lights up.
9. The volume of the batch must be set in the "field" - **batch size**
10. Make sure the mixer engine is turned on.
11. The volume of a batch should not exceed the maximum volume specified in the installation properties.
12. The switches for all components must be set to **"Set auto"** mode and make sure all buttons are lit green.



13. There should be no active alarms on the screen to start!

14. Cement silo must be filled before the mixer starts.

15. Before starting work, all safety precautions must be taken.

16. Click **"Start"** to start the mixing process. If the system does not start mixing, an explanation of the malfunction will appear on the display.

When you press the **"Start"** key, it will light green and the mixer will start, then step-by-step delivery of components (the steps are set in the recipe).

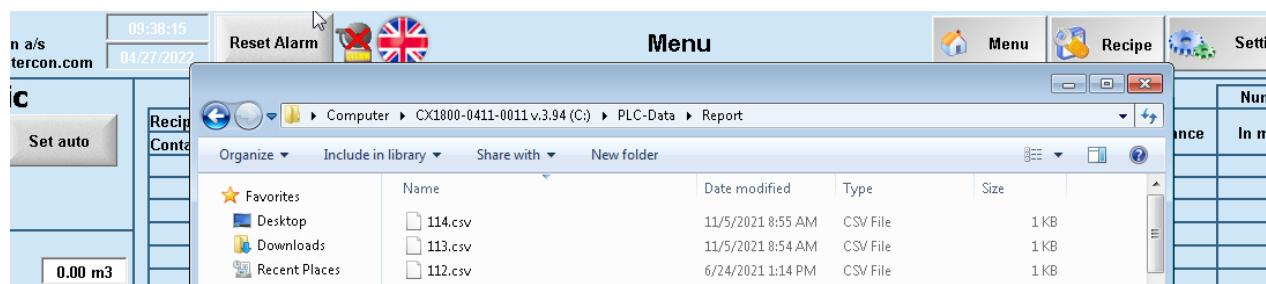
Note: If one of the silos is empty, you can press **"Pause"**, so you can add material, then press **"Pause"** again, to continue the batching process.

If the **"Automatic Emptying"** button is active, then after the end of the **"Mixing time"** the mixer unloads the batch, closes the gate, and continue the mixing process, if the programmed number of batches has not yet been completed.

When you select **"Manual emptying"** the gate for unloading will open and close at your command.

4.2.5 ACCESS TO PAST RECIPES

All past recipes can be found in the PLC memory: Computer>C:>PLC-Data>Report. The PLC can be accessed by pressing on the time and then using the taskbar below.



4.2.6 ALARM AND EMERGENCY STOP

Alarm

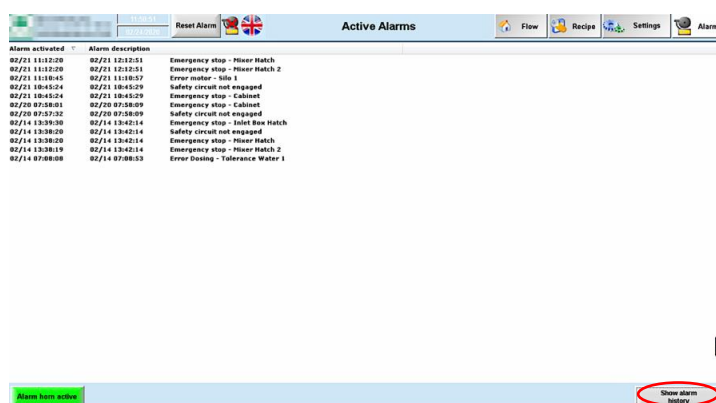
When an alarm is active, it appears in red.



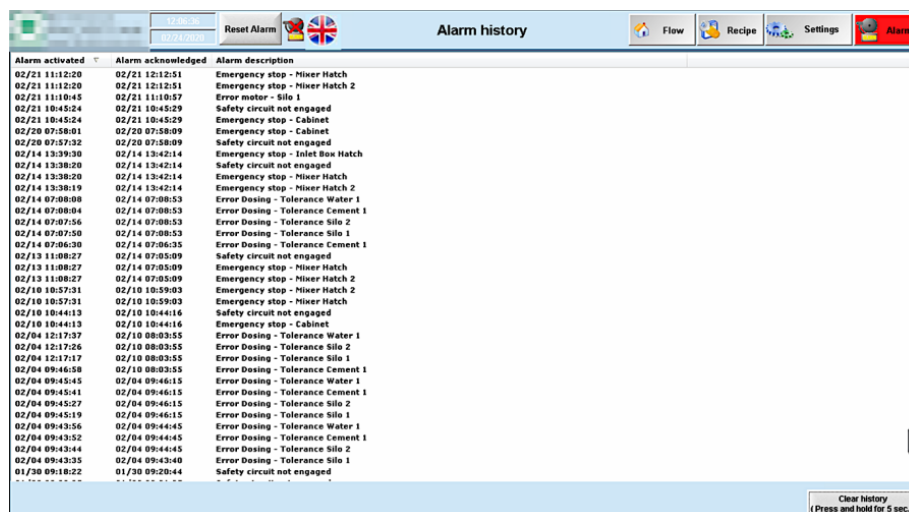
The alarm is displayed on the screen panel until it is recognized by the **"Reset alarm"**



If **"Alarm"** in the main menu flashes red when we click on it, we will see errors that have been detected.



All alarms are displayed in the alarm history, which is available by clicking the button in the lower right corner of the **"Show alarm history"**.



In this window, there is an opportunity to trace:

- ▶ When alarm activated
- ▶ When it was acknowledged
- ▶ A small description of the problem appears.

Note: To clear the alarm history, press and hold the **Clear History button for 5 seconds**.

Alarm Reset

Alarms can be identified by clicking the **"Reset Alarms"** button at the top of the menu.

Alarm activated	Alarm description
02/21 11:12:21	Safety circuit not engaged
Reset alarm Acknowledge	

Note: When you press the **"Reset Alarm"** button, make sure the error that caused the alarm is fixed.

Emergency stop

In case of activation of **"Emergency Stop"** it is necessary:

Note: If **"Emergency Stop"** is activated, first, make sure that the cause of its activation is determined and resolved.



To disable **"Emergency Stop"** you must:

1. Gently turn the button knob to the right and release.
2. Then press the blue button **"Reset Security"**. The blue indicator will turn off.



Note: If the blue light does not go out, the safety circuit is broken / damaged.

Resetting Safety Circuits

If the safety circuit is disconnected, for example by opening "the inspection door", the **"Reset Security"** button turns blue.

In the case of an open inspection door - it must be properly closed:

- ▶ Click on "Reset Security".
- ▶ The blue indicator on the button should turn off.
- ▶ If it stays on, all doors must be checked again.

Note: It is IMPORTANT to ensure that all doors are properly closed, and emergency shut-downs are not activated. Press the button **"Reset Security"** again.

4.3 SETTINGS MENU - CALIBRATION

4.3.1 SETTINGS – SILO AND VIBRATOR

Silo	1	Silo	2
Afterrun	20.0 kg	Afterrun	20.0 kg
Max. dosage tolerance	55.0 %	Max. dosage tolerance	55.0 %
Max. run time	120 sec	Max. run time	120 sec
Flow pr. second	25.0 kg	Flow pr. second	25.0 kg
Sensor installed	Installed	Sensor installed	Installed
Material Moisture	0.0 %	Material Moisture	0.0 %

Silo and vibrator

Afterrun - to avoid spilling or minimize dosing errors, you can set / change the number of kilograms, which will remain on the conveyor. For example, if the number of kilograms is greater, the program will recount and stop the conveyor earlier. This will allow you to choose the right dosage for a given recipe and reduce the cost overrun of materials.

Max dosage tolerance - For example: 5%, means that if the deviation from the preset dosage is more than 5%, an "Alarm" will appear indicating that a reboot / pouring has occurred.

Max run time - If the running is not completed at the maximum set operating time, an "Alarm" will appear and report an error. This may mean, for example, that silo has run out of material.

Flow pr. Second - flow rate of the material on the conveyor. This indicator is NOT adjustable in manual control, but changes automatically, depending on the width of the tape and its speed of rotation.

Material Moisture - It allows you to set the moisture of the material, which is fed by a given recipe, - adjusted automatically. It can be adjusted if a material moisture sensor is installed on this concrete mixing plant.

4.3.2 SETTINGS – CEMENT (DRY CHEMICAL)

Cement

Cement 1	
Afterrun	5.0 kg
Max. dosage tolerance	10.0 %
Max. run time	120 sec
Flow pr. second	8.0 kg

Cement pre weight	
Level, start refill	-1 kg
Level, stop refill	0 kg
Alarm level high	0 kg
Alarm level low	-100 kg
Max. run time	0 sec

Cement is weighed in the mixing chamber.

Afterrun - to avoid spilling, you can set / change the number of kilograms, which will remain in the auger. For example, if the number of kilograms is greater, the program will recount and stop the auger earlier. This will allow you to choose the right dosage for a given recipe and reduce the cost overrun of materials.

Max dosage tolerance - For example: 5%, means that if the deviation from the preset dosage is more than 5%, an "Alarm" will appear indicating that a reboot / pouring has occurred.

Max run time - If the running is not completed at the maximum set operating time, an "Alarm" will appear and report an error. This may mean, for example, that silo has run out of material.

Flow pr. Second - flow rate of the cement in the auger. This is NOT adjustable in manual control, but changes automatically, depending on the width of the tape and its speed of rotation.

4.3.3 SETTINGS – WATER AND CHEMICALS

Water and Chemicals

Chemical 1	
Afterrun	0.01 kg
Max. dosage tolerance	3.0 %
Max. run time	120 sec
Flowpuls Scale Factor	0.0100 L

Water 1	
Afterrun	1.00 kg
Max. dosage tolerance	66.0 %
Max. run time	120.0 sec
Flowpuls	1.000 l
Offset	0.0 l

Water tank	
Current level	2 %
Level, Stop filling	80 %
Level, start filling	70 %
Min. level, start batch	1 %
Min. Level, start heater	20 %
Setpoint temperature	0 °C

General Settings	
Min level in mixer for dosing water and chemical	1.0 kg
Min level in mixer for dosing water and chemical	

Afterrun - to be more precise in the calculation of a given recipe, you can specify / change the number of kilograms that will remain in the tube.

Max dosage tolerance - If the dosage deviation is more than specified in this field, an "Alarm" will appear with a message that an overdose has occurred.

Max run time - maximum time for filling water / chemicals. If the filling of water / chemical additives is not completed at the maximum set operating time, an "Alarm" will appear and will report an error. This may mean, for example, that the tank has run out of water / chemicals.

Flow pr. second - This field sets the number of liters per 1 pulse at the water counter.

4.3.4 WATER TANK

Current level - Current level in water tank.

Level, Stop Filling

Level, Start Filling - Maximum and minimum level of filling the water in the tank.

Min. level, Start batch - The minimum water level to start the batch.

Note: - If the water level is lower than 30%, then the batch will not start! An error message will appear.

- If necessary, drain all the water from the tank, you need to set 0% and this will allow us to pump out all the water from the tank without using a drain valve.

4.3.5 GENERAL SETTINGS OF WATER AND CHEMICALS

Minimum level in mixer before dosing water and chemicals - The set number in this field is important in automatic mode.

For example, it is set in this field - 100 kg. The recipe says - Step 1: sand and water supply, - then the water supply only starts when 100 kg of sand is in the mixer.

4.3.6 SETTINGS – WEIGHING CELLS

Weighing cells

Mixer weight	Cement pre weight
Current weight -0.3 kg	Level, start refill -1 kg
Scale Factor 1.000	Level, stop refill 0 kg
	Alarm level high 0 kg
	Alarm level low -100 kg
Tara	Max. run time 0 sec

Scale Factor - adjustable weight ratio (usually 1.0)

The most simplified process for calibrating weights in a mixer and cement weights:

1. To reset the scale simply press the «**Tara**»

Note: The mixer must be clean!

2. Set the mixer weight (or cement pre weight) to the calibration weight.

400 kg minimum. Set the scaling factor.

The weight that the computer shows and the weight that stands on the mixer must match.

4.3.7 SETTINGS – MIXER GATE

Mixer and Gate

Mixer Gate	Concrete conveyor
Time, open halfway 10.00 s	Runtime after gate closed 5.0 s
Weight emptying, open full 20 kg	
Weight empty 30 kg	
Extra empty time, last batch 20.0 s	

Time, open halfway - gate opening time, when controlling gate in automatic mode.

Weight emptying, open full - The mixer gate will open fully when the number of kilograms specified in this field remains in the mixer.

Weight empty - The weight of the remaining concrete in the mixer at which the gate closes again.

Extra empty time, last batch - The weight of the remaining concrete in the mixer at which the gate closes again.

4.3.8 SETTINGS – SILO LOGISTIC

Silo logistic

		Trip Counter	Total Counter	Total in silo	
Silo 1	sand	43.42 kg	43.42 kg	-42 kg	
Silo 2	Gravel	45.04 kg	45.04 kg	-45 kg	
		0.00 kg	0.00 kg	0 kg	
		0.00 kg	0.00 kg	0 kg	
Cement 1	Cement	48.95 kg	48.95 kg	-49 kg	
		0.00 kg	0.00 kg	0 kg	
		0.00 kg	0.00 kg	0 kg	
		0.00 kg	0.00 kg	0 kg	
Water 1	Water	5.00 kg	5.00 kg	-5 kg	
		0.00 kg	0.00 kg	0 kg	
Chemical 1	Chemy	0.00 kg	0.00 kg	0 kg	
		0.00 kg	0.00 kg	0 kg	
		0.00 kg	0.00 kg	0 kg	
		0.00 kg	0.00 kg	0 kg	
		0.00 kg	0.00 kg	0 kg	
		0.00 kg	0.00 kg	0 kg	
		0.00 kg	0.00 kg	0 kg	
		0.00 kg	0.00 kg	0 kg	
		0.00 kg	0.00 kg	0 kg	
		0.00 kg	0.00 kg	0 kg	
		0.00 kg	0.00 kg	0 kg	
		0.00 kg	0.00 kg	0 kg	
		0.00 kg	0.00 kg	0 kg	
		0.00 kg	0.00 kg	0 kg	
		0.00 kg	0.00 kg	0 kg	

Reset counters

All materials that are in the recipe will appear on this window. This page helps control the flow of all materials:

Trip Counter - In this column you can check the actual consumption of material. For example, the operator can reset the material counter, and this allows you to control the consumption of materials on each shift.

Total Counter - In this column you can see how much total material has passed through the concrete mixing plant. This column is not reset.

Total in silo - In this column, you need to enter the total amount of material, and, in the process, you can control the balance for each consumable.

To activate data entry, you need to click on the “pencil” and then enter the quantity:



For example, there is 50,000 kg of sand, 2,400 kg were used, then in this column the balance will show 47,600 kg.

Agregate	Material name	Position
Silo 1	sand	1
Silo 1	sand	

Clear OK Cancel

4.3.9 GENERAL SETTINGS

General settings

Minimum batch size: 0.1 m3

Maximum batch size: 1.0 m3

Maximum order size: 99.9 m3

Alarm horn: Deactivate

Popup (new order, input customer data): Show

Reset the active order, to allow loading a new one.: Reset active order

Always print batch report: Print always

Print last batch Report: Print Last

Reset all settings to default: Reset to default

Minimum Batch Size - Minimum size of the batch that is possible to mix.

Maximum order Size - Not used, specified by the technical capabilities of concrete mixing plant.

Alarm horn - Activate/ Deactivate - By pressing this button, you can activate or deactivate the sound of the alarm. In order to receive "Alarm" sound messages, this button must not be activated.

Popup (new order, input customer data) – Show - When this button is activated, a message will pop up about the start of a new order.

Reset the active order, to allow loading a new one - Reset active order - By pressing the button, the active / current order is canceled, and it will be possible to start a new order. For example, if a failure occurred during batching and the cause of the failure is known, then after solving the problem, to continue kneading, you must click "Reset Active Order". **Tip:** Use this button before changing the active order recipe to avoid errors.

Always print batch report - Print Always - When the button is activated, the printer will print a report after each batch (glows green - means Active).

Print last batch report - Print Last - When the button is activated, the printer will print a report on the last batch.

Reset all settings to default - Reset to default - When the button is activated, all settings will be reset to factory settings.

4.4 BATCH PLANT CLEANING & SHUTDOWN

4.4.1 CLEANING PROCESS

The following cleaning procedure should be followed to maintain COBOD's Mini Batch Plant:

1. For the last batch, dump all the material in the pump.
2. Start mixer.
3. Add 50 kg gravel and 10 kg water manually.
4. After pump is removed, dump gravel and water mix.
5. Pressure washes the inside of the mixing chamber.
6. Manually turn mixing arms to clean.
7. Remove build-up with jackhammer.
8. Pressure washes the gate piston and clean outside of mixer unit.
9. Pressure washes the gate from discharge side.
10. Apply concrete remover if needed.
11. Run mixer while opening in closing gate. Stop mixer, open gate.

4.4.2 SHUT DOWN

1. Check material stockpiles, request next shipment
2. Close and cover cement silo
3. Cover aggregate silos
4. Close admixture containers
5. Close water supply
6. View day's mixes in Computer>C:>PLC-Data>Report
7. Shut down PLC

5. MAINTENANCE SCHEDULE

Starting the plant/machinery									
Initial service after 100 hours									
Daily check									
Weekly check									
Monthly check									
Half-yearly check									
Annual check									
2 years/max Hours									
x	x					x			Check bolted connections and tighten if necessary
x		x							Check all emergency stop functions
x	x			x					Check oil level on gearbox
x	x		x						Check the belts and belt pulleys
x	x		x						Grease spindles by belt pulleys
x	x		x						Grease the bearings by discharge gate
x	x			x					Grease supporting legs

6. TROUBLESHOOTING

	Issue	Cause	Solution
Cement Silo	Cement hardened in the silo.	Environmental conditions. Cement exposed to moisture.	Empty and clean the silo properly
	Cement auger blocked	Hardened material in cement feeder.	Uninstall and clean the cement feeder.
	Vibrator	Cable connection.	Check the cable connections.
Batch Plant	Mixer Gate	Gate not cleaned properly.	Clean the material outlet gate properly.
	Mixer Gate leaking	Rubber wear	Replace rubber
	No Flow Cement	Cement auger block.	Uninstall and clean the cement feeder.
	Tolerance	Less / More material being dosed. Silo's afterrun settings	Increase the afterrun value as mentioned in the operation procedure.
	Added weight to mixer chamber while dosing.	Someone climbed on the mixer chamber	Move down and then restart dosing.
Additives Pump	Pump not primed	Neglecting to prime	Fill line with water from a low-pressure water source.
	Chemical decay over time	Plasticizer sits in the pump for 1-2 weeks in 30-40 degree Celsius	Pump water through the additive pump hoses after every batching day.
	Pump run dry		Must be primed again.

7. QUALITY ASSURANCE

The following parameters should be monitored to ensure COBOD's Mini Batch Plant perform to expectation:

- ▶ Tolerance – The monitoring of the tolerance deviation for the material's being dosed to the mixing chamber.
- ▶ Consistency – The shear vane should be used to measure the initial yield stress of the prepared material; the shear vane values should be within the same range from one batch to another.

8. RELATED DOCUMENTS AND TOOLS

The following additional documents are relevant and are attached to this document:

- ▶ COBOD_MiniBatchPlant
- ▶ COBOD_ControlManual
- ▶ Batchplant checklist