Hydro-Control (HC07) Operators Guide

To re-order quote part number:	HD1048
Revision:	1.3.0
Revision date:	May 2024

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ACKNOWLEDGEMENTS

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Revision history

Revision No	Software Version	Date	Description of Change
V1.0.0	V1.1.0.0	May 2023	First Release
V1.1.0	V1.1.0.0	June 2023	Minor footer and document propertied fields adjustments, error starting mix prompt and CO value added.
V1.2.0	V1.1.0.0	August 2023	Minor adjustments to screenshots
V1.3.0	V1.3.0.0	May 2024	Web browser access information added, screenshots update

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1 About this Manual

1.1 Purpose and Scope

This manual has been designed to act as a reference guide for an operator, describing the basic recipe design and setup, and goes on to more advanced techniques, such as fine-tuning the moisture control modes. For safety information, installation guidance and system parameters description refer to HD1074.

This operators guide is designed to accompany the following documentation:

1. HD1100 – Hydro-Control (HC07) Safety Information

2. HD1074 – Hydro-Control (HC07) Installation Guide

Both above documents are available to download from the www.Hydronix.com website.

This manual complements the Installation Guide, which details the installation, all the system parameters and the initial setup of the Hydro-Control.

1.2 Responsibilities

Read this operators guide before attempting to use the device. The device must only be used in accordance with manufacturer specified intended use.

1.3 Content

The manual is divided into chapters which cover setting up recipes and using the Hydro-Control to make concrete.

| Hydro-Control navigation | Chapter 2 describes how to navigate around the Hydro-Control and introduces the system. |

| Designing the mix cycle | Chapter 4 introduces the mix cycle and Chapter 5 explains the difference between the water addition modes. |

| Setting up a recipe | Chapter 6 describes how to create a recipe and how to edit the parameters to get the desired result. |

| Running the first mix | Chapter 8 shows how to run the first mix and tune the basic preset water addition mode. |

| Using moisture control to automatically add water | Chapter 9 explains how to calibrate the system and start using moisture control for the automatic addition of water into the mixer. |

2 Introduction to the Hydro-Control
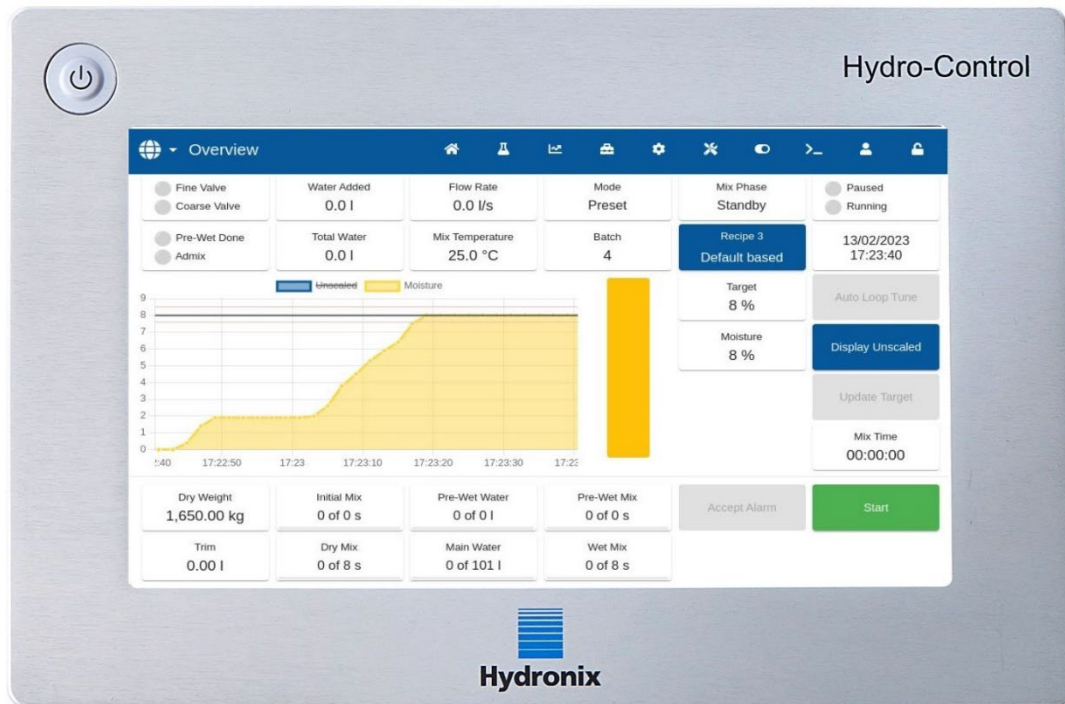
Figure 1: The Hydro-Control

The Hydro-Control (HC07) is a touch-screen computer based on a Linux operating system. It has been designed to work with the Hydronix range of sensors. The unit monitors the moisture level in a process (usually in a mixer) and sends signals to adjust the water flow into the process using water valves.

The moisture level during the process cycle is displayed on the Overview Screen, and there are intuitive and easy-to-use graphical tools for setting up the recipes in the system.

Communication with external systems can be implemented using either the built-in RS232 serial port, ethernet (port 23) or the optional Expansion Board. The Expansion Board also provides two analogue inputs and two analogue outputs.
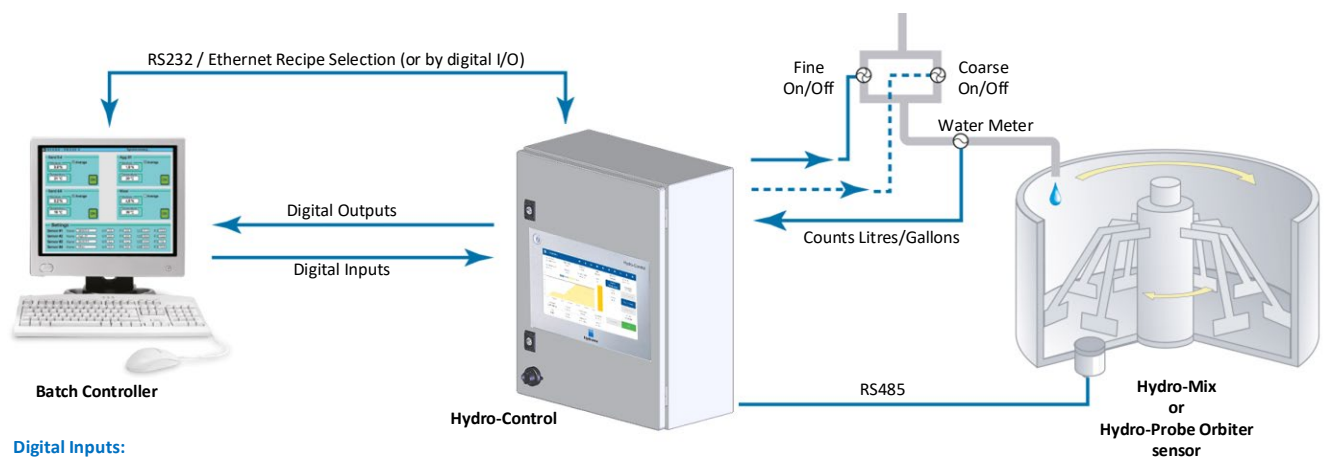
Digital Inputs:
 Start/Resume, Cement In, Pause/Reset, Water Meter Pulse Input, Water Tank Full, Optional 8 inputs for recipe selection

Digital Outputs:
 Coarse Water (switches on the coarse valve), Fine Water (switches on the fine valve), Admin, Pre-Wet Done, Mix Complete, Alarm, Water Tank Fill

Figure 2: Hydro-Control implementation example

1 Powering on, logging in and Powering off

Powering On

The Hydro-Control is switched on by pressing the power button in the top left-hand corner of the unit. The unit will briefly display system boot-up information. A white screen with Hydronix logo will appear, followed by an automatic login message, a black screen, and another white screen with Hydronix logo.

Logging In

Logging in is not required if the device contains only the default user account. The screen will display the Overview Screen with access to the entire menu in the top blue bar (see Figure 3). The Hydro-Control is ready to use.
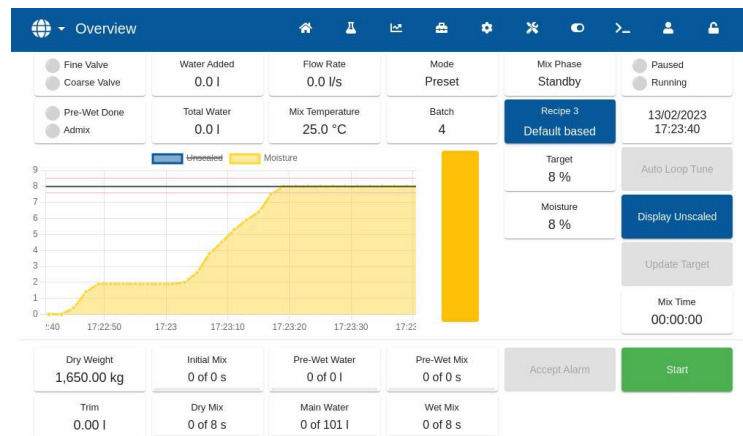
Figure 3: Overview Screen - Default User

If an additional user account is stored in the device beyond the default username, the device will display the Overview Screen with a limited menu, see Figure 4. A user login is required to gain access to the full menu.

For more information about logging in and user accounts management, refer to section 11.
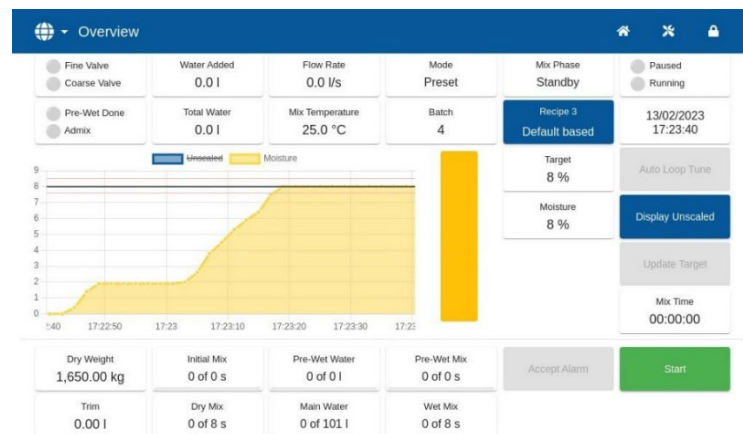
Figure 4: Overview screen - user not Logged in

Powering Off

To switch the unit off, hold the power button in the top left-hand corner until the confirmation box pops up and press OK.

2 Main Menu

The main menu pages are accessible by pressing the icons on the blue bar at the top of the screen. This allows access to the different areas of the Hydro-Control.

Figure 5: Main Menu Bar

1. Quick access language change button
2. Menu page name
3. Main menu access buttons

When no additional user account (beyond the default admin account) is created in the Hydro-Control, the Log-Out button (Padlock symbol) is not displayed on the main menu bar (see Figure 16 in section 11 User Management).

2.1 Menu Buttons

Overview

Displays the main Overview Screen to control the mix cycle and view details about the batch and recipe currently in use (see section 3 Overview Screen).

Recipes

Displays the user-defined recipes stored in the system and allows the user to create, edit, and delete recipes (see section 4 Recipes Screen).

Mix Log

Displays a list and details of previously run batches. Recipe calibration based on a previous batch can be performed using the submenu of this section (see section 5 Mix Log Screen).

System Parameters

Enables configuration of the system parameters, including water meter and valve setup, AUTO Mode and Auto-Track parameters, and alarm configuration (see section 6 System Parameters Screen).

Sensor Overview

Displays the sensor configuration screen allowing changes to the filtering and analogue output settings (see section 7 Sensor Overview Screen).

Settings

Enables configuration of system time and date, units of measurement, IP address and settings, and screen brightness. Software upgrade and database backup can be performed using the submenu of this section (see section 8 Settings Screen).

Hardware

Enables configuration of hardware and process-related inputs and outputs, selection of RS232 communication mode and performing I/O tests (see section 9 Hardware Screen).

Comms

Displays diagnostic information regarding the RS232 communication (see section 10 Comms Screen).

User Management

Enables creating, modifying, and deleting user accounts. This section manages user restriction levels (see section 11 User Management Screen).

Log Out

Enables the operator to log-out from the current user account once finished using the Hydro-Control (see section 11 User Management Screen).

3   Overview Screen

This is the main screen displaying an overview of the mix cycle and details about the batch and recipe currently in use. Accessing this part of the menu is described in section 2.1 Menu Buttons.
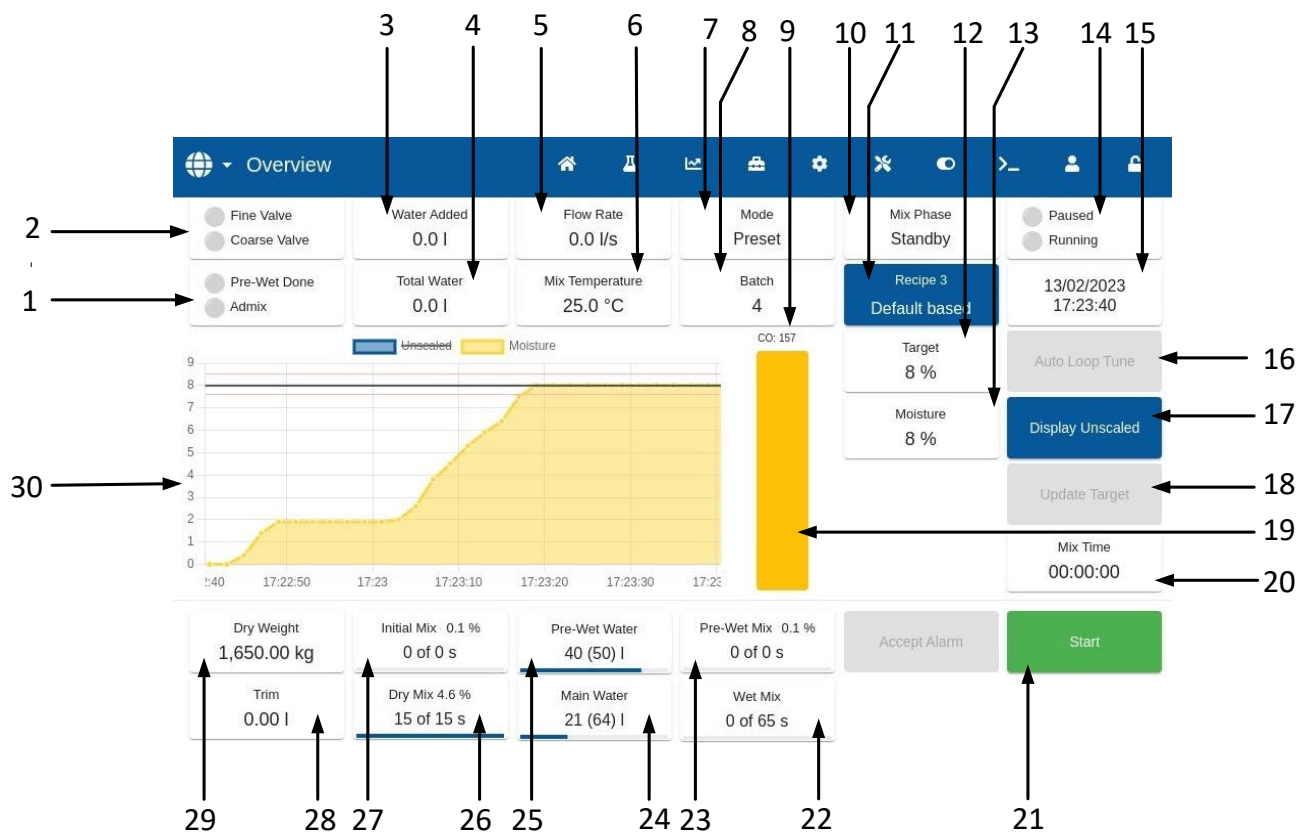
Figure 6: The overview screen of the Hydro-Control

1. Pre-Wet Done and Admix outputs status indicators – turn red when outputs are activated.
2. Fine and Coarse Valve status indicators – turn red when valves are energised.
3. Water added during the current phase.
4. Total water added to the batch.
5. Flow rate.
6. Temperature of the current mix.
7. The control mode in operation for the given recipe (Preset, AUTO or CALC).
8. Current batch number. The Batch number increments with each batch made for each Recipe.
9. Control output level indicator (AUTO mode only), see Chapter 9 section 3.4.
10. Current recipe phase.

11. Displays the Current Recipe Number and Name. Pressing enables access to the Operators Mode recipe screen see Chapter 3.

12. Current Recipe moisture target.

13. Current moisture value. When in air 'EMPTY' is indicated.

14. Process status.

15. Date and time.

16. AUTO Loop Tune enables adjustment of the AUTO Mode Parameters (see Chapter 9 section 3.3).

17. Switches the units shown on the main display between moisture value and sensor unscaled values.

18. Update Target is enabled when the current mix is in the Mix Complete phase. This allows the moisture target of the current Recipe to be updated to the final moisture value of the current batch.

19. Indicator bar showing the current moisture level.

20. Total mix time of the current batch.

21. Main control buttons for controlling the mix cycle. Start, Pause, Resume, Abort, Trim and Accept Alarm. (See Figure 7)

22. Wet Mix Time indicator.

23. Pre-Wet Mix Time indicator.

24. Main water addition indicator.

25. Pre-Wet Water addition indicator.

26. Dry Mix time indicator.

27. Initial Mix time indicator.

28. Water trim amount.

29. Dry material weight of the current batch.

30. Graph showing the last 100 seconds of moisture or unscaled value.
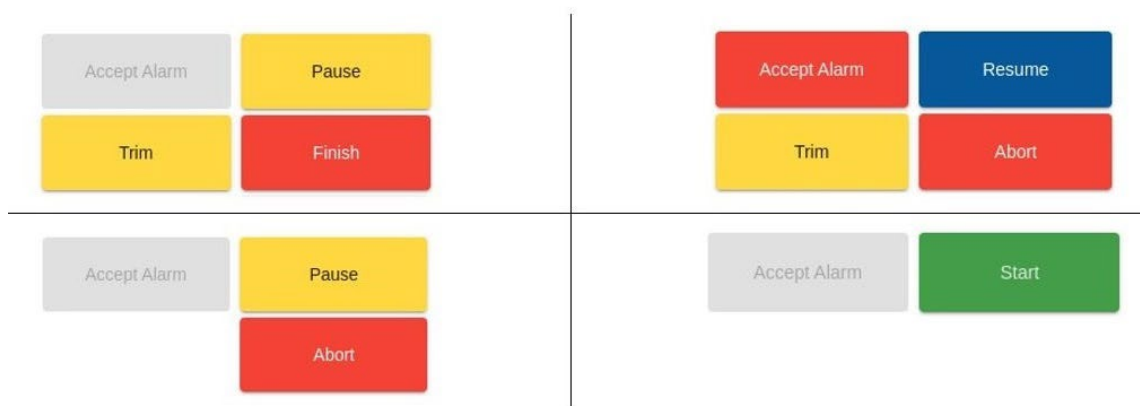
Figure 7: Mix cycle control buttons

Main control buttons	Description
Accept Alarm	User acknowledgement, removes the current alarm message from the display.
Start	Starts the Hydro-Control cycle.
Pause	Pauses the Hydro-Control cycle.

Main control buttons	Description
Resume	Resumes the Hydro-Control cycle.
Abort	Aborts the Hydro-Control cycle.
Trim	Enables inputting the manual trim amount (see Chapter 8, section 2.3). ***NOTE:*** If a certain amount of trim is always required, personnel with supervisor access should be notified to re-calibrate the mix. The procedure for this is described in Chapter 8, section 2.8.

An error message 'Sensor Fault' across the top of the screen shows when the Hydro-Control is searching for the sensor or connection to the sensor is lost.
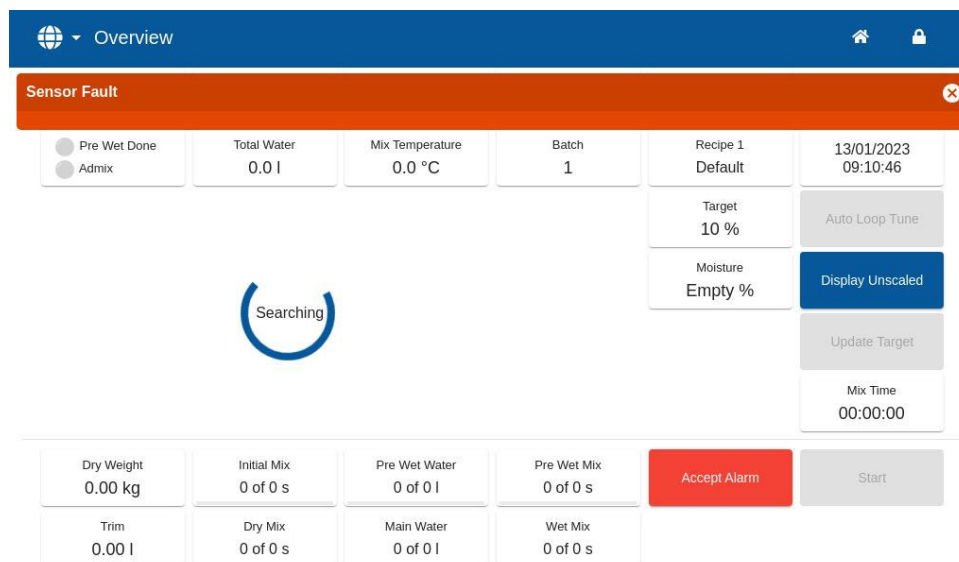
Figure 8: Connection to moisture sensor lost

Press the 'Accept Alarm' button to acknowledge and remove the 'Sensor Fault' message from the screen.

If no sensor is connected this alarm can be disabled. See Chapter 10 Section 1.1.

4 Recipes Screen

This is an overview list of recipes saved in the Hydro-Control. Accessing this part of the menu is described in section 2.1 Menu Buttons. Recipes can be created, selected for editing, or deleted from this screen.

Figure 9: Recipes Screen

Selecting a recipe is done by pressing its name on the list. The selected line will be highlighted and additional buttons will appear (see Figure 10).

To access the recipes not displayed on the current screen use the arrows below the list.

To search for a specific recipe name or description, type either part of or the full name or description in the search bar in the top left of the screen. The list will narrow down to recipes containing the phrase typed into the search bar.

To sort the displayed recipes press on the name of the desired sorting parameter at the top of the table. An arrow will appear indicating the sorted parameter and the order. To reverse the sorting order, press on the same parameter name again.

Pressing the 'Unscaled' button switches the displayed values from 'Moisture' readings into the sensor's 'Unscaled' readings. The button will change from 'Unscaled' into the 'Moisture' button when pressed (see Figure 10), and back to 'Unscaled' when pressed again.

The 'Create Recipe' button enables creating a new recipe in Hydro-Control's database.

Figure 10: Selecting a recipe for editing

Editing a recipe is accessed by selecting the desired recipe and pressing the 'Edit' button.

The 'Set Next Recipe' button marks the selected recipe as the next recipe to be run by Hydro-Control. After pressing the 'Set Next Recipe' button, a green round tick box will appear beside the selected recipe name field.

The 'Delete' button enables the deletion of the selected recipe from Hydro-Control's database.

The 'Close' button returns the screen to the main Overview screen.

5   Mix Log Screen

This is an overview list of the batches produced. Accessing this part of the menu is described in section 2.1 Menu Buttons.

Figure 11: The Mix Log screen

The 'Unscaled' button switches the display of the values shown in the mix log between % Moisture readings and sensor Unscaled readings.

Swiping left and right navigates across the different components displayed in the list, such as mix averages, times, alarms, and other mix log components. The filter options can be used to refine the logs displayed by date, recipe, or alarm type.

To search for a specific batch number type the desired number in the search bar in the top left of the screen and the list will narrow down to mix records containing the typed number.

Selecting a mix log is done by pressing anywhere on its line. After the selection is made, the 'Mix Trace' button will appear. The 'Mix Trace' button enables access to viewing parameters of the selected mix log.

Figure 12: The Mix Log screen – mix selected

The 'Close' button switches the screen to the main Overview screen. For detailed information about using the mix log, see Chapter 7 Using the Mix Log.

6   System Parameters Screen

Note: Some parameters will have been set up by the installer. The alarm configuration is detailed in Chapter 10 Alarm Configuration. The remaining parameters of this section are detailed in the Installation Guide (HD1074).

7   Sensor Overview Screen

Note: Some parameters will have been set up by the installer. All parameters are detailed in the Installation Guide (HD1074). For day-to-day operation, the operator of the system should not need to make changes in this section.

8   Settings Screen

A limited functionality 'System' page within the 'Settings' screen is available without logging into the device. This page displays the operating system version, software version, network address, MAC address and compliance information. Accessing this part of the menu is described in section 2.1 Menu Buttons.
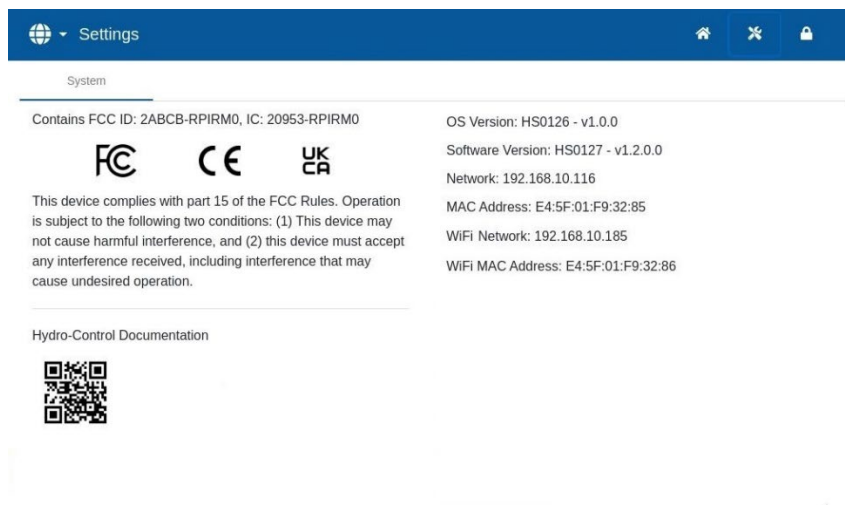
Figure 13: Settings Screen - the System page when logged out

Access to the entire 'Settings' menu is available only for Supervisor and Admin level user accounts. The Backup and restore database feature is described in Chapter 11. Accessing the unit using a remote connection is described in Chapter 12.
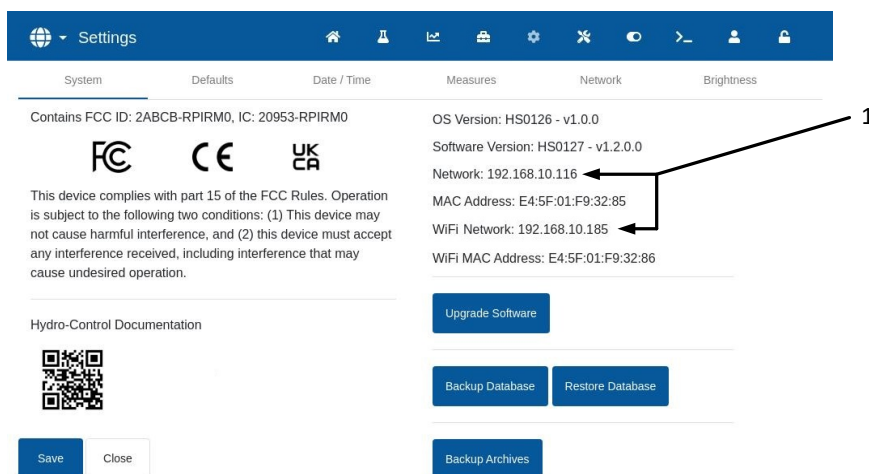
Figure 14: Accessing the backup, restore and software upgrade features

The remaining parameters are detailed in the Installation Guide (HD1074).

9 Hardware Screen

The parameters of this section are not used by an operator and are detailed in the Installation Guide (HD1074).

10 Comms Screen

The parameters of this section are not used by an operator and are detailed in the Installation Guide (HD1074).

11 User Management Screen

User account configuration is performed in this section. Accessing this part of the menu is described in section 2.1 Menu Buttons.

There are three levels of access in the Hydro-Control:

- Plant Operator – Access to the Overview Screen and Operators Mode recipes screen only. Chapter 3 describes Plant Operator controls.
- Supervisor – Access barred to setting up user accounts, sensor configuration and system parameters.
- Administrator – Full access rights

Important Note: *The Hydro-Control in the factory configuration comes with a default user account with administrator rights. To avoid the unit's parameters being manipulated unintentionally, it is advised that additional user accounts with relevant access restrictions are created.*

11.1 General

There are two buttons that appear at the bottom throughout the User Management pages:

- Save – Saves changes to the user accounts configuration settings.

- Close – If unsaved changes are detected the user is given the option to 'Discard' and return to the main User Management screen or 'Cancel' and return to editing the user account. Pressing 'Close' on the main User Management screen switches the device to the Overview screen.

11.2 Logging in

Figure 15 Shows different main menu bar configurations depending on the user level logged into the device: Operator, Supervisor and Administrator.

Figure 15: Main menu access level comparison

When no additional user account (beyond the default admin account) is created in the Hydro-Control, the Log-Out button (Padlock symbol) is not displayed on the main menu bar. There is no need to log in. Access to the entire menu is available.
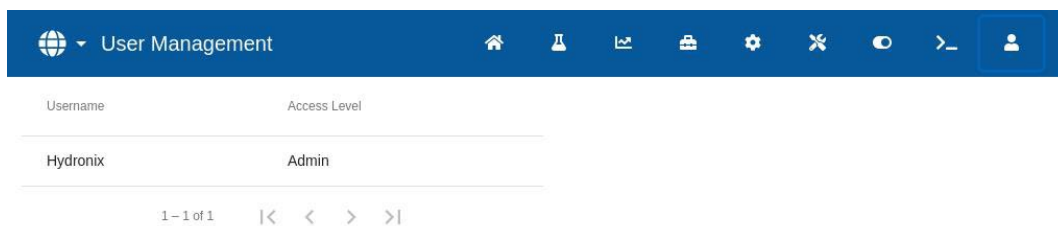
Figure 16: Default User Accounts Configuration – no login/logout button present.

When an additional user account (beyond the default admin account) is created in the Hydro-Control, the device requires logging in to gain access to the menu. The padlock symbol in the top menu bar signifies this.
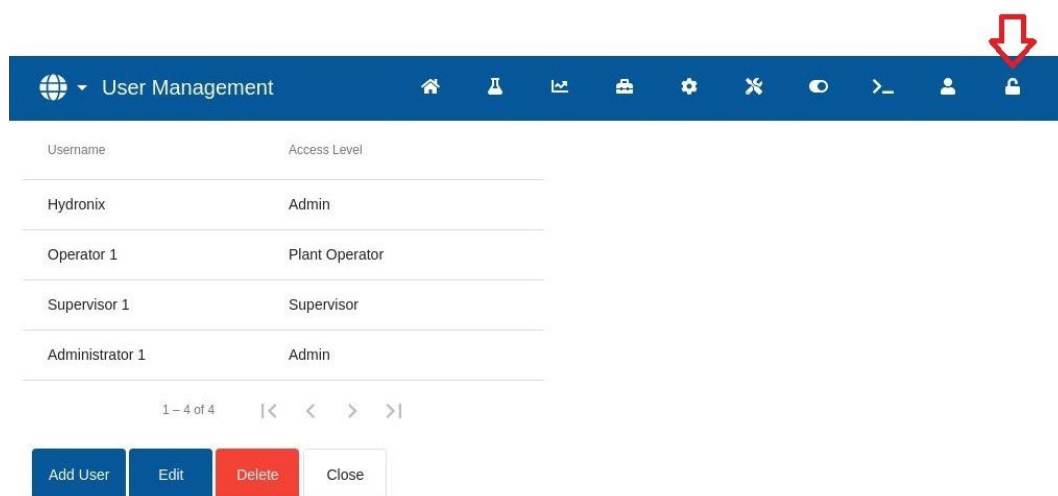
Figure 17: Additional User Accounts

To start the logging-in process, press on the Padlock symbol [🔒]. The Login screen will be displayed (see Figure 18).
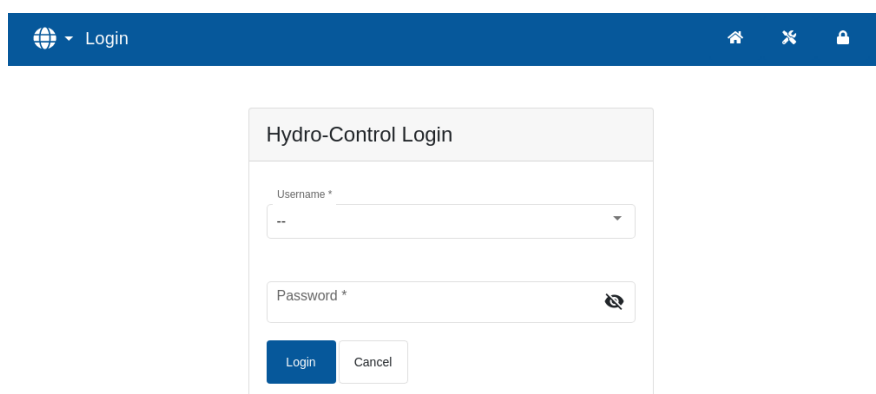
Figure 18: Login screen

Press the username field, select the desired username from the list (see Figure 19), then press the password field and type the desired password using the touchscreen keypad.

Press the 'Login' button to log in to the device (usernames and passwords are case-sensitive).
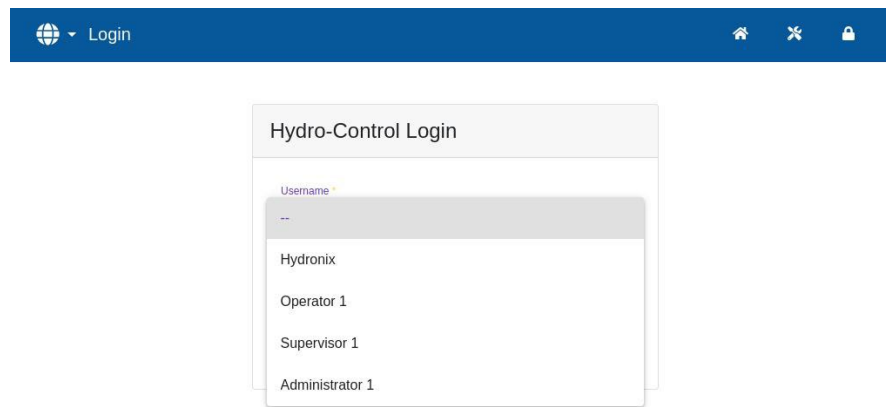
Figure 19: Login screen - user selection

After logging in, Hydro-Control will display the Overview screen. The menu access level in the top blue bar depends on the logged-in user level (see Figure 15).

Once a user has logged in, the menu appears at the top of the screen, and the padlock symbol changes to unlocked. The Hydro-Control is ready to use.

11.3 Creating new user account

To create a new user, press the 'Add User' button, type in Username, then Password and choose the Access level required for the new user. Then press the 'Save' button.
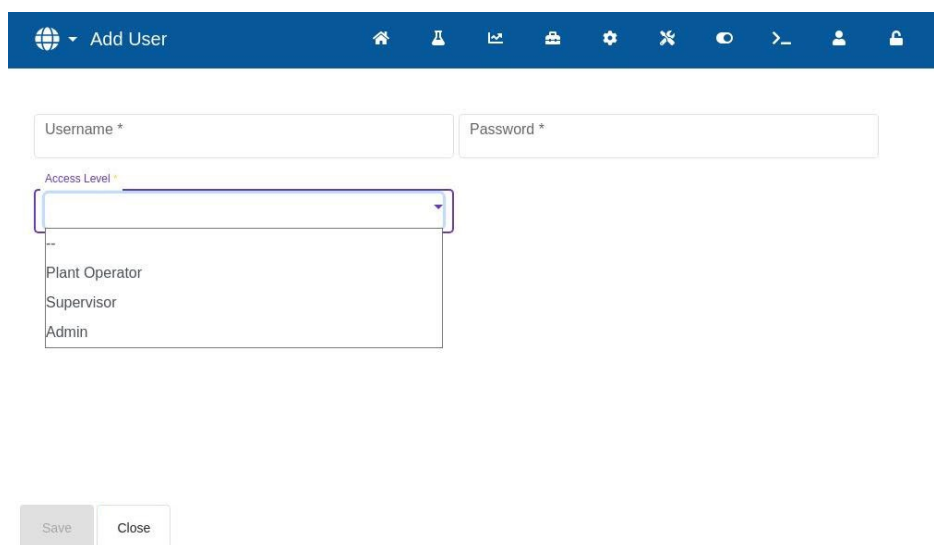
Figure 20: Adding new user account

Once an additional user account beyond the default account is created, the main menu bar includes the Log-Out button .

11.4   Editing existing user account

Figure 21: User management - editing existing user account

To edit details of an existing user account, select the desired user account by pressing on its name on the list and then press the 'Edit' button. Proceed with making the required changes. Press the 'Save' button to record the changes.

To delete a user account, press on the account name to be removed from Hydro-Control's database and then press the 'Delete' button (see Figure 17). A pop-up window will appear. Press 'Yes' to permanently delete the account or press 'No' to return to the previous screen.

11.5   Logging out

The Log-Out button enables the operator to log-out from the current user account once finished using the Hydro-Control.

Logging out will revert the main menu to minimal functionality, and the padlock symbol in the top right corner with revert to locked.

Figure 22: The main menu bar when logged out.

Default username and password

If user credentials become lost, attempt to login into the device using the default user account, username: Hydronix, password 0336. If the default user account password is changed and lost contact Hydronix support (support@hydronix.com).

A plant operator rarely needs to adjust the device's parameters; therefore, no access to the main menu is required in this mode. To access the plant operator controls, press the 'Recipe' button on the Overview Screen (see section 3 Overview Screen, arrow No. 11). Plant operator controls are available only when a user is logged in. This is signified by the 'Recipe' button being blue. After pressing the 'Recipe' button, the pop-up window in Figure 23: Recipe/Mode Screen will be displayed:
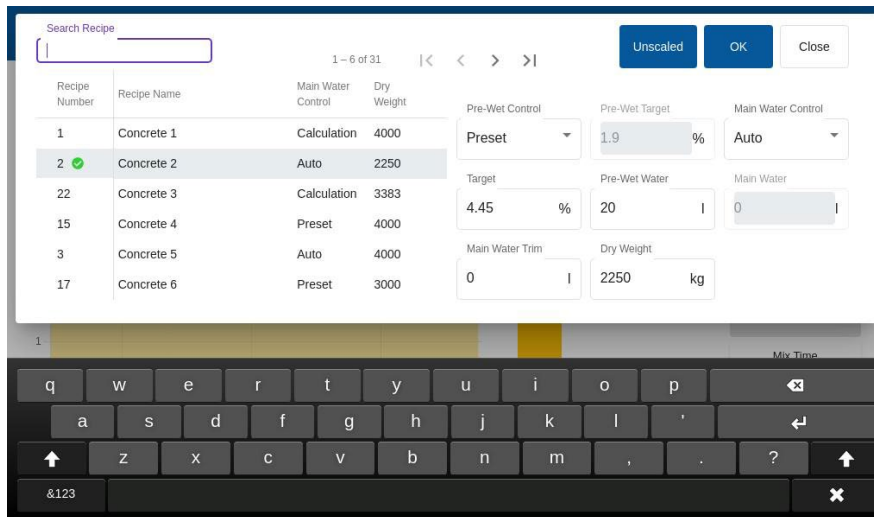
Figure 23: Recipe/Mode Screen – recipe search

This screen is used to change the key control parameters that operators may require to amend during production. The recipe list displays all the recipes in the system.

The 'Unscaled' button, the Search and the Sorting functions work in the same manner as described in section 4, Recipes Screen.

In Preset mode, adjusting Target and Pre-Wet Target is impossible as the system will add only fixed amounts of water. In AUTO or CALC mode, it is impossible to adjust the water values as the water addition is controlled to the water target. See Chapter 5 for an explanation of the different water addition modes.
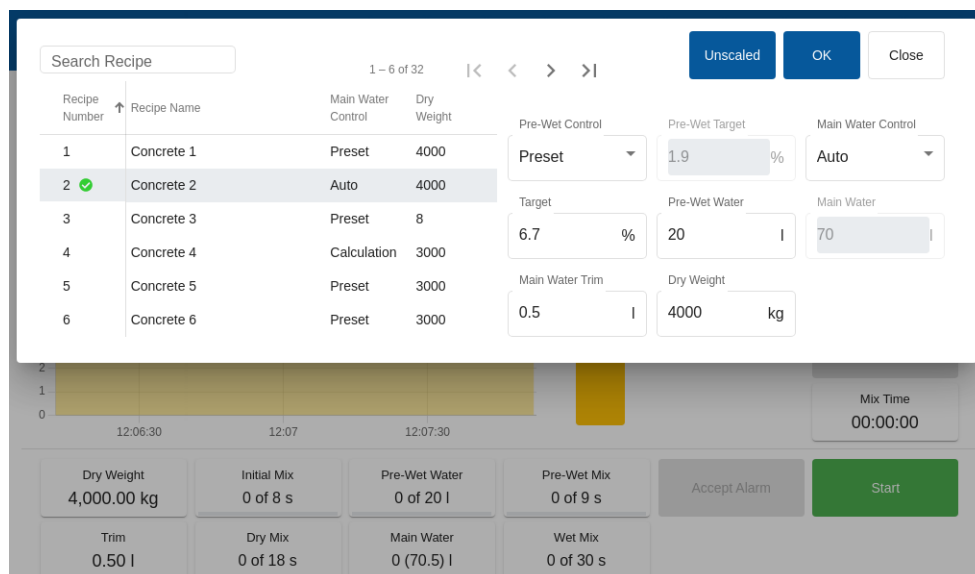
Figure 24: Recipe Mode Screen

If adjustments are required to maintain workability, it is advisable to adjust the amount of admixture used. If this is not possible, the Main Water Trim parameter can be used to adjust the overall amount of water added to maintain workability.

If it is found that a certain amount of trim is always required, personnel with supervisor access should be notified to re-calibrate the mix. The procedure for this is described in Chapter 9, section 2.8. For detailed descriptions of each parameter, see Chapter 6 Creating and Editing Recipes.

To be able to optimise the system for the best performance (accuracy, repeatability, and speed), it is essential to understand the mix cycle and its phases. There are two main types of mix cycles, a simple mix cycle, and a mix cycle incorporating the Pre-Wet water phase.

This chapter describes mix cycle phases and explains their configuration options.

1   The Simple Mix Cycle

One of the simplest cycles is shown in the moisture trace in Figure 25.
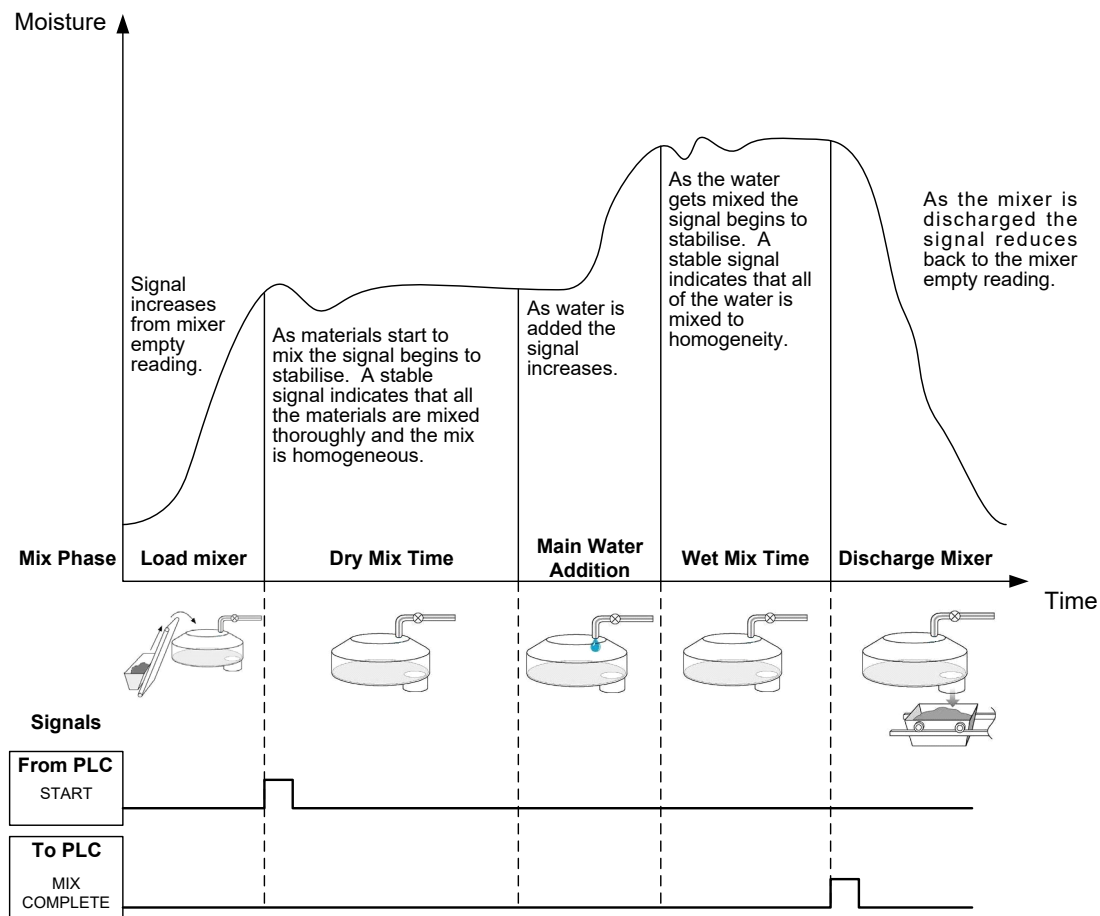
Figure 25: A simple mix cycle moisture trace explained

Once the material is loaded, the batch control PLC activates the 'Start' signal to start the Hydro-Control cycle. The first phase of the simple mix cycle is the Dry Mix (Dry Mix Time in the recipe parameters). After this period, water is added, after which the Wet Mix commences (defined by Wet Mix time parameter). At the end of the Wet Mix Time the cycle is finished, and the 'Mix Complete' signal is activated. This signals to the batch control PLC to discharge the mixer.

2   Cycle with Pre-Wet Water Phase

2.1   What is Pre-Wet Water?

Pre-Wet Water is a quantity of water that may be optionally added at the beginning of the mix cycle before the Dry Mix phase.

2.2   Why use Pre-Wet Water?

Pre-Wet Water may be used for several reasons. These include:

1.   To reduce cycle times. This is especially true for large batches requiring large quantities of water. The Pre-Wet Water (typically 2/3 of the total water) is dosed with the addition of the aggregates. This enables the bulk of the required water to be mixed into the material earlier in the mix cycle. The moisture sensor is then used to accurately dose the remaining water.

2.   To improve the efficiency of the mixing process when using certain admixtures, so that when the chemicals/dyes are added they are not being added to dry material.

3.   To wet the aggregates before adding the cement to the mixer. This may be necessary for several reasons, for example to aid the mixing of cement into the material (preventing 'balling') or perhaps a particular colour admixture needs to be added to a wet mix before the cement is added. Another benefit of adding Pre-Wet water before the cement is to loosen the material and reduce the mixing power, useful in mixers that are not capable of mixing all dry materials together.

4.   To wet the aggregates to bring them above their Water Absorption Value (WAV – also known as the SSD – "Saturated Surface Dry" point), typical for lightweight or synthetic aggregates.

Example case**:**

If the water needed to produce a repeatable concrete mix varies between 55 and 68 litres (depending on the moisture of the raw materials), then the recipe could be setup to put 40 litres of Pre-Wet water. The remainder of the water can be added in the main water phase.

2.3   Additional I/O for Pre-Wet Water

When adding Pre-Wet Water to the aggregates the Hydro-Control has an output called "Pre-Wet Done" which is activated at the end of the Pre-Wet phase in the cycle. This can be used by a batch control PLC to control the loading of the cement.

If using the "Pre-Wet Done" signal it is best practice to pause the Hydro-Control until the cement has finished loading. For this the Hydro-Control has an input called "Cement In". After the "Pre-Wet Done" output is given, the Hydro-Control waits for the "Cement In" before continuing onto the Dry Mix phase.

Whilst the Hydro-Control is paused, there is a timer running that will trigger an alarm if the "Cement In" input is not received within a set amount of time. If the "Cement In" input is not used, then the Cement Timeout parameter in the recipe **must** be set to zero to disable the alarm.

2.4 The Mix Cycle when using Pre-Wet Water

The mix cycle when using Pre-Wet Water is shown, along with a typical moisture trace, in Figure 26.
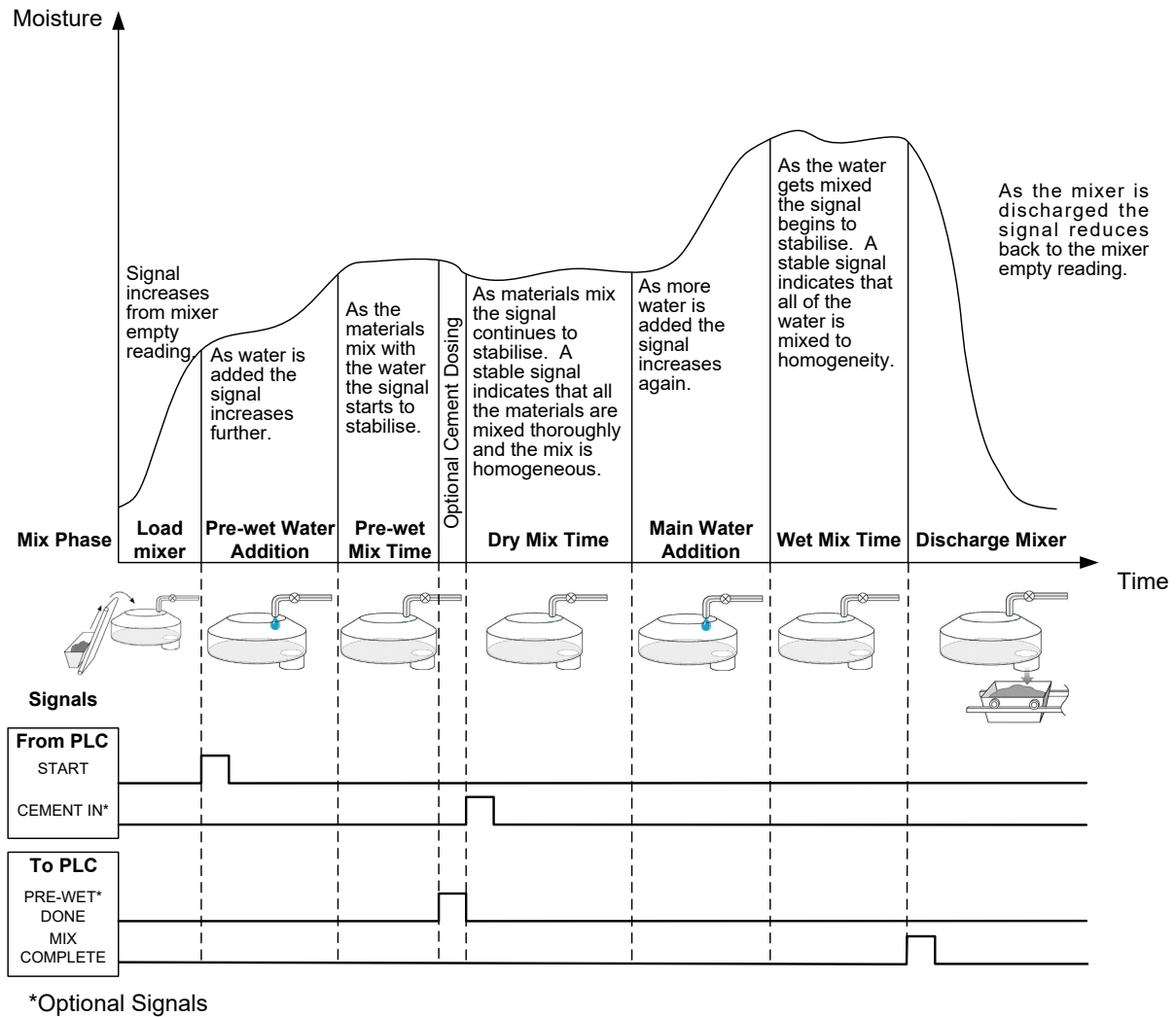
Figure 26: The mix cycle with Pre-Wet

The Hydro-Control starts its cycle when the "Start" signal is received. The first phase is the addition of the Pre-Wet Water, followed by the mix time defined in the parameter "Pre-Wet Mix Time". The "Pre-Wet Done" output then goes high and if enabled, the Hydro-Control pauses until the "Cement In" input is activated (the Cement Timeout parameter in the recipe must be set to enable the "Cement In" input).

The next phase is the Dry Mix Time, set in the recipe. After this period, water is added, after which the wet mixing time commences, also set in the recipe. At the end of the Wet Mix Time the cycle is finished and the "Mix Complete" signal is set, which signals the batch control PLC to unload the mixer.

2.5   The Mix Cycle when using Initial and Pre-Wet mix phases.

In some mix designs, it may not be possible or take an undesirable amount of time, to obtain a stable reading in the dry or wet mix once certain materials or chemicals are added. Reasons may include:

- Using metal fibres

- Mixes with very little fine material where the addition of cement causes clumping or 'balling' of the mix

- Some SCC admixes

In these situations, the Hydro-Control can be configured to calculate an amount of water to add based on a reading with either just aggregates or aggregates and water added. Once water has been added to a fixed moisture content it is then optional whether an additional calculation is made to add the main water or whether a pre-set amount of water, scaled for changes in the dry weight is added. Calibrating recipes is covered in more detail in Chapter 9 Using Moisture Control.

The Hydro-Control has been designed to operate in one of three modes of water addition: Preset Mode, AUTO Mode and CALC Mode. In all installations, the initial setup of each mix design should be done with the water addition set to Preset Mode.

1   Preset Mode

No sensor signal is required to operate in this mode. The Hydro-Control simply adds a fixed amount of water (in litres, gallons, kilograms, pounds, or seconds) as defined by the recipe.

Preset Mode is used when setting up a recipe to add a fixed quantity of water to the mixer. The amount of water that is added can be adjusted on subsequent batches to optimise the amount of water added to the mix. After a good batch has been made, that batch can then be selected in the mix log and a recipe calibration can be obtained automatically.

When each batch is completed, the system updates the Preset Water parameter with the amount of water that was dosed. This enables a more straightforward changeover from CALC Mode or AUTO Mode to Preset Mode.

2   CALC Mode

This mode takes a reading at the end of the dry mix, and then calculates the exact quantity of water required to reach the moisture target in the recipe using calibration data and the dry weight of the materials in the mixer.
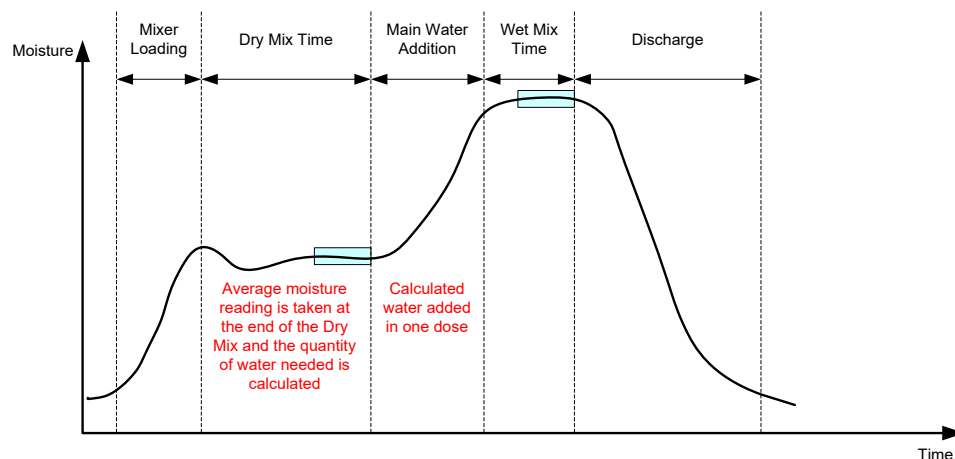
Figure 27: The moisture during CALC Mode

Figure 27 shows a typical moisture trace during a batch run in CALC Mode. The boxes show the point at which an average moisture reading is taken at the end of the Dry Mix and Wet Mix Times.

The length of time that the system uses for averaging is defined using the Averaging Time parameter in the System Parameters.

As the moisture calculation relies in part on the dry weight of the materials in the mixer, it is necessary that the dry weight parameter in the recipe is accurate. If there is a possibility of this changing, for example if the raw material moisture is not being compensated for, then it is preferable to use AUTO Mode.

For best results, it is important to have a stable moisture reading (homogenous mix) at the end of the Dry Mix Phase to give accurate data for the water calculation. However, it is not necessary to have complete homogeneity at the end of the final mix stage. If the final product homogeneity is not important, for example if there is further processing after the mixer, then the Wet Mix Time can be decreased.

3   AUTO Mode

The AUTO Mode progressively adds water to the mixer to achieve a defined moisture target. The Hydro-Control controls the speed at which the water is added and slows the addition as the current moisture nears the target moisture to accurately reach the target without overshooting it.
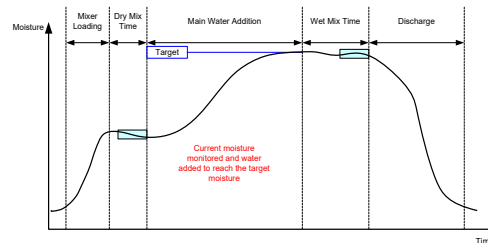
Figure 28: The moisture during AUTO Mode

Figure 28 shows a typical moisture trace during a batch run in AUTO Mode.

As there is no requirement for complete homogeneity during the Dry Mix Phase, the Dry Mix Time can be made shorter than in CALC Mode so the water can start to be added earlier in the batch.

The system is shipped with default parameters for controlling the water addition. To optimise the system these settings may require adjustment.

To ensure that the moisture is correct and that the mix is homogeneous, it is important to allow a sufficient Wet Mix Time before discharging the mixer.

4   Selecting the Best Mode – AUTO or CALC?

The most appropriate mode for moisture control varies depending on the application. It is important to understand the differences between AUTO Mode and CALC Mode to select the mode that is the most appropriate.

- *Do the batch sizes vary from one batch to another?*

  If yes, then AUTO Mode will work without needing to have an exact dry weight parameter in the recipe before a batch is made. To use CALC Mode the dry weight recipe parameter would have to be updated on a batch-by-batch basis, either by sending it using the RS232 port on the Hydro-Control, or by manually editing the recipe.

- *Is the water supply pressure constant?*

  The AUTO Mode control method requires water to be added consistently. If there are changes in flow rates due to pressure fluctuation, then the AUTO Mode will not be able to perform optimally.

- *Are mixing times critical?*

  If yes, then it is likely that CALC Mode may be quicker to use than AUTO Mode.

- *Is it possible to achieve a stable reading in the dry mix time?*

  A prerequisite of CALC Mode is that the water calculation is based on a correct and stable Dry Mix reading for addition in a single dose. If the Dry Mix reading is not stable enough, then it is unlikely that CALC Mode will give the desired accuracy. AUTO Mode does not need a stable signal due to water being added continuously to reach the target.

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This chapter explains how to create a new recipe and how to edit an existing recipe. It also describes the functions of recipe parameters.

For information on how to access the Recipes Screen and a description of the functionality of the buttons in the bottom part of the screen, refer to Chapter 2 Navigation, section 4: Recipes Screen.

Note: Some parameters will have been set up by the system installer and are detailed in the Installation Guide (HD1074).

1   Introduction

The Recipe Screen lists all the recipes stored on the Hydro-Control. To navigate through the recipes, use the arrows beneath the list. Press the column description to sort the recipes in ascending or descending order. This helps locate a specific recipe Press on the same column name again to swap between ascending and descending sort order.

2   Creating New Recipe

Creating a new recipe can be done in one of two ways:

- based on a basic, system default recipe

- based on an existing recipe

2.1   Creating a New Recipe Based on the System Default Recipe

To create a new recipe based on the system default recipe, ensure no recipe is selected on the recipes list and press the 'Create Recipe' button. Confirm that 'System Default' is selected in the 'Copy From' drop-down menu of the 'Create Recipe' window and press the 'Submit' button. This is a basic recipe with specific parameters being pre-defined.

Figure 29: Creating a new recipe data input

2.2   Creating a New Recipe Based on an Existing Recipe

To create a new recipe based on a recipe existing in Hydro-Control's database, select the desired recipe on the recipes list and then press the 'Create Recipe' button. Ensure the desired recipe is selected in the 'Copy From' drop-down menu of the 'Create Recipe' window and press the 'Submit' button.

Figure 30: Copying an existing to create a new recipe

Recipe Parameter	Description
Copy From	This indicates which recipe is the basis for the new recipe being created. This is a quick way of copying parameters from one recipe to another.
Recipe Number	The new recipe's number. This field will be automatically populated with the next available recipe number. It can be edited if required.
Recipe Name	Name of the new recipe.
Recipe Description	Description of the new recipe.
Dry Weight	The dry weight of the mix, including the cement.
Pre-Wet Water Limit	In the Pre-Wet phase, this value limits the amount of water added before the system alarms.
Pre-Wet Water	The amount of water to add during the Pre-Wet phase.
Main Water Limit	The maximum amount of water that the system will add or calculate to add before it alarms. If the system is in CALC Mode, a check is made when the water calculation has been made. If the system is in AUTO Mode, then the system alarms when the system reaches this value.
Main Water	The fixed amount of water to add during the main water addition when running in Preset mode.

Recipe Parameter	Description
Dry Mix Time	Defines the dry mix time.
Wet Mix Time	The amount of time to mix for, after adding the main water and before signalling that the mix is complete.

3   Editing an Existing Recipe

To edit an existing recipe, select the desired recipe by pressing on its line. Additional buttons will appear (for details see Chapter 2, Section 4 Recipes Screen).

Press the 'Edit' button to enter the recipe editor. Subsections 3.2 to 3.9 of this chapter describe each recipe parameter.

3.1   General

At the bottom of the Recipe editor pages are three buttons:

- 'Unscaled' or 'Moisture' – This button toggles the sensor values in the recipe to display unscaled or moisture values.

- Save – Saves changes to the recipe.

- Close – If unsaved changes are detected the user is given the option to 'Discard' and return to the Recipes screen or 'Cancel' and return to the recipe editor.

3.2   Recipe Details
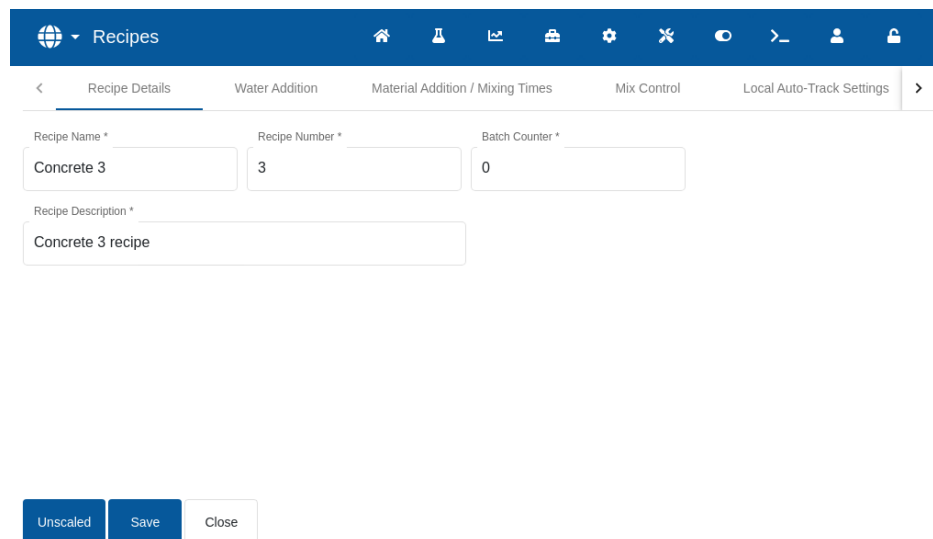
Figure 31: Editing a Recipe – Recipe Details

Recipe parameter	Description
Recipe Name	The name of the recipe displayed on the Overview Screen.

Recipe parameter	Description
Recipe Number	The number of the recipe in the Hydro-Control.
Batch Counter	The number of the last batch made.
Recipe Description	The recipe description.

3.3   Water Addition

Figure 32: Editing Recipe - Water Addition

Recipe parameter	Description
Pre-Wet Water	The fixed amount of water to add during the Pre-Wet phase of the mix cycle if the Pre-Wet Water Control Method is set to Preset Mode. If not using Pre-Wet Water, then set this value to zero.
Pre-Wet Water Limit	In the Pre-Wet phase this value limits the amount of water that will be added before the system alarms.
Main Water	The amount of water to add during the main water phase of the mix cycle if the system is in Preset Mode.
Main Water Limit	The maximum amount of water that the system will add or calculate to add before it alarms. If the system is in CALC Mode a check is made when the water calculation has been made. If the system is in AUTO Mode, then the system alarms when the system reaches this value.
Main Water Trim	The amount of trim water to add to the recipe. Trim water is included in the water calculation and changes the target when calibrating the system to allow for a calibration to be made to a batch which is not perfect.
2 Step Addition	Enables the two-step addition mode, which splits the main water addition into two stages. During the second stage the Admixture signal is activated. This can be used whilst dosing admixtures that have a large effect on the sensor calibration to keep the moisture display accurate.
Admix Enable Percentage	The point in % during the main water phase that the Admix signal will be set.

Recipe parameter	Description
Admix Amount	Not used by the Hydro-Control but appears in the Recipe. This is the amount of admix stated in the mix design. This can be manually input for information only.

3.4   Material addition/Mixing Times

Figure 33: Editing Recipe - Material Addition and Mixing Times

Recipe parameter	Description
Dry Weight	The dry weight of all the materials in the mixer, including all aggregates and cement. If this can change due to weighing errors or moisture correction, this value should be sent from the batch control system to allow the calculation to be done to the best accuracy.
Cement Weight	The weight of the cement added and, if entered, the Hydro-Control log will contain the water/cement ratio for a particular batch.
Cement Timeout	The amount of time that the system will wait after issuing a Pre-Wet done signal before alarming if it has not received the cement in signal.
Initial Mix Time	The amount of time that the system will mix after aggregate addition before adding water
Pre-Wet Mix Time	The amount of time that the system will mix after adding the Pre-Wet water before it sets the Pre-Wet done signal. This can be used if it is required to mix the water into the batch before adding cement. The cement should be controlled using the Pre-Wet Done signal and once the cement dose is complete the Cement In signal should be activated.

Recipe parameter	Description
Dry Mix Time	The amount of time to mix the batch after the Pre-Wet water has been added and mixed, and the Cement In signal has been received (if used). After this time, the main water is added.
Wet Mix Time	The amount of time to mix after the main water has been added before signalling Mix Complete.

3.5   Mix Control
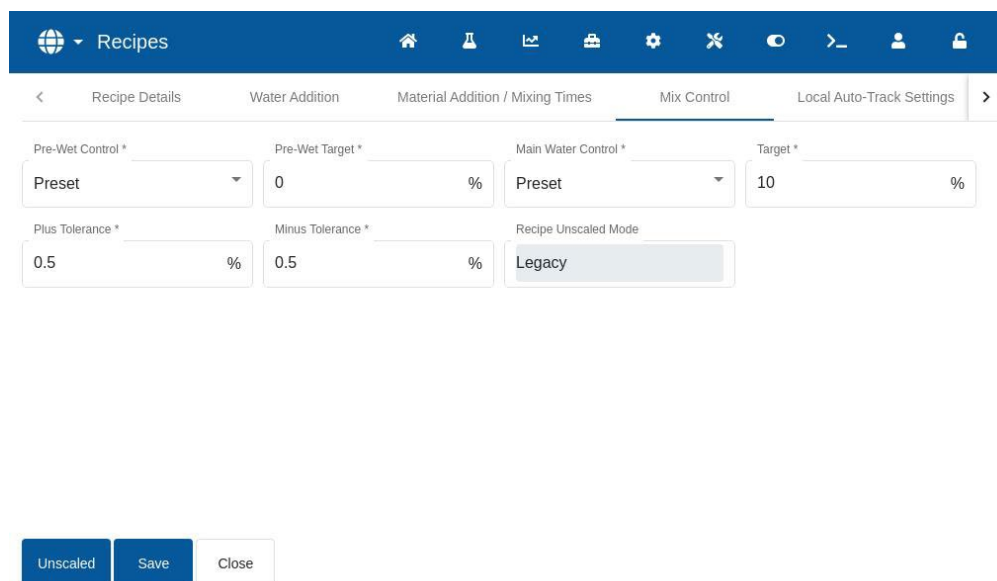
Figure 34: Editing Recipe - Mix Control

Recipe parameter	Description
Pre-Wet Control	The method used to control the addition of the Pre-Wet water. If Preset is used, then the fixed quantity of water specified on Page 1 is used. If the method is set to Auto, then the addition is governed by the Pre-Wet moisture target.
Pre-Wet Target	The parameter defining the way in which the Pre-Wet water addition is controlled. It has three settings, Preset, Auto and Calc. These methods are discussed in Chapter 5.
Main Water Control	The parameter defining the way in which the main water addition is controlled. It has three settings, Preset, Auto and Calc. These methods are discussed in Chapter 5.
Target	If Main Water Control is set to Auto or Calc then this setting defines the moisture target that the automatic mode is using.
Plus Tolerance	The limit used for the upper limit before alarms are triggered to indicate the final moisture is out of tolerance with the moisture target defined in the previous parameter.

Recipe parameter	Description
Minus Tolerance	The limit used for the lower limit before alarms are triggered to indicate the final moisture is out of tolerance with the target defined by the Target parameter.
Recipe Unscaled Mode	This indicates the sensor measurement mode used for the recipe.

3.6   Local Auto-Track

Figure 35: Editing Recipe - local Auto-Track settings

Recipe parameter	Description
Auto-Track Initial Enable	Setting enabling the Auto-Track feature for the initial mix phase of the recipe. For more information on this feature see Chapter 8.
Auto-Track Pre-Wet Enable	Setting enabling the Auto-Track feature for the Pre-Wet mix phase of the recipe. For more information on this feature see Chapter 8.
Local Auto-Track Enable	If enabled the recipe will use the locally set parameters for the Auto-Track function instead of the ones set on the system parameters page.
Auto-Track Dry Mix Enable	Setting enabling the Auto-Track feature for the Dry Mix phase of the recipe. For more information on this feature see Chapter 8.
Auto-Track Wet Mix Enable	Setting enabling the Auto-Track feature for the Wet Mix phase of the recipe. For more information on this feature see Chapter 8.

Recipe parameter	Description
Auto-Track Initial Mix Time	When using Auto-Track control, this is the amount of time that the Initial Mix must be within the Initial Mix Deviation below to continue. If the sensor signal has not stabilised within this window by the end of the Initial Mix Time, the system will prompt the operator to continue regardless of whether it has stabilised or not.
Auto-Track Initial Mix Dev	This is the maximum deviation that the sensor signal must be within for the system to continue.
Auto-Track Pre-Wet Mix Time	When using Auto-Track control, this is the amount of time that the Pre-Wet Mix must be within the Pre-Wet Mix Deviation below to continue. If the sensor signal has not stabilised within this window by the end of the Pre-Wet Mix Time, the system will prompt the operator to continue regardless of whether it has stabilised or not.
Auto-Track Pre-Wet Mix Dev	This is the maximum deviation that the sensor signal must be within for the system to continue.
Auto-Track Dry Mix Time	When using Auto-Track control, this is the amount of time that the Dry Mix must be within the Dry Mix Deviation below to continue. If the sensor signal has not stabilised within this window by the end of the Dry Mix Time, the system will prompt the operator to continue regardless of whether it has stabilised or not.
Auto-Track Dry Mix Dev	The maximum deviation that the sensor signal must be within for the system to continue.
Auto-Track Wet Mix Time	When using Auto-Track control, this is the amount of time that the Wet Mix must be within the Wet Mix Deviation below to continue. If the sensor signal has not stabilised within this window by the end of the Wet Mix Time, the system will prompt the operator to continue regardless of whether it has stabilised or not.
Auto-Track Wet Mix Dev	The maximum deviation that the sensor signal must be within for the system to continue.

3.7   Calculation Mode Settings

Figure 36: Editing Recipe - Calculation Mode Settings

Recipe parameter	Description
Pre-Wet Moisture Offset 1 Pre-Wet Moisture Gain 1	Calibration coefficients for the Pre-Wet phase of the recipe. These define the relationship between the amount of moisture in the batch and the unscaled sensor value. These are automatically calculated when the recipe is calibrated.
Moisture Offset 1 Moisture Gain 1	Calibration coefficients for the recipe. These define the relationship between the amount of moisture in the batch and the unscaled sensor value. These are automatically calculated when the recipe is calibrated.
Moisture Offset 2 Moisture Gain 2	Calibration coefficients for the recipe with the admixture in. These are automatically calculated when the recipe is calibrated using the two-step Preset method.
Use Pre-Wet value for main water	If enabled the Hydro-Control will use the reading measured at the end of the Pre-Wet mix rather than the dry mix to calculate how much water to add in the main water addition

View Calibration

Opens the Mix Trace Graph of the mix log used to calibrate the recipe. Only available if the recipe has been calibrated.

Reset Calibration

Resets the Calculation Mode calibration coefficients to the default value.

3.8   Auto Mode Settings
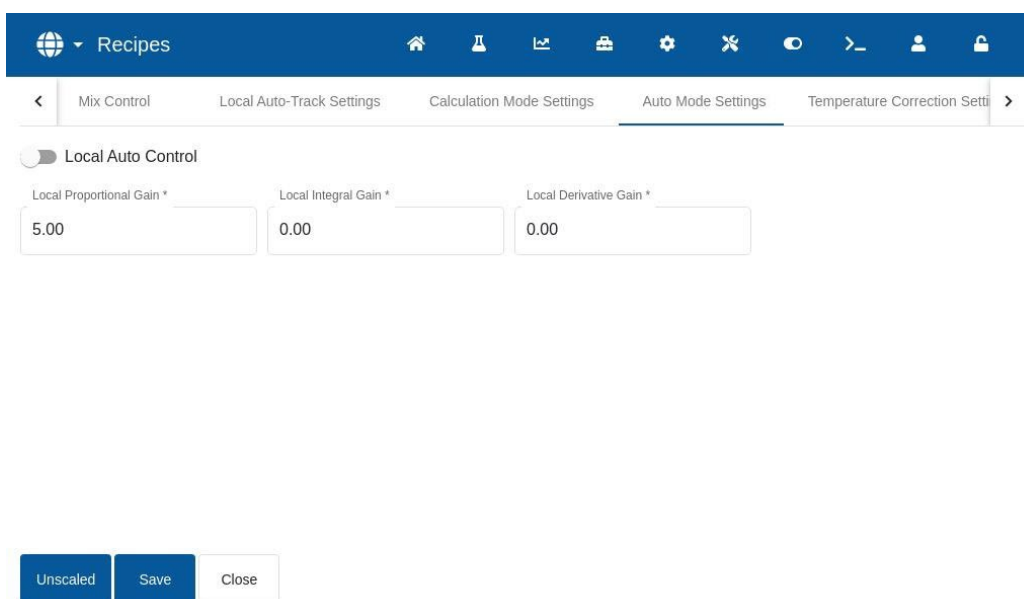
Figure 37: Editing Recipe - Auto Mode Settings

Recipe parameter	Description
Local Auto Control	By default the Auto Parameters in the System Parameters will be used. For difficult mixes it may be necessary to set up unique parameters for the recipe. This parameter allows the system parameters to be overridden and the local parameters to be used to control the rate of the water addition.
Local Proportional Gain	The parameter used by the control mode to adjust the rate that the water is added to the mixer. It defines the initial speed of the water into the mixer.
Local Integral Gain	The parameter used by the control mode to adjust the rate that the water is added to the mixer. It adjusts the rate of the water addition based on the amount of time the addition has taken. It can be used to correct an offset at the end of the water addition without having to use excess Proportional Gain which can cause overshoot.
Local Derivative Gain	The parameter used by the control mode to adjust the rate that the water is added to the mixer. It adjusts the rate of water addition based on the rate of change of the difference between the current sensor value and the target.

3.9   Temperature Correction Settings

Figure 38: Editing Recipe - Temperature Correction Settings

Recipe parameter	Description
Temperature Set Point	The base temperature for the temperature coefficient to work from.
Temperature Coefficient	The change in moisture per degree Celsius that the current temperature is different from the Temperature Set Point that is added to or subtracted from the target unscaled. This is used to allow the concrete to vary depending on the temperature to allow for the increased rate of hydration in hotter atmospheres.

After inputting the desired parameters, press the 'Save' button. A notification window will pop up confirming that the changes were saved in Hydro-Control's database successfully.   To discard changes press 'Close'. If changes are made a notification window will pop up giving the user a choice of whether to discard the changes or return to the recipe editor.

Figure 39: Recipes updated confirmation pop-up.

This chapter describes the parameters listed in the Mix Log.

For information on how to access the Mix Log Screen and a description of the functionality of the buttons in the bottom part of the screen, refer to Chapter 2 Navigation, Section 5: Mix Log Screen.

1 Introduction

The Mix Log records information on mix cycles run with the Hydro-Control. The following information about each batch is stored:

- A log of the sensor measurement taken approximately once per second during the mix cycle - the Mix Trace.
- Details of the quantity of water calculated and the parameters used to calculate it.
- A log of the actual water dosed into the batch.

The mix trace shows a graphical trace of the change in moisture for each cycle over time. The stored information enables the following functionality within the Mix Log pages:

- Calibration of recipes from a previous batch.
- Analysis of previous batches for diagnostic and quality assurance.
- View of the mix log trace to analyse homogeneity during the mix times.

2 Information contained in the Mix Log

The Mix Log screen (see Figure 11 and Figure 12) contains the batch details of all the mixes that have been run. Additional data can be accessed by swiping the table left and right.

Filter options may be used to filter the number of mixes shown, and the Display Group control may be used to filter the data shown for each mix by date, recipe, or alarm type.

The filter options can be used to refine the logs displayed by date, recipe, or Alarm type.

The 'Unscaled' or 'Moisture' button can be used to toggle between % Moisture and Unscaled values. The % Moisture values have been derived from the % Moisture target set at the time of making the batch.

The columns in the log summary are described in the following table:

Column	Units	Description
Entry Time		Time that the batch was completed.
Batch Number		The batch number is an incrementing number for each batch made of that recipe.
Recipe Number		The number of the recipe that was made.
Pre-Wet Control		The method used to control the Pre-Wet phase of the batch. This can be Preset, AUTO or CALC.
Main Control		The method used to control the main water phase of the batch. This can be Preset, AUTO or CALC.

Column	Units	Description
Auto-Track Initial		Indicates if the Auto-Track function was used during the initial mix phase
Auto-Track Pre-Wet		Indicates if the Auto-Track function was used during the Pre-Wet mix phase
Auto-Track Dry		Indicates if the Auto-Track function was used during the dry mix phase
Auto-Track Wet		Indicates if the Auto-Track function was used during the wet mix phase
Pre-Wet Mix Value	%/US	This is the moisture value taken during the Averaging Time or Auto-Track time at the end of the Pre-Wet Mix.
Pre-Wet Mix Value Mode F	%/US	This is the Mode F moisture value taken during the Averaging Time or Auto-Track time at the end of the Pre-Wet Mix.
Pre-Wet Mix Value Mode V	%/US	This is the Mode V moisture value taken during the Averaging Time or Auto-Track time at the end of the Pre-Wet Mix.
Pre-Wet Mix Value Mode E	%/US	This is the Mode E moisture value taken during the Averaging Time or Auto-Track time at the end of the Pre-Wet Mix.
Pre-Wet Mix Deviation	%/US	This is the deviation in the signal taken during the Averaging Time or Auto-Track time at the end of the Pre-Wet Mix.
Pre-Wet Mix Deviation Mode F	%/US	This is the Mode F deviation in the signal taken during the Averaging Time or Auto-Track time at the end of the Pre-Wet Mix.
Pre-Wet Mix Deviation Mode V	%/US	This is the Mode V deviation in the signal taken during the Averaging Time or Auto-Track time at the end of the Pre-Wet Mix.
Pre-Wet Mix Deviation Mode E	%/US	This is the Mode E deviation in the signal taken during the Averaging Time or Auto-Track time at the end of the Pre-Wet Mix.
Initial Mix Value	%/US	This is the moisture value taken during the Averaging Time or Auto-Track time at the end of the initial Mix.
Initial Mix Value Mode F	%/US	This is the Mode F moisture value taken during the Averaging Time or Auto-Track time at the end of the initial Mix.
Initial Mix Value Mode V	%/US	This is the Mode V moisture value taken during the Averaging Time or Auto-Track time at the end of the initial Mix.

Column	Units	Description
Initial Mix Value Mode E	%/US	This is the Mode E moisture value taken during the Averaging Time or Auto-Track time at the end of the initial Mix.
Initial Mix Deviation*	%/US	This is the deviation in the signal taken during the Averaging Time or Auto-Track time at the end of the initial Mix.
Initial Mix Deviation Mode F	%/US	This is the Mode F deviation in the signal taken during the Averaging Time or Auto-Track time at the end of the initial Mix.
Initial Mix Deviation Mode V	%/US	This is the Mode V deviation in the signal taken during the Averaging Time or Auto-Track time at the end of the initial Mix.
Initial Mix Deviation Mode E	%/US	This is the Mode E deviation in the signal taken during the Averaging Time or Auto-Track time at the end of the initial Mix.
Dry Mix Value*	%/US	This is the moisture value taken during the Averaging Time or Auto-Track time at the end of the Dry Mix.
Dry Mix Value Mode F	%/US	This is the Mode F moisture value taken during the Averaging Time or Auto-Track time at the end of the Dry Mix.
Dry Mix Value Mode V	%/US	This is the Mode V moisture value taken during the Averaging Time or Auto-Track time at the end of the Dry Mix.
Dry Mix Value Mode E	%/US	This is the Mode E moisture value taken during the Averaging Time or Auto-Track time at the end of the Dry Mix.
Dry Mix Deviation*	%/US	This is the deviation in the signal taken during the Averaging Time or Auto-Track time at the end of the Dry Mix.
Dry Mix Deviation Mode F	%/US	This is the Mode F deviation in the signal taken during the Averaging Time or Auto-Track time at the end of the Dry Mix.
Dry Mix Deviation Mode V	%/US	This is the Mode V deviation in the signal taken during the Averaging Time or Auto-Track time at the end of the Dry Mix.
Dry Mix Deviation Mode E	%/US	This is the Mode E deviation in the signal taken during the Averaging Time or Auto-Track time at the end of the Dry Mix.
Pre-Wet Target Value	%/US	This is the target value to be achieved for Pre-Wet phase of the recipe.

Column	Units	Description
Target Value	%/US	This is the final target value to be achieved for the recipe.
Wet Mix Value	%/US	This is the moisture value taken during the Averaging Time or Auto-Track time at the end of the Wet Mix.
Wet Mix Value Mode F	%/US	This is the Mode F moisture value taken during the Averaging Time or Auto-Track time at the end of the Wet Mix.
Wet Mix Value Mode V	%/US	This is the Mode V moisture value taken during the Averaging Time or Auto-Track time at the end of the Wet Mix.
Wet Mix Value Mode E	%/US	This is the Mode E moisture value taken during the Averaging Time or Auto-Track time at the end of the Wet Mix.
Wet Mix Deviation	%/US	This is the deviation in the signal taken during the Averaging Time or Auto-Track time at the end of the Wet Mix.
Wet Mix Deviation Mode F	%/US	This is the Mode F deviation in the signal taken during the Averaging Time or Auto-Track time at the end of the Wet Mix.
Wet Mix Deviation Mode V	%/US	This is the Mode V deviation in the signal taken during the Averaging Time or Auto-Track time at the end of the Wet Mix.
Wet Mix Deviation Mode E	%/US	This is the Mode E deviation in the signal taken during the Averaging Time or Auto-Track time at the end of the Wet Mix.
Recipe Mode		The sensor mode used for the recipe.
Pre-Wet Water	l/gal/sec/lbs/kg	This is the quantity of Pre-Wet Water that was added.
Main Water	l/gal/sec/lbs/kg	This is the quantity of Main Water that was added.
Target Water	l/gal/sec/lbs/kg	This is the amount of water that was calculated as being needed. This is the target for the Main Water Addition.
Automatic Trim	l/gal/sec/lbs/kg	This is the automatically calculated Trim value that was added during the calibration of the recipe.
Manual Trim	l/gal/sec/lbs/kg	This is the amount of water that the operator selected to add or subtract manually during the batch.
Addition Error	l/gal/sec/lbs/kg	This is the difference between the actual quantity calculated for the batch and the amount added as recorded by the flow meter.

Column	Units	Description
Total Water	l/gal/sec/lbs/kg	This is the total amount of water added to the mixer by the Hydro-Control during the batch.
Water/Cement Ratio		This is the ratio of the water in the batch calculated from the average moisture value during the wet mix and the dry weight (and so assumes the moisture calibration has been entered as a real moisture value) to the amount of cement added into the mixer.
Initial Mix Time	Seconds	This is the initial Mix Time of the batch.
Pre-Wet Mix Time	Seconds	This is the Pre-Wet Mix Time of the batch.
Dry Mix Time	Seconds	This is the Dry Mix Time of the batch.
Wet Mix Time	Seconds	This is the Wet Mix Time of the batch.
Water Addition Time	Seconds	This is the total time taken to add the water during the batch.
Total Time	Seconds	This is the total mix time, from the time that the start signal is received by the Hydro-Control to the time that the Hydro-Control activates the Mix Complete signal.
Dry Weight	Kg/lbs	This is the dry weight of the batch.
Cement Weight	Kg/lbs	This is the weight of the cement that was added to the batch if it has been entered into the recipe or sent from the batch control system.
Mix Temperature	°C/°F	Recorded temperature of the finished mix
Pre-Wet Moisture Gain		This is the moisture gain used during the Pre-Wet mix
Pre-Wet Moisture Offset		This is the moisture offset used in the Pre-Wet mix
Moisture Gain 1		This is the first Moisture Gain value used to calculate the moisture for display.
Moisture Offset 1		This is the first Moisture Offset value used to calculate the moisture for display.
Moisture Gain 2		This is the second Moisture Gain value used to calculate the moisture for display. This is used to rescale the graph after admixtures have been added to the mixer.

Column	Units	Description
Moisture Offset 2		This is the second Moisture Offset value used to calculate the moisture for display. This is used to rescale the graph after admixtures have been added to the mixer.
Calc Gain		This is the Gain value used to calculate the quantity of water to add to the mixer when running calculation mode.
Calc Offset		This is the Offset value used to calculate the quantity of water to add to the mixer when running calculation mode.
Proportional Gain		This is the Proportional Gain value used during the batch if the system is running in Auto mode.
Integral Gain		This is the Integral Gain value used during the batch if the system is running in Auto mode.
Derivative Gain		This is the Derivative Gain value used during the batch if the system is running in Auto mode.
2 step addition		Indicates whether 2 step water addition was used
Admix Enable %		This is the point during the water addition phase at which the Hydro-Control activates the Admix signal so that the batch control system can begin dosing the admixtures. It is based on the percentage of the total water that has been added.
Switch Cal Point		The unscaled value that triggers a change in the moisture calculation from using Moisture gain/offset 1 coefficients and Moisture gain/offset 2 coefficients
Cement In Error		A Cement In alarm was triggered during the batch.
Water Meter Fault		A Water Meter Fault alarm was triggered during the batch.
Leaking Water Valve		A Leaking Water Valve alarm was triggered during the batch.
Waiting For Water Tank Fill		A Waiting For Water Tank Fill alarm was triggered during the batch.
No Water Required		A No Water Required alarm was triggered during the batch.
Too Much Water Calculated		A Too Much Water Calculated alarm was triggered during the batch.
Pre-Wet Target Not Reached		A Prewet Target Not Reached alarm was triggered during the batch.

Column	Units	Description
Mix Too Wet Rejected		A Mix Too Wet alarm was triggered during the batch and the mix was rejected by the operator.
Mix Too Dry Rejected		A Mix Too Dry alarm was triggered during the batch and the mix was rejected by the operator.
Mix Too Wet Accepted		A Mix Too Wet alarm was triggered during the batch and the mix was accepted by the operator.
Mix Too Dry Accepted		A Mix Too Dry alarm was triggered during the batch and the mix was accepted by the operator.
Water Limit Exceeded		A Water Limit Exceeded alarm was triggered during the batch.
Max Dry Time Reached		A Max Dry Mix Time Reached alarm was triggered during the batch.
Max Wet Time Reached		A Max Wet Mix Time Reached alarm was triggered during the batch.
Mix Aborted		The Mix was aborted during the batch.
Sensor Fault		The Sensor communication was lost during the batch.
Mixer Blades worn		Mixer Blades worn alarm Activated.
Mix Log ID		The unique id of the mix log record
Calibration Mix		Indicates if the Mix Log was used to calibrate the recipe.
Calibration Mix Id		Indicates the Id of the Mix used to calibrate the recipe.

3   Viewing the Mix Trace

Trace page

To access details for a particular batch, select one of the batches from the list and then click the 'Mix Trace' button (see Figure 12, the button is only available once a mix log is selected by pressing on its line). This will then display the mix trace page (see Figure 40, Figure 41 and Figure 42).

This page provides a graphical representation of the moisture variation throughout the mix cycle. It can be used as a diagnostic tool to verify the sensor's signal stability.
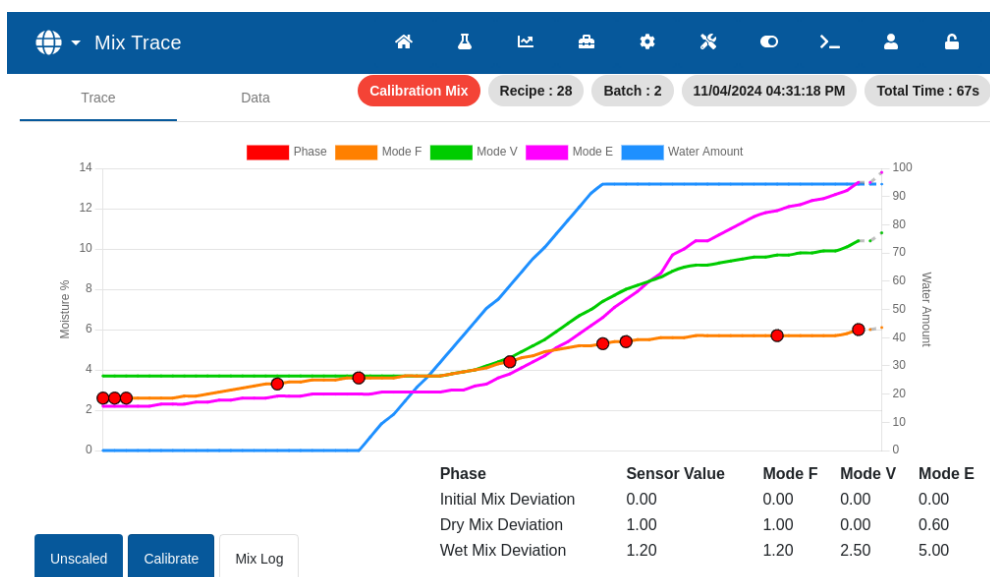
Figure 40: Mix Trace Screen

The mix trace provides a quick way of identifying the degree of homogeneity at any point during the mix. It also supports optimisation of the cycle time by providing visual indicators of homogeneity, for example, at the end of the dry and wet mixes, where the mix times can be reduced without compromising the final mix.

For the current sensor range, signal traces for all three sensor modes are displayed. A single trace is displayed for the legacy sensors.
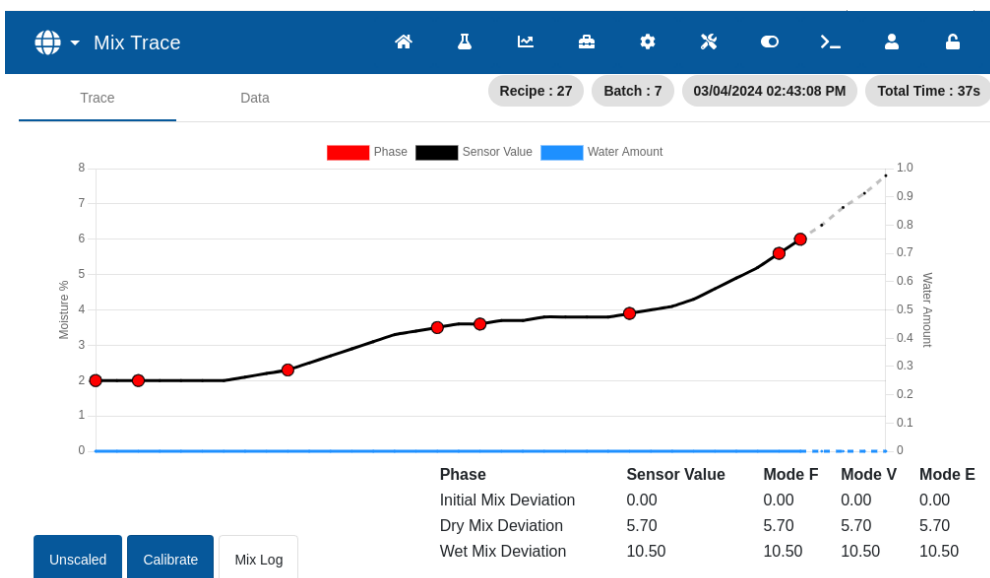
Figure 41: Mix Trace Screen for a legacy sensor

It is possible to view recorded details of the process by pressing anywhere on the desired line of the graph. Action changes are signified by a dot on the trace line. The details are displayed in a window next to a selected point (see Figure 42).
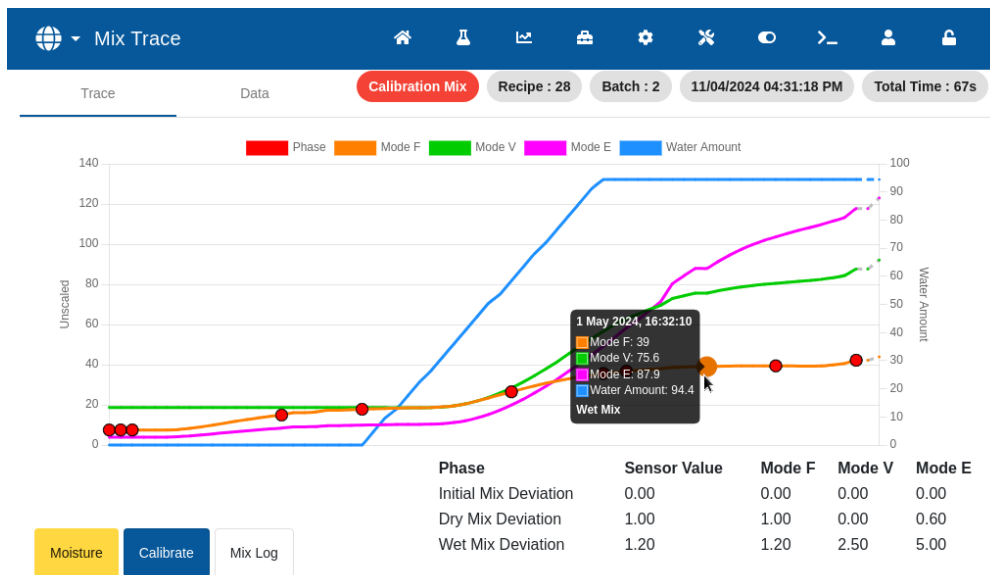
Figure 42: Mix Trace Screen - action changes

The 'Calibration Mix' button opens the mix trace from which the currently viewed recipe was calibrated. This button is not available on the mix trace screen for a mix with no calibration mix associated with it.

The 'Calibrate' button calibrates the recipe using the batch as a template. For more information on this topic, see Chapter 8, Section 2.4: Check the Mix Log and Chapter 9, Section 2.8: The CALC Mode calibration procedure.

The 'Mix Log' button returns the screen to the Mix Log screen.

Data page

The Mix Trace Data page contains a list of points recorded during the batch and the amount of water the Hydro-Control added at that point (see Figure 43).

Figure 43: Mix Trace Data page

This chapter explains how to set up a recipe and run a mix for the first time. Section 1 describes the theory behind running the first mix of a newly created recipe. The remaining sections of this chapter explain actions to prepare a mix suitable for calibration.

1   The First Mix recipe parameters considerations

Running a mix for the first time involves making several batches in Preset mode by adding water in a manually controlled manner and observing the mixing characteristics of the mixer. The aim is to create a 'good' batch of concrete for calibration purposes. Only after this step is completed can an appropriate control method be selected for the recipe.

1.1   How to select Mix Times for the First Mix

The dry and wet mixing times will ultimately affect how well the materials are mixed. Users need to be aware that when these times are reduced, as may be in high-production environments, there is a balance between speed and quality.

The sensor shows the moisture variation as the materials are mixed. When the reading stabilises, this indicates a homogenous mix. When using CALC Mode it is important to obtain stable dry and wet mix readings for calibrating the water calculation. After calibration is complete, the wet mix time can be reduced depending on the required quality and homogeneity of the mix.

The mixing times can only be determined empirically as there are many factors that affect how long it takes to mix all the ingredients in the mixer. The best way to establish suitable Dry Mix and Wet Mix times is to extend them to begin with, and then shorten them once it is determined how long the signal has been stable for.

Using Auto-Track during initial setup and testing is not recommended until the mixer characteristics have been observed.
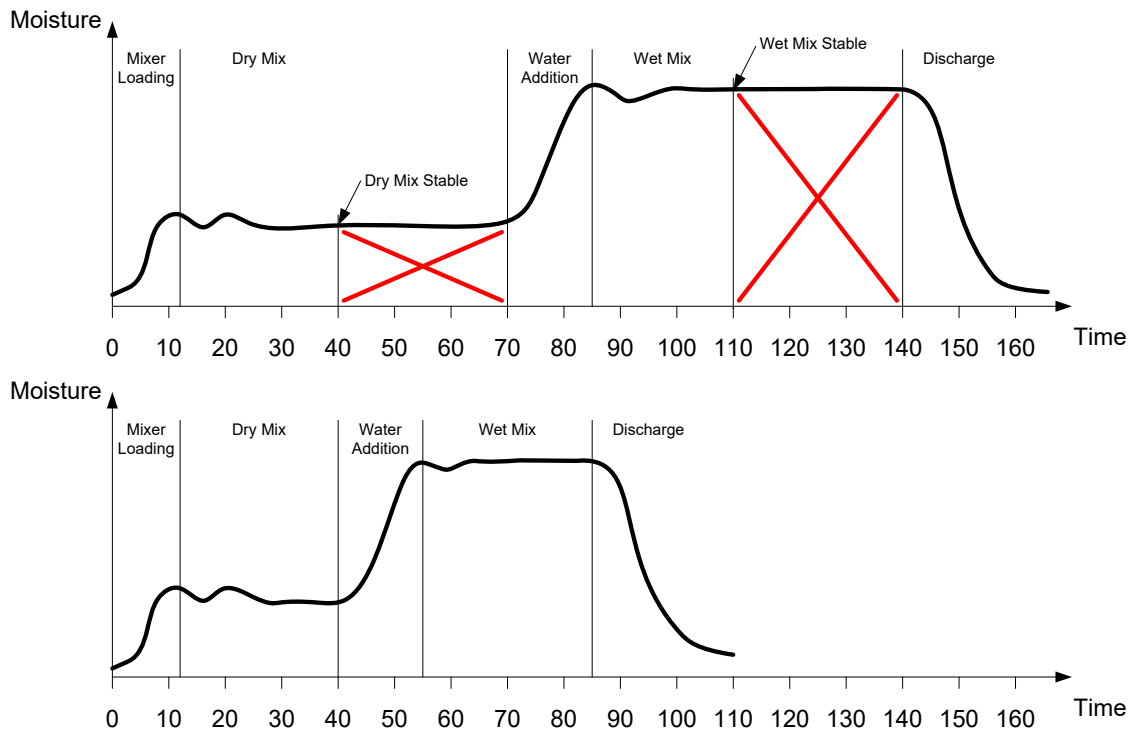
Figure 44: Extending the mix times for calibration

The top diagram in Figure 44 shows a mix trace for a recipe that is configured with a Dry Mix and Wet Mix time of 60 seconds. Both the Dry Mix and the Wet Mix reach stability sooner than the 60 seconds defined. These mixing times may be reduced by approximately 30 seconds, as indicated by the red cross. The lower diagram shows the resultant mix with a shorter overall mixing time.

1.2   How to Set the Water Quantity for the First Mix

To achieve the correct consistency (slump, workability), the correct amount of water must be added, and the simplest way to determine this is as follows.

Batches are made of the recipe required using the Preset mode. After each batch is completed, the output quality is checked, and the water quantity for the next batch is changed if necessary. For the first batches, the water is reduced to deliberately make mixes that are too dry, and then the Trim function is used to open the valves to add more water until a point where the mix consistency is correct. The recipe is then updated automatically with the trim water that was added and can be run again. This process is detailed below.

After the correct water quantity has been determined, the recipe can be calibrated using the mix log, as detailed in Chapter 9.

2   Set up the Recipe for the First Mix

2.1   Set Water Quantity and Mixing Times Parameters

This process starts with creating a new recipe. For detailed information about creating a new recipe, refer to Chapter 6 section 2, Creating New Recipe.

When setting up the First Mix, some parameters differ from those set up for normal production see section 1 The First Mix recipe parameters considerations.

Input desired basic mix parameters into the Create Recipe window (see Chapter 6, section 2) by following the guidelines listed in the table below.

NOTE: Before selecting which control mode to use for a given recipe, it is necessary to begin using the Preset mode to make several batches by adding water in a controlled manner and observing the mixing characteristics of the mixer.

For a detailed description of the parameters listed in the table below, refer to Chapter 6.

Recipe Parameter	Description
Main Water	This is the quantity of water to be dosed into the mix.
	Set this to a value that is approximately 10 litres less than the final amount.
	The rest will be added manually using the trim function.
Dry Mix & Wet Mix Time	Initially select longer times than are required, for example, 70 seconds each. These will be reduced later when the performance of the mixer is evaluated.

2.2   Start the Mix Cycle

Start the mix cycle by pressing the 'Start' button or issue a start signal from the control system. Make sure that the batch control is set so that the mix will not be discharged automatically. This will allow the mix consistency to be checked. Wait for the cycle to finish.

2.3   Trim the Water Manually to Reach Desired Consistency

Check the consistency of the mix. If possible, observe the mix in the mixer through the inspection hatch to see if more water is needed.

To add a set quantity of water, enter the amount to add and press the 'Trim' button within the pop-up window.
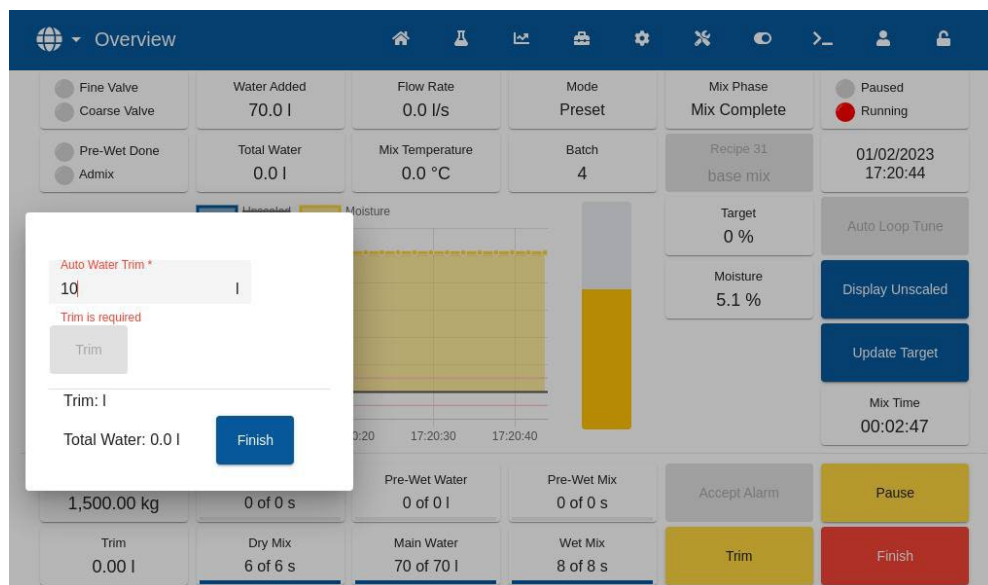
Figure 45: Water Trim function pop-up window

Repeat the previous step until the mix reaches the desired consistency and press the 'Finish' button.

NOTE: *If it is found a certain amount of trim is always required, personnel with supervisor access should be notified to re-calibrate the mix. This procedure is described in Chapter 9, section 2.8* The CALC Mode calibration procedure*.*

Press the 'Update Target' button on the main screen to copy the current moisture value into the recipe's 'Target' parameter. It is essential to ensure the sensor value is stable before pressing the 'Update Target' button.

Discharge the mix manually using the batch control system. Once discharged, press the 'Finish' button to end the mix cycle.

2.4   Check the Mix Log

After running the first mix, it is important to view the mix log to check that the mix times are long enough.

Navigate to the Mix Log screen and select the mix to be checked from the list of mix logs (see Chapter 7 Using the Mix Log for details).

Displaying the Deviation values in unscaled (Dry Deviation US and Wet Deviation US) shows the stability of the signal during the Averaging Time at the end of the mixing phases (see Figure 46).

For a good calibration with CALC Mode, the Deviation should be less than 3 Unscaled, and for best results, the Deviation must be less than 0.5 unscaled.

Figure 46: Mix log - sensor values display group

Confirm that the sensor signal is stable during the Dry Mix and Wet Mix phases by analysing the mix trace (see Chapter 7 section 3 Viewing the Mix Trace).

If the signal is not stable, increase the mix times and run another batch to check the stability. It may be advantageous to extend the mixing times to ascertain the point at which the signal becomes stable.

This chapter describes selecting between using CALC Mode and AUTO Mode for a given recipe and configuring and optimising a recipe for that mode.

1   Moisture Control and Homogeneity

The aim of moisture control is to accurately reach a chosen moisture target in the shortest time possible for a homogenous mix.
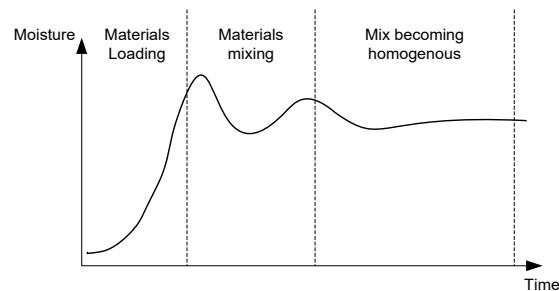
Figure 47: Mix trace showing homogeneity

The sensor shows the dispersal of the moisture and other materials as they move around the mixer. The trace from the sensor accurately shows the state of homogeneity, as shown in Figure 47. A mix is homogenous when the materials are all evenly mixed, and the water has been dispersed throughout the mix. When the sensor signal is stable (a flat line), the mix has reached a homogenous state.

The user can define the degree of homogeneity required, and this will affect the mix time.
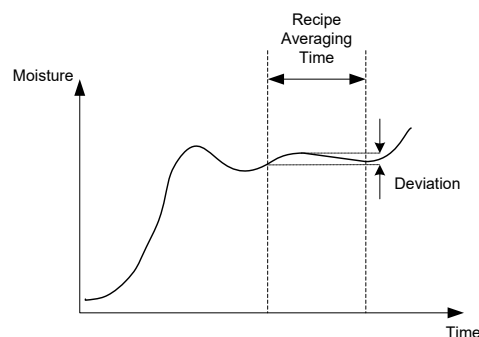
Figure 48: How the deviation is calculated

The Mix Log shows the homogeneity of the mix by displaying a deviation which is calculated as the difference between the maximum and minimum values seen during the averaging time, as shown in Figure 48. This calculation is performed at the end of the Dry Mix and Wet Mix phases.

If the deviation is higher than that required, then the mix times must be extended to allow the mixer more time to homogenise the raw materials.

During the wet mix stage, it may not be important to have a completely stable signal when the system is used for general production, as the requirement for homogeneity will depend on the product being made and whether more mixing happens after the discharge from the mixer.

If using the Auto-Track function, then it is important to ensure that the deviation limit parameters used in the recipe are not set too high.

It is always best to view deviations in unscaled units as this is not affected by any calibration values that are defined in the recipe.

2 CALC Mode
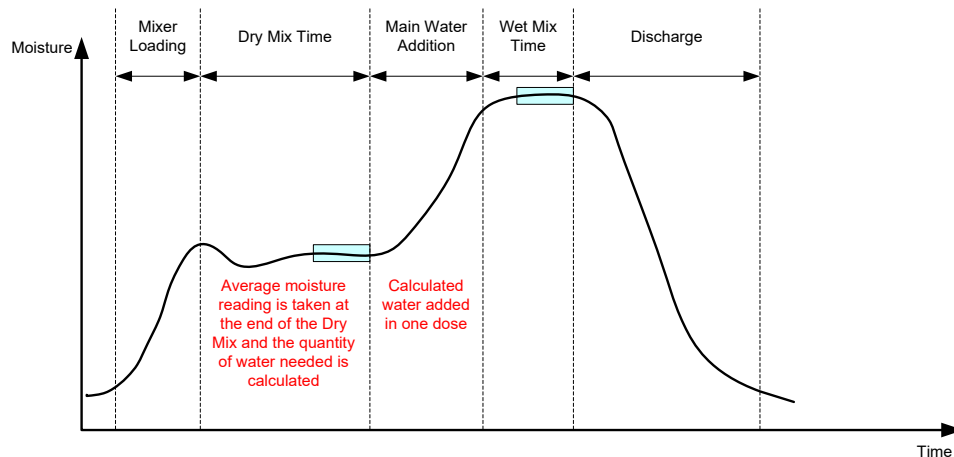
Figure 49: The moisture during CALC Mode

2.1 Introduction

CALC Mode takes an average moisture reading at the end of the dry mix phase and uses that to calculate a quantity of water to add to reach the target defined in the recipe. The water addition is then performed as one complete addition.

Advantages:

- CALC Mode is less dependent on the quality of the mixing action or the final homogeneity in the mixer therefore, it may be faster in certain applications.

- The calculated water is dosed in one shot making the main water addition phase quicker than AUTO Mode.

- Different applications will require a different level of homogeneity in the final product. Running in CALC Mode enables the water/cement ratio to be correctly adjusted for, without the need for a long Wet Mix Time.

- As the water calculation is performed at the end of the Dry Mix and the Main Water Addition is performed in one shot, the degree of homogeneity at the end of the Wet Mix can be varied by adjusting the Wet Mix Time. It is important to note that if the Wet Mix Time is shortened, then the alarm tolerances may need to be increased to stop the controller from alarming at the end of the mix due to the mix not being completely homogenous.

Disadvantages:

- The dry reading used for the calculation must be stable, which usually requires the dry mix time to be longer than is necessary for AUTO Mode control.

- The water calculation is batch size dependant so if the dry weight of material varies significantly then the recipe must be updated with the current batch weight, either by manually editing the recipe or sending the value from a remote connection.

- If significant changes are made to the recipe it will need to be recalibrated.

2.2 Configuring the recipe

When using CALC Mode each recipe must first be calibrated. This is done by using a batch that has previously been run which is of the correct moisture and quality. The previous chapter details how to run the first batch. The Hydro-Control will then use the data recorded during the batch to generate a calibration for the recipe to use with further batches.

For a good calibration it is important for the sensor signal to be as stable as possible during the averaging periods at the end of both the dry and wet mix times. The stability of the signal can be improved by extending the mix time to allow time for the mix to become homogenous. For the best calibration, the deviations should be as close to zero as possible, always less than 3 unscaled units and preferably less than 0.5 unscaled units.

When planning to use a mix for calibration it may be necessary to temporarily extend mixing times to investigate how the signal changes over time. After the calibration has been completed, the wet mix time can be reduced for actual plant operation. It is important to note that this can affect the quality of the mix produced.

CALC mode can be done in either the Pre-Wet phase, the main phase or during both phases.

2.3 CALC Mode – Main Water

This is the most common place to use Calc mode. This is for mixes where after addition of Pre-Wet water and cement, a stable dry mix and wet mix reading can be obtained. The calibration made based on the dry and wet readings is used for the Pre-Wet phase also. If initial or Pre-Wet mix phases are used before cement is added the moisture reading during this period may be invalid. This is commonly not a problem as in most circumstances only the moisture of the finished mix is of concern.

2.4 CALC Mode – Pre-Wet Water

In some cases, it is possible that after addition of certain admixtures (usually SCC admixtures) that the wet mix reading is out of the measurement range of the sensor. In situations where materials, such as metal fibres, are added during the dry mix the sensor may no longer be able to give reliable readings. In such cases it is possible to calibrate the mix based on the initial mix reading, the Pre-Wet water, and the Pre-Wet mix reading. The Pre-Wet water added is usually the amount of water required before addition of the admixture.

2.5 CALC Mode – Pre-Wet + Main Water

This mode can be used if an accurate moisture is required at all points throughout the cycle. It is the longest method of addition and so would only be used where quality tracking throughout the mix is necessary and time constraints are low.

2.6 CALC Mode – Main using Pre-Wet value

In some cases, once cement is added it can take a long time for the mix to homogenise to the point where a stable dry mix reading can be taken for calculating the required water. In such cases it is common that prior to adding cement a stable reading can be obtained quite quickly. In this method of calibration, a stable Pre-Wet mix is required but a stable dry mix is not.

2.7 CALC Mode – Pre-Wet and Main using Pre-Wet Value

This mode allows the user to calculate both the Pre-Wet water. It also allows the main water to be calculated from the Pre-Wet mix value in the situation where the dry mix does not stabilise quickly.

2.8   The CALC Mode calibration procedure

This process starts by selecting a suitable mix from the Mix Log screen.

A suitable mix has the following:

1.   Correct final moisture.

2.   Stable dry and wet readings (low deviation values).

3.   More than 5 Unscaled between dry and wet average readings.

Identify a good batch to use as a basis for the calibration. This is done by navigating to the Mix Log Screen, searching for, and then selecting the desired mix (see Chapter 2, section 5 Mix Log Screen). For information on how to create a good recipe and a good batch, refer to Chapter 8 Running the First Mix.

Select the mix in the Mix Log that corresponds to the selected good batch, check the stability of the mix by setting the mix log to display Unscaled values (press 'Unscaled' button) and looking at the Dry Mix Deviation and Wet Mix Deviation. These must be less than 3 and preferably less than 0.5 unscaled. For sensors with multiple measurement modes check the deviation for each available mode.

To further check the signal stability of a specific mix, review it's mix trace. This is done by pressing on the relevant line to select the desired log entry and then pressing the 'Mix Trace' button (refer to Chapter 7, section 3 Viewing the Mix Trace).

Once a suitable mix log is found, select it, and press the 'Calibrate' button to continue with the calibration process. A Calibration pop-up window will appear. Input the desired values (refer to the parameter description table below).
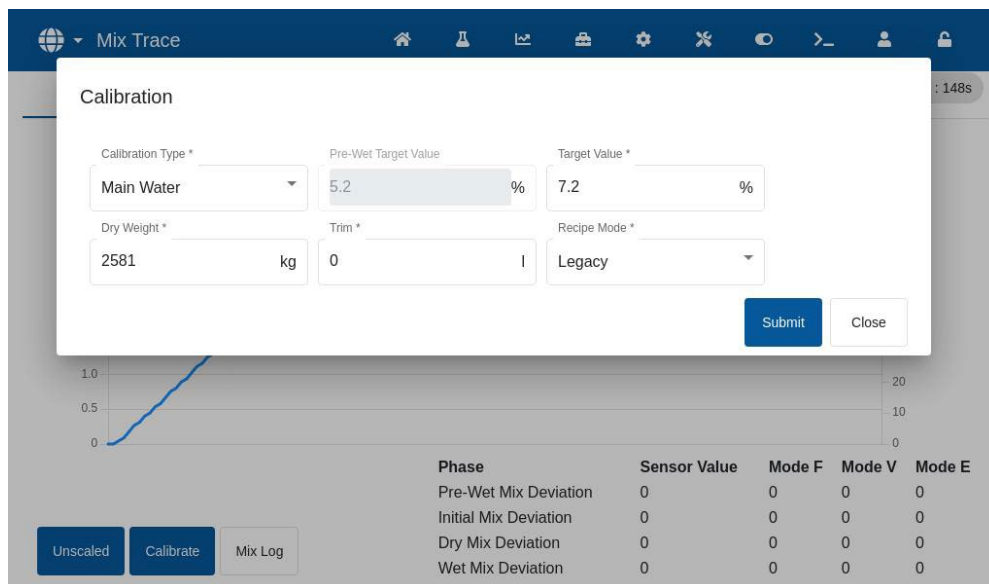

Figure 50: Calibrating a recipe

Parameter	Description
Calibration Type	Choose the calibration mode appropriate for the mix. The options are: Pre-Wet, Main Water, Pre-Wet and Main

Parameter	Description
Pre-Wet Target Value	If calibrating using Pre-Wet in calculation mode a Pre-Wet target value must be entered.
Target Value	Enter a target for the main water addition (see NOTE below).
Dry Weight	If no dry weight has been entered into the recipe, then the calibration process will prompt the operator to enter one at this point.
Trim	If the mix consistency can be improved by adding or subtracting a certain quantity of water, then this value can be added at this point, and the 'OK' button pressed.

NOTE: The target value in % Moisture is only used to set the display value the operator sees on the Overview Screen. It can be any value the user chooses and does not have to be accurate for the unit to correctly calculate water. The W/C Ratio recorded will not be correct in this case. If a real moisture value (and/or W/C Ratio) is required, then one of the following values can be entered:

• The theoretical value from the mix design.

• The water added from the raw materials (calculated from oven tests for moisture and wet weights of aggregates) and the water added during the mixing cycle.

Press the 'Submit' button to confirm the parameters and continue to the next page of the calibration section.

Select which sensor measurement mode to use (only available with compatible sensors).

The Hydro-Control will then display a summary of the parameters on which the calibration will be based. Choose the control method for Pre-Wet Water and Main Water mode most appropriate for the mix and press OK. A pop-up window with the message 'Recipe Updated' will appear.

Figure 51: Summary of calibration parameters

After calibration, it is always good practice to monitor the following batches of the same recipe and check the strength and quality of the mix output.

2.9   Optimising CALC Mode

CALC Mode works by taking one average value at the end of the Dry Mix, and a second average value at the end of the Wet Mix. Using these two values and the percentage moisture change between the two points (this is the quantity of water added divided by the batch weight) it is possible to calculate the quantity of water that is needed to get from any other start point to the target moisture value.
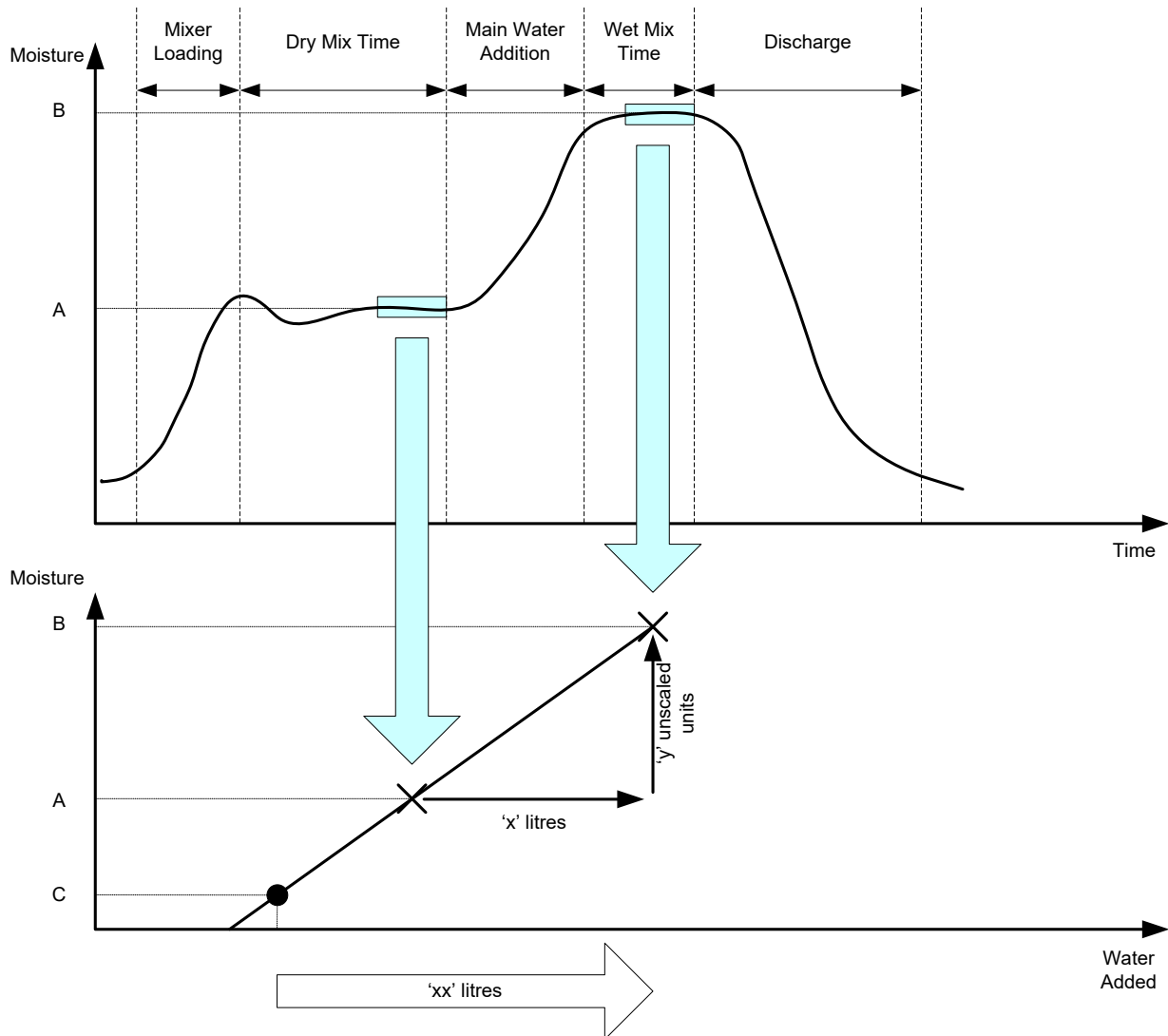
Figure 52: The CALC Mode Calculation

As the diagrams in Figure 52 show, if it takes 'x' litres to get from moisture point A to moisture point B then, as the sensor unscaled value is linear with moisture, a calibration line can be obtained that can then be used to calculate the amount of water needed to get from any new moisture point to the target value, B. In the example diagram, it takes 'xx' litres to get from point C to the target.

The real moisture percentage values are not required for this calculation as it relies only on the change in the unscaled values. To achieve an accurate calibration, the following values must be known:

- Batch weight.
- Quantity of water added.
- An accurate Dry Mix sensor reading.
- An accurate Wet Mix sensor reading (which also gives the target value)

It is important that there is sufficient difference between the sensor reading taken at the end of the dry mix phase and the sensor reading taken at the end of the wet mix phase to give a good moisture range for the calibration calculation.

Note: The Hydro-Control requires the difference between the two readings to be greater than 4 unscaled (this is approximately 1% moisture). If this is not the case, then the error message: 'Calibration failed, no water added to the mix' is displayed. It is necessary to reduce the amount of Pre-Wet water going into the mixer or to use drier aggregates.

The deviation of the signal during each of the dry and wet mix averaging phases must be minimal to give a correct average value for the calculation. The deviation is displayed on the Mix Log screen when viewed as unscaled units. The value should be less than 3 unscaled, and preferably below 0.5.
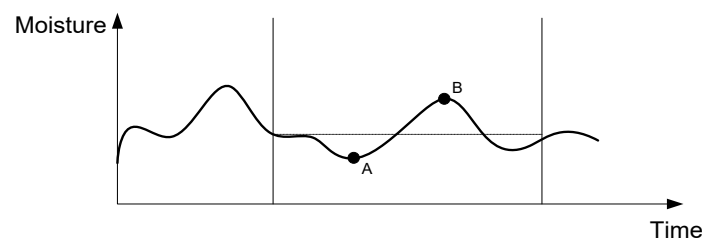

Figure 53: Comparison of averaging times

It can be seen from Figure 53 that if the signal is not averaged, then the instantaneous value taken for the calculation could be, as an example, at point A or point B and would not be representative of the moisture in the mixer. Therefore, it is important to average the signal and to make sure that the averaging time is set correctly. A longer averaging time will give a better average reading but will also extend the mix time. In normal circumstances, a typical averaging time would not be greater than 10 seconds.

After calibration has been set, the system should be monitored for at least two more mixes to check that the system is correctly compensating for changes in the dry moisture.

2.10 Selecting the Sensor Measurement Mode

When connected to a compatible sensor the Hydro-Control will log all available Measurement Modes (see Sensor Configuration and Calibration Guide HD0679 for more details). Each Measurement Mode uses a different method to calculate the Unscaled value and as result the Dry Mix and Wet Mix values can differ. This difference enables the user to select the most appropriate Measurement Mode to produce a stable mix it may also increase the difference in Unscaled between the dry and wet mix phases.

When selecting the Measurement Mode it is necessary to inspect the Mix Trace for each mode to confirm that the signal is stable in the dry and wet mix phases (see Figure 40 in Chapter 7, section 3. It is also important to confirm that the Unscaled value does not go above 100.

In Figure 54 three measurement modes are displayed. All three measurement modes are stable and do not go above 100 Unscaled. However, the blue trace has the greatest difference between the dry and wet mix phase so is selected to be used for the calibration.
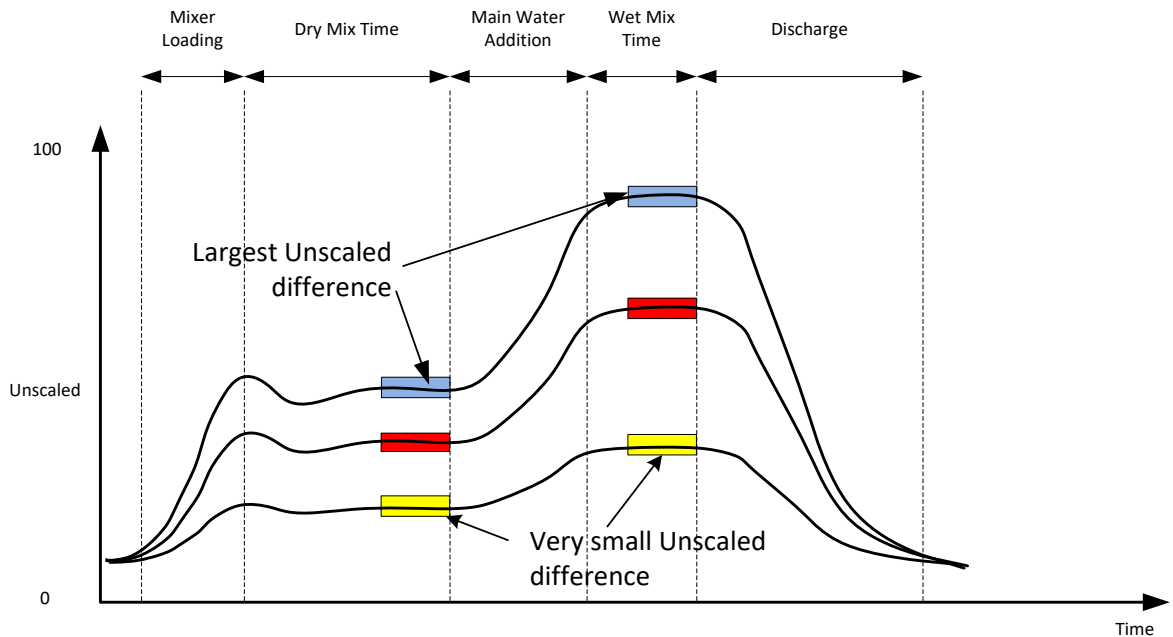
Figure 54: Comparing Measurement Modes

For advice on selecting the measurement mode contact the Hydronix support team at support@hydronix.com

2.11 Dry weights

If the raw material dry weights change between batches, then this value must be updated in the recipe. This can either be manually entered for each batch or sent by the control system to the Hydro-Control. Using incorrect values will result in the calculation incorrectly determining the moisture change for the calibration.

Even when using a mixer moisture control system, it is important to correct for the weight of the moisture in the raw material being used to ensure that the mix design is consistent. Any moisture in the raw materials will affect the weight of the raw material dosed and will affect the aggregate/cement ratio.

It is important to use a control system that controls all the raw materials being added into the mixer. All materials should be added to the mixer in the same order each time, and admixtures should be dosed at the same time during the cycle so that the effect of any materials on the sensor signal is consistent.

3   AUTO Mode

Figure 55: The moisture during AUTO Mode

3.1   Introduction

AUTO Mode adds water progressively to reach the moisture target defined in the recipe parameters.
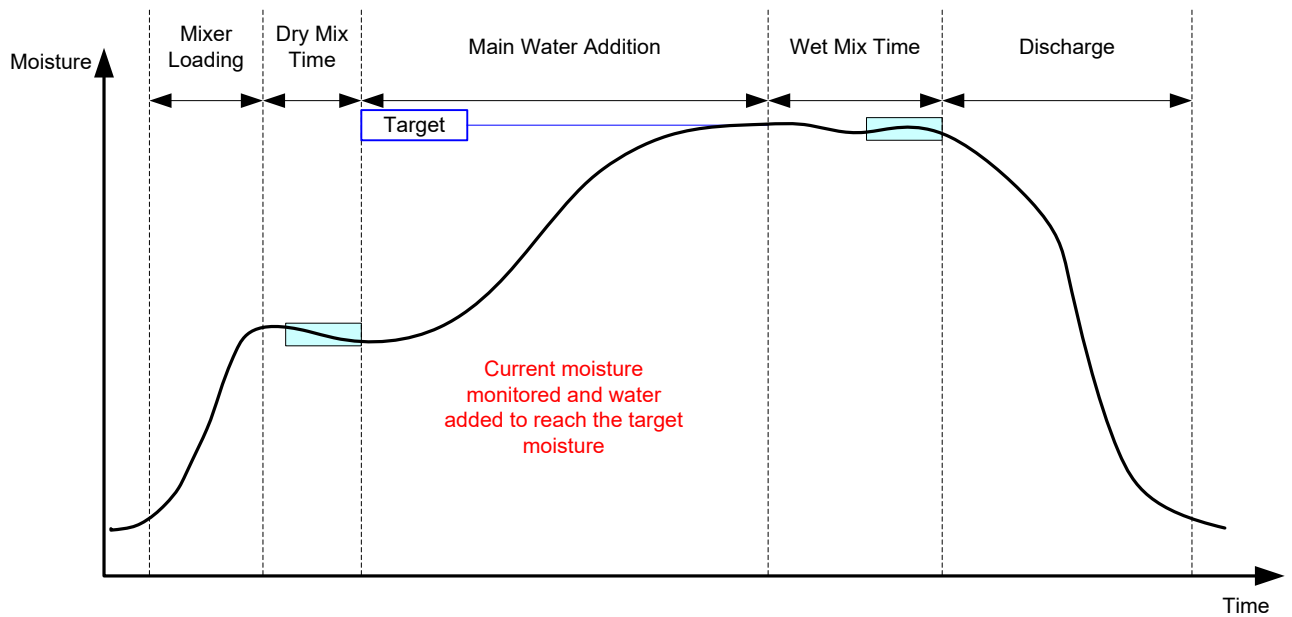
Advantages:

- As the control only relies on the current reading and moisture target, no calibration of the recipe is required, if the true moisture values do not need to be displayed.
- A short dry mixing time can be used, for example 10 seconds, as the water amount is not calculated at the end of the dry mix phase.
- AUTO Mode is more independent of the dry weight of material. Therefore, the control will work even if there are minor changes in the batch sizes. It is still recommended to use a separate recipe for large changes in batch size, for example, half batches.

Disadvantages:

- The AUTO Mode is more dependent on mixer efficiency than the CALC Mode as the sensor must be able to monitor the water that has been dosed. This is not always the case in some mixers and therefore it can take a long time for total water addition, as water must be added more slowly to allow the sensor to detect the added water and for the Hydro-Control to react accordingly.
- The AUTO Mode parameters may need to be adjusted for optimal performance of the system as described in section 3.3 below.

3.2   Configuring the recipe

It is not necessary to calibrate a recipe when using AUTO Mode unless real moisture values are required. The only recipe parameter that is required for the Hydro-Control to add the correct quantity of water for each mix is the 'Moisture Target %' which is determined by running test mixes and recording the value at the end of a good quality mix.

When a recipe is created the Hydro-Control uses a default calibration to calculate the moisture for display. Some operators prefer to use an arbitrary value for the moisture target such as 10% and to use this to monitor repeatability and deviation.

If required, it is possible to calibrate the recipe to display a real moisture value. The same sequence as for CALC Mode should be used (see section 2.8 above). After entering the calibration data, the Recipe will default to CALC Mode and should be set to Auto Mode.

3.3   Optimising (Auto Loop Tune)

Different installations will mix the water in at different rates and therefore the AUTO Mode parameters may need to be adjusted to optimise the speed and accuracy of the water addition.

The AUTO Mode water addition is adjusted using 3 AUTO Mode parameters, Proportional Gain, Integral Gain and Derivative Gain. Normally these parameters are set globally for all recipes using the values in the System Parameters pages, but these can be over-ridden for individual recipes if necessary.

For most applications, it is only necessary to change the Proportional Gain, and there is an option on the recipe selection screen to do this easily without having to go to the recipe editor. The Integral and Derivative Gains are disabled by setting their values to zero.

To optimise the AUTO Mode, it is necessary to run several batches whilst increasing the Proportional Gain value to a point where it just overshoots the target value, then reduce the gain value so that it stops overshooting the target, and this gives the optimal value for the Proportional Gain parameter.

If during the water addition phase, the moisture value approaches the target but is not able to reach it then this may be due to insufficient water being added each time the valves are pulsed. The Integral Gain should be increased with an associated reduction in Proportional Gain to prevent overshoot in the initial stages of the water addition.

If the coarse valve is not on long enough during the water addition, increasing the Derivative Gain whilst decreasing the Proportional Gain will allow the coarse valve to be on for longer in the initial stages without ultimately overshooting the target.

The Minus Tolerance in the recipe parameters is used as a dead band and when the moisture value reaches this offset from the target the target is deemed to have been reached.
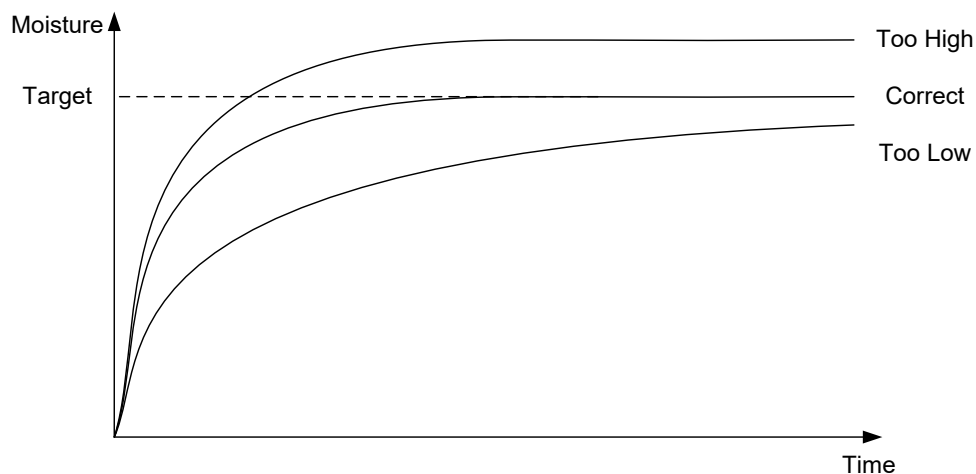

Figure 56: The effect of changing the Proportional Gain

As can be seen from Figure 56, if the Proportional Gain is set too high then the moisture will overshoot the target value. If the Proportional Gain is set too low, then the water is added to slowly and the moisture will take too long to get to the target value.
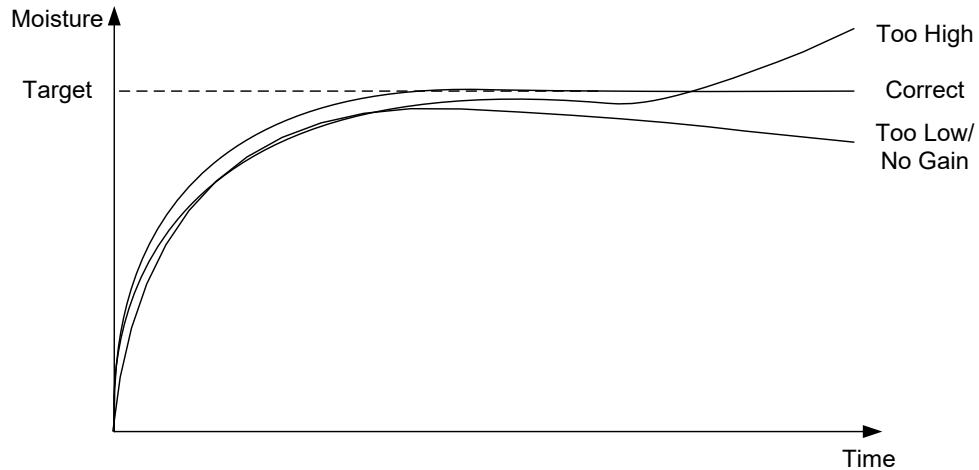
Figure 57: The effect of changing the Integral Gain

Figure 57 shows the effect of changing the Integral Gain. Integral Gain will act to increase the water flow depending on the length of time that has passed. This can be used to correct the addition when the moisture tails off after the initial water addition.
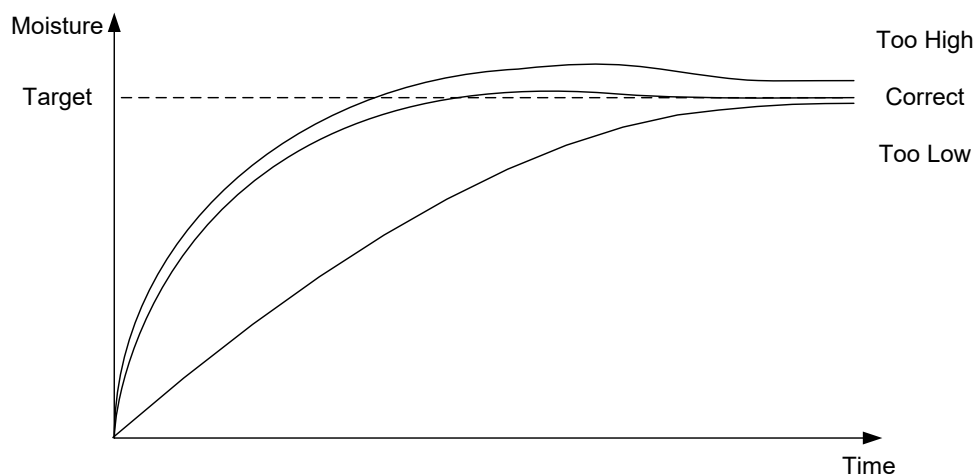
Figure 58: The effect of changing the Derivative Gain

The Derivative Gain only needs to be changed if there is overshoot on the target that settles as the water is mixed in as shown in Figure 58.

3.4 Control output value

The CO value is displayed on the Overview screen when the Hydro-Control runs in Auto mode. This informs the operator of the status of the PID loop output level. This is not needed for normal operation. The CO value is used for diagnostic purposes.

4 Using Admixtures

4.1 Introduction

In general, admixtures or colours should be dosed after the water addition has started so as not to be added on top of the dry material. Dosing simultaneously with the water aids dispersion into the mix and can help the mixing action, improve mix quality, and reduce mix cycle times. Refer to the manufacturer's datasheets from the admixture supplier for specific advice regarding admixture dosing.

Because admixtures do not have the same electrical properties as water, if they are added part way through a mix cycle the effect is to change the properties of the base material and hence change the relationship between the unscaled value and the moisture % part way through the mix cycle. In most cases the admixture is added in the same proportion to each batch and the final moisture % target will be correct. This is regardless of the operating mode in use. However, the moisture value recorded at the end of the Dry Mix time (before the addition of the admixture) will not represent a true moisture %.

The Admix Enable % parameter in the Recipe is used to control the point at which the admixture is dosed during the main water addition phase. In CALC Mode this is a percentage of total calculated water and in AUTO Mode it is a percentage of the final moisture target.

In cases where an admixture is being used and where an actual moisture % for both the Dry Mix and the Wet Mix is required for quality records the Hydro-Control can utilise the 2-Step Water Addition mode to achieve this.

The 2-Step water addition mode can be used in all operating modes but is configured in Preset Mode using a 2-step water addition technique shown in Figure 59. The operation of AUTO and CALC is not affected, the calibration automatically changes at the appropriate time so that a correct moisture % is always shown throughout the mix.

If a 2-Step Water Addition is required, check the 2-Step Addition box in the Recipe and set the Admix Enable % to the value required.

It should be noted that the 2-Step Water Addition mode does not affect the calibration performed for the water control in CALC Mode.
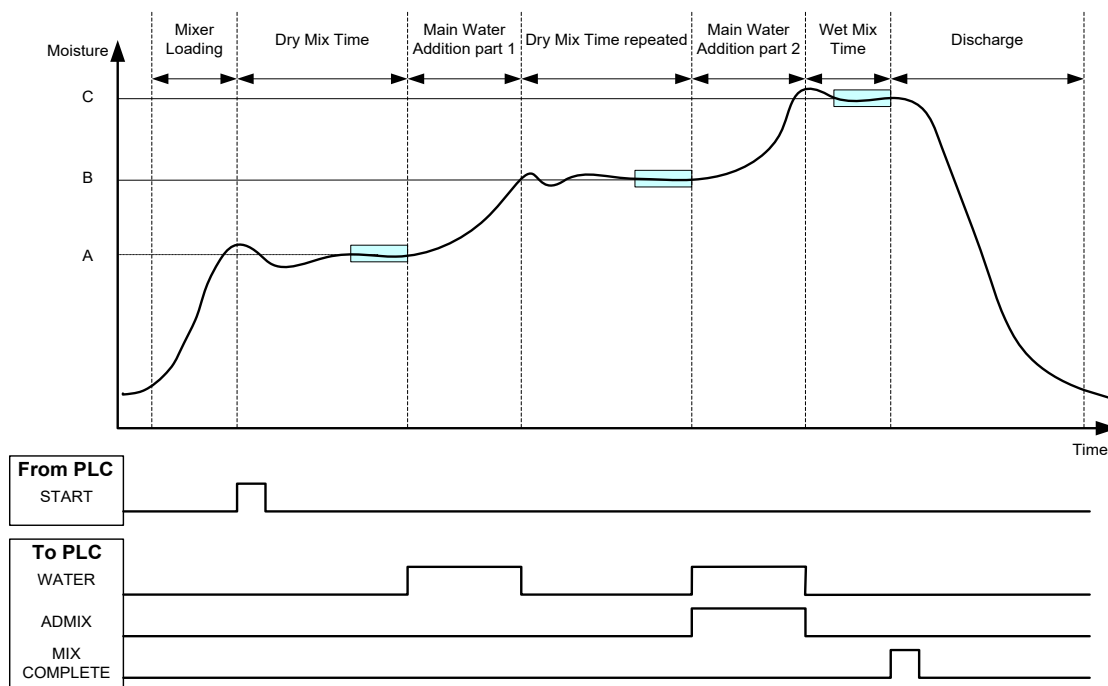

Figure 59: The 2-step Preset Mode cycle

Figure 60 shows the 2-Step Water Addition calibration points that are taken from the cycle shown in Figure 59. The line from point A to point C is used for the water calculation when in CALC Mode. The moisture value shown before admixture addition is based on the A to B line and after the admixture addition the B to C line is used.
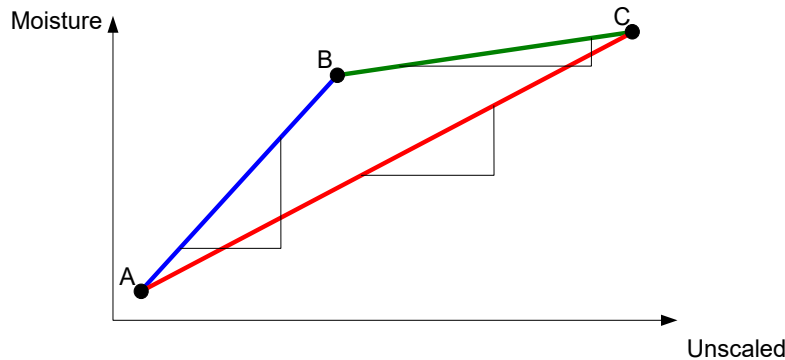

Figure 60: The calibration lines from the 2-step preset mode cycle

4.2   Setting up the 2-Step Water Addition

This procedure requires that a basic recipe has already been set up as per Chapter 8 Running the First Mix.

Navigate to Recipes Screen, select the recipe that needs to be edited by pressing on its name and then press the 'Edit' button (see Chapter 6). Then go to the Water Addition Page and press and swipe the 2-Step addition slider (see Figure 32). The slider will change from grey to yellow.

Set the Admix Enable to the point in the main water addition that admixtures are to be introduced. If required, the amount of Admixture can be entered here and will be reported in the Mix Log.

Press the 'Save' button to retain the changes.

After the recipe has been setup, run the mix and then adjust the quantity of water as in the normal calibration to get a good mix at the end of the batch.

Once a good mix has been obtained then the calibration can be performed from the mix log using the same procedure as a normal mix.

5 Auto-Track

Auto-Track is an alternative to using defined mixing times and allows the Hydro-Control to automatically adjust the mix time for each phase so that it will finish mixing when the deviation in the sensor value is within the user defined Auto-Track parameters set in the Recipe. This is useful if variation in the raw materials causes differences in the mixer action which then varies the time taken to homogenise the material.

There are separate Auto-Track parameters for the Dry Mix phase and the Wet Mix phase. These consist of an Auto-Track Time and an Auto-Track Deviation. The sensor signal must remain within the Auto-Track Deviation for the duration of the Auto-Track Time before moving to the next mixing phase.
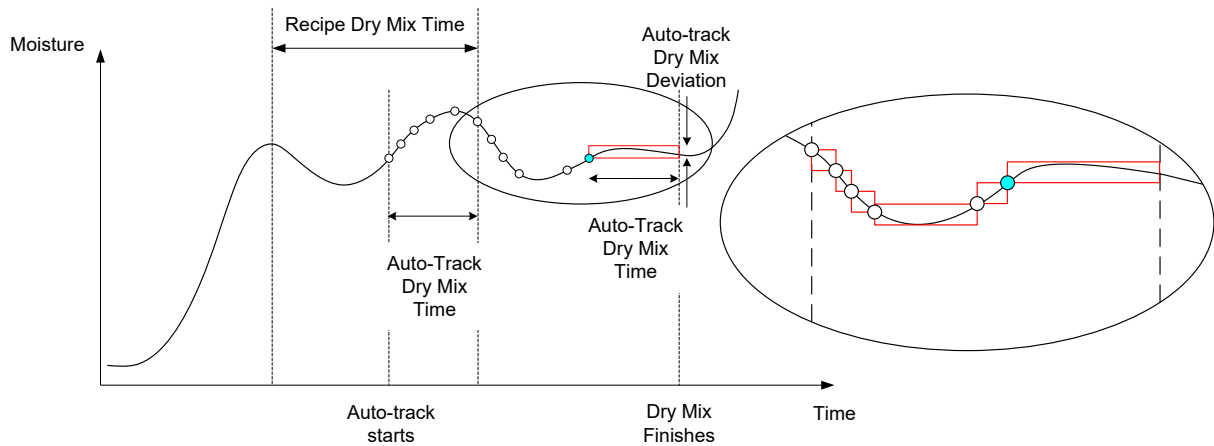
Figure 61: Mix trace showing the Auto-Track function

Figure 61 shows the mix trace for a Dry Mix phase using the Auto-Track feature. The Auto-Track feature is enabled at the point Dry Mix Time – Auto-Track Time. It will then continue to mix until the Auto-Track parameters are met or to the end of Dry Mix Time.

The Auto-Track monitors the sensor values. If the value falls outside of the Auto-Track Mix Deviation parameter, the Auto-Track timer is reset as shown in the inset diagram in Figure 61. If during the mixing phase the values remain within the Auto-Track Mix Deviation parameter for the defined Auto-Track Mix Time, then the Hydro-Control continues to the next phase.

If the Auto-Track deviation parameters are not met within the allotted Dry Mix Time, the system repeats the mixing phase a second time. If after a second Dry Mix time sufficient stability has not been achieved the Hydro-Control will alarm 'Max Dry Mix Time Reached' or 'Max Wet Mix Time Reached' if during the Wet Mix phase. The operator will then be prompted to either stop the mixing phase and move on to the next phase or repeat the mixing time. If the mix time is repeated, then the Hydro-Control will automatically update the mix time in the recipe so that the next time it is run the longer mixing time is used.

5.1   Considerations When Setting up Auto-Track

The following points should be considered when setting up Auto-Track.

- Dry Mix Time should be set to half the overall anticipated dry mixing time.
- In CALC Mode the Auto-Track Mix Deviation should be set small enough to ensure a stable reading is used as the basis for the water addition calculation. For example, a 0.1% deviation allows a 0.1% change in the water calculated.
- The Wet Mix Deviation should be set dependant on the required final homogeneity of the mix. For example, pipes will require a high degree of homogeneity whereas a plain block may require less homogeneity.

In Auto Mode where a short Dry Mix Time is often used, Auto-Track can be used to delay water addition until the cement is reasonably mixed. This can improve repeatability if the aggregate moisture values vary.

6   Temperature Compensation

In environments where there are large changes in temperature it can be necessary to change the viscosity of the mix. It is advisable to do this by varying the amount of admixture in the mix. In this circumstance it is advisable to calibrate the recipe when the least amount of admix is required (usually at the coolest part of the day). The mix should be completed normally and when the mix complete signal is given any additional admixture can be added.

In some systems it is not possible to vary admixture addition in this way. In this situation the amount of water can be varied based on water demand increase per °C. Temperature Correction Settings in the recipe can be used to do this. The Hydro-Control will adjust the target to compensate. It should be noted that this method will increase variance in the water/cement ratio and thus widen strength variation tests.

The temperature compensation works simply by taking the difference between the current temperature and the 'Temperature Set Point' parameter in the recipe and multiplying the result by the 'Temperature Coefficient' parameter. This value is then added (or subtracted if negative) to the 'Target' for the recipe at the start of the batch.

Example

A recipe is calibrated at 25°C to a moisture target of 10%.

At 35degC (an increase of 10°C) a moisture target of 11% (an increase of 1%) is required to maintain consistency.

In the above example, for each 1°C increase in temperature a corresponding 0.1% increase in the moisture target is required. For this example, the temperature coefficient should be set to 0.1%.

It should be noted that adjusting the water demand due to temperature will cause variation in the Water/Cement ratio. When setting up this parameter ensure that Water/Cement ratios will remain in tolerance for the working temperature range.

If the temperature coefficient is set to zero, this function is disabled.

This chapter describes the system alarms. Alarms are messages displayed on the device's screen that assist in managing, monitoring, and controlling the mixing process.

1   Alarms

When an alarm is triggered, a visual prompt is displayed, indicating the nature of the problem. The Alarm output is also activated to signal to the batch control system that a problem exists. This output could also be used to trigger an audible or visual warning. The alarm is also recorded in the Mix Log.

The user must acknowledge an alarm by pressing the 'Accept Alarm' button, which removes the message from the screen. The system uses a mixture of configurable and non-configurable alarms.

1.1   Configurable Alarms

To gain access to configuring the alarms, navigate to the System Parameters screen, then the Alarms page (see Chapter 2, section 2.1 Menu Buttons).
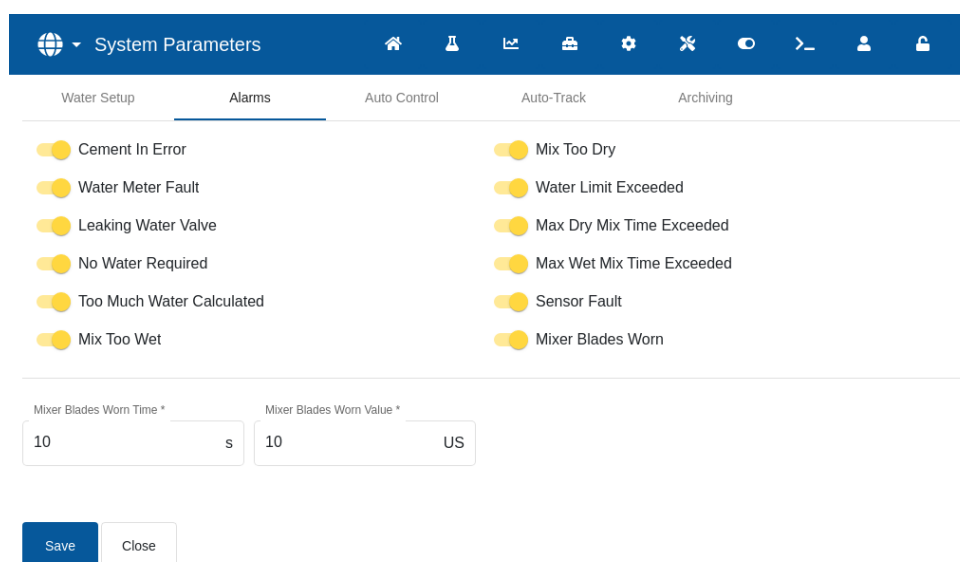

Figure 62: System Parameters screen – alarm outputs configuration

When troubleshooting alarms, the wiring connections to Inputs and Outputs should be checked to ensure they are not the cause of the fault. Inputs and Outputs can be checked by navigating to the Hardware screen, Inputs/Outputs page (refer to Chapter 2, section 9 Hardware Screen).

Cement In Error

This alarm is triggered if the 'Cement In' input signal is not received within the time defined by the 'Cement Timeout' parameter in the Recipe after the 'Pre-Wet Done' output signal is set.

Check:

- Cement is feeding from the cement silos.
- The control system sends the 'Cement In' signal to the Hydro-Control correctly and within the timeout. If the control system does not send the 'Cement In' signal, then the timeout in the recipe should be set to zero.

Water Meter Fault

This alarm is triggered if a water valve has been opened and the water meter has not pulsed within the time set by the 'Water Meter Timeout' parameter defined in the System Parameters pages.

Check:

- The operation of the water valves.
- The water meter operation. Check the water meter input by ensuring that the water meter counter increments when the water valves are opened (navigate to the Hardware screen, Inputs/Outputs page (refer to Chapter 2, section 9 Hardware Screen).

Leaking Water Valve

This alarm is triggered if the water meter pulses when both water valves have been closed for more than 5 seconds during the dry and wet mix phases.

Check:

- The valves to see if they are leaking.
- The water meter is working correctly.

No Water Required

This alarm is triggered in CALC Mode if the calculation has determined that no water is needed as the dry mix moisture is already at or above the target for the recipe.

Check:

- The moisture level of the incoming aggregates.
- Reduce any Pre-Wet water that is added. If no Pre-Wet water is being added, then consideration of the aggregate handling and storage is advised.

Too Much Water Calculated

This alarm is triggered in CALC Mode when the calculated water required is above the 'Water Limit' parameter defined in the recipe.

Check:

- The recipe 'Water Limit' parameter is high enough.
- The calibration of the recipe is still correct. It may be necessary to recalibrate the recipe using the Preset mode.

Mix Too Wet & Mix Too Dry

These alarms are triggered at the end of the Pre-Wet Mix Phase and the Wet Mix Phase and if the average moisture recorded during the Recipe Averaging Time is below or above the Target by more than the 'Minus Tolerance' or 'Plus Tolerance' parameters specified in the recipe.

The mix can then be rejected or accepted by the operator, and this is recorded in the mix log. If rejected, the unit will remain in Pause to allow for trim water to be added. If accepted, the unit will resume to 'Mix Complete'.

Check:

- The calibration is correct especially the stability of the signal at the end of the mixes (indicated in the Mix Log by the Mix Time1 Deviation). A more stable signal will give a much more repeatable result.
- The tolerances in the recipe parameters can be increased, if necessary, to decrease the number of alarms.

Water Limit Exceeded

In AUTO Mode this alarm is triggered if the water addition has reached the 'Water Limit' parameter defined in the recipe.

Check:

- The recipe 'Water Limit' parameter is high enough.
- The AUTO Mode tuning should be adjusted not to overshoot the target value.

Max Dry Mix Time Exceeded

Max Wet Mix Time Exceeded

These alarms are triggered when the Auto-Track is running, and the sensor reading has not stabilised within the configured Auto-Track values before the end of the Dry Mix and Wet Mix Times set in the recipe.

Check:

- The Auto-Track control settings are set correctly. The frequency this alarm is triggered can be reduced by decreasing the Auto-Track Mix Time or increasing the allowed Mix Deviation, either in the recipe or the system parameters.
- The recipe mix time parameters are set to be long enough for the mix to stabilise.

Sensor Fault

This alarm is triggered when the Hydro-Control detects a problem with the RS485 communications with the sensor.

Check:

- Ensure that communications cables are routed away from heavy-duty power cables and electrical equipment.
- Ensure cables are of the required standard.
- Ensure that the cable screen is connected at the sensor end only.

Attempting to start a mix with the 'Sensor Fault' error message displayed on the screen will result in the following screen prompt to be displayed:
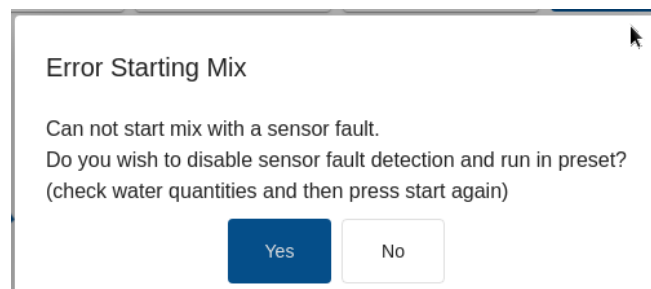

Figure 63: Unsuccessful mix start error message

Attempting to use the device with the 'Sensor Fault' alarm disabled will result in the red 'Enable Sensor Fault Alarm' button to appear on the Overview screen. Press the button to re-enable the alarm function.

Further information on cabling can be found in the sensor user guides.

Mixer Blades Worn

This alarm notifies the operator about mixer blades needing adjustment. The alarm is triggered when the device is in standby mode and the Unscaled value remains higher than the value set in the 'Mixer Blades Worn Value' field for longer than the 'Mixer Blade Worn Time'.

1.2 Non-Configurable Alarms

Waiting For Tank Fill Alarm

This alarm is triggered if:

- the Hydro-Control has reached a water addition stage when using weighed water and

- the Water Tank Full input has not been received.

Check:

- Water tank filling should be investigated. It may be filling slowly or not at all. If needed, then the mix times, or the time between mixes, should be lengthened to allow the water tank time to fill.

Pre-Wet Target Not Reached Alarm

This alarm is triggered in AUTO Mode during Pre-Wet phase water addition if:

- the added water has reached the Pre-Wet Water Limit defined in the recipe and

- the sensor moisture value has not reached the Pre-Wet Target.

Check:

- The Pre-Wet target is low enough.
- The AUTO mode is tuned correctly.
- The Pre-Wet Water Limit is set high enough.

This chapter describes how to back up and restore the internal database. Performing a software upgrade is also described in this chapter. Having access to the device's database is extremely useful when diagnosing system performance-related problems.

A USB memory stick may be used for backing up and restoring recipes, system parameters and mix log files. The memory stick may be inserted and removed with the power supply on. Do not remove the memory stick when a backup or restore is in progress.

Typically for ease of access, an external USB socket is mounted on the enclosure that the Hydro-Control is installed in.

1   Backing up and Restoring

The Hydro-Control database stores system settings, parameters of all recipes and the mix log. The database can be backed-up to a USB memory stick. This facilitates the restoration of the Hydro-Control in the event of a fault or user error.

There are four USB ports on the Hydro-Control accessible from underneath the unit. If the USB ports are difficult to access, the installation may utilise a USB extension with a panel-mounted socket. Please check the installation to find a usable and functioning USB port.

The memory stick can be inserted and removed with the Hydro-Control powered on. **DO NOT remove the memory stick when a backup or restore is in progress.**

To access the Backup and Restore functions, navigate to the 'Settings' screen and then to the 'System' page (see Figure 14).

1.1   Database Backup

To back up the Hydro-Control's database, insert a USB memory stick in one of the USB ports, then press the 'Backup Database' button.

A 'Database Backup Complete' message will appear once the back up is successful.

1.2   Database Restore

To restore the Hydro-Control's database insert a memory stick containing a backup of the Hydro-Control into the USB port of the device (The file HC07_Database_backup.db should be in the root directory of the memory stick), then press the 'Restore Database' button.
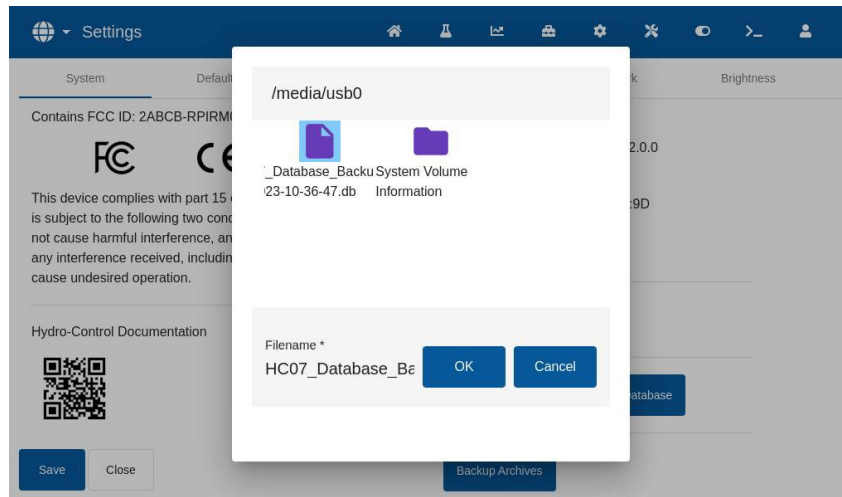
Figure 64: Restoring the database

A file explorer pop-up window will appear. Select the HC07_Database_Backup.db file by pressing on its icon and then press the 'OK' button to over-write the current database. The Hydro-Control will then restore the recipes, settings, and log file from the memory stick file.

A 'Database Restore in Progress' message will appear, followed by the 'Database Successfully Restored – System will Reboot' message. The Hydro-Control will automatically reboot and revert to the Overview screen.

The memory stick can only be removed after the device has fully restarted.

1.3 Archives Backup

The archiving feature is described in the Installation Guide (HD1074). The 'Backup Archives' button copies the archives stored in the device's internal memory onto a USB memory stick.

To use this feature, insert a memory stick into the USB port of the device and press the 'Backup Archives' button (see Figure 14). The 'Copying Archives' pop-up message will appear, then 'Archives Copied:' followed by the number of archives saved on the USB will be displayed. Press OK to accept the notification.

2 Upgrading software

Hydro-Control's software can be upgraded using a USB memory stick. The newest version of the software can be downloaded from www.Hydronix.com.

To access the Software Upgrade function, navigate to the 'Settings' screen and then to the 'System' page (see Figure 14).

2.1 Performing software upgrade

To upgrade the software, insert a memory stick containing the Hydro-Control software file into the USB port of the device, then press the 'Upgrade Software' button (see Figure 14). The software upgrade file should be in the root directory of the memory stick.
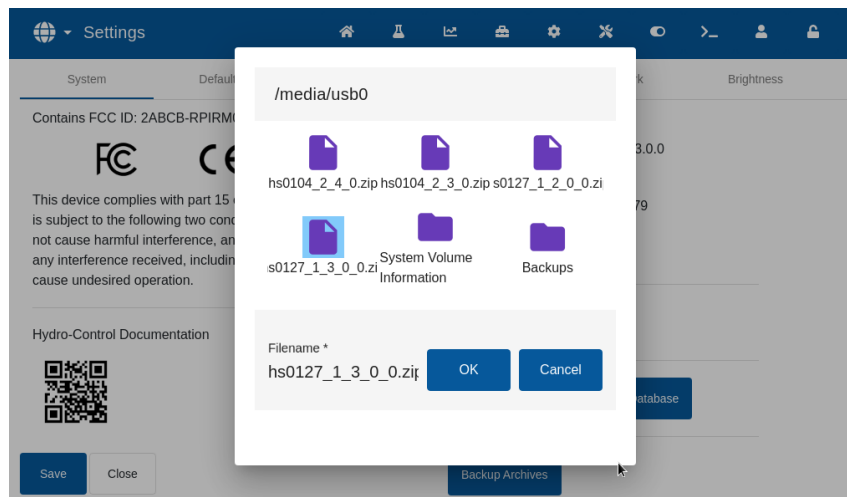
Figure 65: Upgrading the Software

An 'Update in Progress – System will Reboot' message will appear. The Hydro-Control will automatically reboot and revert to the Overview screen.

The memory stick can only be removed after the device has fully restarted.

IMPORTANT NOTE: **DO NOT REMOVE THE USB MEMORY STICK OR DISCONNECT POWER DURING THE UPGRADE PROCEDURE.**

A remote connection can be established with a Hydro-Control unit utilising Ethernet connectivity.

An engineer using a PC in a remote location can connect to the Hydro-Control to view, control, and change the device's configuration. As the engineer at the remote location makes changes, the operator will see what changes are being made and what screens are accessed.

This facility enables distributors, installers, and site managers to aid operators who may be having difficulties configuring or operating the Hydro-Control.

1   Establishing a remote connection

To connect to the Hydro-Control remotely, the device's IP address needs to be known. To establish the device's IP address navigate to the 'Settings' screen and then to the (see Chapter 2, Section 8:Settings Screen). Arrow No. 1 on Figure 14 points to where the IP address is displayed.

The computer used for remote connection and the Hydro-Control must be part of the same network.

Once the address of the desired device is known, a remote connection can be established using either UltraVNC software or an internet browser.

2   Remote connection using UltraVNC

To connect to the Hydro-Control remotely using UltraVNC software start the remote access software, enter the IP address of the desired unit into the software's dialog window and press the 'Connect' button (refer to Figure 66).
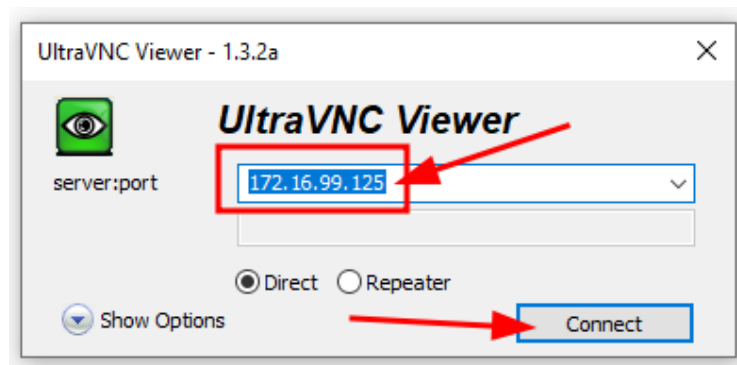

Figure 66: Connecting to Hydro-Control Remotely

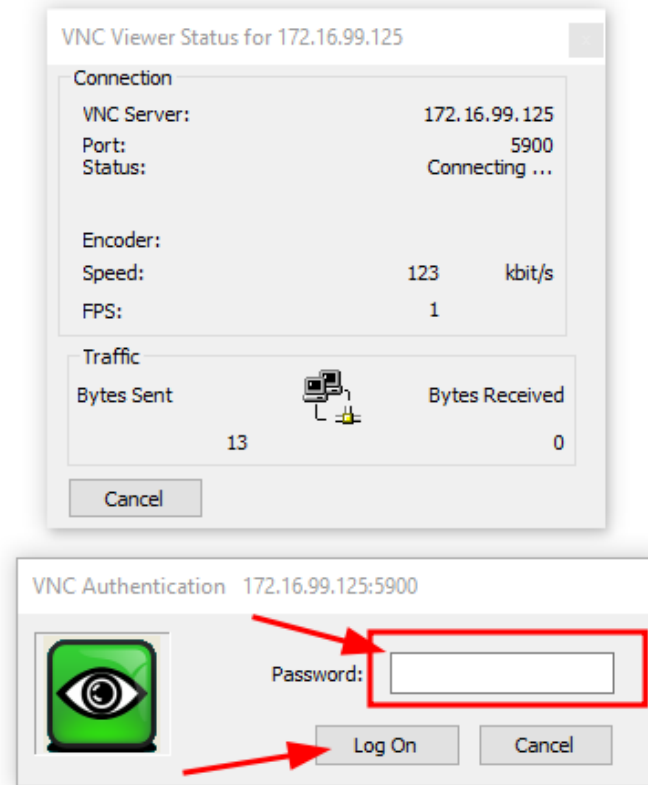When prompted for the password, type Hydr0n1x.

Figure 67: Logging in remotely

The software window will then show the current screen displayed on the Hydro-Control (HC07).

The UltraVNC session mirrors the device's screen. Changing the screen using the software will change the screen displayed on the device, and vice versa.
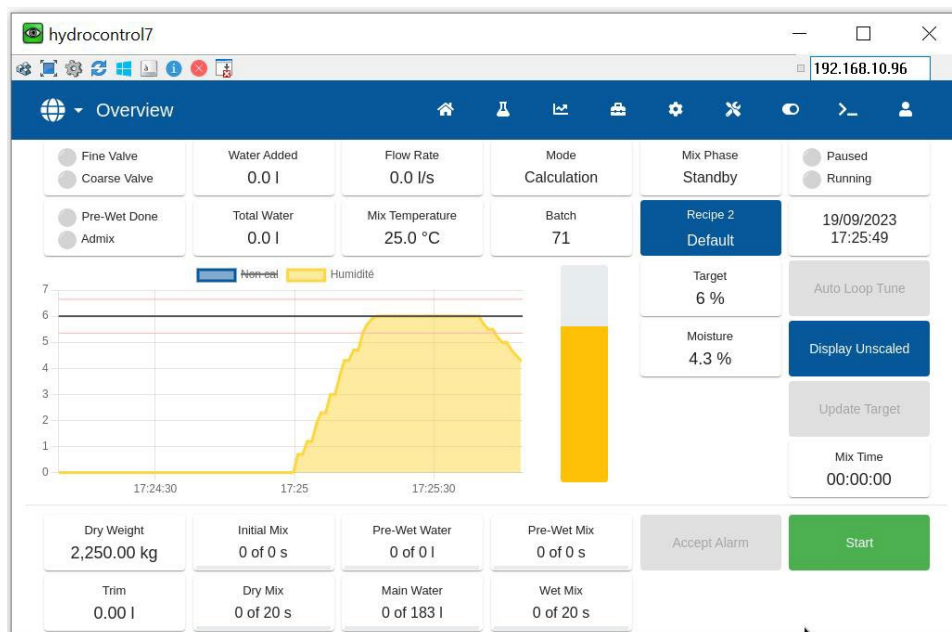

Figure 68: UltraVNC remote connection session

To view all the parameters on the Mix Log screen using UltraVNC connection, the horizontal scroll bar needs to be triggered.

Hovering the mouse cursor over the last entry on the Mix Log list makes the horizontal scroll bar visible (see Browsing the entire table is achieved by clicking on the horizontal scroll bar and moving it left to right.
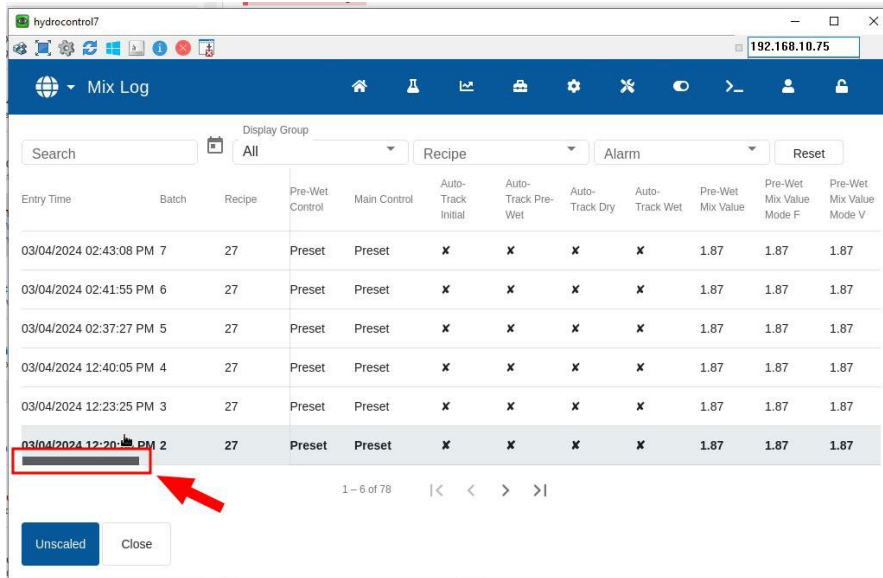

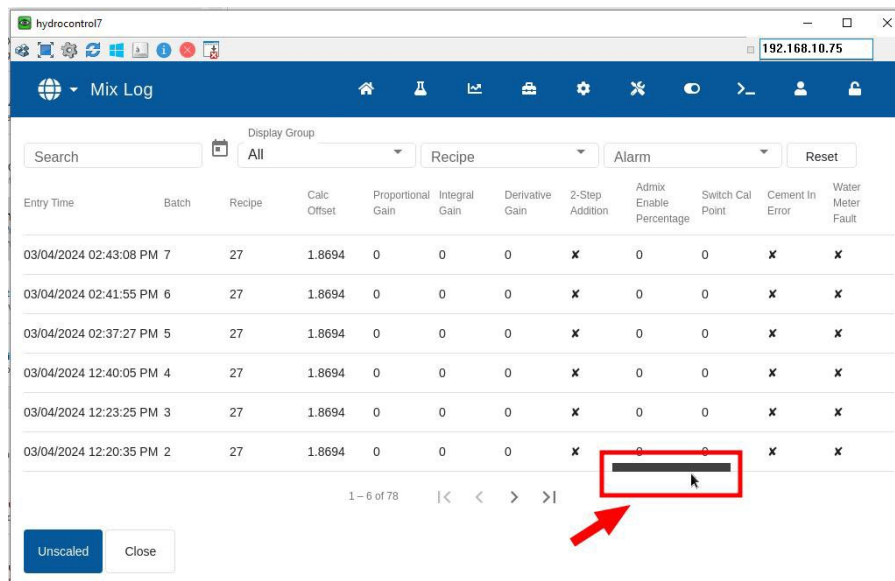**Figure 69: Triggering the horizontal scroll bar in UltraVNC**

Figure 70: Using the horizontal scroll bar in UltraVNC

3   Connection using a web browser

To connect to the Hydro-Control remotely using a web browser, open a new browser window, type the IP address of the desired unit into the address bar and press 'Enter' on the keypad.

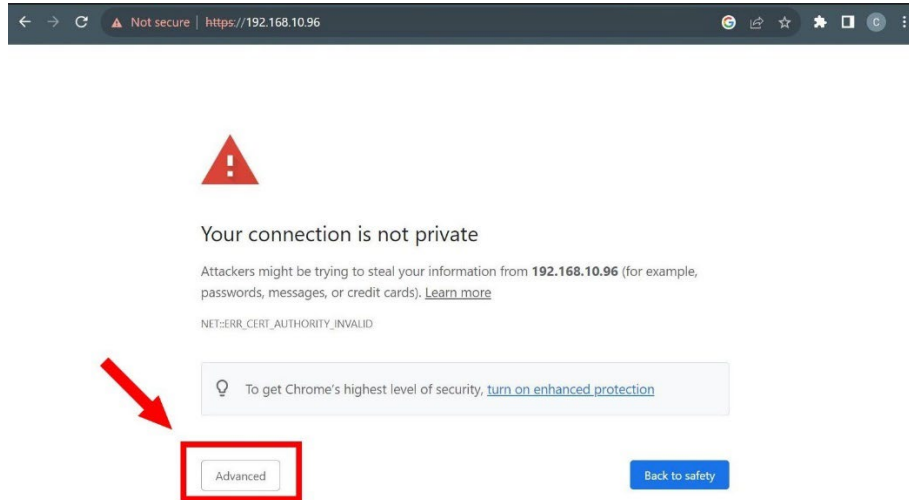The following error message might be displayed (see Figure 71):

Figure 71: Browser error message

Click the 'Advanced' button and choose the 'Continue' or 'Proceed option to go to the next screen (see Figure 72).
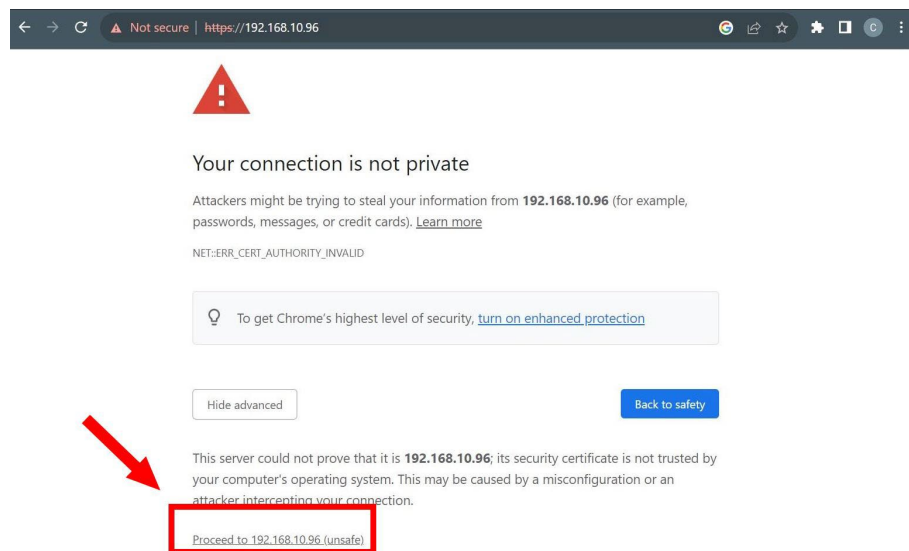

Figure 72: Browser error message

A login screen will be displayed (see Figure 73).

If a user account is up on the device, type the username and password of your choice.

If no user account details are available or no user account is set up, type the default account details: Username: 'Hydronix', Password: '0336'.
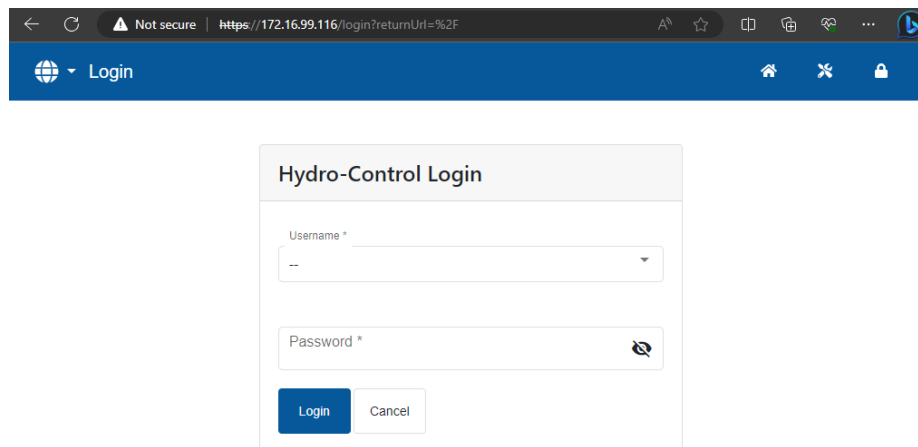

Figure 73: Login screen

The browser window will then display the Hydro-Control (HC07) 'Overview' screen.

Accessing the Hydro-Control's menu through a browser is unique to this session and separate from the device. The menu pages displayed within the browser will not be displayed on the device's screen. However, the 'Overview' screen will show the same parameters status as on the device.
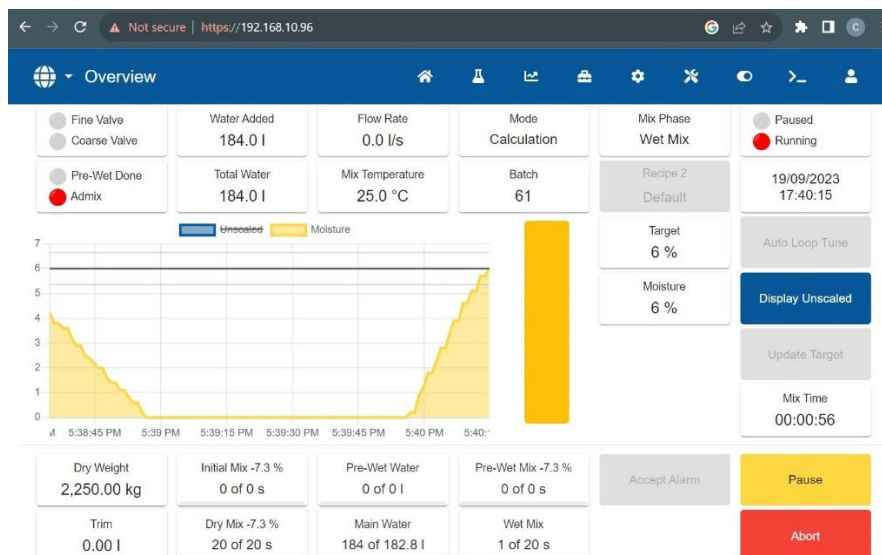

Figure 74: Internet browser remote connection session

3.1   Removing the unsecure certificate error message

To proceed directly to the login screen without the certificate error screen being displayed (Figure 71 and Figure 72) the device's current IP address and hostname need to be added to the 'hosts' file in your windows system.

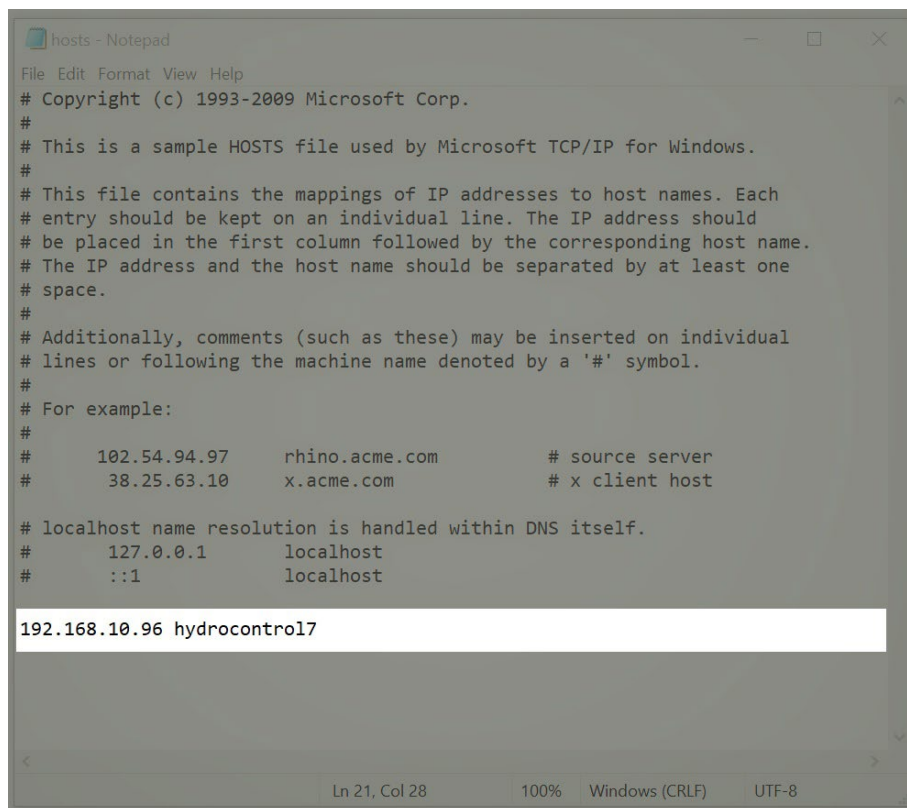Add the following line to the 'hosts' file content:

*'**IP address of the device***' hydrocontrol7*

*Example: **192.168.10.96 hydrocontrol7***

Figure 75 shows an example of an edited 'hosts' file.

Example path to the hosts file on a Windows PC: *c:\Windows\System32\Drivers\etc\hosts* Making changes to the content of the 'hosts' file requires administrator level user account.

Consult the IT department when making changes to the PC system settings.

Figure 75: Example 'hosts' file content

After the change to the host file is completed, a remote connection to the Hydro-Control using a web browser requires typing in ***https://hydrocontrol7*** into the address bar and pressing 'Enter' on the keypad.

4   Web API

An Application Programming Interface (API) is available to communicate with the Hydro-Control. Refer to Hydronix.com website or contact Hydronix support for detailed information about the API calls and the data structures returned from them.

The moisture reading from a sensor can only indicate what is happening in the mixer. The speed of reading, or the time taken to reach a steady reading when the materials are homogeneous, reflects the mixer's effectiveness. By taking some simple precautions, the overall performance can be considerably improved, and the cycle time reduced with consequent financial savings.

1 Mixer

- Mixers vary in performance; a well-maintained mixer will always be more efficient than a poorly maintained mixer.
- Look at the mixing process. Check how the water disperses. If water sits on top of the aggregates for a time before dispersing, then spray bars will be required to disperse the water into the mixer more quickly to shorten the mixing time.
- Spray bars are more effective than single water inlets. The wider the area the water sprays, the faster it will mix into the material.
- Add water during the aggregate addition.
- Keep the mixer blades adjusted to 0-2mm above the mixer floor. This will have the following benefits:
  - All the residual mix is discharged when emptying the mixer.
  - The mixing action close to the floor of the mixer is improved, thereby improving the reading of the sensor.
  - Wear on the mixer floor plates will be reduced.
  - Reduced cycle times will result in savings in power consumption and reduce mixer wear.

2 Ingredients

- If the aggregate masses are not corrected for high moisture contents, then the aggregate/cement ratio will change considerably, having an adverse effect on consistency and concrete performance. There will also be varying ratios of the different aggregates used and this can increase the amount of water to achieve the repeatable consistency.
- If the aggregates are very wet, as may be the case at the beginning of the day due to water draining in the storage bin then there may be more water in the aggregates than the mix requires.
- The moisture content of the aggregates should be above the saturated surface dry (SSD).
- Hot cement can affect consistency (workability) and thus water demand.
- Changes in ambient temperature can affect water demand.
- Where possible, the cement should be added either at the same time or within a few seconds after the start of the addition of sand and aggregates. Combining the materials together in this way will greatly assist the mixing process.

3   Consistency

A sensor measures moisture, not consistency.

Many factors affect consistency but may not affect moisture content. These might include:

- Aggregate grading (coarse/fine ratio)
- Aggregate/cement ratio
- Admixture dosage dispersion
- Ambient temperature
- Water/cement ratio
- Ingredient temperature
- Colours

4   Calibration Based Water Addition

- When calibrating, omit the admixtures, metal fibres and plastic fibres.
- When performing a calibration, it is advised that both the dry and wet mix times are extended to ensure that both are homogeneous.
- A different calibration may be required for large variations in batch volume (e.g., half batches).
- Calibrate when conditions and ingredients are typical e.g., not first thing in the morning when the aggregates are very wet, or when the cement is hot.
- When using a calibration-based water addition method, it is essential to obtain a correct dry reading.
- Dry mix time must be long enough to obtain stability of the signal.

5   Mixing

- Minimum mix times are a function of the mix design (ingredients) not just the mixer.
- Different mixes may require different mix times.
- Keep batch sizes as consistent as possible e.g., $2.5m^3$ + $2.5m^3$ + $1.0m^3$ is not as good as 3 x $2.0m^3$.
- In CALC Mode, keep the dry mix time as long as possible to allow the required water to be calculated correctly, to the detriment of the wet mix time if necessary.

Q: *The Hydro-Control display continually says "Searching For Sensor on address xx"*

A: This message indicates that there is a problem with the communication between the Hydro-Control and the sensor. The first thing to check is the cabling between the sensor and the controller. Try switching off power, as this resets the sensor and the controller. If the problems still exist, see Appendix A: Diagnostics for more details on communication diagnostics.

— — —

Q: *We had a lightning strike, and now the unit doesn't work correctly, can I do any onsite repairs?*

A: It is not possible to do any repairs onsite, and any attempts of onsite repairs will invalidate any warranty outstanding. In such cases the equipment should be sent back to Hydronix for repair.

— — —

Q: *I ordered a 110v AC unit but the label on the back shows a 24v DC power input. Is this labelling a mistake, should I just wire 110v AC to power the unit instead?*

A: The 110v AC refers to the operating voltage of the input and outputs only. This should be matched to the operating voltage of ancillary equipment like valves and switches etc. All Hydro-Control units require a 24v DC power supply.

— — —

Q: *The LCD screen has lines running through it. Can I replace the screen without sending the unit back to Hydronix?*

A: It is not possible to repair damaged screens onsite. The controller should be sent back to Hydronix for repair by a qualified technician.

— — —

Q: *How do I know what version I have?*

A: The information about the current software version of the Hydro-Control is available on the 'System' page (see Chapter 2, section 8).

— — —

Q: *I have changed the sensing arm on my Hydro-Probe Orbiter. Do I need to recalibrate anything?*

A: It will be necessary to calibrate the new sensing arm to the sensor electronics so that the air and water factory calibration settings are correct. This process is fully detailed in the Hydro-Probe Orbiter User Guide. The calibration can be performed using the 'Sensor Overview' screen (see Chapter 2, section 7). After changing the arm, it should not be necessary to recalibrate recipes, assuming that the sensing arm is fitted at the same angle and height as the old arm. However, the signal should be monitored during the first batches of each recipe to check that nothing has been affected.

— — —

Q: *I have a recipe running that has been calibrated. What happens if I change the gain and offset in the recipe manually?*

A: The moisture displayed is a number that is calculated from the sensors unscaled readings, the recipe gain and recipe offset. If the gain and offset are changed, then this will affect the displayed moisture.

— — —

Q: *Can I still run in calculation mode without recalibrating if I change my mix design?*

A: Any change in the mix design may need a different calibration and so should be run with a separate Hydro-Control recipe. This might include changes in pigment (colour), ratios of aggregates, cement supplier or type of admixture. If the mix design is the same but the quantity changes, then the recipe can be run as long it is updated with batch weights between batches.

— — —

Q: *On hot days, I must add extra water to my recipes. Is there a way to do this automatically?*

A: As the temperature increases, the concrete becomes less workable, and more water needs to be added to increase the slump. Each recipe has a temperature compensation coefficient which allows the moisture target to be changed depending on the temperature of the mix. The temperature compensation is described in Chapter 9, section 6.

         It should be noted that to maintain the concrete's water/cement ratio, the workability should be controlled using admixtures rather than by changing the amount of water added.

— — —

Q: *What is the minimum amount of water that needs to be added to a batch to achieve a good calibration for CALC Mode?*

A: To calibrate a recipe then there must be a reasonable change in the sensor readings before and after the water addition. To achieve this, the Final Water addition should be at least 1/3 of the total water that is added. The difference between the wet and dry readings must always be greater than 5 unscaled units for the calibration calculation to work. A greater difference between the Dry Mix and Wet Mix Values will give a better calibration result.

— — —

Q: *Which mode is better to use when batching and how do I know for my specific application?*

A: There is no rule as to which is better, as it may vary between applications and mixers. See Chapter 9 for more details.

— — —

Q: *Can I switch back and forth from auto to calc mode without problems?*

A: If the recipe is already calibrated and the weight of materials in the mixer remains unchanged, then the two modes can be switched back and forth. This assumes that the Auto mode has already been optimised to run efficiently.

— — —

Q: *What are the basic requirements for the unit to work with my batch controller?*

A: For the Hydro-Control to work automatically with the batch control system, the required input/output signals are water meter (input), start (input), reset (input), fine valve (output) and mix complete (output). All other inputs/outputs are optional.

— — —

Q: *The deviations for the dry and wet mix are stored in the mix log. Are these deviations of unscaled values or deviations of % moisture?*

A: The deviations stored in the mix log can be viewed in moisture or unscaled units. See Chapter 7 for more details.

— — —

Q: *How do admixtures affect the moisture sensor?*

A: The sensor can linearly measure water content in a material, therefore if chemicals are added they will affect the moisture signal to a certain degree. In most cases the effect will be negligible but there are some instances where the admixture may affect the signal enough to require the recipe to be calibrated from a batch that has been run using 2-step water addition. See Chapter 9 for more details.

– – –

Q: *My Hydro-Control is not working consistently. What information is necessary for Hydronix to help me diagnose the problems?*

A: The mix log is a very useful tool for diagnosing problems with the controller. It is also useful to know the recipe, system, and control parameters. These can be transferred onto a USB Memory Stick by doing a Backup (see Chapter 11). The file can be emailed to Hydronix as an aid for diagnostics.

– – –

Q: My Hydro-Control needs to be sent for repair. If I get a service replacement, how do I transfer all the parameters from the old to the new unit?

A: All System, Recipe and Mix Log data can be downloaded from one Hydro-Control onto a USB Memory Stick and then uploaded to another unit. If the damaged unit still switches on and has a functioning USB port, then all the data can be transferred.

– – –

Q: *How do I calibrate my controller to display real moisture?*

A: To display real moisture, when calibrating a recipe enter the true moisture for the final target. The true moisture can either be determined by measuring the moisture content of incoming materials and working out mathematically how much total water and how much of dry material was in the mixer, or by calculating the amount of water in the mixer using the mix design parameters. It is important to ensure that the correct dry weight is entered into the recipe for the calibration.

– – –

Q: *Does the Hydro-Control display water/cement ratio?*

A: The final water cement ratio is displayed in the mix log. This value will only be true if the cement weight is entered into the recipe and the recipe has been calibrated to display true moisture.

The following tables list the most common faults found when using the controller that can possibly be diagnosed by a qualified operator. In case of difficulties experienced in diagnosing the problem, contact the system administrator or Hydronix technical support on +44 1483 468900 or by email: support@hydronix.com.

Symptom: **Displays shows 'Searching For Sensor' - no output from the sensor**

Possible explanation	Check	Required result	Action required on failure
No power to sensor.	N/A	N/A	Contact your distributor.
Sensor has temporarily locked up	Power down and re-power sensor	Sensor functions correctly	Visually inspect the sensor connector pins.
Sensor MIL-Spec connector pins are damaged	Disconnect the sensor cable and check if any pins are damaged.	Pins are bent and can be bent to normal to make electrical contact.	Check sensor configuration by connecting to a PC.
Internal failure or incorrect configuration	Connect the sensor to a PC using the Hydro-Com software and a suitable RS485 converter.	Digital RS485 connection is working.	Digital RS485 connection is not working. Sensor should be returned to Hydronix for repair.

Symptom: **Incorrect sensor readings**

Possible explanation	Check	Required result	Action required on failure
Sensor Unscaled readings are incorrect	Press the 'Unscaled' button on the 'Overview' screen	Readings should be the following: Sensor exposed to air = close to zero. Hand on sensor = 75-85 US	Contact system administrator.
Incorrect recipe calibration	Check recipe for parameters 'moisture gain' and 'moisture offset'	Moisture offset = 0 to -5 Moisture gain = 0.12 to 3	Recalibrate recipe as per instructions in Chapter 9. The signal trace should be stable at the end of the first and final mix times for increased accuracy.

Symptom: Faulty display contrast

Possible explanation	Check	Required result	Action required
Backlight has failed	-	-	Contact Hydronix for repair details.

Analogue Output

The analogue outputs are continuously variable voltages or currents that can be configured to output the sensor's moisture or unscaled output to a batch control system using an analogue input module.

Automatic Calibration (AutoCal)

To simplify fitting a new sensor arm to a Hydro-Probe Orbiter, the sensor can be automatically calibrated. This sets the air and water values for the arm. The sensor face must be clean, dry and obstruction free to run the automatic calibration.

Averaging

During a mix cycle, the Hydro-Control takes an average value at the end of the mix times. The time the averaging is taken over can be defined on the system parameters pages.

Backup/Restore Settings

The mix log and recipe and system parameter databases can be backed up to or restored from a memory stick.

Calibration

The Hydro-Control calculation mode is calibrated by running mixes in pre-set mode and adding fixed quantities of water and changing this quantity depending on the resulting material. When a good mix has been obtained, the recipe can then be calibrated from the mix log.

Dry Mix Time

The time taken for the Dry Mix, which is the first mix that occurs after the Pre-Wet water has been added.

If a 2-step addition is selected, then the dry mix time is done twice, once after any Pre-Wet water is added and the second after the first main water addition (this is stopped when the water addition gets to the admixture addition point).

Dry Weight Moisture

This is the moisture content of the material calculated as a percentage of moisture using the dry weight of the material.

Main Water Addition

This is the water that is added after the dry mix before the wet mix is done.

Material

The material is the physical product that the sensor is measuring moisture in. The material must be flowing and must completely cover the sensor's ceramic faceplate.

Moisture

The water held in the material. Moisture is defined in either dry weight or wet weight and is given as a percentage.

Pre-Wet Water

This is the water that is added at the start of the process before any dry mixing is done.

Probe

See Sensor.

RS485

This is the serial communication protocol that the sensors use to communicate digitally with the control system.

RS485 Address

As more than one sensor can be on a RS485 network together, the address determines which sensor is which. The sensors leave the factory set to address 16 by default.

Sensor

The sensor is the physical probe that is used to measure moisture in materials. The sensor consists of a stainless-steel case containing the electronic components connected to a resonator which sits behind a ceramic faceplate.

Trim Water

This is an amount of water that is added to the mixer after the calculated amount has been added. This can be added manually by the operator or automatically from the recipe.

Unscaled

This is the raw value of the sensor and is a value that changes linearly with the amount of moisture in the material being measure. It is pre-set in the factory for each sensor and is between 0 (in air) and 100 (in water).

USB

The Universal Serial Bus is an interface that can be used to attach external devices, such as memory sticks, to the Hydro-Control.

Wet Mix Time

This is the time taken for the wet mix which is the mix that occurs at the end of the mix after all the main water has been added.

Wet Weight Moisture

This is the moisture content of the material calculated as the percentage of moisture in the wet weight of material in the sample.

1   Document Cross Reference

This section lists all other documents that are referred to in this User Guide. It is beneficial to have a copy available when reading this guide.

Document Number	Title
HD1074	Hydro-Control (HC07) Installation Guide
HD1100	Hydro-Control (HC07) Safety Information

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