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1132 W 1700 N, LOGAN, UT 84321

H2 GrainGages: Best Practices for Moisture Calibration

Moisture calibration aligns the GrainGage moisture reading with a bench-top lab sensor. Sample moisture curves are available for use with the H2 GrainGages which provide a basis for moisture measurement. For better accuracy, the practices in this guide are designed to streamline the calibration process and teach users how to create moisture curves.

1. **Download Sample Moisture Curves**: If users are using sample moisture curves, check the rest of the calibrations on the system are correct then user can begin harvesting of plots.
2. **Plan ahead for calibration:** Creating an accurate moisture curve requires using grain samples with a range of moisture percentages. Collecting enough samples to calibrate properly requires some advanced planning. HarvestMaster recommends two separate strategies; planting grain varieties that will be available for harvest before test plots are ready for harvest or harvesting border plots early and drying them to varying moistures.

3. **Imitate harvest conditions:** When calibrating, it is recommended to imitate harvest conditions as close as possible. This means grain has enough time to equilibrate to ambient outdoor temperature before calibrating. The grain should be cycled through the hopper or cyclone to reduce grain packing differences. If using moisture chamber inserts, a separate moisture curve with and without inserts is required.

   HarvestMaster recommends cycling samples 3-5 times each in both the bench-top sensor and Graingage and then averaging the moisture readings. When possible, grain samples should be tested in the lab and in the GrainGage within an hour of each other.

   When calibrating GrainGages mounted on Quantum combines run the combine for at least 30 minutes before doing the moisture calibration. We need to make sure the moisture sensor is at harvest temperature.

4. **Collect and prepare samples:** The challenge is to create a moisture curve that is representative of the moisture range that will be encountered during harvest. The more samples available during calibration the more accurate the curve will be. HarvestMaster recommends no less than three samples be used to generate a curve.

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5. **Adjust for high moisture corn harvest:** HarvestMaster recommends initially calibrating with samples below 26% to set the curve then manually calibrate the curve above 26% for high moisture samples. A split curve will generate better data than an average curve.

6. **Annually check and tune moisture curves:** Checking and tuning moisture curves each season will give breeders the best data quality.

Steps for creating Moisture Curves in Mirus 4.X

1. If grain samples have been in air conditioning or cold storage, acclimate them by spreading them out on a clean surface overnight. **Do not** leave them in the sun to warm up.

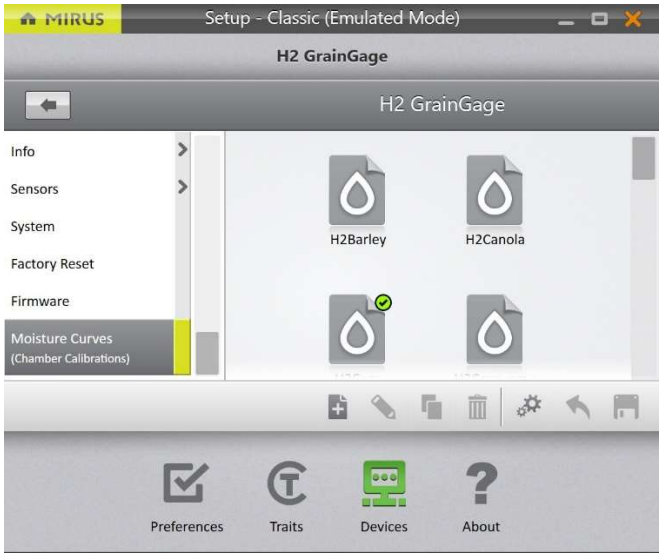
2. Test the ambient samples in the bench-top sensor by cycling sub-samples from each larger sample 3-5 times then averaging the moisture readings. This is the **Known Moisture**.

3. Within the hour, take the samples out to the GrainGage. If calibrating outside, make sure the samples stay in the shade.

4. Open **Mirus**. 

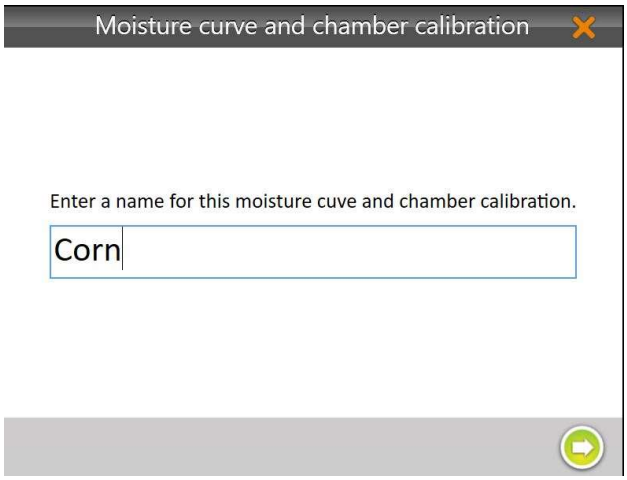
5. Make sure that the **H2 GrainGage** plugin is loaded.

6. Select **Setup** > **H2 GrainGage** > **Moisture Curves**.



7. Select the **New** icon  to create a new moisture curve.

8. Enter a **Name** for the moisture curve and chamber calibration.



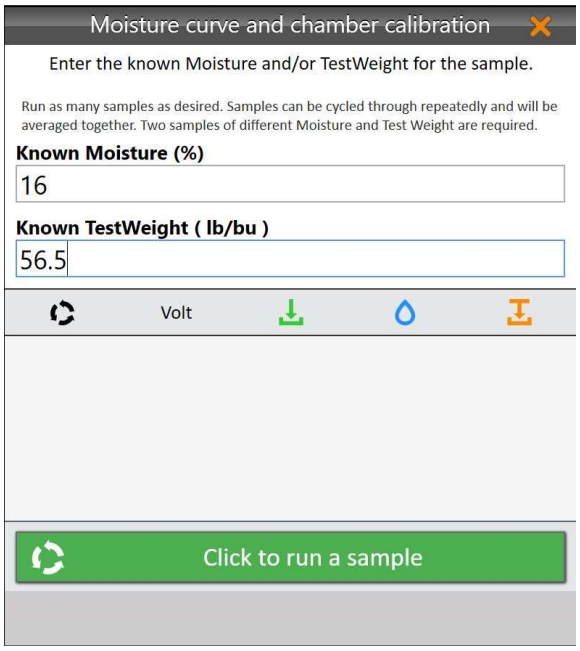
9. Tap the **Next** arrow.  Mirus will initialize a tare and display the **Insert Count**.

    a. If inserts are being used for low yielding grains, confirm the insert count is correct. If inserts are not being used, then the count should be Zero.
    b. The moisture chamber characteristics change when inserts are installed. Separate curves should be created when harvesting with inserts and separate curves should be created when harvesting without inserts.

10. Pour the grain sample into the GrainGage. It is recommended to pour samples into the hopper or cyclone to best simulate harvest.

11. Enter the **Known Moisture** percentage and the **Known Test Weight**. Entering test weight value during moisture calibration automatically adjusts the Chamber Volume and saves time in calibrating test weight.

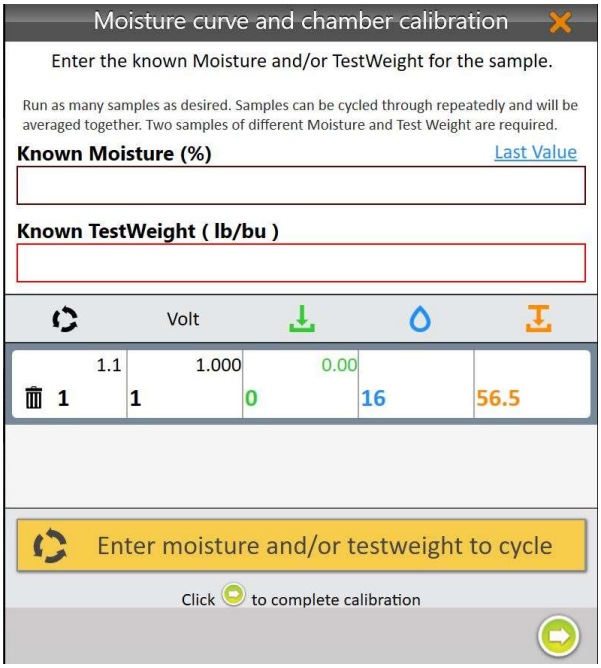
a. *Note Test Weight – Weight Calibration should have been performed before adjusting the Test Weight Chamber Volume.*



b. *If Test weight is not known or not to be collected, do not enter a test weight value.*
c. *It is recommended that when calibrating test weight that the moisture value of the sample being used for calibration is in the normal range of moisture to be harvested. Test weight from high moisture grains above 23% should not be used in calibration.*

12. Tap **Click to run a sample**. The GrainGage will cycle the grain, and Mirus will display the **Voltage**, **Bucket Weight**, **Moisture Percentage**, and **Test Weight**.

13. Tap **Last Value** to automatically populate the Moisture and Test Weight with the same values as the last sample.



14. Pour the grain sample into the GrainGage again.

15. Repeat the calibration cycle 2 more times, for a total of 3 times with this grain sample to get an average of the moisture.

    a. *Mirus 4.2 allows 48 total cycles of grain when creating a new curve.*
    b. *If calibrating for corn, it is recommended to use 3-4 samples below 25% in moisture to generate the curve and set test chamber volume if enabled*
    c. *Manual adjustment of the curve above 25% can be done by following the "High Moisture Corn Calibration" Instructions.*

16. Repeat steps 11–16 until all grain samples have been cycled through the GrainGage.

17. Tap the **Next** arrow  to complete the calibration. Mirus will display the results of the calibration.

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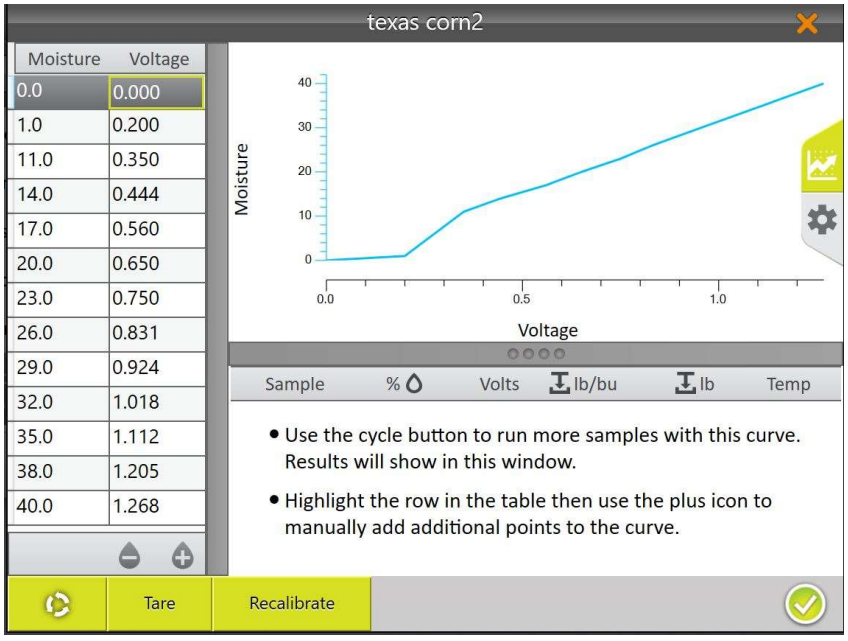
18. Tap the **Check** icon. Mirus will display the moisture curve and voltages graphically.

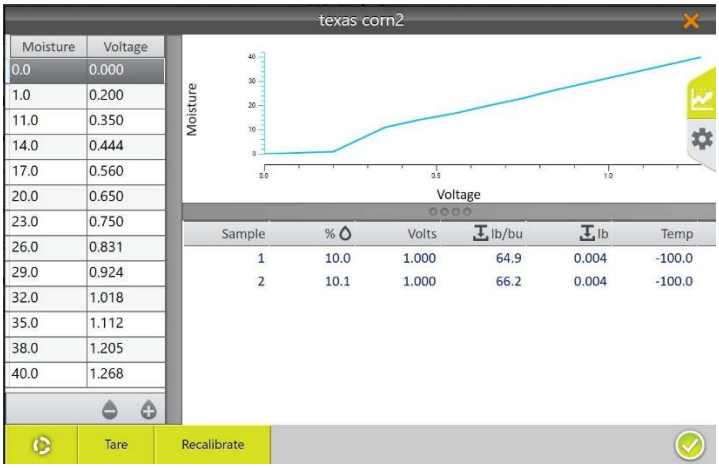
    Select the **Check** Icon to save the new moisture curved.



HarvestMaster recommends testing the new moisture curve against the grain samples. This can be done from the **Moisture Curve** edit screen.

1. Select the **Moisture Curve Edit** Icon.

2. Cycle the grain in the same manner as generating the curve. When the grain is in the hoper press the **Cycle** button. 
3. The moisture reading, moisture volts, temperature and test weight are all displayed.



4. Manual adjustment of moisture curve points can be made in the edit screen. Points can be deleted or added. Manually average the moisture readings recorded during **Cycle** process  to adjust any points in the curve.
5. Select the **Gear** icon  to view other settings associated with the moisture curve.

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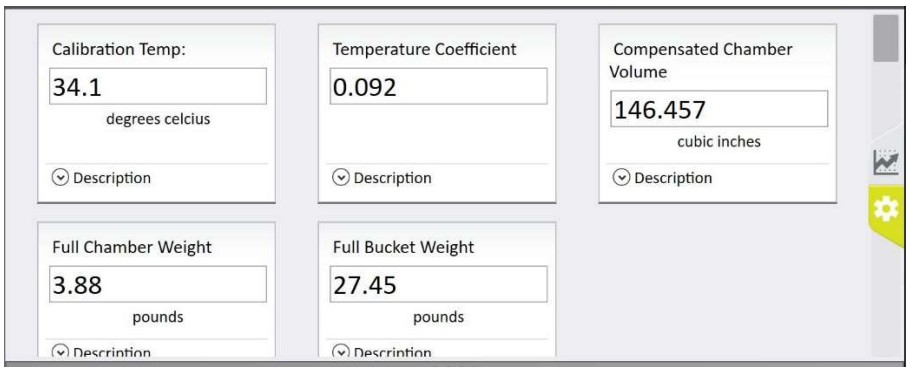

Note: When calibrating GrainGages mounted on Quantum combines run the combine for at least 30 minutes before doing the moisture calibration. We need to make sure the moisture sensor is at harvest temperature.

6. The **Recalibrate** 

feature is designed to adjust existing moisture curves with a new grain sample.
    a. *This feature is designed to adjust previously created moisture curves to match new grain samples. The slope of the curve is not changed but the whole curve shifted to match the new samples. Fine tuning of a curve is often done later in the season as additional moisture samples are available.*

Manual Calibration Using Excel

1. Moisture calibration can also be performed using the Excel spreadsheet, **H2 EM2 Moisture Probe Sample Curves w/Calculator** found on the HarvestMaster website at the following link.

http://www.harvestmaster.com/HarvestMaster/support/Downloads/Mirus-Harvest-Software

2. The spreadsheet includes instructions for creating a two-point calibration. Additional calibration using multiple grain samples must be done manually.

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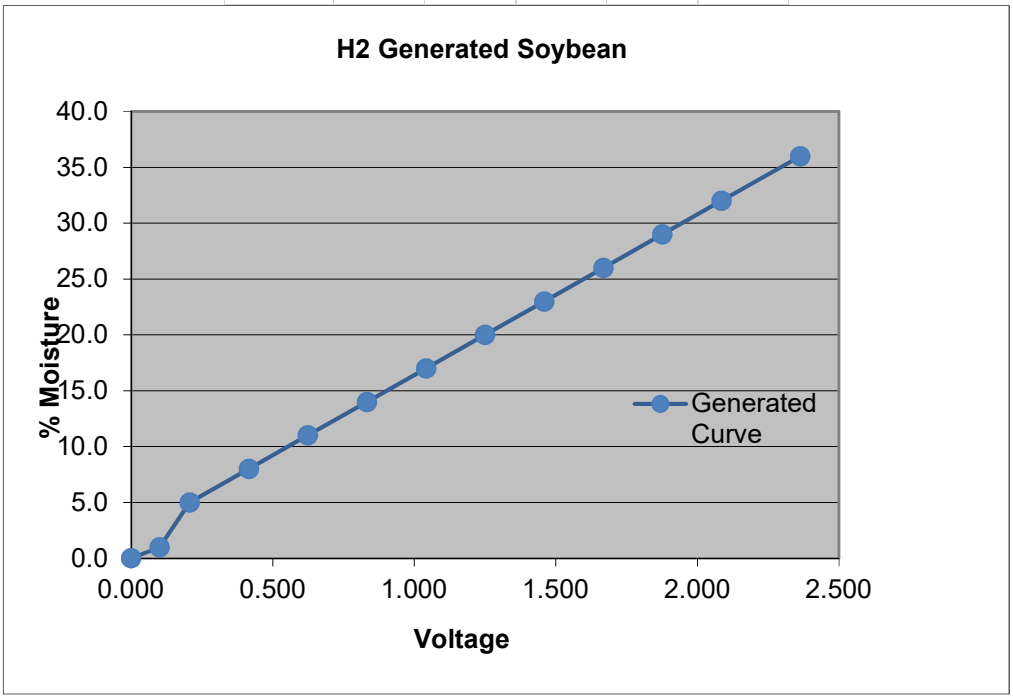
Dry Sample:	9.5	0.516	< Enter Dry Sample readings		
Wet Sample	12.3	0.715	< Enter Wet Sample readings		
Generated C	0.0	0.000		Cal Temp:	20
	1.0	0.100			
	5.0	0.206	-0.209	Calc'd m:	14.4
	8.0	0.415	-0.209	Calc'd z:	2.0
	11.0	0.624	-0.209		
	14.0	0.833	-0.209		
	17.0	1.041	-0.209		
	20.0	1.250	-0.209		
	23.0	1.459	-0.209		
	26.0	1.668	-0.209		
	29.0	1.876	-0.209		
	32.0	2.085	-0.278		
	36.0	2.363	-0.278		
	40.0	2.642	2.642		



Corn Moisture Curve Adjustment

Sometimes the moisture curve response may not be linear especially when trying to measure high moisture corn samples. To adjust moisture curves with grain samples above 25% the following steps apply.

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1. This step requires manual adjustment. It can be done used Mirus and the moisture curve edit feature or using the **H2 EM2 Moisture Curve Spreadsheet.**
2. Only work half the curve at a time. For example, adjust curve from 0-25% first then adjust curve from 27-40%
3. Take moisture samples in lower range, 0-25%, and cycle thru Graingage 3-5 times each to get an average moisture reading and voltage reading.
4. If the measured moisture samples do not match the standard, all the samples should have the same negative or positive error, otherwise it is recommended to generate a new curve.
5. If samples have more than 1-2% error, it is recommended to generate a new moisture curve.
6. Take the average of the percentage error for each sample then adjust the Moisture % points on the curve by this average.
7. If the average % error is a positive 1.5%, adjust the individual points in the curve in the opposite direction, see example below.
    a. 0 = 0
    b. 10% becomes 8.5%
    c. 12% becomes 10.5%
    d. Subtract 1.5% from each point up to 25%
8. Once curve is adjusted, recheck samples.
9. After the lower half of the curve is adjusted, cycle samples above 27% and repeat the adjustment procedure again, (steps 1-7), only adjusting the points above 27% and leaving points below 25% as is.
10. Multiple samples above 27% are required to adjust the upper end of the curve successfully.
11. In some cases, the higher the moisture the more the curve slopes which requires adding additional % moisture to moisture value. For example, adding the following percentages to the default curve will help match higher moisture grain samples.
    a. Add 1% to samples from 26% to 27%
    b. Add 1.5% to samples up to 30%
    c. Add 2% to sample above 30%
12. Examples of manually adjusted high moisture curves

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Original Curve

%	V
0.0	0.000
1.0	0.400
8.0	0.793
11.0	0.892
14.0	0.990
17.0	1.089
20.0	1.187
23.0	1.286
26.0	1.385
29.0	1.483
32.0	1.582
36.0	1.713
40.0	1.845

Adjusted Curve

%	V
0.0	0.000
1.0	0.400
8.0	0.793
11.0	0.892
14.0	0.990
17.0	1.089
20.0	1.187
23.0	1.286
27.0	1.385
30.5	1.483
34.0	1.582
39.0	1.713
44.0	1.845

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