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7 Milk Meter Calibration

Afimilk MPC is calibrated in the factory to ensure milk measurement results within the required accuracy ranges. However, since installation environment may affect milk measurement accuracy, *Afimilk MPC* requires calibration at installation.

Three calibration procedures are described in this chapter:

- 1. Calibrating Electrodes
- 2. Air intake compensation
- 3. Accuracy adjustments (on farm calibration)

7.1 Calibrating Electrodes

Three electrodes in the milk meter body are the measuring probes of the meter. Although electrodes are calibrated at the factory, cable and connection resistance may affect their accuracy. Electrodes calibration compensates for resistance of the lines and therefore, it is necessary to calibrate the milk meter after installation.

Electrodes calibration procedure is performed with a 100Ω (±0.1%) resistor. During calibration, the resistor is connected between electrodes to test and calibrate them. Afimilk offers a calibration tool for the technician incorporating the resistor and probes for hooking to the electrodes (See below).





7.1.1 Milk Meter Electrodes Calibration tool

The easy to use calibration tool is built of an encased resistor connected to two socket connectors used for plugging on the calibrated electrodes.

7.1.1.1 Electrodes Calibrating Procedure

At each meter, calibrate the holding and operating electrodes in one single procedure, as described below:

Holding (middle) electrode:

Calibrate electrodes as follows:

- 1. Carefully unlock the bottom clasp of the body and remove the lower cover with the inner valve cylinder connected to it.
- 2. Connect the 100Ω resistor between the Common (lower) and the holding (middle) electrodes.
- 3. Ensure that the meter is in wash mode (illuminated cleaning key indicator
- 4. Press **1 5 9 0** and **b** to access electrode calibration mode.
 AdJt appears on the display panel.
 5. Press **2**.

H### is displayed (### represents the calibration value). The range of calibration values for Holding electrode is typically between H112 and H118.



Operating (top) electrode:

Connect the 100 Ω resistor between the Operating (top) electrode and the Common (lower) electrode.

- 1. Press **3**
- 2. **H###** is displayed (**###** represents the calibration value).
- 3. Press **3** a second time to calibrate the electrode.

AdJt appears.

- 4. The electrodes have been calibrated.
- 5. Press to exit editing mode.

7.1.1.2 Reviewing Calibrated Values of Electrodes

If a milk meter fault leads to a suspected calibration problem, the technician may check calibration value at the display:

- 1. Ensure that *Afimilk MPC* is in wash mode (wash LED illuminated
- 2. Type **2580** and press **v** to access programming mode.
- 3. Press Group access number 4 to enter Calibration Group
- 4. Scroll down to **DA** (Operating Electrode).
- 5. **DA##** is displayed. (**##** represents the calibration value.) If the resulting value is less than **17** or more than **34**, electrode calibration is required.
- 6. Press *m* to scroll to calibration value **u** (Holding Electrode). **u** ## is displayed. (## represents the calibration value.) If the resulting value is less than **17** or more than **33**, electrode calibration is required.
- 7. Press + (double press) to return to wash mode.

7.2 Air intake compensation

Milking clusters are manufactured with orifices allowing admission of air for improving milk flow inside the milking system tubing. Air intake of these orifices generally varies

from 6 to 12 liters per minute. *Afimilk MPC* calibration neutralizes air intake influence. Calibration is required whenever clusters are changed and/or when air vented liners are used.

Calibration procedure adjusts the value of parameters "G" (Air admission Adjustment) and "H" according to the air admission of the claws orifice.

7.2.1 Checks before Calibration

A thorough visual check of the milking parlor is necessary before calibrating. Complete the following procedure:

- Check the milking equipment and pipe connections between the milk clusters and the milk lines. At this point, unless all milking tubing is new, AfiMilk recommends replacing rubber liners, as well as rubber gaskets and cracked (usually plastic transparent) parts of used milking clusters.
- 2. Ensure an open air orifice in each cluster.
- 3. Check the vacuum lines. Clean and drain.
- 4. Check the milk meter power supply voltage at the last milking point of each parlor side. A minimum of 23Vac is required while operating at full capacity.



Steps 5 through 9 below are maintenance steps and may be skipped at initial calibration (new milk meters).

- 5. Replace all milk-meter rubber parts if not new.
- 6. Use a spirit level to check the levelness of the length and width of the top rim of the milk meter body mid-section.
- 7. Remove the body's solenoid diaphragm and ensure that it is complete and flawless (replace it if there is any minor difference or flaw). Check for moisture on the underside of the diaphragm. If moist, dry it.
- 8. Blow pressurized air into the solenoid from its diaphragm end. Check for clean and free airflow to the bottom opening of the solenoid.
- 9. Check all parts of the milk meter body, hoses, and connectors.

7.2.2 Measuring Claw Air Admission

For calibration purposes an exact claw air admission measurement is required. Although claw manufacturers specify products' air admission, it is highly recommended to verify actual performance of each claw on-site.

This method incorporates the use of an air gauge to measure Air Admission. *Afimilk* recommends an air gauge manufactured by Dwyer Instruments Inc., the RATEMASTER[®] FLOWMETER RMA-22-SSV.

Follow the procedure described below if an air gauge is available to ensure accurate results.

- 1. Remove the milk and pulsation hoses from the cluster as illustrated in Figure 12 below.
- 2. Insert four plugs into the four milking cups.
- 3. Clean the air orifice in the cluster.
- 4. Connect the air gauge as illustrated in Figure 12 below. The lower port of the air gauge is connected to the claw via a short 5/8 inch hose connector. The top outlet port of the air gauge is inserted into the milk hose leading to the milk meter body.



Figure 12: Air Gauge Installation

- 5. When the gauge is securely connected as described, press III on the display panel in order to open vacuum to the cluster.
- 6. Check and seal any vacuum leaks at connections in the air gauge and cluster.
- 7. Block the air orifice with your finger to verify that the only air intake allowed is via the air orifice. The ball in the gauge should fall to zero if no air leakage occurs.
- 8. Hold the air gauge in a vertical position and allow air admission via claw orifice. Write down the air intake the gage measures. This measurement will be used for calibrating the "G" parameter value as described below.

Repeat measurement procedure at each milking point.

7.2.3 Default G and H parameters per air intake

The table shows the default **G** and **H** parameters according to measured air admission in the cluster.

Air Admission in the Cluster (Liters per minute)	G value for calibration	H value for calibration
6–7	40	30
7–8	46	37
8–10	49 (default)	40
11–13	55	46
14–17	60	50
18–20	65	55

To adjust **G** and **H** parameters follow the procedure in paragraph <u>Adjusting G and/or H</u> <u>parameter value</u> or via the AfiControl interface mentioned in paragraph <u>Adjusting the G</u> <u>and/or H parameter value via communication</u>.

7.2.4 Adjusting G and/or H parameter value

- Ensure that Afimilk MPC is in wash mode (wash LED illuminated
- Type **2580** and press **v** to access programming mode.
- Press Group access number 4 to enter Calibration Group. G is the first parameter in the group and its value will appear after a short delay.
- Press ♥ →G flashes indicating that editing is enabled. Type the desired value.
- Press to confirm.
- Scroll down to the second parameter in the group H and change its value in the same manner as explained above.

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• When done, press vitwice to exit editing mode.

7.2.5 Adjusting the G and/or H parameter value via communication

The easiest way to adjust G and H parameters values is via the AfiControl interface. As explained below, you may change the value of each milking point individually **OR** set a uniform value to ALL the milk meters.

To change the **G** and **H** values via AfiFarm PC enter **Parameters≻Tools≻Parlor** and select the stall to adjust as shown below.

On the right hand side section of the screen, adjust the **G** and **H** values for the selected stalls.



7.3 Accuracy Adjustment

AfiMilk MPC milk meters are supplied with default adjustment calibration values. After the initial setup (see adjustment per air intake explained above) inaccuracies of milk measurements vs. bulk tank OR in specific milk meters can be found; therefore **G** and **H** parameters values may need further adjustment. Initial calibration (after installation) is performed by adjusting the **G** parameter value. If additional – fine tune calibration – is required for individual milk meters, update the **H** parameter value according to the procedure explained here.

Local authorities may require an initial calibration and periodic accuracy checks (usually yearly) of the milk meters, mainly for herd book approval. This can be done by three different methods. These methods will be described here. The periodic accuracy check or periodic routine test is usually done as a water test which will be compared to water test reference values set during or after the initial calibration (see document Afimilk MPC Periodic routine test).

 Compaire between bulk tank vs. milk measurements with fine adjustment with a water test (minimal required for official recording).

Based on the comparison, the **G** parameter is set equal for all meters. A water test is fulfilled to check differences (i.e. faulty meters) and set a farm avarage as the reference value. Based on the individual meter results (minimum of two

measurements) a \mathbf{G} parameter adjustment for each meter is done. If adjustment is needed for more then 5 points (2%), a minimum two new water tests are required and are then used as the reference value for this meter.

• Milk test for calibration and meter adjustment followed by a water test for future reference values (recommanded by Afimilk).

Based on a milk test of at least three valid readings the \mathbf{G} parameter will be adjusted. After all milk meters are calibrated, a water test is performed for each meter. This will be used as reference value.

 Milk test for calibration and meter adjustment (advanced calibration with Hparameter).

Based on a first milk test of at least three valid readings the \mathbf{G} parameter will be adjusted. A second milk test, which might include milk speed data, is used to adjust the \mathbf{H} parameter. After all milk meters are calibrated, a water test is performed for each meter. This will be used as the reference value.

7.3.1 Use of bulk tank and fine adjustment and references by water test

Bulk tank calibration is used for adjusting average accuracy of all the milk meters together. This procedure is performed by calculating the parlor difference between the milk measured by the milk meters and the bulk tank total. This results in an average **G** parameter at which the bulk tank and the total of the milk recorded by the Afikim MPC meters is more or less equal.

Before performing the test the following parlor tests and checks should be carried out:

- Milk meters are cleaned properly. Verify functionality and operation of each unit.
- Consumable rubber parts (upper and lower gaskets, diaphragm and valve gaskets) are replaced as recommended, and seem flawless and clean.
- Clean air line is drained of water, milk meter solenoid air inlet is properly connected to the clean air line and to the vacuum supply.
- Test the vacuum level and stability. Ensure vacuum level above 30 kPa.

Below an example of using data of bulk tank and total milk yield recorded

Description	Amount	
The amount collected by the milk tanker	12.480	Kg
Milk consumption locally (not loaded in tanker)	100	Kg
Thru milk meter but not in bulk tank (i.e. bucket collection)	-150	Kg
Total milk amount	12.430	Kg
The milk amount recorded by all AfiMilk MPC in the same period	12.315	Kg
Previous G parameter value (i.e. based on air blend)	50	
New G parameter (50 +(12.430/12.315) x 2,5)) 1)	53	
1) milk meters show almost 1% less than bulk tank collection		
So modify the G parameter: -1 x (-2,5)=+2,5 to 53 (rounded)		

Note - Use the same measurement unit

- Make sure to be <u>accurate</u> in adding and subtracting

- For further expenation calculating difference and adjustment (see <u>Statistical Accuracy Calculation</u>)

IMPORTANT



Make sure you work accurate with collecting all the data you need. This includes i.e. missing data due to missing cow identification, milk thru the meter but not in the bulk tank and milk substraction out of bulk tank.

To adjust the **G** parameter valua follow the procedure in paragraph <u>Adjusting G and/or H</u> <u>parameter value</u> or via the AfiControl interface mentioned in paragraph <u>Adjusting the G</u> <u>and/or H parameter value via communication</u>.

7.3.1.1 Equipment and water test preparation and description

7.3.1.1.1 Equipment required

For performing the AfiMilk MPC water test, the following equipment is used:

Milking bucket equipped with 7/8" inlet and vacuum ports

Manual vacuum shut off valve placed between the milk line and the hose connected to the collection bucket.





Suction pipe with an inlet hole of 3.5mm, which allows a 4 ± 1 LPM (Liter per Minute)

flow of water. The entire set should be tested and verified for the defined flow rate (see testing the equipment below). This part will replace the milking claw for the purpose of the test.



A nipple with air inlet 1mm in diameter should provide air intake of 10 ± 1 LPM.

Air inlet nipple should be connected no closer than 50cm from the water sucking port.

Hoses and connectors to set-up the test system – the milking bucket should have an inlet port of 20mm or more. Hence, the internal diameter of piping connecting between milk meter and bucket must be at least 20mm.

Water pail containing at least 20 liters water volume.

Electronic weighing scales.

7.3.1.1.2 Testing the equipment

Prior to the water test, the equipment (sucking pipe and air inlet) needs to be tested and confirmed for running the desired water flow rate for the test (4 ± 1 LPM) and for precise air intake of the air hole (10 ± 1 LPM).

Testing the water flow

To test the sucking pipe, a water flow gauge is used.



When testing the equipment, the water flow gauge is connected between the sucking pipe and air inlet nipple, before the milk meter inlet. When the vacuum is opened, water starts running through the system and the water flow is read (as shown in picture on the right).

Once confirmed for flow rate in the range of 4 ± 1 liters per minute, the water flow gauge is no longer used during the actual water test.





Testing the air intake

To test the air inlet an air flow gauge is used

To perform the test, place the air flow gauge in place of the water flow gauge.

Block the water inlet to allow air flow through the air inlet alone.

Open the vacuum valve and register the air intake measured.

 \circ Verify that the air intake measured is in the range of 10 \pm 1 liters per minute.

7.3.1.1.3 The water test procedure

Preparing the testing solution

Prepare the test solution as follows:

Measure a quantity of 13-20 liter of water for the test solution. Use lukewarm water at temperature as close as possible to the ambient temperature.

Calculate amount of salt and dissolve **4.5 grams of table salt** in each **liter of water**. Stir carefully to ensure that all salt is dissolved.

Measure the conductivity of the solution using a conductivity meter (see picture on the right). The target is to achieve conductivity between 10 and 12 Mili-Siemens. If required, add water or salt to reach the desired conductivity.

Testing procedure

The basic steps of the water test

- Produce 20 kg of testing solution in a pail.
- Using the sucking pipe connected to the milk meter, run testing solution through the unit and into the milking bucket until the display shows 12 ± 0.5 kg.
- Stop the vacuum using the manual valve and press the "removal" button of the milkmeter.
- Wait until the milk-meter valve opens to release the water accumulated during the last flow.
- The collected quantity of test solution should now be weighed and recorded against the figure shown on the display of the milk meter.





7.3.1.2 Water test adjustment and setting reference

7.3.1.2.1 Global Test description

- Perform one (or direct two consecutive) water tests procedures as described above (same amount of water) for each milk meter in the parlor.
- Check if on or more meters deviate in result against the other meters (result difference > 0,25 kg on average difference of all meters). If so, re-check this meter(s) and approve result or perform a re-test.

Afimi	Imilk MPC Setting reference values by water test Imilk 1265887														
Farm:	1265897				Technical	check	>	Vacuum lev	vel (kPa)		42,0		Parlor:	Harringbone (2x5)	
	Farm te	sing			Hygienico	check	•						Date:	-30-7-2018	
	Cow roa	d			two n	neasurem	ents wi	ith mutual	difference	max	. 0,1 kg	Perf	ormer:	Test person Joe	
	Cow city	/			thre	e within 0	,2 (els	e replace fa	aulty meas	urem	nents)				
		Pre watert	est		Conduc-	2e water test Conduc-									
Meter	G-value	Display	Unster	Diff.	tivity	Display	Unste	r Diff.	tivity						
1	53	12,20	11,44	0,76	11,7	12,32	11,4	8 0,84	11,8						
2	53	12,30	11,56	0,74	11,6	12,26	11,4	6 0,80	11,8						
3	53	12,25	11,55	0,70	11,6	12,20	11,4	8 0,72	11,7						
4	53	12,28	11,20	1,08	11,6	12,32	11,2	0 1,12	11,6						
5	53	12,30	11,48	0,82	11,5	12,40	11,6	0,80	11,6						
6	53	12,44	11,68	0,76	11,8	12,30	11,4	8 0,82	11,9						
7	53	12,18	11,26	0,92	11,7	12,46	11,6	6 0,80	11,8						
8	53	12,20	11,40	0,80	11,7	12,28	12,28 11,46 0,82								
9	53	12,24	11,46	0,78	11,6	12,26	11,5	0 0,76	11,6						
10	10 53 12,16 11,36 0,80 11,5 12,20 11,34 0,86 11,6														
	Ava	rage water	test diff.	0,82											

Example form to store and analyse the collected data

In this example, two measurements are done. Meter no. 4 shows a bigger difference as all other meters. This meter is re-checked and considered to be Ok. This value is accepted.

 If within the milk meter the two water tests are differ no more then 0,1 kg, that meter is Ok. If the difference is more then 0,1 kg a third measurement should be performed. The three measurements should differ no more then 0,2 kg. If so, re-test and replace one or more existing measurements.

Afimi	lk MPC	Setting r	eferenc	e valu	es by wa	ter test						,					
Farm:	1265897	7			Technical	check	>	Vacuum lev	vel (kPa)		42,0		Parlor:	Harring	oone (2x	5)	
	Farm te	sing			Hygienico	check	•			_			Date:	30-7-202	18		
	Cow roa	d			two n	neasurem	ents w	ith mutual	difference	max.	0,1 kg	Perf	ormer:	Test per	son Joe		
	Cow city	y			thre	e within O),2 (els	e replace fa	aulty meas	ureme	ents)						
		Pre water test Conduc- 2e water test Conduc- 3e water test Co							Conduc-	А	varage	Calculated					
Meter	G-value	Display	Unster	Diff.	tivity	Display	Unste	r Diff.	tivity	Displ	ay	Unster	Diff.	tivity	Diff	Deviation%	G- value
1	53	12,20	11,44	0,76	11,7	12,32	11,4	8 0,84	11,8						0,80	-0,2%	53
2	53	12,30	11,56	0,74	11,6	12,26	11,4	6 0,80	11,8						0,77	-0,5%	54
3	53	12,25	11,55	0,70	11,6	12,20	11,4	8 0,72	11,7						0,71	-0,9%	55
4	53	12,28	11,20	1,08	11,6	12,32	11,2	0 1,12	11,6						1,10	2,2%	47
5	53	12,30	11,48	0,82	11,5	12,40	11,6	0,80	11,6						0,81	-0,1%	53
6	53	12,44	11,68	0,76	11,8	12,30	11,4	8 0,82	11,9						0,79	-0,3%	53
7	53	12,18	11,26	0,92	11,7	12,46	11,6	6 0,80	11,8	1	12,40	11,52	0,88	11,7	0,87	0,3%	53
8	53	12,20	11,40	0,80	11,7	12,28	11,4	6 0,82	11,7						0,81	-0,1%	53
9	53	12,24	11,46	0,78	11,6	12,26	11,5	0 0,76	11,6						0,77	-0,5%	54
10	10 53 12,16 11,36 0,80 11,						11,3	4 0,86	11,6						0,83	0,0%	53
	Ava	arage wate	r test diff.	0,82								Farm	referen	ce wil be:	0,83		

In this example, the two measurements for meter no. 7 differ more then 0,1. A third water test is performed. All three differences are within the 0,2 limit, so no futher action needed.

- Based on de water test differences a new G parameter can be calculated (<u>Statistical</u> <u>Adjustment Calculation</u>). If the new G parameter differs more then 5 (meaning >2% deviation and adjustment), two additional water tests for that specific meter are required after the adjustment of G in order to set references (in this example meter 4).
- Set de new **G** parameter in the individual meter using the **G** adjustment procedure (see links below)

For meter no. 4 the adjustment is more than 2% and two new water tests are needed. In this example the new water test looks like:

		1e water t	est		Conduc-	2e water	r test		Conduc-	Meter
Meter	G-value	Display	Unster	Diff.	tivity	Display	Unster	Diff.	tivity	Reference
4	47	12,10	11,40	0,70	11,8	12,16	11,48	0,68	11,8	0,69

To adjust the **G** parameter valua follow the procedure in paragraph <u>Adjusting "G" and/or</u> <u>"H" parameter value</u> or via the AfiControl interface mentioned in paragraph <u>Adjusting the</u> <u>"G" and/or "H" parameter value via communication</u>.

For the periodic routine test, the following results, following this example, have to be handed over to the persons/organizations involved in routine testing (reference values for the next annual routine test :

Form with the calculated reference values for the annual routine test based on the calibration test.

Afimi	Ik MPC	Period											
Farm:	126589	7			Technic	al check		Vacuum	level (kP	a)		Parlor:	Harringbone (2x5)
	Farm te	esing			Hygien	ic check		- at refe	rence det	ermine	42,0	Date:	
	Cow ro	ad			G-/H-va	alue chec	k 🗌	- this rou	utine test			Performer:	
	Cow city Against ref. val.: One test: limit 0,1 kg; two tests: avg									/g 0,2 kg			
Nr.	G-value	H-value	Air intake	Ref.value	Cond.	Display	Unster	Diff.	Display	Unster	Diff.	Conclusion	Remarks
1	53	40	9	0,83	11,8			0,00			0,00		
2	54	40	9	0,83	11,7			0,00			0,00		
3	55	40	9	0,83	11,7			0,00			0,00		
4	47	40	9	0,69	11,8			0,00			0,00		
5	53	40	9	0,83	11,6			0,00			0,00		
6	53	40	9	0,83	11,9			0,00			0,00		
7	53	40	9	0,83	11,7			0,00			0,00		
8	53	40	9	0,83	11,7			0,00			0,00		
9	54	40	9	0,83	11,6			0,00			0,00		
10	53	40	9	0,83	11,6			0,00			0,00		

7.3.2 Milk test for calibration and reference values by water test

This test is performed by collecting milk of individual cows into a bucket, measuring it and comparing the amount with the reading of the milk meter. Then, statistical deviation calculations are done to indicate the accuracy level of the device.

It is very important to carry out a proper scaling procedure to ensure accurate scaling in accordance with regulations.

To carry out the scaling procedure, an electronic weighing scale and a few milk buckets are required. This chapter describes the correct procedure of scaling and statistical calculations. If deviations in measurements are found, correct those by adjusting G&H values as described above.

Before performing the test the following parlor tests and checks should be carried out:

- Milk meters are cleaned properly. Verify functionality and operation of each unit.
- Consumable rubber parts (upper and lower gaskets, diaphragm and valve gaskets) are replaced as recommended, and seem flawless and clean.
- Clean air line is drained of water, milk meter solenoid air inlet is properly connected to the clean air line and to the vacuum supply.
- Test the vacuum level and stability. Ensure vacuum level above 30 kPa.

7.3.2.1 Collecting the Milk into a Milk Bucket

Per international regulations the following rules are adopted for scaling:

- Multiple attachments measurements are **not** included in the statistics.
- Only milking claw air admission is allowed. Tests may not be valid if liners cracks or piping holes allow additional air intake by the system. Furthermore, tests where liner slippage or large udder causing squawks (liner slip) occurs are also rejected.

- The Milk Meter reading should be taken after the last dump of milk (milk dump after removal).
- For each reading, list milk meter reading vs. actual milk weighed.
- At least **three** valid readings are required for calculating milk meter accuracy.

To ensure proper measurements, see that the following restrictions are kept:

- \circ The collecting bucket must be placed below the meter outlet port.
- The hose connecting the Milk Meter to the bucket is situated correctly in a downward slope towards the bucket.
- The hose connecting the Milk Meter to the bucket has no pulling or pushing pressure on the outlet of the Milk Meter.

7.3.2.2 Statistical Accuracy Calculation

After scaling milk weights for all the milk meters in the parlor, statistical accuracy calculation is performed for each milk meter.

Statistical calculation is done for each reading and corresponding weigh scale measurement for calculating the difference as a percentage value between the reading of the milk meter and the actual milk weighed.

The following formula is used for calculating difference between the milk meter reading and the milk weighed.

Average all of the DIF% deviations for each Milk Meter.

Change the value of " \mathbf{G} " parameter per calculated average deviation. If the result is negative (Milk meter reading is lower than the actual weight), the calculated adjustment value needs to be added to the value of \mathbf{G} . If the adjustment is positive, the calculated value needs to be subtracted from the value of \mathbf{G} .

General adjustment calculation \rightarrow %Dev X (-2.5) = Adjustment value

Example: if the actual value of G in the milk meter is 55 and the measured deviation -4% (Milk meters show 4% less than actual weight), modify the "G" parameter value by:

To adjust the **G** parameter valua follow the procedure in paragraph <u>Adjusting "G" and/or</u> <u>"H" parameter value</u> or via the AfiControl interface mentioned in paragraph <u>Adjusting the</u> <u>"G" and/or "H" parameter value via communication</u>.

During initial calibration it is the aim to adjust each meter around 0% deviation, while this is the base for setting the reference values with water.

Example form for data collection of milk meter data compared with collected milk in a bucket

Afimi	ilk MPC	Initial	milk	test		· · ·		-						-
Farm:	126589	7			Technic	cal check 🛛 🔽	Vacuum le	vel (kPa	a)	42,0		Parlor:	Harri	ngbone (2x5)
	Farm te	esing			Hygien	ic check 🛛 🗹						Date:	30-7-2	2018
	Cow ro	ad				Minimal	three meas	uremer	its		Pe	rformer:	Test p	person Joe
	Cow cit	ty				Aim for 0% dev	iation as ba	se for w	ater test					
Nr.	Display	Unster	Diff.	G-value	Concl.	Remarks		Nr.	Display	Unster	Diff.	G-value	Concl.	Remarks
1	8,35	8,46	-1,3%	50				6	13,26	13,65	-2,9%	50		
	15,73	15,55	1,2%	50					16,90	17,30	-2,3%	50		
	20,22	20,20	0,1%	50	Ok				16,15	16,20	-0,3%	56		After adjustment
									17,78	17,70	0,5%	56	Ok	
2	14,86	15,20	-2,2%	50				7	19,36	19,10	1,4%	50		
	18,92	19,30	-2,0%	50					18,42	18,30	0,7%	50		
	15,24	15,15	0,6%	55		After adjustmen	t		15,96	16,00	-0,2%	52		After adjustment
	17,40	17,36	0,2%	55	Ok				14,56	14,50	0,4%	52	Ok	

7.3.2.3 Setting the reference value by water test

An initial water test is performed after installation of the milk meters, after calibration of the system or during installation of the entire system. The results of this water test are the "**reference values**" for the periodic water tests performed for each milk meter annually or more frequently.

Please note that the initial water test is performed to establish a baseline and the following water tests at the farm are conducted to validate stability of the system. Since the device is calibrated for measuring milk rather than water, the deviations between water measurements and the scaling of the fluid <u>are</u> the baseline tested, rather than ultimate accuracy of measurements (as calculated in milk tests).

Preparation of the needed equipment and how to perform the water test is described in paragraph <u>7.3.1.1 Equipment - and water test preparation and description</u>.

At least two measurements per meter with a mutual difference of max. 0,1 kg are recorded. The reference value for each meter is the average of these two measurements.

	Afimilk MDC Satting reference values by water test														
Afimi	Afimilk MPC Setting reference values by water test														
Farm:	126589	7			Techni	cal check	◄	Vacuum	level (kP	'a)	42,0	Parlor:	Harringbone (2x5)		
	Farm te	esing			Hygien	ic check	◄					Date:	30-7-2018		
	Cow ro	ad			tw	o measur	ements v	vith mutu	ual differ	ence max	. 0,1 kg	Performer:	Test person Joe		
	Cow city three within 0,2 (else replace faulty measurements)														
Nr.	G-value	H-value	Display	Unster	Diff.	Cond.	Display	Unster	Diff.	Cond.	Ref. value	Cond.	Remarks		
1	50	40	12,10	11,44	0,66	11,7	12,22	11,48	0,74	11,8	0,70	11,75			
2	55	40	12,20	11,36	0,84	11,6	12,16	11,36	0,80	11,8	0,82	11,70			
3	53	40	12,15	11,55	0,60	11,6	12,10	11,48	0,62	11,7	0,61	11,65	More measurements needed		
4	58	40	12,18	11,20	0,98	11,6	12,22	11,20	1,02	11,6	1,00	11,60			
5	52	40	12,20	11,48	0,72	11,5	12,30	11,60	0,70	11,6	0,71	11,55			
6	56	40	12,34	11,48	0,86	11,8	12,20	11,38	0,82	11,9	0,84	11,85			
7	52	40	12,08	11,46	0,62	11,7	12,36	11,76	0,60	11,8	0,61	11,75			
8	50	40	12,10	11,40	0,70	11,7	12,18	11,46	0,72	11,7	0,71	11,70			
9	52	40	12,14	11,46	0,68	11,6	12,16	11,50	0,66	11,6	0,67	11,60			
10	51	51 40 12,06 11,36 0,70 11,5 12,10 11,34 0,76 11,6 0,77							0,73	11,55					

Example form for collecting reference values for the annual water test

For the periodic routine test the following results, following this example, would be handed over to the persons/organizations involved in routine testing:

Form with the calculated reference values for the annual routine test based on the calibration test.

Afimi	Ik MPC	Period	ic Routir	ne test									
Farm:	126589	7			Technic	cal check		Vacuum	level (kP	a)	_	Parlor:	Harringbone (2x5)
	Farm te	esing			Hygien	ic check		- at refe	rence det	ermine	42,0	Date:	
	Cow ro	ad			G-/H-va	alue chec	k 🗌	- this rou	utine test			Performer:	
	Cow city Against ref. val.: One test: limit 0,1 kg; two tests: a								tests: av	rg 0,2 kg			
Nr.	G-value	H-value	Air intake	Ref.value	Cond.	Display	Unster	Diff.	Display	Unster	Diff.	Conclusion	Remarks
1	50	40	9	0,70	11,8			0,00			0,00		
2	55	40	9	0,82	11,7			0,00			0,00		
3	53	40	9	0,61	11,7			0,00			0,00		
4	58	40	9	1,00	11,6			0,00			0,00		
5	52	40	9	0,71	11,6			0,00			0,00		
6	56	40	9	0,84	11,9			0,00			0,00		
7	52	40	9	0,61	11,8			0,00			0,00		
8	50	40	9	0,71	11,7			0,00			0,00		
9	52	40	9	0,67	11,6			0,00			0,00		
10	51	40	9	0,73	11,6			0,00			0,00		

7.3.3 Milk test for calibration (two sessions) and references by water test

This test is performed by collecting the milk each cow gives into a bucket, measuring it and comparing it to the reading of the milk meter. Then, statistical deviation calculations are done to indicate the accuracy level of the device.

It is very important to carry out a proper scaling procedure to ensure accurate scaling in accordance with regulations.

To carry out the scaling procedure, an electronic weigh scale and a few milk buckets are required. This chapter describes the correct procedure of scaling and statistical calculations. If deviations in measurements are found, correct those by adjusting G and H values as described below.

Before performing the test, the following parlor tests and checks should be carried out:

- Clean milk meters properly. Verify functionality and operation of each unit.
- Replace consumable rubber parts (upper and lower gaskets, diaphragm and valve gaskets) as recommended, and flawless and clean.
- Drain the clean air line of water; milk meter solenoid air inlet is properly connected to the clean air line and to the vacuum supply.
- Test the vacuum level and stability. Ensure vacuum level above 30 kPa.

7.3.3.1 Collecting the Milk into a Milk Bucket

Per international regulations the following rules are adopted for scaling:

- Multiple attachments measurements are **not** included in the statistics.
- Only milking claw air admission is allowed. Tests may not be valid if liners cracks or piping holes allow additional air intake by the system. Furthermore, tests where liner slippage or large udder causing squawks (liner slip) occurs are also rejected.
- The Milk Meter reading should be taken after the last dump of milk (milk dump after removal).
- For each reading, list milk meter reading vs. actual milk weighed.
- At least three valid readings are required for calculating milk meter accuracy.

To ensure proper measurements, see that the following restrictions are kept:

 \circ The collecting bucket must be placed below the meter outlet port.

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- The hose connecting the Milk Meter to the bucket is situated correctly in a downward slope towards the bucket.
- The hose connecting the Milk Meter to the bucket has no pulling or pushing pressure on the outlet of the Milk Meter.

7.3.3.2 Statistical Accuracy Calculation

After scaling milk weights for all the milk meters in the parlor, statistical accuracy calculation is performed for each milk meter.

Statistical calculation is done for each reading and corresponding weigh scale measurement for calculating the difference as a percentage value between the reading of the milk meter and the actual milk weighed.

The following formula is used for calculating difference between the milk meter reading and the milk weight.

Average all of the DIF% deviations for each Milk Meter.

Change the value of " \mathbf{G} " parameter per calculated average deviation. If the result is negative (Milk meter reading is lower than the actual weight), the calculated adjustment value needs to be added to the value of \mathbf{G} . If the adjustment is positive, the calculated value needs to be subtracted from the value of \mathbf{G} .

General adjustment calculation \rightarrow %Dev X (-2.5) = Adjustment value

Example: if the actual value of G in the milk meter is 55 and the measured deviation -4% (Milk meters show 4% less than actual weight), modify the "G" parameter value by:

Fine Tune Calibration

After basic calibration of G parameter, it might happen that specific meters are deviating and need further adjustment. In that case the H parameter can be used.

The procedure of calibrating with H parameter is basically the same procedure as calibrating with G parameter. In this case change the e value of H parameter per calculated average deviation.

If the result is negative (Milk meter reading is lower than the actual weight), the calculated adjustment value needs to be added to the value of \mathbf{H} . If the adjustment is positive, the calculated value needs to be subtracted from the value of \mathbf{H} .

General adjustment calculation \rightarrow %Dev X (-5) = Adjustment value

Example: if the actual value of H in the milk meter is 37 and the measured deviation -4% (Milk meters show 4% less than actual weight), modify the "H" parameter value by:

-4 X (-5) = +20 to 57

To adjust the **G** and **H** parameter valua follow the procedure in paragraph <u>Adjusting G</u> <u>and/or H parameter value</u> or via the AfiControl interface mentioned in paragraph <u>Adjusting</u> <u>the G and/or H parameter value via communication</u>.

During initial calibration it is the aim to adjust each meter around 0% deviation, while this is the base for setting the a reference values with water. If a single meter after both G & H calibration still is deviating, the meter has to be replaced.

7.3.3.3 Setting the reference value by water test

An initial water test is performed after installation of the milk meters, after calibration of the system or during installation of the entire system. The results of this water test are the "**reference values**" for the periodic water tests performed for each milk meter annually or more frequently.

Please note that the initial water test is performed to establish a baseline and the following water tests at the farm are conducted to validate the stability of the system. Since the device is calibrated for measuring milk rather than water, the deviations between water measurements and the scaling of the fluid <u>are</u> the baseline tested, rather than ultimate accuracy of measurements (as calculated in milk tests).

The preparation like needed equipment and how to perform the water test is described in paragraph <u>7.3.1.1 Equipment - and water test preparation and description</u>.

At least two measurements per meter with a mutual difference of max. 0,1 kg are recorded. The reference value for each meter is the average of these two measurements.

Afimi	Ifimilk MPC Setting reference values by water test													
Farm:	126589	7			Techni	cal check		Vacuum	level (kP	'a)	42,0	Parlor:	Harringbone (2x5)	
	Farm te	esing			Hygien	ic check						Date:	30-7-2018	
	Cow ro	ad			tw	o measur	ements v	vith mutu	ual differ	ence max	. 0,1 kg	Performer:	Test person Joe	
	Cow ci	ty			tł	nree with	in 0,2 (el	se replac	e faulty r	neasuren	nents)			
Nr.	G-value	H-value	Display	Unster	Diff.	. Cond. Display Unster Diff. Cond. Ref. value Co							Remarks	
1	50	46	12,10	11,44	0,66	11,7	12,22	11,48	0,74	11,8	0,70	11,75		
2	52	38	12,20	11,56	0,64	11,6	12,16	11,46	0,70	11,8	0,67	11,70		
3	53	50	12,15	11,55	0,60	11,6	12,10	11,48	0,62	11,7	0,61	11,65	More measurements needed	
4	58	42	12,18	11,20	0,98	11,6	12,22	11,20	1,02	11,6	1,00	11,60		
5	52	40	12,20	11,48	0,72	11,5	12,30	11,60	0,70	11,6	0,71	11,55		
6	51	36	12,34	11,68	0,66	11,8	12,20	11,48	0,72	11,9	0,69	11,85		
7	57	46	12,08	11,26	0,82	11,7	12,36	11,56	0,80	11,8	0,81	11,75		
8	50	58	12,10	11,40	0,70	11,7	12,18	11,46	0,72	11,7	0,71	11,70		
9	52	60	12,14	11,46	0,68	11,6	12,16	11,50	0,66	11,6	0,67	11,60		
10	51	42	12,06	11,36	0,70	11,5	12,10	11,34	0,76	11,6	0,73	11,55		

Form calibration test with collected data resulting in the calculation of reference values

For the periodic routine test, the following results, following this example, would be handed over to the persons/organizations involved in routine testing:

Form with the calculated reference values for the annual routine test based on the calibration test.

Afimilk MPC Periodic Routine test													
Farm:	126589	7			Technic	al check		Vacuum	level (kP	a)	_	Parlor:	Harringbone (2x5)
	Farm te	esing			Hygieni	ic check		- at refe	rence det	ermine	42,0	Date:	
	Cow ro	ad			G-/H-va	alue chec	k 🗌	- this rou	utine test			Performer:	
	Cow cit	ty			Agains	st ref. val	.: One te	st: limit 0	,1 kg; two	tests: av	/g 0,2 kg		
Nr.	G-value	H-value	Air intake	Ref.value	Cond.	Display	Unster	Diff.	Display	Unster	Diff.	Conclusion	Remarks
1	50	46	9	0,70	11,8			0,00			0,00		
2	52	38	9	0,67	11,7			0,00			0,00		
3	53	50	9	0,61	11,7			0,00			0,00		
4	58	42	9	1,00	11,6			0,00			0,00		
5	52	40	9	0,71	11,6			0,00			0,00		
6	51	36	9	0,69	11,9			0,00			0,00		
7	57	46	9	0,81	11,8			0,00			0,00		
8	50	58	9	0,71	11,7			0,00			0,00		
9	52	60	9	0,67	11,6			0,00			0,00		
10	51	42	9	0,73	11,6			0,00			0,00		