MicroFeeder Pitstop^{PLUS}

Instruction for use with detailed documentation of functions

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Schematic overview of the system

Pitstop^PLUS is a cloud-based Internet of Things (IoT) technology for precision mineral supplementation. The Pitstop^PLUS system consists of Pitstop feeders PLUS electronics and software:

A. *The cows have electronic ear tags or transponders, based on HDX or FDX ISO standards (this is a pre-condition, not a system component).*
B. *A master unit do the main computing and handles the communication; wireless LoRa-based communication with the feeders, and communication to the Cloud via wired connection to a router. The master unit holds information about the cows, their daily allowance of mineral supplements, the already eaten amount, etc.*
C. *The feeders are equipped with RFID antennas to identify the cows, slave units that communicates with the master and controls the function of the dosing aggregates - one or two per feeder.*
D. *Data is stored in "The Cloud".*
E. *The user interface is the Pitstop^PLUS Manager app.*
F. *Monitoring, remote-controlled software updating, and analysis of "big data" for patterns related to yield response, health, climate, geography, etc.*
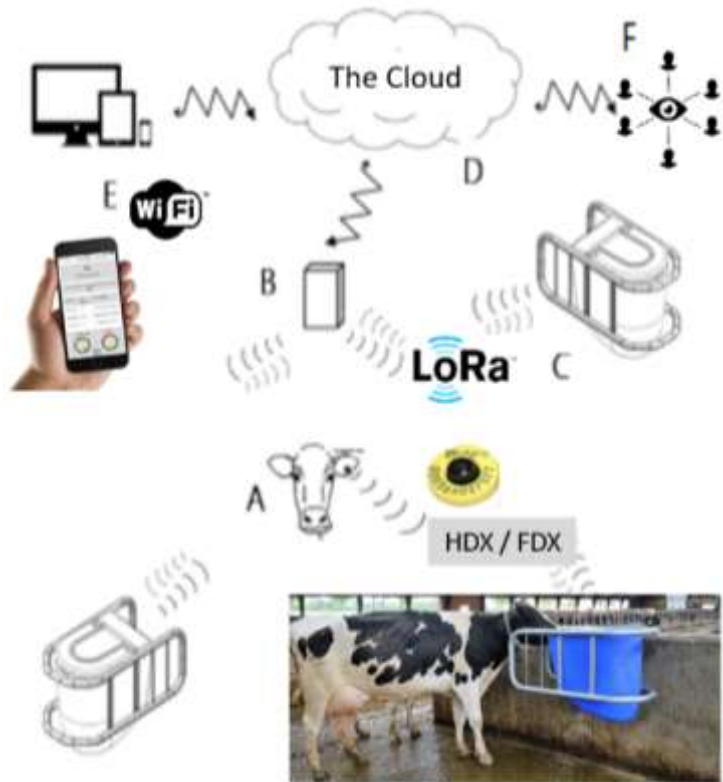
You install the system and start using it by following steps 1-3:

1 – Installation and start of the master unit

The Pitstop^PLUS master unit is installed in the stable itself or nearby at a suitable place, where there is an electrical outlet and access to the Internet in the form of a router or switch with a free RJ45 slot.

After correct installation and connecting the master unit to both electricity and the Internet according to the configuration scheme to the right, the diode under the master unit will start to light after some seconds.

The diode on the master unit is interpreted as follows: When the master unit is powered up, the diode is first red until it is connected to the Internet (until
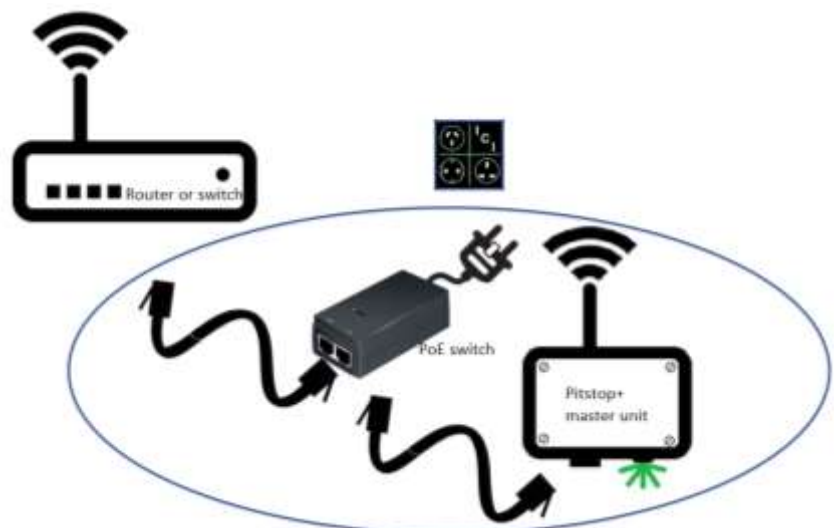
it has been assigned an IP address) and the software has started up, then it turns green. After that, the diode is usually green, but red for a short time / a few seconds when a feeder is visited by a cow. If the diode is constantly red, it is due to lack of Internet connection.

2 - Mounting of feeders

It is a pre-condition for the function of the feeders and the entire Pitstop^{PLUS} system that cows are tagged with electronic ear tags or wear neck collar-mounted transponders of HDX or FDX type.

The power supply that follows each feeder is equipped with a 4-metre cable and there must therefore be an electrical outlet within that distance from the placement of the feeder.

Mounting of feeders is done as described in the Mounting Guide for MicroFeeder Pitstop w. large mounting bracket – https://www.microfeeder.com/docs/MicroFeeder_Pitstop_-_multilingual_instruction_for_mounting_and_use.pdf.

Please ensure that the cable to the power supply is mounted so that it is out of reach for the cows.

After correct installation of a feeder and connection to power, diodes are seen to light up in the front flap, initially in both red and green, and at rest after a few seconds only in green.

Feeders are automatically identified and connected to the master unit.

3 - Activation and installation of Pitstop^{PLUS} Manager

Activation of Pitstop^{PLUS} Manager

1. The process is started automatically by scanning the QR code on the Pitstop^{PLUS} master device with a mobile phone. Alternatively, go to https://www.pitstopplusmanager.com/Account/Registration manually and enter the S/N number of the Pitstop^{PLUS} master device.
2. The primary user then creates his profile by following the on-screen instructions, stating the following:
   a. E-mail address
   b. Password
   c. Name
   d. Street and house number
   e. Further address
   f. Zip code
   g. City
   h. Country
   i. Culture (is selected from the dropdown, for instance "de-DE", "en-GB", etc.)
   j. Country (selected from dropdown) – decisive for the standard ID-string that is part of the official ID of the animal via an ISO3166-code - https://www.iso.org/iso-3166-country-codes.html.
   k. Herd number – is included in the same way as the country in the ID string for the animals' official number. Is also used to identify the files that contain data / information about the animals' use of Pitstop^{PLUS}.
   l. Serial number (S/N) of the delivered system (appears from the Master unit)
   m. Herd name.

3. The primary user can then create secondary users through their user profile at https://www.pitstopplusmanager.com/Account/Manage, which is registered only with E-mail address and Password.

Installing Pitstop^{PLUS} Manager

4. To facilitate the daily use of Pitstop^{PLUS} Manager, it is recommended to install this as a standalone app and add the icon to the Home screen. The procedure for this is different for mobile phones, tablets and computers.

Use of Pitstop^{PLUS} Manager

Pitstop^{PLUS} Manager is a web-based application for controlling and monitoring of MicroFeeder Pitstop^{PLUS} operations.

The prerequisite for using Pitstop^{PLUS} Manager is that, when installing MicroFeeder Pitstop^{PLUS} you have created a profile as described above during installation.

The web address is https://www.pitstopplusmanager.com.

Pitstop^{PLUS} Manager

- Is tested with Microsoft Edge, Google Chrome and Firefox browsers, whereas we do not recommend the use of e.g. Internet Explorer;
- Is based on the so-called Progressive Web App (PWA) technology and can therefore be installed as an app on all device types, and its responsive design adjust to the used platform; and
- is apart from its dashboard having three modules – *"Status"*, *"Cow list"*, and *"Settings"*, presented in the following.

Dashboard

The dashboard is meant for a quick overview of the main system functions and use.

Status

The module is intended for providing a quick overview of the use of the feeder via key performance indicators.

A button gives access to see a complete list of all registered visits to the feeders, which can be downloaded in EXCEL format.

Cow list

The module gives an overview of cows with access to the MicroFeeder Pitstop^{PLUS} feeders.

The module is interactive, and you can add, delete or edit cows:

Adding cows to the list

Adding cows to the list happens in the following way:

- The ear tag (or special collar-mounted transponder of FDX/HDX type) id is entered in the "Tag ID" field according to the instructions given on the screen. You can purchase electronic ear tags if your cows are without such, either official ear tags or unofficial, re-useable electronic chips. For unofficial ear tags, it is the 12-digit number of the chip, which is entered in the "Tag ID"-field, initiated by your country code and the "_"-sign.
- It is optional to specify something in the "Other ID" field. The field can be used for writing the cow's official number in case of unofficial electronic ear tags are used. You can also enter the name of the cow in the field or any remark you wish. A maximum of 24 characters can be entered in the field.
- "Calving Date" is indicated by paging a calendar when the field is active.
- "Allowance per 24h, gram" of mineral feed for "#A" and "#B" for Group 1, and "#A" and "#B" for Group 2 are prefilled cf. the standard entries under "Settings". If you want to give the

individual cow more or less than the standard quantity, this is stated in the fields for "Deviation".

Once specified, press the "Insert" button.

Exchange

Adding cows to the cow list can be rationalised by uploading a complete list of cows, for instance once per quarter in either EXCEL or CSV file format. Follow the instructions on the screen.

Editing cows

Editing is done by clicking on the edit icon on the left of the list next to the ID of the cow to be edited.

Indication of information is as stated above regarding the addition of cows.

After editing the information, these are saved by clicking "Save changes".

Deleting cows

Deleting of cows occurs automatically when the cow has passed the period for access to mineral feed according to the entries under "Settings".

For systems running in auto mode, cows are automatically deleted 14 days after their latest recognition.

If you want to delete a cow from the list manually, for example, because the cow has left the herd, this happens by clicking the delete icon located to the right of the list in the row for the cow you want to delete. A warning will be given, which you must confirm before deletion actually happens.

Warning colours

The ear tag / transponder ID is indicated on red background in case a cow has not visited the feeder during the accumulation period. Such "Alarm cows" who do not visit the feeders at all should be found and inspected, as they may have health problems.

The ear tag / transponder ID is indicated on yellow background in case of an "Observation cow" that has not visited the feeder in the last 24 hours. The reason for the low usage of the feeder might be that the cow is becoming sick – an early warning, and it should be observed.

Visit log

All registered visits to the feeders of an individual cow is listed when clicking on the Tag / Transponder ID.

Settings

The following is an overview and a brief explanation of the setting options:

- Name: MicroFeeder Pitstop^{PLUS} can handle two types of mineral feed per group (e.g. lactating and dry cows), and the name of the supplement is a guide to the management and interpretation of the system's use.
- Gram supplement per dose: This is the amount determined by calibration - see above under Calibration.
- No of doses per visit: Here you can indicate whether one or more doses per visit should be given.

- Supplements, gram per visit: This number is calculated by the systems as "Gram supplement per dose" x "No of doses per visit". It is recommended to adjust "No of doses per visit" so that the cow receives between 20 and 80 grams of mineral feed per visit.
- Standard daily maximum allocation, gram: This is the amount of mineral feed that you want the system to dose to the cows on average per day.
- Start day and end day: Number of days relative to the calving date, eg. ÷15 (minus 15) if the intended start / end is 15 days before calving date, 0 if start / end is at calving and 90 if start / end is 90 days after calving date.
- Max number of feedings per 24 hours: This number multiplied by "Supplement, gram per visit" sets a maximum for the amount of mineral feed a cow can receive per 24 hours. The number must be sufficiently high for the cow to eat approx. the double of the "Standard daily maximum allocation, gram", i.e. so that it can also eat of any accumulated amount in case the intake has been less the previous days.
- Accumulation, days (min. 1): Cows and other animals do not eat the same amount every day. By allowing to save a non-eaten amount over several days is ensures that the cow can get the desired amount of mineral feed and at the same time exhibit normal eating behaviour. It is recommended to allow accumulation for 3-7 days. 7 days can be a practical accumulation period in case you want to follow a weekly routine for filling and inspecting the feeders.
- Feeders for lactating / dry cows: The system detects the associated feeders and assigns them by default to Group 1. Feeders for Group 2 must be actively associated with these.
- System mode: Allows you to set the system in "Normal mode", "Auto mode" or "Calibration mode".
  a. The normal mode is used with a managed cow list, where the system knows the expected or actual calving date of the cows.
  b. In Auto mode, cows are automatically registered and listed when actively using the feeders. This is especially useful when all cows in the group shall have access to get extra supplements. Cows are automatically deleted from the list in case they have not been visiting any feeder for more than 14 days.
  c. Calibration mode is used when you have to set the number of grams per dose of a given supplementary feed, and otherwise when you want to check whether the feeders dose as expected.

System modes are explained in detail below.

Function when the *System Mode* is set to *Normal*

Dosing from a feeder to a given cow is subject to the following conditions:

1. The cow must have an electronic ear tag (or special collar-mounted transponder of FDX/HDX type) with a known ID string so that its identity can be registered by the feeder. The ID string consist (normally) of
   a) A 3-digit, numerical ISO country code according https://www.iso.org/iso-3166-country-codes.html (click 'Online Browsing Platform') with the code for the country the animal is born in.
   b) An underscore sign – ”_”.
   c) A 12-digit numerical code, of which the first two (2) indicated the type of livestock (two zeros means bovine), the next five (5) provide for the designator assigned to the herd, one (1) numeric character being a check digit and four (4) numbers to identify the animal[1].

   > Example of ID-string for an electronic ear tag for a cow from Great Britain:
   >
   > 826_009999909999

2. Pitstop^PLUS Manager settings:
   a. The cow must be registered in the list of cows under "Cow list".
   b. Its calving date must be within the number of days from calving according the entries under "Settings".
   c. "Allowance per 24 hours, gram" must under "Cow list" be a positive number.
   d. The cow must on beforehand have had fewer feedings within the last 24 hours than stated as "Max feedings per 24 hours" under "Settings".
   e. "Accumulated allowance, gram" under "Cow list" must be positive and greater than "Supplements, gram per visit" under "Settings". It is simply calculated as the difference between the possible and the actual intake during the accumulation period:

      ” Accumulated allowance, gram”

      =

      (”Accumulation, days (min. 1)” under ”Settings” (however, max distance in days from 1st day with access)

      x ” Allowance per 24 hours, gram” under ”Cow list”)

      ÷

      (”No. of visits in the accumulation period” under ”Cow list”

      x ”Supplements, gram per visits” under ”Settings”)

3. Additional pre-conditions are:
   a) The feeders must under settings be connected to the correct group.
   b) 10 seconds must have passed since another cow visited the feeder.
   c) 1 minute must have passed since last dosing to the same cow.
   d) The front flap must be open, i.e. the cow must have its head inside the feeder.

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[1] https://ec.europa.eu/food/animals/identification/bovine_en

Function when the *System Mode* is set to *Auto*

Dosing from a feeder to a given cow is subject to the following conditions:

1. The cow must have an electronic ear tag (or special collar-mounted transponder of FDX/HDX type) with a known ID string so that its identity can be registered by the feeder. The ID string consist (normally) of
   a. A 3-digit, numerical ISO country code according https://www.iso.org/iso-3166-country-codes.html (click 'Online Browsing Platform') with the code for the country the animal is born in.
   b. An underscore sign – ”_”.
   c. A 12-digit numerical code, of which the first two (2) indicated the type of livestock (two zeros means bovine), the next five (5) provide for the designator assigned to the herd, one (1) numeric character being a check digit and four (4) numbers to identify the animal[2].

      Example of ID-string for an electronic ear tag for a cow from Great Britain:

      826_009999909999

2. Pitstop^PLUS Manager settings:
   a. The system checks whether the cow is registered on the list of cows under "Cow list". If so, continue the procedure as if the system mode was set to Normal (see above). Otherwise proceed as follows:
   b. The cow is given a feeding, cf. "Gram supplements per dose" and "No of doses per feeding" under "Settings" for "Lactating cows" or "Dry cows".
   c. The cow is added to "Cow list" with its ID and default "Supplements, gram per visit", since the calving date is not known.
3. Additional pre-conditions are:
   a. The feeders must under settings be connected to the correct group.
   b. 10 seconds must have passed since another cow visited the feeder.
   c. 1 minute must have passed since last dosing to the same cow.
   d. The front flap must be open, i.e. the cow must have its head inside the feeder.

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[2] https://ec.europa.eu/food/animals/identification/bovine_en

Function when the System Mode is set to *Calibration*

Calibration is for ensuring the highest possible preciseness of the dosing and should be done in connection to the installation of the system and whenever you start using a new mineral feed. Calibration follows this procedure:

1. The system is set to calibration mode for each of the groups under "Settings" in Pitstop^{PLUS} Manager, choosing whether to calibrate feed A or B. Remember to click "Save settings" after the Calibration Mode is ticked.

   The calibration mode is specific to the selected cow group and dosing unit on all connected feeders.

   Calibration Mode has the effect that the normal functions for dosing of mineral feed (see below) are out of force and dosing of minerals is activated by any ear tag ID (electronic earmark), also for animals that are not listed under "Cow list". No dosing limitations applies in "Calibration mode". Note that, alike other settings in Pitstop^{PLUS} Manager, it may take up to 2 minutes before activation of Calibration Mode comes into force.

2. The concerned compartment of the Pitstop^{PLUS} feeder used for calibration is filled half in relation to a normal filling rate with mineral feed.
3. A suitable collection tray is weighed in empty condition, for example on a letter scale, and placed under the outlet of the dosing aggregate in question.
4. A random ear tag is placed near the front flap, which is pushed in / tilted to simulate a cow visit / feeding, after which a dosing occurs. Repeat this 5-10 times to get an accurate calibration.
5. Weigh the collection tray with the amount of mineral feed dispensed.
6. The weight of a dose is calculated as (all figures in gram):

$$Weight\ of\ a\ dose\ = \frac{End\ weight \div start\ weight\ of\ collection\ tray}{Number\ of\ dosings}$$

7. The weighing / calculated weight per dose is entered in the *"Gram supplement per dose"* field under *"Settings"* for *"Lactating cows"* or *"Dry cows"* in Pitstop^{PLUS} Manager for the mineral feed in question.
8. You should check that the calculated amount under "Supplement, gram per visit" under "Settings" in Pitstop^{PLUS} Manager corresponds to the desired, and optionally change "Number of doses per visit".
9. Finish by setting the system back to the usual "Normal" or "Auto" mode and press the *"Save changes"* button.

Please note that all cows have access to get mineral feed when the system is in "Calibration mode", also cows that otherwise does not have access.

Use of Pitstop^{PLUS}

Quarterly routine

It is suggested quarterly to update the cow list in case your system runs in Normal Mode for at least one group.

Cows can be registered at the "Cow list" as soon as their expected calving date is known. The system ensures they are not given supplements outside the periods you have decided according the "Settings".

Cows are automatically removed from the "Cow list" when they have passed the period, where you according the "Settings" give them access to get extra supplements from the feeders.

Weekly routine

It is recommended to inspect and refill the feeders once per week according to a fixed routine.

By refilling, do not fill in more minerals than the cows eat during a week, as the risk for clogging increase with the filling.

Daily routine

It is recommended on a daily basis to open Pitstop^{PLUS} Manager to check for observation cows and alarm cows, and to follow this up by a physical inspection of the cows in question.

In case a feeder say "Service needed!" or in case the consumption of mineral feed does not correspond to the number of feedings

For this, set the system in calibration mode and bring a random ear tag.

Simulate a feeding by pushing the front flap open with an electronic ear tag in your hand to activate a dosing. Check that the feeder actually doses mineral supplements as expected in Calibration Mode. Otherwise do the following:

1. Check that the mineral supplements run to the dosing aggregate. Loosen the remaining mineral supplements in the feeder if there is a need for that.
2. A dosing aggregate that is stalled and does not respond to the simulated feeding, should be cleaned or replaced. You can clean the tube in which the spiral auger is placed, using the cleaning stick situated under the top lid of the feeder. Cleaning can happen via the hole in the outer feeder wall. In severe cases, it may be necessary to lift up the entire innards with dosing aggregates from the feed funnel, possibly to replace the entire unit.

Necessary cleaning

Usually, cleaning of the feeders is not necessary.

If dusty types of supplementary feed are used and, if the humidity is high, accumulations can build up on the walls inside the feeders, on the part outside the reach of cow tongues. If the proportion of organic constituents in the supplementary feed is high, such accumulations can mould and form toxins. In such cases, the feeders should be kept clean so that there is no risk of the cows being poisoned.

Frequently asked questions

What happens if the internet connection is lost?

- When the Internet connection is lost, the system continues to operate autonomously on the basis of communication between the feeders and the master unit. After restoring the Internet connection, synchronization with the "cloud" resumes so that the system can again be controlled and monitored via PitstopPLUS Manager.
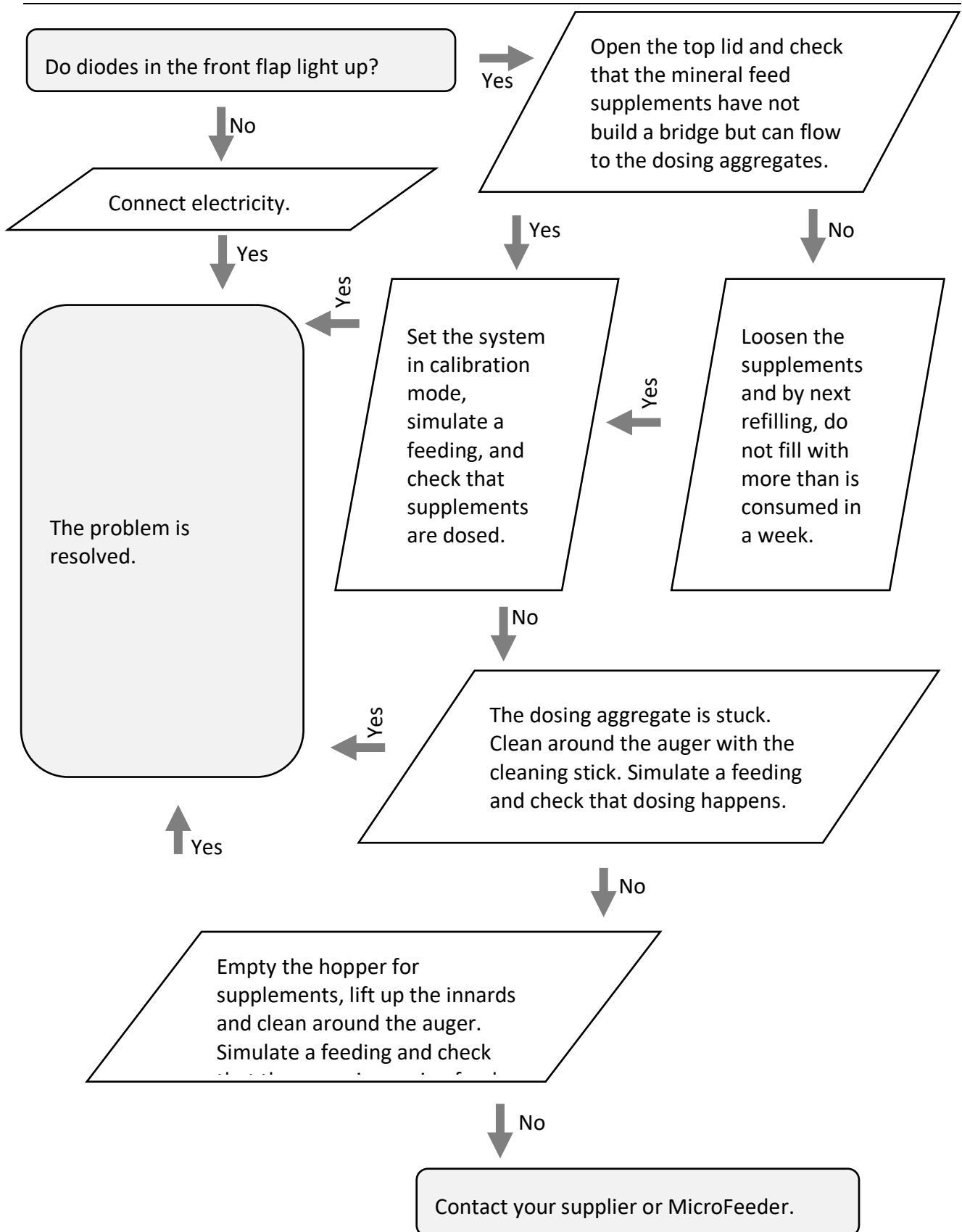
Why is the number of feedings per day low?

Under normal circumstances, the number of feedings will correspond to the cows eating at least 70% of the supplements amount they are offered.

- One reason may be that the mineral feed is hygroscopic and clumps together, or that the mineral feed does not have a sufficiently good taste. You can stimulate the use of the feeders by opening them daily and loosening the minerals in them, as well as by reducing the amount of minerals you fill in the feeders at a time. The optimal is to switch to mineral feed that flows easily and has a good taste.
- The feeders must be located where there is the most cow traffic in the stable, and the location must allow cows that are socially low ranked to dare to visit the feeders. Feeders located in dark corners of the barn have low utilization.

Troubleshooting

No dosing happens from a feeder

Do diodes in the front flap light up?

→ Yes

↓ No

Open the top lid and check that the mineral feed supplements have not build a bridge but can flow to the dosing aggregates.

Connect electricity.

↓ Yes

↓ Yes

↓ No

Set the system in calibration mode, simulate a feeding, and check that supplements are dosed.

← Yes

Loosen the supplements and by next refilling, do not fill with more than is consumed in a week.

← Yes

The problem is resolved.

↓ No

The dosing aggregate is stuck. Clean around the auger with the cleaning stick. Simulate a feeding and check that dosing happens.

← Yes

↑ Yes

↓ No

Empty the hopper for supplements, lift up the innards and clean around the auger. Simulate a feeding and check

↓ No

Contact your supplier or MicroFeeder.

microfeeder.com · +45 6141 5441 · iusr@microfeeder.com