

## Water Min Max and MMR

Max = Highest water used in any interval per day as % of total

Min = Lowest water used in any interval per day as % of total

MMR = Min/Max per day as %

Interval = Logging interval typ 15 minutes

96 logging intervals per day so one logging interval = 1.04%

E.g.

For equally spread use Max = 1.04% Min = 1.04% and MMR = 100%

For all use in one 15 minute interval max = 100% Min = 0% MMR = 0%

<b>Good</b>		
<b>Factor</b>	<b>Status</b>	<b>Possible Reasons</b>
<b>Max</b>	High	Pigs are synchronised and can express this
<b>Min</b>	0 / V Low	No leakage. No competition.
<b>MMR</b>	0 / V Low	Because Min is low
<b>Bad</b>		
<b>Max</b>	Low	Intake suppressed. Pigs unable to drink through competition. Disturbed group behaviour.
<b>Min</b>	High	Leakage. Competition. Disturbed group.
<b>MMR</b>	High	Combination of Max Low and Min High

### Notes

Early analysis suggests that for typical situations Max is a constant. The daily volume increases but the maximum is the same percentage of the total, so the pattern remains approximately the same.

The higher the Max (as % total daily volume), the more the group is synchronised (wants to do the same thing at the same time) and the more they are able to express it (i.e. water supply is not limiting).

The lower the Min, the more it can be said that there is a time in the day when all the pigs are at rest and neither need nor want to drink. Min should always be expected to be zero.

MMR simply relates one to the other in a simple way. Low MMR means there is a large variation throughout the day. High MMR means there is less variation. Max may be low, or Min may be high.

The average intake over the day is 1.04% (i.e. total divided by 96 logging intervals). So you can consider Max as being relative to the average for the day. High max means they are much more likely to drink at one time than another. Max nearer 1 means they are not much more likely to drink at one time than another.

Logging Technical Note : Data Errors : Water monitoring uses an electronic counter to count up pulses from the water meter. The counter rolls over to zero at a certain value (in fact  $2^{15}$ , but here we will assume 1000). The counter reading is recorded at logging intervals. Data processing works out successive differences, and has to take account of rollovers. E.g. if one reading is 999 and the next is 1, it assumes a rollover at 1000 and therefore gives a value of 2. If the counter is reset to zero for any reason (e.g. program restart), it cannot detect it, and so it may give a high value. E.g. If a reading is 900 and the next is 1, it calculates 101, due to rollover, meaning a data error - a large apparent max value for that day, meaning an incorrect value for max% and MMR. Some systems encounter large actual increments, so it is not practical to filter such data errors from raw data, though techniques could be applied in post processing.

## WMMR General Comments

- 1 This is an idea for a technique which I think may be useful. I've tried a few (see examples) and the ones I've thought would give unusual results, do so, in the way I'd expect.
- 2 A useful aspect is that - for any particular site over a period, Max % comes out as a relatively consistent - i.e. it doesn't vary much from day to day. Hence, I'm assuming that it is some kind of characteristic of the normal water pattern in that particular room.
- 3 Though not a complete way to define a water pattern, it is simple and easy to do with a spreadsheet and fairly easy to understand. Frequency distribution would be a more complete solution, but would require an interface to the raw data values, and I suspect the numbers would be harder to understand.
- 4 At present, it means extracting the data and doing it with a spreadsheet. Automating the function in Barn Report - perhaps in a "Pro" version is possible at a later date. Depends whether it's worthwhile (as opposed to merely academically interesting). For the time being, it's accessible for anyone who wants to do it using a spreadsheet. Barn Report Pro would probably offer such facilities as data filtering at the raw data level (which would help remove the data error anomalies).
- 5 WaterMax and WaterMin report columns have to be added to BR report pages (on request).
- 6 Research would be needed to find out what normal values are - or more to the point - what they should be. However, here follows a discussion and suggestions of what I think are likely :
- 7 If all pigs were completely synchronised (doing exactly the same thing at the same time), then the Max value would indicate just how much each pig drinks at any one time (as a percentage of their total daily intake).
- 8 General indications are that older pigs tend to take a few large drinks a day, while younger pigs take more but smaller drinks. Hence, we should expect the Max % to be marginally lower for smaller pigs. Hence, we should expect the Max value to creep up, in a growing situation and it seems to be the case in the examples studied.
- 9 Max 4 to 6% indicates a strongly synchronised group, with non limiting water availability. I believe this is the target to aim for.
- 10 Max 3% or so means a broader range of intake times - more weakly synchronised, and perhaps limited - limited drinker availability or inhibited by high temperatures during the day.
- 11 Max 2% or less is of real concern. It says that drinking is spread over a large part of the day, which doesn't appear to be a natural condition.
- 12 Min should always be 0% or very low. If it's not, then you would hope it is just leakage. It may seem odd to say you hope you've got leakage. But this merely means slightly extra utility costs, because the alternative reasons are all so much worse.
- 13 If it's leakage, you'd expect the Min value to have steps and bumps (as in surely the guy notices and fixes leaks now and then).
- 14 As well as values, look for trends. An occasional value may not mean too much - though, remember, counter resets will mostly result in a higher value, not a lower one. You may also get total data losses for a day or more.
- 15 A gradual trend in one direction or another most likely means it's "real" rather than a measurement aberration. For example, a gradual drift upwards in Min may mean gradually increasing leakage, but is more likely to mean a progressive change because of the pigs growing.

## How To

- 1 In BR, find the area of data you want to look at by looking at water in the charts page.
- 2 Check the report page is set up for WaterMax and WaterMin. (If not, ask for a change in site processing configuration.)
- 3 Use AirSpace : Define Batch to set up the period to be studied. Hint : If a batch period has already been defined, but the batch does not show values in the Watermax and WaterMin columns, right click on the batch and choose Update.
- 4 Defining a batch creates a text file containing the daily values of all the parameters, and shows it as an extra row on the report page, with the starting date. If BR doesn't show the batch you just created, select Airspace, uncheck Show Batches and the check it again.
- 5 Open your spreadsheet and then open/import the file you just created - which is (usually) located in \BrLogging\Sitename\batches\xxxxxx.bch - as a text or csv file.
- 6 The filename has the form [RoomRoot]xxxxx.bch. RoomRoot is something like U11 (meaning Unit 11 on the network) and xxxxx is the start date in serial format. E.g. 36179 means 1<sup>st</sup> Jan 1999. The easiest thing to do is just to open most recently created .bch file in the folder.
- 7 You may have to play around with the import conversion in your spreadsheet to get the figures into columns. (Hint : Lotus 1-2-3 does it automatically. Excel can do it, but I find it much harder.) Good idea to save the file (with your choice of name) at this point.
- 8 You'll then have many columns showing a value for each day for each of the report columns in BR. You may as well delete all except dates, Water, WaterMin and WaterMax. Create new columns (and the necessary formulae) to give you WaterMin/Water (Min) and WaterMax/Water (Max) and WaterMin/WaterMax (MMR) - show them as % and just stick them in a chart. You may need to use a different scale for MMR.
- 9 You will probably find some areas you want to see in detail. Go back to BR and select the batch you created for a charts view. (It may not show the whole period, depending how long the batch is.) Since this can display all the individual values, you can get a better assessment of factors such as leakage, etc.