Case Study : Nursery : Successive Batches (Farm ref esc)

This case study concerns the feed and water intake in three successive batches of pigs in a single room of a nursery unit in Midwest US. The room holds about 1000 pigs, which are housed for about 54 days.

Batch	Start Date	Ext Mean daily temp	Min Room Temp	Mean Room Temp	Max Room Temp	Water Mean daily intake/pig	Pigs
Batch 1	2001-02-28	39.1ºF	71.3ºF	73.7ºF	76.3ºF	0.65	1005
Batch 2	2001-04-25	64.8ºF	75.9ºF	79.4ºF	83.0ºF	0.53	996
Batch 3	2001-07-05	75.9ºF	77.5ºF	82ºF	87.8ºF	1.02	1187

Batch 1, being during cold weather outside, runs relatively close to target temperature (this is lowered progressively over the growing period, with a mean value of 76.2ºF).
Batches 2 and 3 were during much warmer weather - Batch experienced periods of high outside temperatures, whilst Batch 3 had higher and more sustained high temperatures.

It is noted that water intake in Batch 3 is much higher. This suggests a connection with ambient temperature, though if it were simply a temperature effect, one would expect Batch 2 to be somewhere in between, which it is not.

Water is measured with a single meter for the entire room, but feed is provided by a number of individual augers, which each appear to run for only a few minutes each a day (only up to about 15). It's not clear why the feed system is designed like this. However, it's noted that the running times for individual augers is extremely similar, which suggests that the building is evenly stocked.

The short daily running times means that daily feed measurement is somewhat inconsistent. In the subsequent analysis, running times from all the augers has been added together, and is shown as a daily total and a 5 day rolling average. (The data suggests that the rolling average is a reasonable representation of actual feed intake.) Please note that the rolling average representation may result in a dip at the end of the trace which is not real.

In many cases, there are prolonged gaps in the feed trace - lasting several days. It's not at all clear whether these are due to a simple lack of demand (there being enough in the hopper) or whether there is a policy of allowing the hoppers to empty when changing the feed ration.

Note : The data covers pigs in the same room over approximately the same growth period, so some there may be some timing errors when comparing one batch with another.

Batch 1
This represents the kind of trace one might expect - an apparently steady trace from one end to the other.
Note that room temperature drifts from running slightly below set - cold outside, small pigs, heating required - to slightly above set - milder outside, bigger pigs, heat surplus.
However, note the negative feed and water traces, particularly at from Day 15 and Day 30 - these correspond to gaps in the feed trace (suggesting emptying hoppers to change feed).

Batch 2
By comparison with Batch 1, it appears somewhat undesirable. Whilst initially similar to Batch 1, it never appears to properly recover from the downturn around Day 15. Feed goes down and becomes very patchy, water flattens off. There is a period around days 37-42 when the augers do not operate at all.
Although water rises at the end to a similar value to Batch 1, this may be due to the rise in temperatures at that time.

Batch 3
Feed is broadly more similar to Batch 1, though the total area under the curve (i.e. total feed) is lower. Water is very much higher, but seems to be largely due to temperature - around 40-45, when temperatures return to more normal values, water intakes become more similar to the corresponding values in Batch 1.

(It is conceivable that there are sprinklers which have been, inappropriately, connected through the water, though logging does not suggest this, and the control specification does not appear to include sprinkler control.)

The final trace (from Barn Report) shows a small section in detail near the end of Batch 2. Note that on the hottest day, water intake is much higher, and the depression effect is greater on the subsequent day - not only a daily reduction, but an acute dip in the middle of the day. This middle of the depression, once encountered, remains thereafter.

Summary & Conclusions

There appear to be significant differences in outcomes for these three batches of pigs (judged in the absence of outcome data).

In this case, water intake appears to be strongly influenced by daily maximum temperature - at higher temperatures, the pigs increase intake significantly but it has an effect on subsequent eating and drinking patterns.

Significant changes in feed intake occur at what appears to be a change in feed ration. Feed intake changes are difficult to track in systems with inconsistent daily operation, or where hoppers are allowed to run out. However, daily water intake changes appear to be a useful guide (though changes for other reasons must be taken into account), and a 3 to 5 day rolling average appears to be sound.

If these changes are due to ration changes, the comparisons suggest a significant challenge to the pig at these times. For example, the change around Day 30-35 for Batch 2 - from which they never properly recovered.

The feed intake downturn may be due to other factors - such as disease outbreak - but equally, a disease outbreak could be due to the challenge presented by the change in feed.

There is evidence to support the view that changes in ration have a much greater effect on pig feed intake than the marginal change in formulation suggests. Studying such effects has only become viable now that Barn Report is available. (Feed trial data - on which formulations are based - may have some inherent flaws in so far as the effects of dynamic changes are unlikely to be revealed).

"Running out the hoppers" may well be undesirable in itself and be part of the effect, but consideration should be given to (trialing at least) blending from one ration to another instead of step changes. A simple but accurate and low cost blending system (using an intermediate hopper, but without mixing equipment) has been previously developed by Farmex (for another application).

Batch 1
Feed secs — Water galls — Days
W-pig — Daily Feed — 5 day avg

Batch 2
Feed secs — Water galls — Days
W-pig — Fd-Pig — 5 day avg

Batch 3
Feed secs — Water galls — Days
W-pig — Fd-Pig — 5 day avg

Temperatures Batch 1

| Ext | Mean | Max | Set |
| Min | | | |

Temperatures Batch 2

| Min | Max | Set | Set |
| Mean | | | |

Temperatures Batch 3

| Ext | Mean | Max | Set |
| Min | | | |