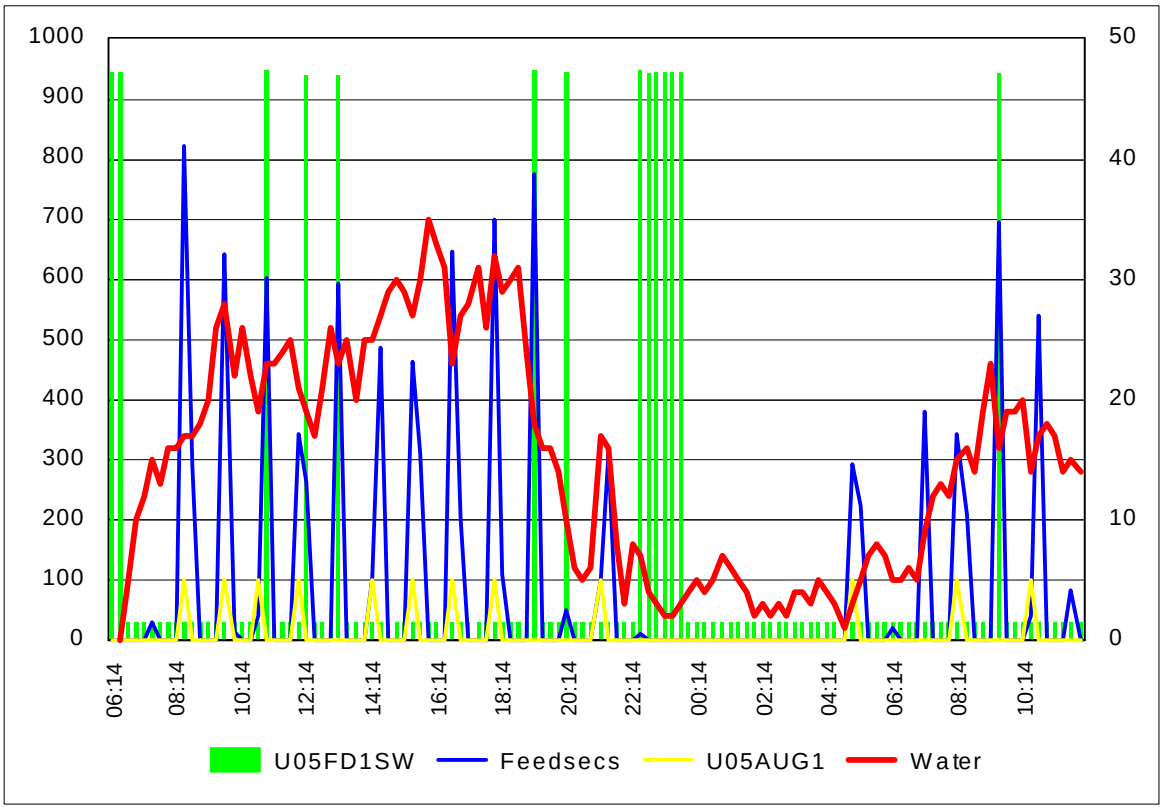
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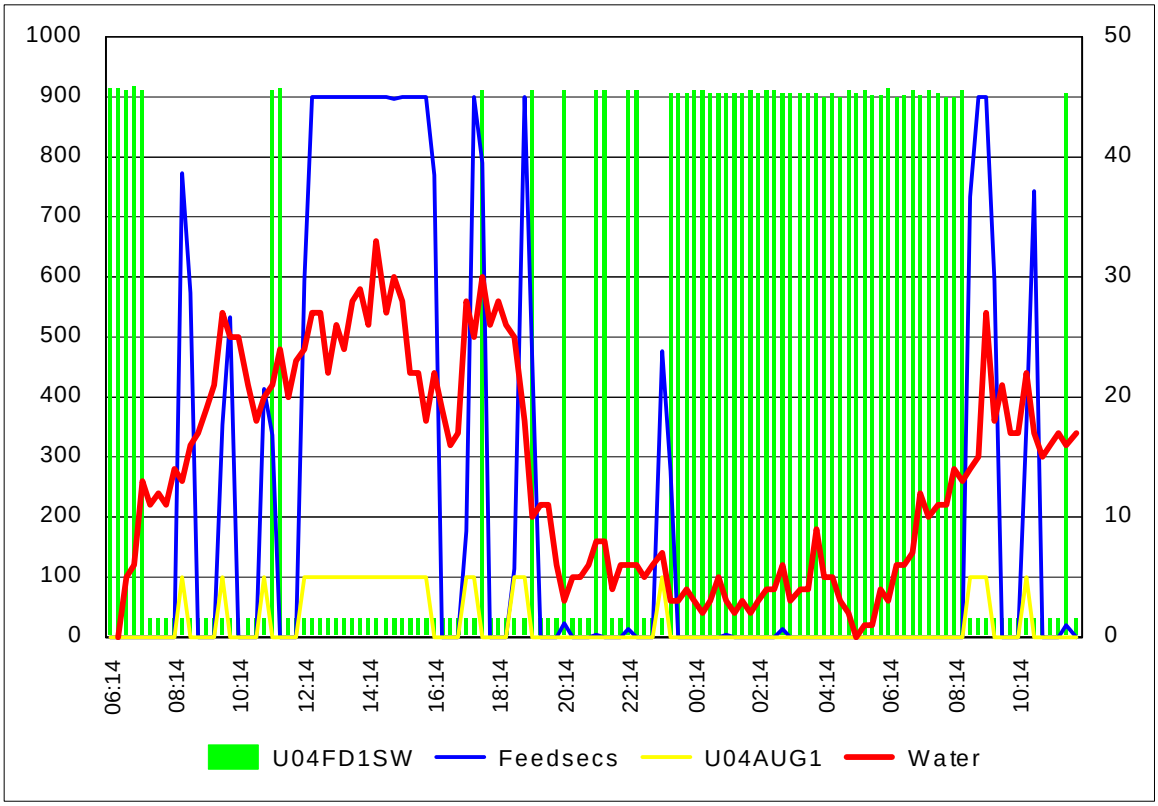
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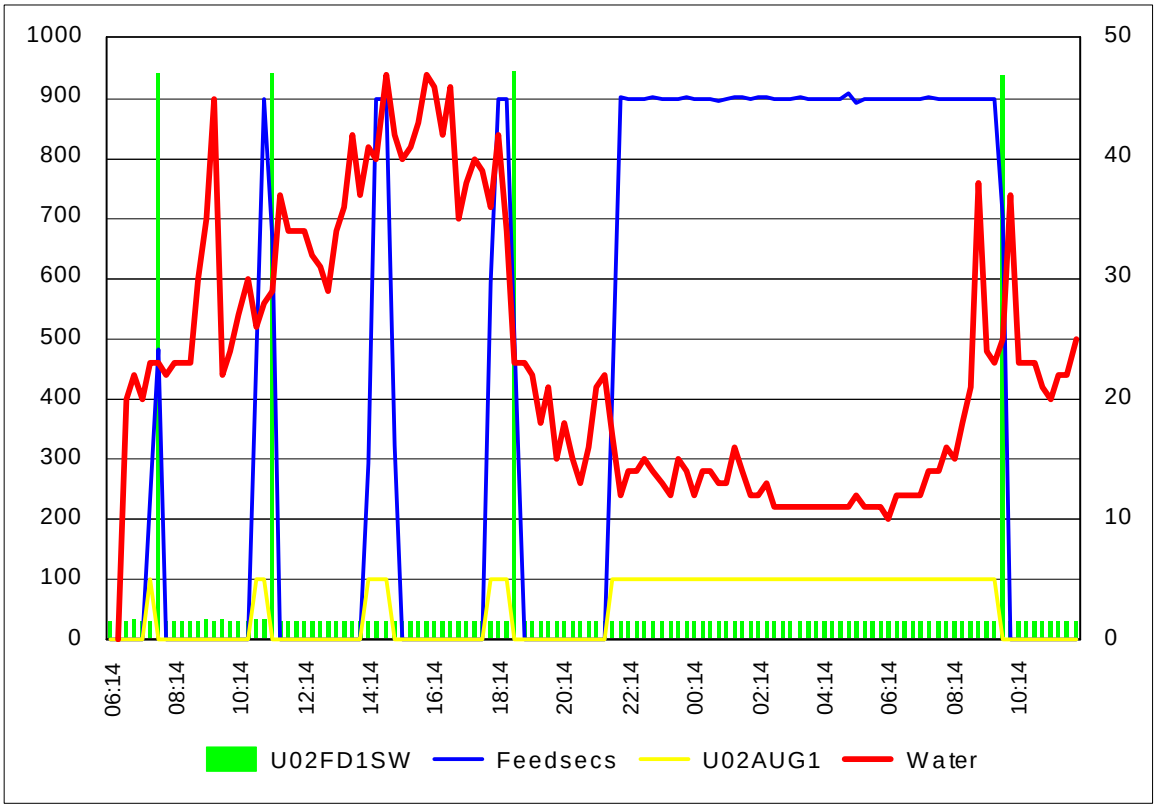
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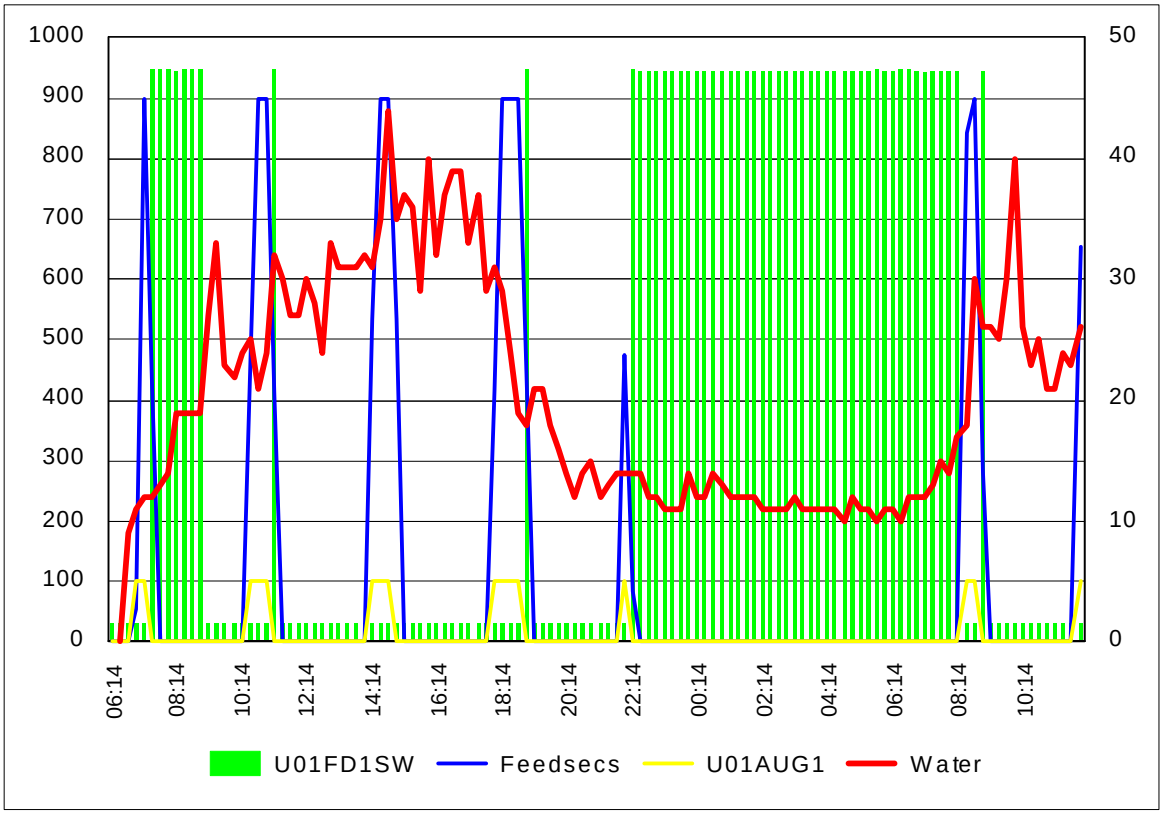
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Feedsecs
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Feed Control and Alarm Case Study

4 Barns of about 1000 head finishing pigs.

Key to Charts :

FeedSw = Status of feed level switch
Low value = switch not triggered i.e. hopper not full
High value = switch triggered i.e. hopper full

FeedSecs = number of seconds of auger operation in each 15 minute period
Value of 900 = auger ran continuously throughout the 15 minute period.

Aug1 = Auger switch status
0 = Off; 100 = On

Water = water used in each 15 minute period (right hand scale)

Study charts by reference to the first Chart (U05) which appears to represent what one would expect to see.

U05 Chart

Water intake (a good guide to general level of activity and feed water intake) shows a normal trace.
During the day (main period of consumption) it can be seen that the feed auger run times are reasonably related to the water trace - the more water, the more feed.
Auger run times are around 5 to 10 minutes on each occasion (300 to 600 seconds).
Control is such that once the level switch is triggered (goes high), the auger stops and auger operation is "locked out" for a certain period - in this case, around an hour.
However, note that the switch is triggered only briefly - in many cases, so briefly that it does not even show as going high. (Logging records the status on a 15 minute sampled basis, so it only shows high if it is high at the 15 minute interval. Therefore, one has to assume it was high at least temporarily, to stop the auger.)
The fact that it goes low again so quickly implies that there is little or no hysteresis in the level switching mechanism. (Indeed, it may not be a level at all, but pressure within the auger system.)
During the night (from around 23:00 to 05:00), the auger system is locked out altogether.
The level switch indicates full for an hour or so. When auger operation is enabled again, it runs for only 5 minutes, indicating that very little feed was eaten during the night.
Note that auger runs tend to precede a localised peak in water consumption. It could be that the running of auger stimulates the pigs to eat, or that some of the in-pen hoppers may have become empty.
Clearly, sundown is around 18:00 - water intake drops away suddenly. Although feed continues to be available until about 11pm, there is

U04 Chart

Note the feed auger over-run from around 12:00 to 16:00. The auger was powered continuously during this time. (Or at least, the mains detection circuit was. It is conceivable that an overload trip has triggered.) The most likely reason for this situation is that the bin has bridged, or else it is empty.
(Although an alarm appears to have been given, there appears to have been no response to it, or at least, no effective action taken.)
Note that there is a reduction in water intake in the afternoon (not due to high temperature inhibition, as no other building is similarly affected). It's a reasonable guess that feed actually ran out in-pen (or in some pens) at about 14:30 (i.e. about 2 hours after the feed system failed to deliver feed) - where the water intake begins to fall away.
Water and Feed intake recover when the feed system is fixed, but there is still a net loss.

Net water intake appears to be down by 8.3% in the day. Making allowance for the feed auger registering (but presumably not delivering feed) feed usage is down by between 8 and 15% (depending on the estimate of non-delivery).
Using the "Maintenance Multiplier Principle" this represents an actual loss of growth in the following ranges -

	Normal X Maintenance Intake		
Loss of Intake	1.5	2	2.5
8%	24.0%	16.0%	13.3%
12%	36.0%	24.0%	20.0%
15%	45.0%	30.0%	25.0%
	Loss of Growth		

That is, somewhere between 13 and 45% loss of daily growth - a significant loss, given that the auger system was only out of action for a few hours, and was fixed well before sundown.
The following table translates these into notional economic values, taking into account feed cost only.

Feed cost/ton	£120			
No of pigs	1000			
		Daily Intake (kg)		
Loss of growth	x Maint	2	2.5	3
13%	2.5	£6.40	£8.00	£9.60
24%	2	£14.40	£18.00	£21.60
45%	1.5	£36.00	£45.00	£54.00

[US$ Values : Approximately 1 to 8 cents per pig.]
[The Maintenance Multiplier Principle means that loss of growth is greater than loss of feed intake, since food for maintenance is needed before any growth can occur. The effect is in proportion to how much the animal would normally eat, relative to that needed for maintenance. E.g. If an animal normally eats twice the maintenance requirement, then half is used for growth. If, on a particular day, it eats 25% less than normal - i.e. only 50% greater than maintenance, growth is reduced by 50%.
Feed cost value is based on the increased cost of the growth since maintenance ration becomes a higher proportion of the total consumed.]

U01 and U02 Charts

The feed system is set up slightly differently, such that once it has run, the auger is "locked out" for 3 hours, so the auger runs less frequently, and for longer.
Most notable in these charts are that water consumption remains at a much higher level during the night - as well as being higher during the day - than the other two buildings.
This implies that there is a background leakage of around 0.9 gpm in both buildings. If, so this would amount to about 6 tons of extra slurry per day per building.
If this situation persists, it will amount to additional costs of around £300 per month ($440).
A fault has developed in U02, such that the auger runs (or appears to run) all night. Although an alarm condition has been detected, it seems that corrective action was not taken until about 10am the following day.

Discussion, Summary and Conclusions

This is the very first period of logging data on this site, covering only a day and a half, and reveals problems from the outset with poor reliability in the apparently simple tasks of delivering feed and water to the pigs.

Most producers would be satisfied with the fact that the feed outage (in U04) was "spotted in time". On the ground observation would indicate that the pigs then ate their fill, and so there was nothing to worry about. The data suggests that there was a net loss. Not so great as to break the bank, and certainly not so much as to cause pig losses, nor even great discomfort, but a loss nevertheless.

Such problems are by no means atypical of pig production sites. (The only thing which is atypical about this period and site is that the data has been analysed more closely.)

An important aspect of the data is that it shows that even relatively brief periods of feed outage can have an impact on economic performance, depending on when they occur. The most crucial time is during the middle to end of the day, when most feed is consumed.

Alarms clearly have an important potential role to play. Many producers and stockmen are extremely reluctant to use alarms - not least through fears of being "dragged needlessly from their beds". Of those who do use alarms, there is a tendency to regard them as being necessary during the night.
Curiously enough, feed alarms (and feed control via Dicam) do not alarm during the night if correctly configured - when feed supply is in any case less crucial.
The crucial time for feed alarms is during the day when many, perhaps most, producers may imagine that normal stockmanship observation might suffice.