Managing all-in/all-out - Pig Flow

Sit with the owner, manager and farm staff to discuss farm records and areas of problems. Discuss the farm’s pig flow and pig flow model and how closely the farm is currently following the model. On new newly visited farms this may be a primary focus. Without an agreed pig flow model the farm will have variable pig production.

When managing the health of pigs there is only one piece of magic that veterinarian’s have in their tool box, that is all-in/all-out. The break provided by removing the animals, their faeces and fixing the building is essential to maximizing the health and well-being of the stock and managing their clinical diseases. All-in/all-out is more difficult than most farmers really realize and is impossible, (without cheating on the piglet’s age or having variability in numbers), without a well designed and implemented pig flow model.

There are two major misconceptions in pig farming, ① that all records are accurate and ② that averages are OK. There are only two records that can be trusted on a pig farm —

a). The kg of pig meat paid for by the slaughterhouse (customer) and
b). The size of the farm — either number of farrowing places, sq meters of finishing floor, number of drinkers etc.

Farms should not be compared by global output figures such as pigs per sow per year because they are largely meaningless. The farms producing the most pigs per sow per year are not necessarily the most profitable nor has the best cost structure or perhaps is the most welfare satisfactory. The annual kg of pig meat paid for is a vital number to obtain from the farm, (although generally more difficult than would be expected), as it provides an endpoint to setting targets. For example 100 pigs can be marketed at 114 kg live weight but if 7 are condemned; you will be short of 560 kg of pig meat paid for (assuming 80 kg deadweight carcase) but you still achieved your 26 pigs sold per sow per year.

Likewise the size of the farm is a truth, because as an advisor it is easily measured and verified.
Measuring the size of the farm

Using a tape measure

Using an ultrasound distance measure

While ‘pig flow’ is discussed by the farming community, the discussion concentrates on maximizing the output, not considering the whole farm’s efficiency. Examination of over 60 farms in the last 5 years would indicate farmers have no real idea how to achieve a consistent flow of pigs through their facilities. Farms generally farm by today’s events and make do, rather than following any specific farm plan – “I mated her because she was in heat” can cause chaos to the pig flow.

The rule of pig flow should be:

**Plan your farm** and then

**Farm you plan**

As the basis of any farm health management visit, the veterinarian or advisor should initially discuss the farm’s output plan

In brief a pig flow model considers what would be the likely output target for a unit and is composed of four major areas:

<table>
<thead>
<tr>
<th>Gilt pool</th>
<th>Bred</th>
<th>Farrow</th>
<th>Finished kg</th>
</tr>
</thead>
<tbody>
<tr>
<td>95 kg to service</td>
<td>17 weeks</td>
<td>x weeks</td>
<td></td>
</tr>
<tr>
<td>Females a batch to serve</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sows a batch to farrow</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>kg to wean per batch</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>kg a batch to sell</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>kg paid for annually</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>pigs sold annually</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

With specific records of:

Each of these areas needs to be in balance with each other to allow for the flow to occur. For example a farm farrowing 10 sows a week (about a 250 sow unit) would have an idealized pig flow model as described below
Pig flow model for a 10 sows a batch to farrow farm:

With specific records of:

- Gilt pool 95 kg to service: 12-15
- Females a batch to serve: 12
- Sows a batch to farrow: 10
- Kg to wean per batch: 800
- Kg a batch to sell: 7600
- Kg paid for annually: 395200
- Pigs sold annually: 4940

There are some targets that have to be met:
- The farm weans a weekly batch;
- The ninety percentile farrowing rate is 82% (the farrowing rate is over 82% ninety percent of the time);
- 10 piglets weaned per crate with an average weight of 8 kg at 24 days of age;
- A 5% post-weaning mortality, therefore 95 pigs at 80 kg dead weight are paid for each batch (week).
- The gilts are given 10 weeks introduction to allow for adequate compliance with biosecurity arrangements.
- In addition to take finishing pigs to 80 kg dead weight, requires 26-27 weeks.

When planning a pig flow model the basic parameters to use are the unobstructed pig space. It would be most satisfactory to start at the finishing barn, the reality is that the farrowing house is a useful fulcrum from which to build a pig flow discussion.
Setting up a pig flow model

The following questions could be used to start the pig flow investigation:
How many farrowing places are there?
How many rooms are there?
How many places are there in each room?

A simple example using 24 day weaning – 5 week turn round for the room
A simple example would be:
How many farrowing places are there? 125
How many rooms are there? 9
How many places are there in each room? 5 rooms of 15, 5 rooms of 10 and one room of 25

Layout of the farrowing rooms:

```
15 15 15 15 15 10 10 10 10 25
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Normally it is concerning that the number of rooms is not divisible by 5 as this may indicate all-in/all-out is impossible. However, in this case; the pig flow model would easily work with an output of 25 sows farrowing per week. To achieve all-in/all-out and no variability in output per week the rooms are organized into groupings of:

Batching of rooms to achieve all-in/all-out:

```
15+10 15+10 15+10 15+10 25
```

The pig flow model would be (taking similar target parameters as before)

<table>
<thead>
<tr>
<th>Gilts</th>
<th>Bred</th>
<th>Farrow</th>
<th>Finished kg</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>31</td>
<td>25</td>
<td>19040</td>
</tr>
</tbody>
</table>

With specific records of:

- Gilt pool 95 kg to service 35-45
- Females a batch to serve 31
- Sows a batch to farrow 25
- Kg to wean per batch 2000 (10 piglets x 8kg x 25 crates)
- Kg a batch to sell 19040 (95% of 250 x 80kg dead weight)
- Kg paid for annually 990080
- Pigs sold annually 12376
A slightly more complex example:
An example using 24 day weaning + 5 week turn round for the room
A simple example would be:
How many farrowing places are there? 69
How many rooms are there? 7
How many places are there in each room? 2 rooms of 12, three rooms 6 and rooms of 8 and 9.

This is more typical of a family farm which grows and adds rooms and facilities. Again, there is great concern about the lack of multiples of 5 farrowing rooms for a 5 week rotation (24 days weaning), the distribution is chaotic.

Layout of the rooms: 8 9 12 6 6 6 12

The potential output target for the farrowing area would be 11.75 crates per week, with 10 weaned this is 118 per week? While such figures are presented in various texts, this is clearly nonsense as pigs are whole animals. Eleven crates a week would underutilize the rooms of 12 but be in great excess to the other three rooms.

The answer reached by the farm health team was:
To add an extra place to the room of 9 and divide the room of 8 into a 2 and a 6 using a plywood wall. This allowed 5 rooms of 12.

Batching of rooms to achieve all-in/all-out: 6 + 6 2 + 9 + 1 [new] 6 + 6 12 12

The farm now had all-in/all-out and a consistent flow.

The new pig flow model now looks like:

<table>
<thead>
<tr>
<th>Gilts</th>
<th>Bred</th>
<th>Farrow</th>
<th>Finished kg</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>15</td>
<td>12</td>
<td>9120</td>
</tr>
</tbody>
</table>

10 weeks 17 weeks 26 weeks

With specific records of:

- Gilt pool 95 kg to service 15-20
- Females a batch to serve 15
- Sows a batch to farrow 12
- Kg to wean per batch 960 (10 piglets x 8kg x 12 crates)
- Kg a batch to sell 9120 (95% of 120 x 80kg dead weight)
- Kg paid for annually 474240
- Pigs sold annually 5928

This farm had never weaned over 9.6 and now weans 10-10.2 pigs per farrowing place and weaning weights have improved from 6.5 to 7.5 kg per pig at 24 days of age. Pre-weaning -
diarrhoea plagued the farm before the changes and is now a rare event. Pre-weaning diarrhoea now mainly associated with poor door management and chilling.

Managing the pig flow, gilt pool, breeding numbers and the finishing floor

The farrowing house is generally the start of the calculation process; however, the ultimate output is determined by the finishing floor space. Historically this has been strictly true only in the broad sense. In reality the finishing floor has little impact, as farmers have forced whatever the output is onto and out off the finishing floor (eventually).

This can be illustrated using one classic example, 15 sows a week to farrow client phoned the practice concerned with a sharp increase in pneumonia and death in his finishing herd. The farm had recently moved from Large white cross to Meishan cross pigs. The sow output had increased from 9 (LWX) to 11.5 (MeiX) weaned per farrowing place. Therefore, while the farm worked with minimal pneumonic problems at 135 pigs per finishing room per week, the building/pig combination completely failed when 172 pigs (a 30% increase) were crammed into the rooms each week. It was not surprising that mycoplasma pneumonia and death exploded in the rooms. The farmer actually questioned whether the Meishan was more susceptible to pneumonia. The pigs did not get any more pneumonia (actually less) than the Large white cross finishing pigs when appropriately stocked.

With the trend towards recommended stocking rates table 3, the drive towards a controlled pig flow model to comply with slaughterhouse management requirements will be essential.

Table 3
Recommended US and Legal EU Stocking rate regulations

<table>
<thead>
<tr>
<th>EU Legislation 91/630</th>
<th>Swine Care Manual (NPB 2003)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average Weight of pig</td>
<td>Weight of pig</td>
</tr>
<tr>
<td>kg</td>
<td>lbs</td>
</tr>
<tr>
<td>≤10 kg</td>
<td>0.15</td>
</tr>
<tr>
<td>≤20 kg</td>
<td>0.20</td>
</tr>
<tr>
<td>≤30 kg</td>
<td>0.30</td>
</tr>
<tr>
<td>≤50 kg</td>
<td>0.40</td>
</tr>
<tr>
<td>≤85 kg</td>
<td>0.55</td>
</tr>
<tr>
<td>&gt;110 kg</td>
<td>1.00</td>
</tr>
</tbody>
</table>

1 kg = 2.2 lbs
1 m^2 = 10.76sq feet
1 lb = 0.454 kg
1 sq foot = 0.0929 m^2

For example, if the total finishing herd space for pigs from 30kg to slaughter (114kg) is 1038.7 m^2 to comply with the EU legislation 91/630 for fan ventilated fully slatted floors 0.65 m^2 should be provided for each pig when the average weight is between 85 and 110 kg, there is only room for 1598 finishing pigs on the farm. To finalize the computation, if there is a 17 week growth requirement from 30 kg to 114 kg (pig flow cannot accommodate summer and winter variations), 94 pigs per week can be marketed, with a 5% loss, 99 pigs a week will be weaned, therefore, a minimum of 10-11 sows a week will be required to farrow.
It is essential to ensure that the pigs are marketed to keep the group’s average weight of below 110 kg, otherwise a severe space penalty is legally required (from 0.65 to 1 m²).

The farm’s breeding records are summarized in table 4

**Table 4. Summary of sixteen weeks worth of breeding records with results**

<table>
<thead>
<tr>
<th>Week</th>
<th>Number bred</th>
<th>Number farrowed</th>
<th>Number weaned</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>16</td>
<td>14</td>
<td>139</td>
</tr>
<tr>
<td>2</td>
<td>12</td>
<td>10</td>
<td>100</td>
</tr>
<tr>
<td>3</td>
<td>9</td>
<td>7</td>
<td>69</td>
</tr>
<tr>
<td>4</td>
<td>10</td>
<td>9</td>
<td>93</td>
</tr>
<tr>
<td>5</td>
<td>11</td>
<td>9</td>
<td>91</td>
</tr>
<tr>
<td>6</td>
<td>8</td>
<td>6</td>
<td>59</td>
</tr>
<tr>
<td>7</td>
<td>15</td>
<td>13</td>
<td>130</td>
</tr>
<tr>
<td>8</td>
<td>12</td>
<td>10</td>
<td>101</td>
</tr>
<tr>
<td>9</td>
<td>14</td>
<td>12</td>
<td>118</td>
</tr>
<tr>
<td>10</td>
<td>9</td>
<td>7</td>
<td>69</td>
</tr>
<tr>
<td>11</td>
<td>16</td>
<td>14</td>
<td>140</td>
</tr>
<tr>
<td>12</td>
<td>12</td>
<td>10</td>
<td>102</td>
</tr>
<tr>
<td>13</td>
<td>9</td>
<td>8</td>
<td>82</td>
</tr>
<tr>
<td>14</td>
<td>8</td>
<td>6</td>
<td>60</td>
</tr>
<tr>
<td>15</td>
<td>9</td>
<td>7</td>
<td>69</td>
</tr>
<tr>
<td>16</td>
<td>10</td>
<td>6</td>
<td>80</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Averages</th>
<th>12 bred per week</th>
<th>83% farrowing rate</th>
<th>10 weaned/sow</th>
</tr>
</thead>
</table>

It is clear that the farm overstocked the nursery (let alone the finishing herd) in weeks, 1, 7, 9 and 11 – 4/16 weeks – some 25% of the time. Worse, from a production aspect, and that chilling and more disease occurred in the pigs when the buildings were under-stocked associated with poor insulation, occurred in weeks 3, 4, 5, 6, 10, 13, 14, 15, 16 some 9/16 weeks – 56% of the time!

The farm only had efficient pig flow for 3 weeks out of 16 - only 19% of the time.

When this farm changed over to a pig flow model (which took 18 months) with an accepted variance of 12-13 breed per week, this stabilized the output to around 100 per week. The farm’s performance changed, with a reduction in post-weaning mortality from 8 to 5% with the relative increase in output, growth improved from 200 days to finish 165 days and significantly, the medicine use in the finishing herd fell by 70%. There was one over riding component in achieving this measure of control on the farm – the gilt pool - having sufficient gilts available each week.
Other potential flow realities

The current description of utilizing pig flow to manage health has concentrated on flooring space. However, any aspect of the building/pen design could act as the limiting factor to health and therefore, disease expression.

For example if the pigs have 29.6 m² of finishing floor, the feeders are 2 meters long, air ventilation is good, but there is only one drinker to provide water to the 40 sixty kg pigs remaining in the group. Either the group size should be reduced or the availability of water (purely for example) should be improved to say 3 drinkers or a different drinker used, to do nothing, will result in serious health issues typically respiratory based which will not be resolved by the use of antibiotics.

Many factors can affect the health maintenance of a group of pigs:

- Entry/exit age of the pig?
- How many pigs per drinker?
- How much feed space per pig?
- How much floor space per pig?
- How much air per pig?

All these calculations are needed to determine the maximum flow potential of a pen. Once calculated they are used in the pig flow model.

Pig flow assessments allow for the prescription of the pig’s environment, making it less stressful and easier to manage the pig’s health.

Other records

Once the pig flow model is in place, the other farm records become meaningful. Each key production parameter should have a target, which if not met needs an explanation. This can be a very useful guide to areas that may need more attention during the examination of the stock and buildings.