PIC

Sow and Gilt Management Manual

Introduction

Living up to our motto of Never Stop Improving, we are pleased to present the 2013 edition of the PIC Sow and Gilt Management Manual.

Included in this manual are tested guidelines from around the globe that have and will continue to serve as the cornerstone of progressive, cutting edge production knowledge. You will find tools that can be used to generate thoughts regarding your particular system's production, standard operating procedures (SOP's) or to further enhance the development of employees through the collective wealth of experience, results and vision from the PIC Technical Services team.

Our industry leading team takes great pride and privilege in offering this manual to our customers with a cohesive message of proven practices centered on reaching the enormous genetic potential of the PIC animals in your system and throughout the world!

The Technical Services Team
2013

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Part 1. Health Management

If the replacements are not produced and raised internally there is no other option but to introduce live animals to keep the sow inventory constant and parity structure consistent with maximizing weaned piglet output. Gilt introduction is a challenge for many production systems and is certainly a risk from a disease introduction and herd health/stability point of view.

Isolation

The goal of isolation is to prevent introduction of new pathogens to the recipient herd. Isolation should be no less than 28 days in length, separated from the main herd and managed as an all-in-all-out (AI/AO) flow.

Work with your herd veterinarian to develop a diagnostic testing plan specific to your herd to prevent the introduction of diseases. PIC Health Services can assist with this if needed.

Beside blood tests, it is important to make daily observations and perform post-mortem exams on any animals that die in isolation. Gross lesions and/or clinical signs such as coughing, diarrhea, and lethargy may warrant further diagnostics.

Health Acclimation

The goal of acclimation is to expose incoming animals to the organisms and pathogens existing in the recipient herd, while giving ample time for the animals to recover and establish immunity. Proper acclimation will require close clinical monitoring. Too little exposure will give inadequate immunity, but too much exposure to a live pathogen could cause morbidity and death. Your herd veterinarian and PIC Health Services can help develop a herd specific acclimation program.

Acclimation should always occur as a combination of natural exposure and vaccinations, under recommendations from your veterinarian. Exposure can be achieved by direct contact with potential shedders or feedback (using manure and/or tissue homogenates from the recipient herd as an oral inoculum).

Vaccines programs can change according to the specific health status of the farm so a basic vaccination scheme is presented in Table 1.

- *Haemophilus parasuis* (HPS) vaccine may be advised in herds with a history of the problem.
- *Ileitis* (*Lawsonia intracellularis*) vaccine is strongly recommended.
- *Mycoplasma hyopneumoniae* vaccine is necessary if replacements from a Myco negative source are entering a Myco positive herd. Two doses are recommended, with the second one given no less than 4 weeks prior to natural exposure.

Table 1.

Suggested Vaccine Schedule in Gilts Prior to Breeding	
Vaccine	**Age**
Erysipelas I	8 wks of age
Erysipelas II	10 wks of age
Parvovirus + Leptospirosis + Erysipelas I	160 days of age
Parvovirus + Leptospirosis + Erysipelas II	180 days of age

Direct contact - Old animals are not good shedders so avoid using them and use culled gilts/P1s as shedders.

Feedback

- Replacement gilts should not receive feedback earlier than 20-22 weeks of age and not within 3 weeks of first breeding. The content can include feces from females farrowing within the last 24 hours (P1 feces are preferred), feces from scouring piglets and intestinal tracts from piglets that died within the last 24 hours and are less than 7 days of age. Water can be used as an extender.
- Do not include drying agents, as these can destroy the pathogens and decrease value of feedback.
- Frequency and intensity of exposure to feedback should occur 3 times per week for 3 weeks. Some pathogens causing diarrhea are present in healthy piglet guts, thus utilize intestines for feedback from piglets dying for reasons other than scours.

Recovery from actual infections is also important. Incoming animals should no longer be shedding pathogens when they enter the resident population. This recovery time will vary based on health status, flows, and management. In particular, acclimating PRRS negative replacements will vary, depending on the PRRS status of the recipient herd. Replacements entering PRRS positive herds must be exposed to the receiving herd's strain(s) with sufficient time for recovery. In the case of PRRS, the total process may require 4-6 months. In cases of acute disease breaks, feedback may be counter-productive to herd health stability. Consult your veterinarian for details specific to your herd.

Part 2. Gilt Management

Requirements to Breed Gilts and Targeted Performance

A commercial system needs to have the proper number of eligible gilts that are ready to be bred and are able to be productive in the herd through parity 5 and beyond. Provide the proper multiplication size to supply the required number of eligible gilts. This is usually around 8% to 12% of the commercial sow herd inventory and will let the farm achieve an annual replacement rate of 40% to 50%. Compromising gilt selection standards will result in higher sow culling rates and sow death loss. Eligible gilts must have the requirements summarized in Table 2.

Table 2.

Gilt Eligibility		
Trait	**Target**	**Relative Importance**
Maximize feed intake prior first breeding	Do not limit feed intake. Allow them to eat as much as they can and plan for a minimum of 8 lbs/d	+++++
Body weight	300-320 lbs	+ + + + +
ADG	1.5-1.7 lbs/d (birth-to-breeding) Less than 1.3 lb/d definately limits reproductive performance. Anything beyond 1.8 lbs/d can be associated with lower lifetime performance.	+ + + + +
Immunity level	Solid acclimation 3 weeks from last vaccine or any other health procedure.	+ + + + +
Selection	90%, get rid of the bottom 10% of potential bad performers	+ + + + +
Age	200-210 days; 2nd Heat	+ + +

Maximizing feed intake prior to first breeding is essential to ensure gilts will grow and express their reproductive potential for litter size. When feed intake is limited or disrupted, P1 litter size can be compromised. The recommendation is to have gilts on full feed from the time they are placed into the nursery until they are bred. Thus, avoid feed restrictions while they are growing, but particularly on the 16+ days prior to breeding.

Body weight at first breeding is the single most important indicator of eligibility. It reflects growth and body maturity. The optimum live weight at first service is 300 to 320 lbs (135 to 145 kg). When using the flank-to-flank measurement, taken where the rear leg intersects the body on one side to the same position on the other

side of the gilt (Young and Aherne, 2005). Gilts should be bred at 35 to 36 inches (89 to 91.5 cm) in diameter. Commercial gilts typically reach the recommended body weight by 200 days of age.

Gilts bred heavier than 320 lbs (145 kg) increase the cost of production due to the extra feed, facilities and equipment needed; and also a larger maintenance feed cost during the animal's lifetime. Sows that were first bred at 350 lbs (160 kg) typically require an additional 0.33 lb/d (0.15 kg/d) of gestation feed than the ones bred at 300 lbs (135 kg). In addition, gilts bred at heavier weights tend to have a shorter productive life in farms. Furthermore, they are more prone to have a dip in their second parity performance and/or have an extended wean-to-service interval.

Lifetime average daily gain (ADG) from birth to first breeding has recently emerged as a new key indicator. It allows gilts to be bred at the weight and age mentioned previously. The optimum ADG for replacement gilts is 1.5 to 1.7 lbs/day (680 to 771 g/d) and if possible avoid breeding gilts with Lifetime ADG above 1.8 lb/d (820 gr/d) and below 1.3 lb/d (590 gr/d). See table 3 for a quick reference on age-to-weight relationships according to different scenarios of lifetime ADG.

Table 3.

Lifetime ADG, Age (weeks and days), and Body Weight												
ADG, lbs/d (g/d)		1.30 (591)	1.35 (614)	1.40 (636)	1.45 (659)	1.50 (682)	1.55 (705)	1.60 (727)	1.65 (750)	1.70 (773)	1.75 (795)	1.80 (818)
Age		Weight, lbs (kg)										
wks	days											
25	175	228 (103)	236 (107)	245 (111)	254 (115)	263 (119)	271 (123)	280 (127)	289 (131)	298 (135)	306 (139)	315 (143)
26	182	237 (107)	246 (112)	255 (116)	264 (120)	273 (124)	282 (128)	291 (132)	300 (136)	309 (140)	319 (145)	328 (149)
27	189	246 (112)	255 (116)	265 (120)	274 (124)	284 (129)	293 (133)	302 (137)	312 (141)	321 (146)	331 (150)	340 (154)
28	196	255 (116)	265 (120)	274 (124)	284 (129)	294 (133)	304 (138)	314 (142)	323 (146)	333 (151)	343 (156)	353 (160)
29	203	264 (120)	274 (124)	284 (129)	294 (133)	305 (138)	315 (143)	325 (147)	335 (152)	345 (156)	355 (161)	365 (166)
30	210	273 (124)	284 (129)	294 (133)	305 (138)	315 (143)	326 (148)	336 (152)	347 (157)	357 (162)	368 (167)	378 (171)
31	217	282 (128)	293 (133)	304 (138)	315 (143)	326 (148)	336 (152)	347 (157)	358 (162)	369 (167)	380 (172)	391 (177)
32	224	291 (132)	302 (137)	314 (142)	325 (147)	336 (152)	347 (157)	358 (162)	370 (168)	381 (173)	392 (178)	403 (183)
33	231	300 (136)	312 (142)	323 (146)	335 (152)	357 (162)	358 (162)	370 (168)	381 (173)	393 (178)	404 (183)	416 (189)
34	238	309 (140)	321 (146)	333 (151)	345 (156)	347 (157)	369 (167)	381 (173)	393 (178)	405 (184)	417 (189)	428 (194)
35	245	319 (145)	331 (150)	343 (156)	355 (161)	368 (167)	380 (172)	392 (178)	404 (183)	417 (189)	429 (195)	441 (200)
36	252	328 (149)	340 (154)	353 (160)	365 (166)	378 (171)	391 (177)	403 (183)	416 (189)	428 (194)	441 (200)	454 (206)

When using electronic sow feeding, it is important to train gilts to the feeding station as soon as possible. After being fully trained (usually 2 weeks) and a heat has been recorded, move to stalls >16 days prior to breeding.

Each production system has specific production targets for their incoming gilts. A review of performance and management protocols should be completed to determine where opportunities for improvement exist. For reference, see Table 4. Overall goals should be to utilize gilt management procedures to increase the total number of gilts with a documented heat cycle, understanding gilt heat cycles to accurately achieve breed and farrow targets, achieve higher born alive and pigs per lifetime, greatly enhance parity retention, quicker decisions on non-cycling / non-productive gilts and reduced overall gilt input cost.

Once gilts enter the sow farm they must be managed in a way that does not restrict their productivity potential. Feed intake, stall acclimation, boar exposure, body weight at breeding, body weight gained in gestation, and first lactation management all determine the lifetime productivity potential of the female.

Table 4.

Expected P1 Performance	
Trait/KPI	**PIC Target**
% Heat No Service (HNS)	>95%
% Farrowing Rate	> 93%
Avg Total Born	>14.5
Avg Born Alive	>13.5
Avg Pigs Weaned	>12.5
Consistency	88%+ P1s bred by 7 days Absence of P2 dip
Robustness	75%+ of retention up to P3

Gilt Development

The general needs for rearing gilts are presented in Table 5.

Table 5.

Housing and Husbandry Requirements for Gilts		
Item	**Up to 20 Weeks**	**21 Weeks to Breeding**
Housing	Pens	House in pens until the final 3 weeks before the first service, at which time they should be placed in individual stalls
Flooring	Slatted floors: 1 inch (2.5 cm) or less opening, with straight edges. Solid floors: sloped to avoid manure and liquid build-up.	
Space	Up to 45 lbs (23 kgs): 3.5 sq. ft (0.33 m2) Up to 240 lbs (110 kgs): 7.5 sq. ft. (0.70 m2)	Provide a minimum of 12 sq. ft. (1.11 m2)
Water	Provide fresh and clean water. One water source per every 10 gilts. Flow rate greater than 32 oz/min (1 L/min). When possible, monitor water usage and ensure availability equals to >2.5 gal/day/head (9.5 L/day/head)	
Humidity and Temperature	Follow PIC's recommendations for growing pigs based off of age and weight	
Feeding/Nutrition	Feed ad libitum (full feed), and avoid restricting feed intake Always follow PIC nutrition recommendations. In general, the recommendation is to use dry feed. Feeders should have 14 in (35.5 cm) holes with 8 gilts per space from 60 lbs (27 kgs) and up. After placement in stalls, feed gilts at least 4 lbs (1.8 kg) twice daily. More if they are able to eat more.	
Boar Contact	No Boar Contact	Daily boar exposure starts at/after 24 wks of age. The rule of thumb is 30 sec per gilt per day.

Boar Exposure & Heat Detection

For maximum effect, boar exposure should be a controlled and focused experience. Daily exposure to a mature and active boar, 7 days a week is the most effective way to stimulate puberty in a group of gilts.

Showing an early first estrus may lead to larger litters and increased lifetime productivity

Initiate boar exposure at 24-26 weeks of age. By doing this, >70% of the gilts will have one heat-no-service (HNS) after 3 weeks, and >95% of gilts will have at least one HNS after 6 weeks. The focus needs to be placed in the 6 weeks prior to breeding.

Do not expose gilts younger than 20 weeks of age, since they will not respond to boar stimulus.

On weekends labor can be a challenge to get this process done in a consistent way; however, the most productive sow farms ensure this process is done 7 days per week. Fence line boar exposure can be considered as an intermediate option as it ensures exposure but not heat detection.

Better results are seen when teaser boars are older than 12 months of age with a high libido. Boars will be salivating and have an intense boar odor when working as a teaser. Meishan-cross boars are “adults” at 6 months and are a good option as a teaser boar. These boars will be more active if they get once a week semen collection or have chance to mate a culled sow.

Do not work a boar more than one continuous hour. After an hour, the boar will lose interest and effectiveness. Rotate boars often and alternate sides of barns if possible. This is especially important in warmer weather when boars will fatigue quickly. While not in use, house boars as far away from the gilts as possible.

As a rule of thumb, a sow farms should have at least 1 adult boar for every 250 females in inventory. To calculate inventory, add maiden gilts from 24 weeks of age to the mated female inventory. Thus, a 2,500 sow herd, with 50% annual replacement rate has an average inventory of 2,700 head, which would require no less than 11 adult boars.

Picture 1.

Picture 2.

Picture 3.

Picture 4.

Conduct boar exposure carefully to avoid accidental mating as well as injuries to workers and gilts. Consider using vasectomized boars.

Be active in the pens being induced. Use back and flank stimulation along with boar exposure. Human contact is extremely important to gilt development and future behavior.

Ideally, the boar is inside the pen with gilts and exposure should last 10-15 minutes per pen of 25-30 gilts. Pheromones in the saliva and nose-to-nose contact are the most important mechanisms for stimulating estrus. If it is not possible to allow the boar inside the pen, leave a boar outside the gilt pen for nose-to-nose contact. When using more than one boar, these boars need to be raised together as pen mates to prevent aggressive behavior.

If pens are wet or slippery, utilize barn lime for better footing.

Mark each in-heat gilt and then record as a heat no service (HNS) on the group identification card. Group the HNS gilts in a pen all at once and avoid adding gilts over many days.

Those without a solid heat but with swollen vulvas are recorded as “possible heats” and reviewed the next day. Do not try to force gilts into standing heat.

The key indicator of solid estrus is standing or rigidness when the boar or other gilts mount her or when the worker applies back pressure. Additional indicators are mating behavior, nosing flanks, ear erection, fluids in the vulva and no feed intake.

Once boar exposure begins, if factors like health, nutrition, space, temperature, boar stimulation and human-animal interactions are not limiting. 4-6% of gilts >26 weeks of age will show estrus each day. In other words, a third of the group will show estrus in a week.

The pool of eligible gilts should be limited to 3% of the total sow inventory (5% as maximum) and a system review needs to be done to understand why this figure is consistently at or above 5% and implement interventions to get it down without hurting breeding target consistency.

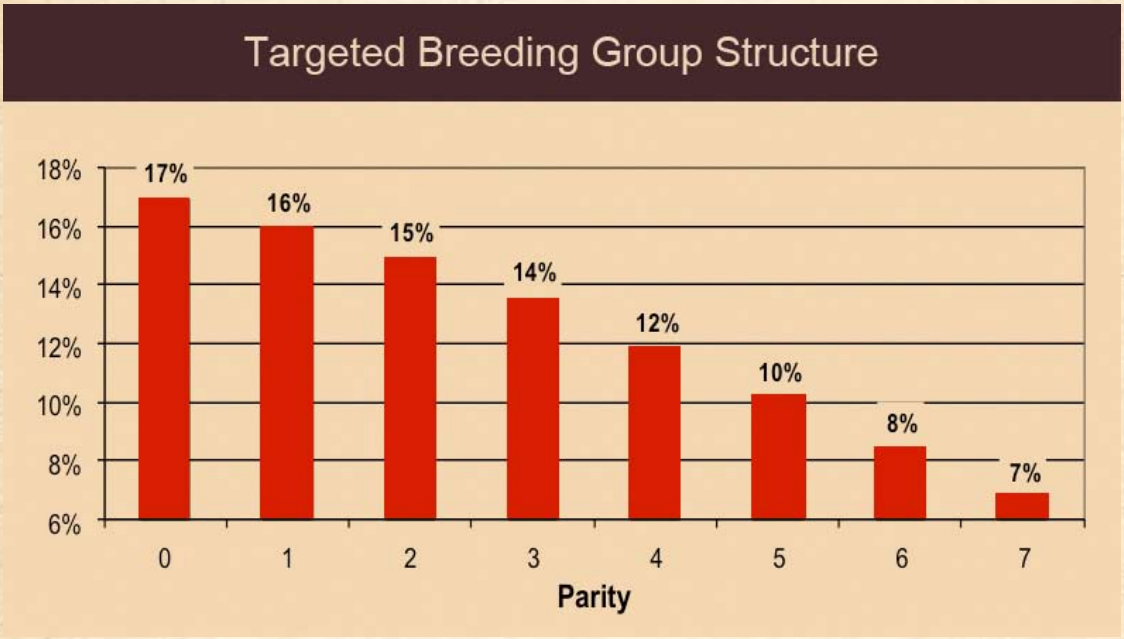
When stocking a new farm, plan to have 6 weeks of gilts at the beginning of the breeding project in order to meet breeding target. This will enable you to accommodate the normal variation in estrous cycles among the gilt population. Example: if the breeding target is 140 matings per week, plan to have 420+ eligible gilts in the first week of breeding.

The use of pharmacological interventions should be considered as a last resort to trigger puberty. It is biologically acceptable to have up to 2-3% of gilts that need to be treated (5% maximum). Some other pharmacological products can be used to synchronize gilt cycles, particularly when batch farrowing.

Part 3. Parity Structure & Lifetime Productivity

A consistent flow of gilts is required to achieve the breeding target; while removing older, non-productive animals and deaths from the herd. Graph 1 represents the typical composition of the breeding groups in a farm with 45% annual replacement rate and 6% to 8% average removal rate by parity up to P3.

Graph 1.



For a start-up farm, replacement rates should be around 25% on year one and 35% on year two.

Gilt selection rate and the ability of the sow herd to retain those gilts will drive the size of multiplication needed to address the weekly needs of the system.

When farms do a poor job of retaining young parity females, a higher number of gilts will have to be brought in to replace losses. This will cause the herd's average age to decrease, which consequently could create issues:

- Lower birth weights and lower colostrum protection in P1 litters. Gilt litters generally have lower birth weights that can lead to higher pre-weaning mortality and lower weaning weights are associated with a higher rate of scours.

- Added cost of additional replacements. A female typically does not pay for herself until her second or third litter is weaned, depending on gilt costs, feed costs, productivity and piglet purchase price.
- Increased cost of weaned piglets. Low total born, higher stillborn, pre-weaning mortality and increased cost of replacements add up to higher weaned pig cost in farms with a younger average age of the herd.
- Decreased full value market pigs per sow. Pigs born in a gilt litter have a lower chance to become a full value market pig than pigs from older females.

Table 6 shows targeted retention rates from first breeding. These retention rates assume gilts are pre-selected at weaning to remove any lower weight females or females with obvious defects and injuries. Health status, stocking density, and facilities will all effect selection rates. Selection rate is ultimately driven by gilt needs.

Table 6.

Female Retention Targets (from 100 bred gilts)		
Age/Milestone	**Retained**	**% From Previous Milestone**
First Breeding	100	100%
1st farrowing	>92	92%
2nd farrowing	>85	92%
3rd farrowing	>75	88%

Culling

Strategic culling is also a management tool so do not be afraid to use it when needed.

Proper gilt development is the first step in creating an efficient and productive population within a sow herd. Culling or removal of undesirable or lowly productive animals is the second part of that equation. Both need to be closely monitored.

The average age of removal for a farm should be > P5, so it is key to retain at least 75% of the bred gilts up to P3.

Culling guidelines are summarized below. Consider that some reproductive reasons can have a seasonal component.

- P7+
- Abortions > 10 weeks of gestation (not necessarily when facing a PRRS break).
- Late weaners: >4 weeks for P1 and P2; > 1 week for P3+. Investigate and fix the problem when there are more late-weaners than 1% of the total sow inventory.
- Severe lameness.
- Poor body condition.
- General sickness.
- Gilts with no HNS 6 weeks from beginning of boar exposure as described earlier in this manual.
- Severe mastitis.
- Low number of functional teats
- Low average number of weaned pigs after 3 farrowings. That number is, by definition, an arbitrary number but a good place to start could be 1 pig under the farm average weaned pigs.

Part 4. Heat Detection

Heat detection timing and frequency is a matter of labor availability and personnel qualifications. If correctly done, once per day heat detection is adequate in most situations and settings.

Proper heat detection should identify all females in heat (gilts, weaned sows and recycles) early in their estrus. This will ensure proper timing of mating and minimize non-productive days; by catching >80% of open sows by 4 weeks of gestation and >95% by 8 weeks of gestation.

Heat detection order: gilts should be heat checked first because of their shorter estrus expression. Weaned sows should be second, 21 day bred group is third. After these areas have been checked move to opportunity sows such as late weaners, NIPs, and abortions.

Never underestimate the number of potential returns. Heat check the 18-23 days post-breeding group, 7 days a week. One indicator of a potential return is the fact that open sows stay standing longer and more frequently than pregnant sows and they tend to not clean up feed.

When a boar stimulates a sow or gilt with his pheromones and nose-to-nose contact and the female stands to the back-pressure (solid heat) she is ready to be inseminated. Mark her according to the farm protocol, then go on to the next female. Sows can be left in the same stall to be bred immediately or later in the day, or to a breeding area for insemination. When bred later in the day, at least 2 hours from heat detection or movement is necessary to avoid a refractory period.

If heat checking in pens, the boar should be put in the pen not just fence line. Especially in the time period of 18-23 days post weaning. This is very important in pens larger than 10.

Keep alert as animals may exhibit signs of heat after or before boar exposure. If using a Boar-Bot or Contact-O-Max, utilize the oldest and most odorous boar available.

Picture 5.

Picture 6.

Planning boar power:

- Have an adult boar for every 250 sows.
- A boar is considered adult when he is 11-12 months of age. Meishan crosses achieve sexual maturity at 5-6 months.
- Replace your boars every 6-12 months when using western lines and every 18-24 when using Meishan or its crosses.
- Heat detection boars work better when they have the chance to mate a cull sow once per week or are hand collected.

Place gilts in an individual stall with more than 16+ days before breeding and always provide full feed.

If the signs of heat are not pronounced enough, rub the rear part of the udder and vulva and look for the presence of fluid in the vulva. Repeat this procedure once if needed. If there is no standing reflex, the female is not in heat. Mark with a small spot and pay attention to her the next day.

Have well-trained employees perform heat detection. Sometimes environmental factors (hot weather, overcrowded pens, slippery floors, movement, vaccination, tattooing) cause gilts to not lock or solidly stand very well and it is hard to catch some individuals in heat.

Know the signs of estrus:

- Stands rigid in response to back pressure and/or to the boar's presence.
- Erect ears in Large White-like females.
- May flick the tail up and down.
- Swollen and red vulva.
- Clear fluid discharge from the vulva.
- Biting bars on stalls.
- Lack of appetite.
- Vocalization/grunting.

Part 5. Breeding

Proper breeding technique places high quality semen in the right location at the right time to produce >92% farrowing rate and >14 total piglets born. PIC is proposing 16 TB and >93% farrowing rate as targets for 2016 and on.

Performance is related to the percentage of multiple matings, which in turn is a function of the heat checking and breeding protocols. The target for multiple matings is >95% and the average number of services per sow in estrus is 1.9 to 2.1.

Semen Care

Sudden changes in temperatures are detrimental to semen viability. Keep semen doses between 61°F (16°C) and 64°F (18°C). Also check that there is free air circulation around the refrigerator/container allowing no less than 2 inches (5 cm) between walls and the unit. Check the integrity of the electric cable, the electric plug, and also that there is electricity coming out from the electric outlet.

Picture 7.

Perform annual service of the refrigerator before the summer to prevent problems during hot weather.

Monitor internal temperatures of the semen refrigerator/container, by reading and recording the temperature of a liquid sample kept inside the unit. See Appendix 1.

Keep the refrigerator clean.

Be sure to remove semen from the bags it was received in.

Do not open the refrigerator door unnecessarily, as this causes fluctuations in temperature.

Fresh semen is best. As semen ages, the number of viable sperm cells declines and bacterial growth becomes a risk. Even if a long-term semen extender is used, fertility could be reduced due to semen aging. Plan semen doses orders in advance to ensure the semen doses will be utilized within 5 days from the collection date in commercial operations, and within 4 days when using single sire matings. Increased frequency of semen deliveries is generally associated with better production performance.

Picture 8.

Rotate each semen dose twice daily to re-suspend the sperm cells. Also rotate the semen dose prior to being used.

As a rule of thumb, do not put more doses in one portable cooler than the number of doses required to inseminate animals during the following 60 minutes.

Service Using Conventional AI

Treat heat detection as a separate chore from breeding. Identify the females in heat and available for breeding then move them to a breeding row. It is important to avoid placing gilts between old/aggressive sows.

Give the females 2 hours to settle down before starting to breed. If inseminated before that period, many of the females will get the first insemination in the middle of a refractory period. In that period, response to stimulus is less pronounced, which in turn does not maximize semen transport.

Picture 9.

Have all supplies in place prior to bringing the boars in front of the females. Never place the boar in front of the females if they will not be heat checked and/or bred within 5 minutes.

Use a minimum of two boars in line to stimulate the females during insemination. This is not trivial and many farms do not adhere to this recommendation, which is a significant mistake. A boar can take care of 3 (5 max) sows lined up, so keep the boar in front of the 3-5 sows while they are bred.

Once the semen tubes/bags are empty, move the boar to the next 3-5 sows and the second boar will keep the first group stimulated. Do not use the same boars for heat detection and breeding.

Protect semen doses from light and put no more than the doses required for one hour in one cooler. Place refrigerated gel packs stored at the same temperature as the semen underneath and on top of the semen doses and close the lid after removing doses.

Do not inseminate a gilt/sow unless she is displaying solid heat. Avoid inseminating females during their refractory period. It is important to understand that 1 good insemination is better than 2 or 3 poor inseminations.

To prevent metritis/vaginal discharges, keep the weaning and breeding rows as dry as possible. Avoid washing the crates and floors in those areas unless they are empty and will dry prior to animals being moved back into the crates.

Wipe the vulva lips with a clean disposable paper towel to remove any dirt. Use one towel per sow. Wiping can also act as a stimulus to the female.

Do not use water or disinfectant to wash the sow before insemination because they could carry contamination into the reproductive tract or kill sperm cells.

Use a new, disposable catheter for each mating. Discard the catheter if it looks dirty or accidentally touches the floor, sow or stall.

Apply obstetric non-spermicidal gel to the catheter tip, but do not plug the opening of the catheter with the gel.

Gently separate the vulva lips using the thumb and forefinger and insert the catheter in an upward 45° angle through the vagina into the cervix.

When using a catheter with spiral tip, rotate the catheter counterclockwise until firm resistance is felt. A plug catheter is different and does not need to be inserted by rotation. Push it firmly towards the cervix, and then pull back gently. If it is not placed correctly, there is no resistance and you need to try again.

Remove the semen from the cooler. Suspend the semen in the dose by rotating with your hand. Open the semen dose and connect it to the catheter. Allow the semen to flow from the container into the animal.

Do not try to accelerate insemination by squeezing the semen dose during breeding and do not perforate the semen container as this can cause backflow. If backflow occurs, record it on the sow card.

Try to keep the semen dose as high as the top of the back of the sow. If backflow occurs, review speed, boar exposure and ensure animals are not in the refractory period.

Maximize uterine contractions during insemination by keeping the boars in front of the females being inseminated. One boar provides stimulation for a maximum of 5 stalls. Stimulate the female with back-pressure, rubbing the shoulders, flanks and underline. “Be the boar” and mimic the process of natural service.
If the sow lies down during insemination, continue with the procedure as she lies down, and don’t make the females stand, as it will interfere with uterine contractions.

After insemination, bend the catheter to prevent backflow and leave it in the sow for another 5-7 minutes to encourage the transportation of semen through uterine contractions. That stimulation needs to be accompanied by a boar in front of the female and back-pressure.

After the crew is done with the breeding for the day, another boar or two can be left roaming in the alleyway to further stimulate the females, which will aid the semen transport process. The boar(s) needs to stay 2 hours with the newly bred females (when using more than one boar, they must be pen-mates).

Sperm cells live up to 24 hours in the sow’s reproductive tract and need 8 hours inside the female before they are capable of fertilization. Ovulation occurs two-thirds to three-fourths of the way through estrus and once the ova (eggs) are ovulated their life span is 2 to 6 hours. It is hard to predict ovulation in the field so multiple matings are used to ensure semen is deposited and sperm are ready to fertilize at the appropriate time.

Choose the simplest and most effective schedule of insemination based on staffing, qualifications and experience of your personnel. Regardless of the schedule, it is important to repeat inseminations as long as the female is in standing heat.

- Breed females the day they are found in heat and repeat every day until they no longer stand. Do not wait until the next morning after detection to initiate service. This timing is simple to explain, simple to implement, labor-efficient and capable of producing excellent results.

Service Using Intrauterine AI

Perform estrus detection as normal. Mark sows found in heat and move to the breed row.

Remove the boar and wait > 30 minutes.

Insert IUI catheter into the sow exactly like conventional AI, then place the inner rod inside the catheter but do not push it through the cervix. After 1 minute, gently work the inner rod through the cervical rings.

If the inner rod does not go through with a little pressure, be patient and wait. Use this time to move to the next sow and come back.

Try to push the inner rod through again, feeling the rings of the cervix as it passes.

Once the inner rod is in the uterine body, attach the semen package.

Gently squeeze bag/tube to start the flow of the semen into the sow

Semen will typically flow into the sow by itself, but slight pressure may be used.

If backflow occurs, the semen is being forced into the sow too fast.

Once semen is deposited, pull the inner rod back into the catheter.

Remove the inner rod-catheter with one smooth downward pull. If there is blood on the catheter, then the technique should be reviewed. In most cases more patience and gentleness with the inner rod will solve this problem.

Bring boars in front of sows after IUI for stimulation. Let them roam in the alleyways for an hour or two after all the breeding is done.

Seasonal Infertility Mitigation

Insure all warm weather environmental controls (fans, misters, drippers and/or cool cells) are properly installed and working well ahead of warm weather.

- Make sure to clean fan blades weekly if needed.
- Annual service of mechanical moving parts is also needed before summer starts.
- Desired farrowing room temp is 65° F (18°C) day 3-5 post-farrowing, so manage room to maximize sow comfort.
  - Clean fans, louvers, and inlets weekly.
  - Check fan belts weekly.

Double check that all females have full access to fresh water in every barn of the farm (B&G, farrowing, GDU).

Consider earlier scheduling of labor to have females fed and heat check and breeding done during the coolest part of the day.
Maximize feed intake from farrowing to breeding

- Minimize the number of over-conditioned sows going into farrowing by actively managing body condition in gestation.
- Detect off-feed sows and treat them as soon as possible. Use a thermometer to evaluate body temperature the day after farrowing. An animal has a fever when rectal temperature is above 104° F (40°C). When this is found, the animal must be treated according to the herd veterinarian's recommendations
- Use *ad libitum* feeders in farrowing or provide full feed from no later than the day of farrowing. If hand feeding, feed sows in farrowing multiple times per day.
- Wet feed can be an option in some individual cases, but it has to be properly managed. *Ad libitum* feeders can have feed flow issues when feed is wet – feed won't flow properly and eventually can mold if not managed properly.
- House P1 females together when loading up farrowing rooms and at weaning to keep a closer eye on them.
- On the day of weaning, sows need to have access to feed in the farrowing house. Also provide feed on the day of weaning in the weaning row.
- Feed weaned sows no less than twice daily but be careful to not waste feed. Ask your PIC representative to provide additional material on feeding weaned sows.

Ensure that boar exposure and heat detection is done 7 days a week and it starts the day of weaning. Without affecting breeding target, HNS sows that come into heat before day 2 post-weaning and from day 7 to 14 post-weaning.

- Heat check weaned sows, gilts, and 18-23 days bred group 2 times per day, if possible. Heat check open or opportunity sows once per day.
- Leave boars in front of weaned sows after breeding for 1-2 hours.
- Use two boars during breeding.
- Second boar should be 5 feet (1.5 m) behind the first boar for extra stimulation after the insemination.
- One boar can stimulate 3-5 sows at a time. Do not inseminate more than 5 sows at once.

Consider culling P5+ sows or sows in poor body condition.

Increase gilt flow during the summer is another strategy to maintain throughput. It requires a strategic plan as gilts needed during the summer are born in November-December of the previous year. A farm won't gain much if these extra gilts are raised in overcrowded pens and/or if the selection criteria are lowered. Be prepared to assist more sows in the farrowing process than in the cooler months.

Early wean young sows (P1 and P2) that start to lose too much weight in farrowing.

PMSG/HCG can be used as a last resort to stimulate heat in anestrous females. Follow label directions. If animals do not cycle after injection then their ovaries were functioning normally.

Part 6. Gestation Management

Management during gestation involves feeding and watering sows to establish proper body condition, checking sows for pregnancy, vaccinating sows with farm specific vaccines, and following feedback protocols.

Over-conditioned sow herds tend to have higher weaned pig cost, reduced lactation intake, reduced farrowing performance, higher stillborn rate, higher sow mortality, and lower retention rate. Make body condition management a priority so sows are not too fat. This should include gilt body condition management to avoid breeding them too heavy.

An average of 1,600 lbs (725 kg) of gestation diet per sow per year is consistent with high levels of production and good longevity. Gilts should gain no more than 100 lbs (45 kg) during their first gestation to farrow weighing 400-420 lbs (180-190 kg). The average body weight gain in subsequent gestations should be limited to 45-50 lbs (20-25 kg) per female.

Make sure the water flow rate is no less than 1⁄2 gal/min (2 L/ min.) and ensure an intake >4.5 gal/day (>17 L/day).

Early Gestation

Early gestation is defined as the time from breeding to the first pregnancy check, which for the most part is done on week 4 after breeding. The importance of this period is not fully appreciated and sows are often moved during this critical time, handled with less care, and do not get enough feed to help them to re-build their body reserves.

After insemination, the embryos are free-floating for 10-18 days before implantation to the uterine wall. Any stress during the first three weeks of gestation may result in a loss of pregnancy or reduced litter size.

Early gestation is the time to assess body condition and feed poor conditioned sows extra feed.

When moving females in this period, avoid doing so from day 5 to day 28 post- breeding, Do not use electric prods, under any circumstance, move groups of 5-6 sows, and during hot summer months make the move early in the day to avoid heat stress.

Do not vaccinate females during this period.

Target for body condition in early gestation is to have >85% of the females in proper body condition by week 5 of gestation (see Picture 1).

For the first 28 days, feed pregnant gilts 4 lbs (2 kg) per day and adult sows 1 lb (0.5 kg) more than the daily amount considered the maintenance level. Thin sows should get the maximum amount of feed recommended for gestation, typically 6 or 7 pounds (2.7 or 3.2 kg) per day. Adult fat sows should be fed 3.5 lbs/day (1.5 kg/day).

Picture 10.
Thin Body Condition

Picture 11.
Good Body Condition

Picture 12.
Fat Body Condition

Feeding Guideline & Body Condition

For farms that manage body condition well, gestation diet usage is 1,600 lbs (725 kg) per sow per year, assuming that a sow will be fed the gestation diet as long as she is not in the farrowing house and that a variable percentage of the bred females do not farrow.

Table 7.

Gestation Feeding Guidelines*	
Milestone	**Amount**
0-28 days	
Gilts bred above 340 lbs	3.5 lbs/d (1.6 kg)
Gilts bred in the optimum body weight range and fat sows	4 lbs/d (1.8 kg/d)
Normal sows	5 lb/d (2.3 kg/d)
Thin sows	6 lb/d (2.7 kg/day)
29-90 days	
Normal sows and gilts	4 lb/d (1.8 kg/d)
Thin sows	6 lb/d (2.7 kg/d)
Fat gilts, gilts bred over 340 lbs and fat sows	3.5 lb/d (1.6 kg/d)
90 days-Exit to Farrowing	
Gilts, normal sows and thin sows	6 lb/d (2.7 kg/d)
Fat sows and fat gilts	3.5 lb/d (1.6 kg/d)

*Assumes only gestation diet use on B&G barn, with energy content of 1,465 Kcal NRC ME/lb

A relatively common practice all over the world is to bump up feed sometime in late gestation. We understand this is a practice intended to avoid a massive body weight loss in young parity females, prepare mammary glands to produce colostrum and milk, and to increase piglet ability to survive after they are born

- Fat/over-conditioned gilts and sows should not receive extra feed in late gestation.
- In general, units having less than 25 psy should not get more feed in late gestation. From 25 to 28 psy, the decision has to be analyzed in a case-by-case basis. From 28 psy and above, we recommend bumping up feed only to females in normal or thin body condition.
- Make sure the return in the cost of extra feed is paid by the incremental productivity improvements. As a rule of thumb, PWM needs to go down from 1% to 4%, depending on the feed prices, weaned piglet price, and daily feed allowance to get 3:1 return.
- Once the decision to bump up feed is taken, our recommendation today is to increase the feed offered per sow by 2 lbs/d (0.9 kg/d), starting from day 90-100 of gestation. Recent research (Soto and et. al., 2011) showed that females on their first gestation that received more feed from day 100 until farrowing saw an improved piglet birth weight; however, the extra feed does not improve birth weights on pigs born from multiparous sows. There were not statistical differences when the extra feed provided was 2 lbs (0.9 kg) or 4 lbs (1.8 kg). Go to Appendix 2 to see economical analysis on the cost:benefit to bump feed up in late gestation.

Pregnancy Checking

The goal of any pregnancy-checking program is to find open females as soon as possible during the first 28-35 days of gestation. Open sows in gestation increase non-productive days, decrease sow herd productivity and increase weaned pig cost.

All sows should be visually inspected every day as part of the routine gestation management. There needs to be a systematic approach to checking sows for pregnancy by using a mature boar. Ultrasonic pregnancy checking needs to be done weekly by a trained and skilled employee between 24 and 35 days of gestation.

Table 8 shows a basic scheme of pregnancy checks but you can use ultrasound devices for pregnancy testing as early as day 24 and/or conduct a second check with a boar at week 6 of gestation.

Table 8.

Pregnancy Checks				
Week of Gestation	**Days of Gestation**	**Method**	**% Open Females**	**Reason**
3	18-24	Boar exposure and heat check	80%	Regular returns
5	30-40	Ultrasound	15%	Regular returns missed by week 3 Non-regular returns Early abortions
8-10	56-70	Visual	5%	Regular returns missed by week 3 and 6 Non-regular returns Abortions Not in sows

Vaccinations and Feedback in the Resident Population

It is important to establish immunity to Leptospirosis, Parvovirus and Erysipelas and other diseases that may be present in the farm in the early reproductive life of a female. As the animal matures through pregnancy, immunity to Leptospirosis and Parvovirus are typically adequate to sustain the female through her reproductive life. It is important to booster Erysipelas immunity prior to or during each gestation cycle. Vaccinations for respiratory and/or enteric diseases might also be needed. Consult your veterinarian for the appropriate vaccination program for your herd.

Feedback programs can be very effective controlling neonatal scours and pre-weaning mortality and/or weaning weight variation. Provide feedback material 3 times a week for 3 weeks, beginning between weeks 10 to 12 of gestation. Proper colostrum intake is one of the keys for feedback success. Also, it will work better when exposing gilts to feedback prior to first breeding is a second important point. During periods of acute clinical signs of some diseases (e.g. coccidiosis, PRRS, Swine Dysentery) feedback in gestation can be counterproductive. Consult your veterinarian for the program appropriate for your herd.

- Considerations for an appropriate feedback program can be reviewed in the Health Acclimation section in Part 1 of this manual.

Group Housing

There is a variety of pen/group housing and feeding systems available to the industry today. Each one has their own advantages and disadvantages but no matter which option you use, group housing is going to require increased attention to animal husbandry and welfare. On top of that, gilt segregation from older parity sows is imperative. Review Table 9 and Table 10, which summarize information on group housing.

Slat quality is critical. 6”:1” slat width to open area, with a minimum ratio of 4” : 1”.

Time in stalls before penning could be critical to recover body condition and to confirm pregnancy.

A challenge for the staff is to develop an action plan to deal with fall-outs after penning. It is estimated that 5% of the females re-grouped can lose their pregnancy.

Movement to farrowing can be as soon as 1 week prior farrowing to allow females to get used to the individual crate and feeding system, but 2-3 days prior also works well.

When penning:

- Avoid mixing gilts with adult sows in the same pen and avoid mixing genetic lines. If gilts must be mixed with older parity females, be sure to use small P-1s.
- Pens can be created either before (24 to 72 hours post-service) or after implantation (at pregnancy detection).
- A safe area should be provided for sows to escape from aggressive females.
- Feed sows prior to making pens
- *Ad libitum* feed in regular pens for the first 2-3 days after the arrival will minimize aggressive behavior.
- Check sows on a regular basis and adjust feed and/or feed curve if necessary.

Feeding options:

- Drop Feeding
  - Pen sizes from 6 animals up
  - Static grouping.
  - Pen sows by size and parity
  - Difficult to individually feed sows. You must feed to the thinnest sow.
  - Provide feed on the floor when making the pens
- Stanchions/Trickle Feeding
  - Pen sizes from 5 up. 10 to 12 is best.
  - Static Grouping
  - Pen sows by size and parity.
  - Provide feed when making pens.
- Electronic Sow Feeding
  - Training gilts works best if started at 180 days of age.
  - Gilts should be trained 3-4 weeks prior to breeding to use electronic sow feeding stations. This is a daily effort that needs to be done with patience.
  - By week 2, >90% of the gilts should be trained. Probably 3-5% of individuals are non-trainable. Never breed a gilt that is not trained.
  - Allows individual sow feeding.

Penning options

- Dynamic
  - Animals can be added multiple times throughout the gestation period.
  - Pen sizes can be from 55 animals and up depending on farm size and number of feed stations per pen.
- Static
  - Pen size usually 55 to 65 animals.
  - Enter all animals at once and never introduce more animals to the group. Can be a challenge if you have significant fallout from breed group.
  - Group by parity and size if possible. Gilts may need to be housed in a dynamic setup.
  - Usually 1 feed station per pen.
- Free Access
  - Most similar to current stalls.
  - Pens are usually 10 to 20 animals.
  - Sort by parity and size.
  - Provides a “safe haven” for each sow.
  - Individual stalls can be closed to allow for individual treatments when needed.
  - Requires larger building footprint, as you need space between back of stalls.

Table 9.

Housing Recommendations		
	Specifications	
System	Sows/pen	Area/Sow
Stalls	1	14 sq. ft (1.3 m^2)
Stanchion	12	19 sq. ft.(1.8 m^2)
Drop with feeding stalls	15	19 sq. ft. (1.8 m^2)
Free access	20	22 sq. ft. (2.0 m^2)
ESF (static)	70	18 sq. ft. (1.7 m^2)
ESF (dynamic)	140	20 sq. ft. (1.9 m^2)

Should the dynamic pens require more square footage than the static pens since animals are taken away/added, thus fallout should be dealt with?

Table 10.

System Comparison				
System	Running Cost	Ease of Management	Management Training	Freedom from Bullying
Stalls	++++	++++	X	++++
Stanchion	+++	+++	XX	++
Drop with feeding stalls	+++	+++	XX	+++
Free access	+++	+++	X	++++
ESF (static)	++	++++	XXX	++
ESF (dynamic)	++	+++	XXX	++

+ Poor, ++ Acceptable, +++ Good, ++++ Very Good.
x Moderate, xx High, xxx Intensive
Ref: Uwe Weddige, Futterkamp Research Station

Sow Husbandry

Regardless the type of facilities and operation size, sows should be visually observed every day to ensure that they are in good condition and maintaining pregnancy. Any sow that appears to be in distress, lame, or off-feed should be treated according to farm protocols. Sows that do not appear capable of completing gestation and farrowing a healthy litter should be considered for culling.

Table 11.

Signs and Symptoms		
Observation	Healthy	Distress
Appetite	Consumes all feed	Off-feed, feed refusal
Body condition	Able to maintain it	Weight loss
Response to stimulus	Stand up	Won't stand up, apathetic or lethargic
Soundness and structure	Bearing weight evenly on all four legs	Lameness
Skin and cover	Short and smooth hair, pink skin	Long or rough hair, yellow, pale or blue skin
Gestation	Able to maintain gestation, mammary gland development	Abortion, no mammary gland development
Body temperature	Normal: up to 101.4° F (38°C) in gestation; up to 104° F (40°C) the day after farrowing	Fever:> 101.4° F (>39°C) in gestation; > 104° F (>40°C) the day after farrowing
Respiratory	Normal frequency: 13-20/min.	Coughing, abnormal respiratory frequency
Feces	Manure is soft	Scours, constipation
Urine	Long and strong urine stream	Short urine, white urine

It is hard to set a target for individual treatments as variability depending on health status, labor quality, body condition productivity level, facilities, type and quality of the floor, and environmental conditions, just to name a few. Highly productive crews have realized that to support performance either early detection of individual health issues and proactive implementation of sound treatment strategies are essential to support high performance.

- As a rule of thumb, it is not unreasonable that every single day, approximately 5% of the farrowing house inventory and 1% of the breeding & gestation inventory will receive individual treatment.

Part 7. Farrowing Management

The 2016 targets proposed for commercial operations are 15.7 TB, 14.7 BA, and 13.7 pigs weaned per farrowing, with a 14.3 lb. (6 kg) average weaning weight at 19-22 days of age.

Pre-Farrowing

Room preparation is the key for success. Try to run farrowing rooms as all-in/all-out (AI/AO).

Complete any repairs after the room is emptied.

Clean and disinfect rooms between each use. Allow sufficient contact time for disinfectants to work and dry. Have the room inspected utilizing a farrowing room inspection sheet, an example is shown in Appendix 3.

Wash and disinfect mats carefully. If you have had scours on your farm, leave the mats submerged overnight in a bleach solution or use disposable mats.

Make sure all fans, heat lamps, nipple drinkers and feeders are functioning before loading. If applicable, perform an alarm check at this time.

Try to load rooms by 112 days of gestation.

Feeding during this period can be *ad libitum* when using self-feeders. Sows will regulate themselves to an amount close to what they were eating in gestation. In hand-fed units, sows should be fed 2 lbs (1 kg) twice daily prior to farrowing. It is system specific to decide which lactation feeding approach (hand feed vs. ad libitum/ self feeders) they prefer, but certainly self-feeders have been successful in getting higher feed intakes during lactation.

Count the number of functional teats and try to use as many as possible during lactation. Do not place or leave more piglets on a sow than her number of functional teats. Limit any litter changes to the first 24 hours post-farrowing.

Farrowing Induction

Induced litters tend to be associated with lower birth weights, higher pre-weaning mortality and lower weaning weights compared to non-induced litters.

In general, avoid induction when:

- The farrowing process has already started. Check sow's behavior, milk ejection and abdominal contractions.
- The staffing on weekends can be a limitation to assist the farrowing process so avoid inducing on Friday and Saturdays.
- Sows have less than 115 days of gestation.

Follow the instructions provided by the suppliers in terms of dose and route of administration. Women of child bearing age should not handle or use/administer drugs that are used to induce farrowing in sows.

The target is to induce no more than 30% of the sows per room. Re-evaluate farrowing room protocols if sows that farrow when labor is not present have similar or better results (in terms of stillborn and pre-weaning mortality rates) than sows farrowing during work hours.

Farrowing Assistance

Monitor P5+, lame, over-conditioned sows and sows with a history of high stillborn rates every 20 minutes. Young and normal sows could be monitored every 40 minutes. More attention needs to be dedicated to the end of the farrowing process on litters with high numbers of piglets born. Record everything on the sow's card.

Scrape manure from behind the sow daily starting the day prior to farrowing until the day after farrowing, as well as before assisting a sow while farrowing.

When assisting, wear a lubricated plastic sleeve and introduce the hand in a cone shape. Be patient. Sometimes a piglet is close to being born and there is no need to reach deep into the reproductive tract. If there is not a piglet low in the reproductive tract, wait 10 to 20 seconds to stimulate a contraction, which will sometimes push a piglet out. If nothing happens following this process, proceed with sleeving.

Oxytocin use:

- Limit the use of oxytocin to sows that actually need it to support uterine contractions. The hormone can be properly used in exhausted sows, after eliminating the possibility that a piglet is blocking the birth canal. In general, it is unlikely you will need to use oxytocin in sows P5 and younger.
- When oxytocin is required, limit its use to no more than 2 injections per farrowing, at least 2 hours apart and no more than 10 IU per injection (typically 0.5 cc). Follow label instructions and herd veterinarian recommendations regarding dose and delivery methodology.
- Oxytocin injections are much safer when administered after the first half of the litter is born, so avoid its use before the sixth piglet is born.

Picture 13.

In some instances sows will exhibit 'puffer sow syndrome' at the start of farrowing and will be characterized by rapid breathing, muscle weakness and high fever. For these puffer sows, an injection of 20-25 cc of calcium can be used. Make sure you talk to your herd veterinarian before implementing this as a treatment.

Picture 14.

Chilling Prevention

In general, piglets born in wet crates, without mats, without supplemental heat sources, or in drafty conditions due to ventilation setup are predisposed to higher pre-weaning mortality.

The first 8 hours of life are the most challenging time for a piglet in farrowing. This time can decide which piglets will live vs. die and how much they will weigh at weaning. The microenvironment under the heat lamp or on the heat pad should be 90-95°F (32-35°C). Piglet behavior should indicate that they are comfortable lying away from their dam and lying no more than 1 1/2 pigs deep (heads on flanks, etc).

When possible, use two heat lamps and two mats until the day after processing or castration. From that day forward, litters need one mat and one heat source.

Dry off piglets as soon as they are born by manually rubbing them. Use a cloth, paper towels, drying powder, a heated box or some combination to dry piglets. This will minimize lethargic piglets. Implementing this practice, when associated with other management practices will get pre-weaning mortality down. Important to remember that putting piglets in a heated box is not the same as split-suckling.

Picture 15.

Drying piglets will help piglets stay warm and active until they get colostrum. See research done in Spain summarized in the Appendix 3. It shows the body temperature difference between piglets that are dried versus those that are not. In the same environment it took 90 minutes for the non-dried piglets' body temperatures to return to normal vs. just 15-20 minutes for the piglets that were dried (Morales, Manso, Aparicio and Pineiro, 2010).

Split-suckling

This management tool is an effective way to control scours, reduce pre-weaning mortality, increase weaning weights and reduce weaning weight variation.

Make it as simple as possible to be effective:

- Split litters of 13+ piglets.
- Never split nurse when piglets are still wet.
- Split nurse in the morning for litters farrowed on the previous afternoon or night. Split nurse in the afternoon for litters farrowed that morning.
- To initiate split nursing, split the litter into halves, put the heavier pigs in a heated box and leave the teats available for the lighter pigs. Typically, the heavier piglets were first born and had more opportunities to get colostrum.
- Keep the two halves separated for 1.5 to 2 hours and then put all the piglets back together with their dam.
- Wash, disinfect, and dry materials/equipment between litters.

Picture 16.

Light Birth Weight Pig Management

Pigs with light birth weights have a reduced chance of becoming full value market hogs. These pigs have a difficult time competing with their littermates, which puts them at a disadvantage post weaning.

Establish a realistic target as an intervention weight and do not spend time and teats on piglets that have no/little chance of recovery.

Litters of light piglets can be created within 24 hours of life beforesocial order is established. A good rule of thumb is to have less than 10% light litters in every room.

Place lightweight piglets on a P2 or P3 sow. Avoid using P1s unless you do not have any other options, like in start-up farm or in P1 farms within a parity segregated system,. . Avoid using P3+ sows.

Determine which sows should nurse light litters by counting and recording on the ID card the number of functional teats. Use sows that weaned 11 piglets or more on their previous lactation.

Postpone processing of the “light litters” for 3-5 days.

If clipping teeth is part of the farm’s standard operating procedures, do not clip teeth in lighter litters as long as there is one functional teat per piglet. This will give the piglets more opportunities to compete and thrive.

Light birth weight pigs should be weaned with their age group and not held back more than 7 days past the average wean age of the farm.

Any of these pigs that do not meet minimum requirements for weaning weight at this point should be flowed separately and not sent on with their wean group.

Optimize Use of Sow Teats and Milk Production

A highly productive sow is partially the result of the first lactation management, in terms of feed intake and number and quality of the piglets nursed. Challenge the P1 female with 13-14 strong piglets to properly develop and stimulate all mammary glands.

Take the temperature of sows to detect any fever the day after farrowing. Sows having more than 104 °F (40°C) should be treated with an antibiotic plus an antipyretic.

In general, minimize the use of fostering after 24 hours from farrowing and try to keep a minimum of 70% of litters intact (no piglets fostered on). Frequent disruptions will have a negative effect by making sows nervous (sometime aggressive), which interrupts milk letdown.

Litters with 12-14 piglets in general should be left intact, so the candidates to foster on/off are the ones with less than 12 and more than 14.

Picture 17.

Picture 18.

Never load sows with more piglets than her number of functional teats.

Depending on the litter size of the farm, it may be useful to put the fall-behind piglets together 3 to 7 days after farrowing on a fresh sow. Be prepared to work with 5% of pigs as fall-behinds at that time.

Feeding Management in Lactating Sows

Regardless of the feeding system in place, the goal is to maximize daily feed intake as soon as possible after farrowing. By doing that, milk production and litter growth are maximized, and body weight lost is minimized.

Feed must be kept fresh, which is a challenge in warm weather.

In general, systems able to have an intake of >825 lbs (375 kg) of lactation per year tend to be more productive than systems having a lower lactation diet usage. In 20-day lactation length, the target average daily feed usage is 15 lbs. (6.8 kg) per farrowing crate, and 16 lbs (7.3 kg) per lactation day.

When longer lactations are being used and better feeder management is in place, there are systems that get closer to 1,000 lbs. (450 kgs) of lactation diet per sow per year.

Make sure the water flow rate is no less than 1⁄2 gal/min (2 L/min) and the water availability ensures an intake of >5 gal/day (19 L/day).

Lower or depressed feed intake is often the first sign of individual problems and/or issues affecting sows in farrowing. Those issues can be:

- High replacement rate (too many gilts farrowing at any given time).
- Illness in sows or litters.
- Room temperature (macro-environment) is too warm.
- Fresh water is not available.
- Feed inaccessible or not palatable (feed is moldy).
- Hoof lesions.
- Shorter lactation.
- Retained placenta/piglet.

It is critical to identify any issues early. Monitor sows and litters closely, particularly in the first 2-3 days. Control rectal temperature 1 and 2 days after farrowing, as higher than 104 degrees during those days indicates infection, whinch should be treated with antibiotics or antibiotics plus antipiretics.

Picture 19.

Ensure every sow gets up, eats, and haas access to fresh water every day.

Keep sow macro-environment (room temp) at 70-74°F (21- 23°C) during first 3 days and at 66°F (19°C) after that.

Set fan bandwidths 1.5° to 2° per each stage as a starting point. Adjust if needed.

Hand feeding

- Do not feed sows on their due date or if they show signs of farrowing. If farrowing has not started by that afternoon, feed 3 lbs. (1.4 kg) as usual and continue with twice-daily feedings until farrowing begins. Stop feeding as soon as signs of farrowing appear.
- Sows must be on full-feed from the same day of farrowing.
- Ensure that sows have feed available at night. Be aggressive with the final feeding of the day. By the next morning, less than 50% of the feeders should be totally empty. If the farm feeds the farrowing room three times daily, add 8 lbs. (3.6 kg) every time the feeder has no feed left. In the best-case scenario, that means sows eat 24 lbs (11 kg) daily. Never leave the farm with empty feeders in lactation.

Self-feeders or ad-libitum feeders can improve lactation feed intake due to sows having fresh feed available all of the time. Make sure feed is always in the tube since sows will be able to regulate their own intake. An additional advantage is labor otherwise spent feeding sows can be redirected to different chores on the farm.

Wet feeding consists of adding water to the lactation diet in the feeder. It is a useful tool that can be used to increase lactation feed intake in hot weather. There are several considerations when contemplating wet feeding:

- Difficult, if not impossible, to implement with self or automatic feeders.
- Adding too much water will force sows to drink extra water before consuming feed. This could cause the sows to fill up on water and not eat feed.

- Feed with high levels of by-products could be problematic. By-products in feed tend to separate when feed gets wet. This could cause sows to pick through feed and drive intake down.

Pre-weaning Mortality

A higher total and live born do not add to the farm's output if those piglets do not survive until weaning. If managed properly the ability to raise the piglets farrowed is one of the PIC sows' advantages.

The goal is to wean >85% of the total piglets born so pre-weaning mortality control (see Graph 2) is one of the drivers of optimized performance in a sow herd. In general, sows that are well managed and where the integrity of the mammary gland-piglet complex is maintained, sows will take good care of the piglets born in the room.

Graph 2.

In the absence of a clinical disease outbreak, pre-weaning mortality is a management issue so it has to be managed. The key fact to understand is that almost two thirds of pre-weaning mortality typically occurs in the first 1-2 days of life, and more than 50% of dead piglets are laid on.

Herds that are unbalanced with too many P1s and too many P7+ tend to have higher pre-weaning mortality than herds with the majority of the population within P2 to P6. Managing parity structure (covered in Part 3) is critical.

Exposing gilts and gestating sows to farm specific pathogens that will be encountered in farrowing can be a critical step to ensure that the female is able to pass on immunity to her litter. Acclimation and feedback were previously discussed in this manual. The herd veterinarian will be able to help develop a farm specific program.

Defects:

- Splay-legged piglets - Tape within the first 6 hours of life. When occurrence is higher than 0.5% check induction protocol (too many sows, too early) and if the micro- environment is not too wet, too cold and/or too slippery.
- Pale piglets – there is some association with the use of farrowing induction and the use of oxytocin. Additionally, check that the interventions used on the farm are not too aggressive.
- Scrotal rupture – ask your PIC representative for the PIC Rupture Repair Slick and/or Simplified Scrotal Hernia Repair CD developed by the PIC Health Assurance.

Savaging:

- Even though reasons for savaging are not fully understood, we do know that the combined effect of young parity females, too much fostering, over-conditioned sows, hunger, thirst, ventilation, temperature, presence of workers doing processing can play a role in the origin of savaging.
- Try to keep those stressors under control to minimize the problem, but especially do not cut down on feed intake before 112 days of gestation.

Weaning Age

During lactation, the hormones and uterus “reset” from pregnancy before a new cycle begins. Uterine involution takes place, which means the uterus returns to its pre-pregnancy size and weight and recovers its internal wall (endometrium) integrity. This process typically takes longer in gilts than in adult sows.

Increased lactation length has been associated with improved performance during subsequent farrowings. In general, every additional day in lactation correlates with 0.1-0.2 additional piglets in the subsequent farrowing.

Weaning older and heavier piglets also impacts piglet performance after weaning. Heavier piglets at weaning have higher average daily gains, less mortality and lower production costs in the nursery and finisher phases of production.

Recent unpublished data shows that weaning age recommendation is very system-dependent. The right one is anywhere from 18 to 25 days, depending on what are the objectives of your own production system. What is absolutely certain is that weaned pigs younger than 18 days of age and lighter than 11 lbs. (5.0 kg) will require extra care, better environments and better nutrition after the weaning. Piglets weaning less than 8 lbs (3.6 kgs) hardly will make it to a full value pig.

PIC position on this matter is that both a minimum of 18 days of lactation and a minimum of 320 lbs (145 kgs) of feed per lactation is what is needed to be competitive in sow farm performance and post-weaning performance.

For different reasons, some females need to be weaned earlier than what is recommended in order to save the sow or the litters. Depending on the reason and the age, a decision has to be made to keep the female or cull her. When keeping them, move them to the opportunity sow area, fed them as a weaned sow and avoid breeding them if they are in heat within 21 days from the early wean event.

Part 8. Weaned Sows

After the sows are weaned, they should be housed in a consistent location, with maximized water intake and feed intake to mitigate body weight losses from lactation.

For a 5.5-day wean-to-service length, you should target to have sows eating no less than 50 lbs. in total. Make sure sows are getting feed in farrowing before weaning and have feed in the weaning row upon placement.

Provide fresh, clean water, ideally through nipple drinkers that allow longer time to consume feed as opposed to running water into troughs and allowing sows less time to eat.

In systems not having individual nipple drinkers - treat the sows as individuals that have different appetites and needs. Sows with bigger appetites will potentially have poorer litter size on their subsequent farrowing in systems where feed drops are set up for average intake. It takes a good caretaker to realize that and act accordingly.

Every suckled teat sends a hormonal signal to the brain to release low levels of cycle-inhibiting hormones. When the sows are weaned, this inhibition is removed and the brain releases hormones that trigger estrus, ovulation and behavior that ensures sows can be bred. In order to initiate the milk production shut-down quicker, sows needs to have plenty of water and feed.

Determine if weaned sows are eligible to be bred again. The ones that are not should be culled or skipped.

Move weaned sows to the weaning row as early as possible in the morning to avoid heat during the warmest part of the day. This strategy also allows the staff to wash and disinfect the farrowing room and give it maximum time to dry before reloading. Avoid placing weaned sows in-group pens.

Place P1 females next to each other and avoid placing them beside older and heavier/more aggressive sows.

Start boar exposure (with an active, adult boar) the day of weaning by allowing a boar in front of sows for at least 1 hour daily. Expect to have more than 90% of the sows bred by 7 days after weaning.

Sows showing estrus the same day of weaning or the day after usually have a low farrowing rate and should be skipped until the next heat. When having a good boar exposure system from day of weaning, sows found in heat from day 2 after weaning can be inseminated. Sows in heat from 7 to 14 days after weaning have lower fertility; so try to minimize the number of these sows bred by maximizing feed intake in farrowing and in the wean-to-service interval. If this will not hurt breeding targets, skip or cull them.

Skip-a-Heat

This practice is designed to allow females that have lost too much weight during lactation to recover body reserves. This is most acute in P1s. More than 10% of body weight loss during the first lactation severely affects performance in P2. Skipping a heat could be a way to manage this but should not be seen as a solution for deficiencies in gilt management, gestation body weight gain (anabolism) and/ or farrowing body weight losses (catabolism).

Skip-a-heat has a cost, so its benefits need to be evaluated from an economic point of view. Variables to include in the analysis are replacement rates, feed price, weaned pig price, interest rate, and percentage of P1s skipped. The decision to skip should be reviewed regularly to see if the practice is still justified when economics change.

When more than 20% of the females need to be skipped, something else needs to be fixed first. Points to be reviewed are: weight at first breeding, gestation diet usage, body weight gained in gestation, feed intake in lactation, and frequency/severity of litter scours.

Once the decision to skip-a-heat is taken, feed sows properly to recover body tissues during the skipped period and breed them at the next heat. Now, with current and forecasted high feed prices, hormone interventions could have a role to increase P-2 productivity, without incurring the cost of the 21 additional nonproductive days associated with skip-a-heat breeding (Patterson et cols., 2008). Thus, further investigation can be initiated on a case-by-case basis.

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Pictures: courtesy of Tosh Farms, Henry, TN
and Thomas Livestock, Broken Bow, NE

Appendix A.

Picture A-1. Liquid temperature to monitor semen temperature in refrigerator

Appendix B.

Analysis of Cost:Benefit to Bump Feed Up By Late Gestation

WP value	$38
WP cost	32
Margin/WP	$6
Margin of marginla pig saved	$37

Variable:	Diet Cost						
Sow inventory			5,600	5,600	5,600	5,600	5,600
LSY			2.5	2.5	2.5	2.5	2.5
Farrowings/yr			14,000	14,000	14,000	14,000	14,000
BA			13.0	13.0	13.0	13.0	13.0
Piglets Born Alive			182,000	182,000	182,000	182,000	182,000
Gestation Diet Cost			$0.11	$0.12	$0.13	$0.14	$0.15
Cost of bump/sow	2	12	$2.52	$2.76	$3.00	$3.24	$3.48
Annual cost			$35,280	$38,640	$42,000	$45,360	$48,720
Additional Weaned Piglets Needed			954	1,044	1,135	1,226	1,317
% PWM To Break Even			0.52%	0.57%	0.62%	0.67%	0.72%
% PWM for ROI 3:1			1.6%	1.7%	1.9%	2.0%	2.2%

Variable:	Litter Size						
Sow inventory			5,600	5,600	5,600	5,600	5,600
LSY			2.5	2.5	2.5	2.5	2.5
Farrowings/yr			14,000	14,000	14,000	14,000	14,000
BA			11.5	12.0	12.5	13.0	13.5
Piglets Born Alive			161,000	168,000	175,000	182,000	189,000
Gestation Diet Cost			$0.13	$0.13	$0.13	$0.13	$0.13
Cost of bump/sow	2	12	$3.12	$3.12	$3.12	$3.12	$3.12
Annual cost			$43,680	$43,680	$43,680	$43,680	$43,680
Additional Weaned Piglets Needed			1,181	1,181	1,181	1,181	1,181
% PWM To Break Even			0.73%	0.70%	0.67%	0.65%	0.62%
% PWM for ROI 3:1			2.2%	2.1%	2.0%	1.9%	1.9%

Variable:	LSY						
Sow inventory			5,600	5,600	5,600	5,600	5,600
LSY			2.42	2.44	2.46	2.48	2.5
Farrowings/yr			13,552	13,664	13,776	13,888	14,000
BA			13.0	13.0	13.0	13.0	13.0
Piglets Born Alive			176,176	177,632	179,088	180,544	182,000
Gestation Diet Cost			$0.13	$0.13	$0.13	$0.13	$0.13
Cost of bump/sow	2	12	$3.12	$3.12	$3.12	$3.12	$3.12
Annual cost			$42,282	$42,632	$42,981	$43,331	$43,680
Additional Weaned Piglets Needed			1,143	1,152	1,162	1,171	1,181
% PWM To Break Even			0.65%	0.65%	0.65%	0.65%	0.65%
% PWM for ROI 3:1			1.9%	1.9%	1.9%	1.9%	1.9%

Variable:	Bump up length						
Sow inventory			5,600	5,600	5,600	5,600	5,600
LSY			2.5	2.5	2.5	2.5	2.5
Farrowings/yr			14,000	14,000	14,000	14,000	14,000
BA			13.0	13.0	13.0	13.0	13.0
Piglets Born Alive			182,000	182,000	182,000	182,000	182,000
Gestation Diet Cost			$0.13	$0.13	$0.13	$0.13	$0.13
Bump up days		5	7	12	17	22	27
From day			105	100	95	90	85
Cost of bump/sow	2		$1.82	$3.12	$4.42	$5.72	$7.02
Annual cost			$25,480	$43,680	$61,880	$80,080	$98,280
Additional Weaned Piglets Needed			689	1,181	1,672	2,164	2,656
% PWM To Break Even			0.38%	0.65%	0.92%	1.19%	1.46%
% PWM for ROI 3:1			1.1%	1.9%	2.8%	3.6%	4.4%

Variable:	Piglet Price						
Sow inventory			5,600	5,600	5,600	5,600	5,600
LSY			2.5	2.5	2.5	2.5	2.5
Farrowings/yr			14,000	14,000	14,000	14,000	14,000
BA			13.0	13.0	13.0	13.0	13.0
Piglets Born Alive			182,000	182,000	182,000	182,000	182,000
Gestation Diet Cost			$0.13	$0.13	$0.13	$0.13	$0.13
Cost of bump/sow	2	12	$3.12	$3.12	$3.12	$3.12	$3.12
Annual cost			$43,680	$43,680	$43,680	$43,680	$43,680
Piglet Price			$25	$30	$35	$40	$45
Additional Weaned Piglets Needed			1,747	1,456	1,248	1,092	971
% PWM To Break Even			0.96%	0.80%	0.69%	0.60%	0.53%
% PWM for ROI 3:1			2.9%	2.4%	2.1%	1.8%	1.6%

Appendix C.

Farrowing Room Inspection Checklist

Room # _____

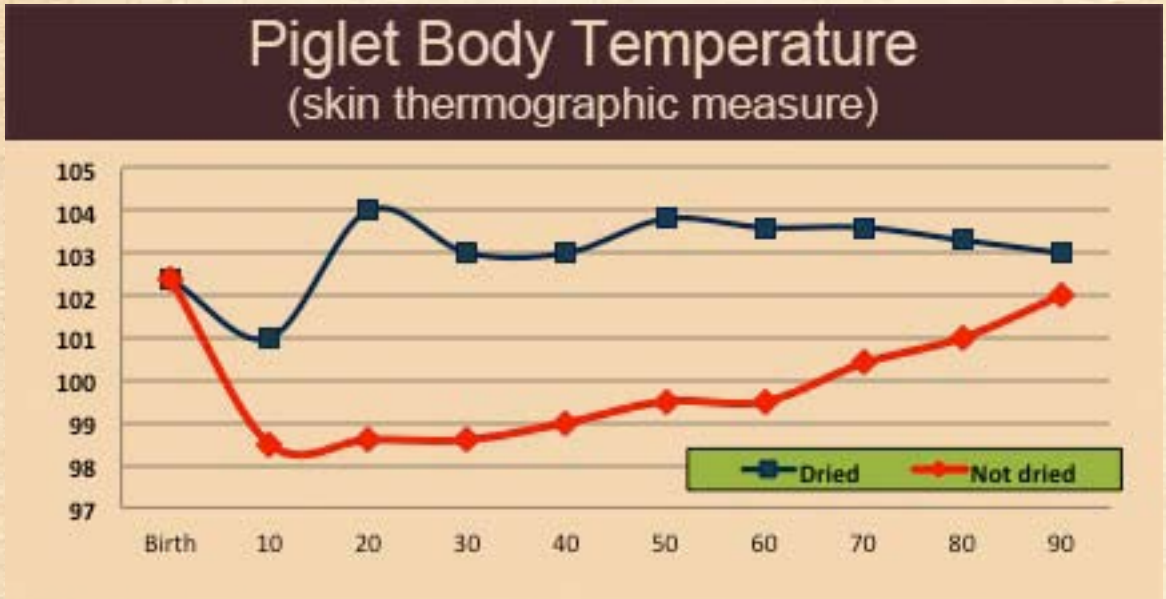
Inspector _____

Area	Free of:	Pass / Fail	Area Notes	Pass / Fail	Final Pass
Farrowing Crates	Biological matter, Feed, Manure etc.	Y / N		Y / N	Y
Floors	Manure, afterbirth, scours	Y / N		Y / N	Y
Mats	Scours, manure	Y / N		Y / N	Y
Divider Panels	Scours, manure	Y / N		Y / N	Y
Feeders	Remaining feed, mold	Y / N		Y / N	Y
Heat Lamps	Dust	Y / N		Y / N	Y
Water Lines	Dust	Y / N		Y / N	Y
Feed Lines	Dust	Y / N		Y / N	Y
Walkways	Manure, feed	Y / N		Y / N	Y
Walls	Dust, manure	Y / N		Y / N	Y
Fan Louvers	Dust	Y / N		Y / N	Y
Split Suckle Boxes	Scours, manure	Y / N		Y / N	Y
Feed Carts	Feed, manure on outside	Y / N		Y / N	Y
Ceiling Inlets	Dust	Y / N		Y / N	Y
Recharge Lines	Dust	Y / N		Y / N	Y
Windows	Fly matter	Y / N		Y / N	Y

Post Inspection Checklist	Yes / No
Room set up and ready for load	Yes / No
Farrowing Charts in place	Yes / No
All heat lamps functional	Yes / No
All heat lamps adjusted	Yes / No
Ventilation set up for day 1	Yes / No
Recharge plugs reset	Yes / No
Pits recharged	Yes / No
Mats set and in place	Yes / No
Split suckle boxes ready	Yes / No
ROOM IS DRY	Yes / No

Appendix D.

Graph D-1. Effect of Dry Piglets at Birth on Body Temperature



Appendix E.

Table E-1.

PIC Female - Global Overview					
Line	**Alternative Name(s)**	**Oriented To**	**Optimum Breeding Weight**	**Age at First Breeding**	**Comments**
Line03	1020	GGP(1) or GP(2) sow, Produce maternal females	300-320 lb (136-145 kg)	32-34 wks	
1070		GP sow, Produce Camborough 29, Low Cost Multiplication		29-31 wks	
Camborough	1050, Camborough Classic	GP or P(3) sow, Highest prolificacy, it can be used as GP or Parent female		30-32 wks	Most contemporary production systems are set up for breeding at the weight/age listed in Table 2
Camborough 29		Parent sow, systems looking for three-way cross and robustness, second to Camborough in prolificacy		30-32 wks	
Camborough 40*		GP or Parent sow, produce a progeny with a solid grow-finish performance (lean growth and FCR)		28-30 wks Adjust vaccination program to ensure the gilts are bred in the right weight/age and the last procedure is done 3 weeks prior to breeding.	Monitor body condition very closely to prevent excessive body weight gain in gestation. Good appetite in lactation; solid display of heat after weaning.
Camborough 48*		Parent sow			