

# Production Variation – “Blame the worker or the system?”

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## Prior to looking at production numbers, look at how:

- ✓ The “system” influences productivity measures
- ✓ Productivity measures are influenced by data management practices
- ✓ Different sources of variation influence how you interpret the data

## Variation in Performance Measures –

- ✓ Common Causes of Variation
  - Always present as a normal part of the process
  - Influenced by the design of the system, or due to the technologies used in the production system
  - Influenced directly by management
  - Assess when you want to look at the management of the business
- ✓ Special Causes of Variation
  - Not inherent in the production process itself
  - Typically occurs for a short time
  - Includes only the variations that are under the control of the farm worker
  - Assess when you want to look at the management of the production

## Why worry about “type of variation”?

The type of variation involved with a trait tells us whether the workers or the system needs to be addressed.

### Example:

Litter Size	—————▶	Common
Feed Efficiency	—————▶	Common
Heat Detection	—————▶	Special
Preg Exam Results	—————▶	Special

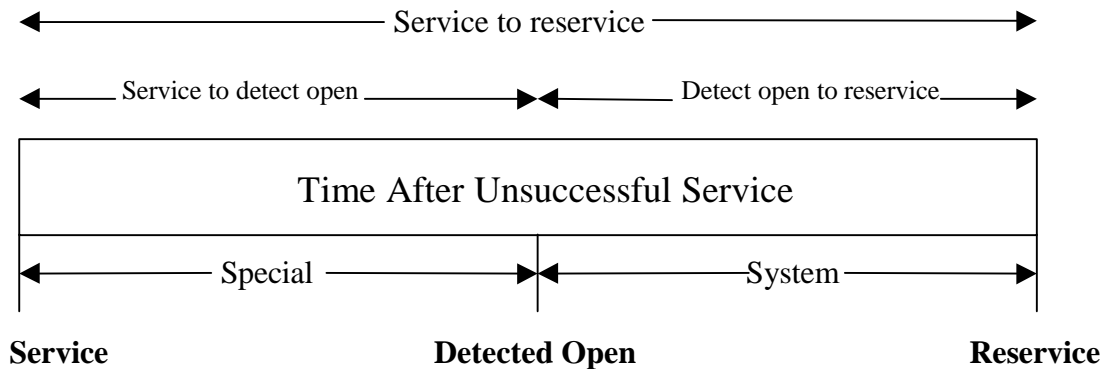
## Measures affected mostly by COMMON cause of variation –

- ✓ Wean to first service interval
- ✓ Gilt entries
- ✓ Total-born litter size
- ✓ Mummy and still born rates
- ✓ Birth weights
- ✓ Gilt acclimation rates
- ✓ Sow mortality rates
- ✓ Service to detect open NPD

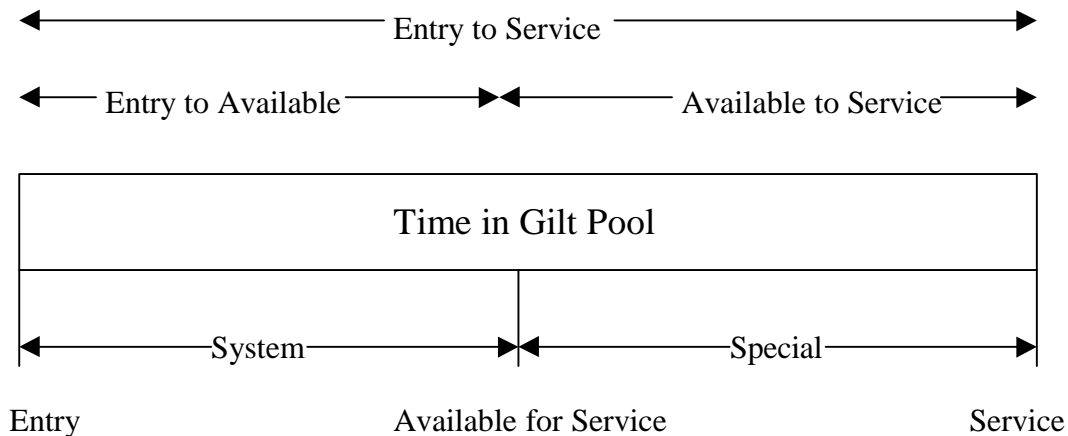
**Measures affected mostly by SPECIAL causes of variation –**

- ✓ NPD associated with heat detection
- ✓ Available-to-service NPD for gilts
- ✓ Herd inventory maintenance (capacity utilization)
- ✓ Voluntary culling rates

**Variation influences for Service-to-reservice Interval –**



**Variation Influences for Entry-to-Service Interval –**



**Examples of BOTH causes of variation in production –**

- ✓ Farrowing Rate
- ✓ Preweaning Mortality
- ✓ Entry-to-service NPD
- ✓ No. Sows Served / Group
- ✓ Stillborn Rates
- ✓ Weaning Weights
- ✓ Pigs Weaned / Group
- ✓ Service-to-Reservice NPD

### Worker Incentives –

- ✓ Production incentives must be based upon measures that are under the influence of the worker
- ✓ When an incentive is based on a production measure, it should be directly related to profits. If not, workers will prioritize their efforts toward improving measures that are not directly related to profit.

### Special VS Common Variation –

Determine which source of variation dominates a production measure.

- Sequentially examine each risk factor for a productivity measure asking: “*Does the management/system or the worker influence this?*”
- Weigh the relative importance of the factors on the endpoint measure.
- Look at the risk factors to determine which variation type dominates.

### Major Contributors to Causes of Variation –

	<u>SYSYEM</u>	<u>WORKER</u>	<u>BOTH</u>
❖ <b>Born Alive (Low)</b>			X
➤ Total Born (Low)	X		
➤ Stillborns (High)			X
➤ Mummies (High)	X		
❖ <b>Total Born (Low)</b>	X		
➤ Boar Factors	X		
▪ Age	X		
▪ Disease	X		
▪ Individual Differences	X		
▪ Season	X		
▪ Usage			X
• Over use of aggressive boars		X	
• Insufficient number of boars	X		
• Temperature	X		
➤ Environment	X		
▪ Housing	X		
▪ Movement			X
• Lack of timely moves		X	
• Facility sow flow	X		
➤ Feed	X		
▪ Feed Additives			X
• Improper Additives	X		
• Failure to use		X	
▪ Micronutrients	X		
▪ Energy/Intake			X
• Low energy diet	X		
• Feeding times and rate		X	
▪ Mycotoxins	X		

	<u>SYSYEM</u>	<u>WORKER</u>	<u>BOTH</u>
➤ <b>Gilt/Sow Factors</b>	X		
▪ Farrow to farrow interval	X		
• Lactation length	X		
• Wean to 1 <sup>st</sup> service interval			X
◆ Too Long	X		
◆ Poor heat detection		X	
▪ Parity	X		
• Removal rates	X		
• Gilt pool management			X
◆ Gilt availability	X		
◆ Heat detection		X	
▪ Reproductive Disease	X		
• PPV	X		
• PRV	X		
• PRRS	X		
▪ Genetics	X		
➤ Management	X		
▪ Matings / service		X	
▪ Mating quality	X		
▪ Timing of matings		X	
▪ Type of service	X		
• Homo vs. Heterospermic	X		
• Artificial Insemination			X
◆ Semen quality	X		
◆ Technician ability		X	
❖ <b>Farrowing Rate (Conventional)</b>			X
➤ Post mating removed for non-reproductive reasons	X		
▪ Environment	X		
▪ Genetics	X		
➤ Adjusted farrowing rate (infertility)			X
▪ Conception failure (regular returns)			X
• Boar factors			X
◆ Age			X
◆ Disease	X		
◆ Genetics	X		
◆ Individual Differences	X		
◆ Season	X		
◆ Temperature	X		
◆ Usage			X
➤ Over use of boars		X	
➤ Insufficient numbers	X		

	<u>SYSYEM</u>	<u>WORKER</u>	<u>BOTH</u>
• Gilt / Sow factors	X		
♦ Parity (low)	X		
♦ Urogenital Disease	X		
• Management			X
♦ Matings per service		X	
♦ Mating quality			X
➤ Worker differences		X	
➤ Environment	X		
♦ Timing of matings			X
♦ Types of service			X
➤ Homo vs. Heterospermic			X
➤ Natural, A.I. vs. Mixed			X
➤ Pen vs. Hand Mating			X
• Mycotoxins	X		
▪ Pregnancy failure (irregular returns)			X
• Environment			X
♦ Housing	X		
♦ Sow movement			X
➤ Timing of moves		X	
➤ Facility restrictions	X		
♦ Season	X		
♦ Temperature	X		
• Feed			X
♦ Lactation energy intake			X
➤ Diet	X		
➤ Amount of feed		X	
♦ Micronutrients	X		
• Gilt / Sow factors			X
♦ Diseases	X		
➤ Reproductive	X		
➤ Non-reproductive	X		
♦ Endocrine dysfunction	X		
♦ Farrow to farrow interval			X
➤ Lactation length	X		
➤ Wean to service int.			X
♦ Parity (high)	X		
▪ Accumulation of repeats			X

### **Examples of COMMON causes of variation –**

- Building design
- Production technologies
  - All-in / All-out
  - Multisite
  - SEW
- Genetic program
- Feed program
- Health status

### **Examples of SPECIAL causes of variation –**

- Failure of worker to accomplish a task to a satisfactory degree or at the proper time.
  - Worker must know that s/he is expected to perform the task.
  - Worker must be trained and capable of performing that task.

### **Understanding the SYSTEM in the breeding herd –**

- Lactation length
- Parity distribution
- Gilt acclimation
- Culling management
- Mating system
- Number of workers and responsibilities
- Season
- Genetics
- Building design
- Mechanization and capital intensity

### **Why be concerned about SYSTEM effects? –**

It is misleading to compare the production numbers generated by one system with that of another system.

For example:

*Comparing the wean-to-first service interval of a farm practicing 14-day weaning with that of a farm practicing 21-day weaning can lead to erroneous conclusions about the farms' performance.*

## Targets and Trends –

*“How do we know where we are going if we do not know where we have been?”*

Most employees, when looking at a performance monitor, are overwhelmed by the amount of information presented to them. They are also not sure of how this information relates to their day-to-day responsibilities on the farm. Target graphs help employees focus on the main areas of the production of the sow herd. Depending on the managers' key production measures, from 5 to 10 areas of production should be targeted on a weekly basis. The main five areas of sow production are:

- ✓ Number of sows serviced / week
- ✓ Number of sows farrowed / week
- ✓ Farrowing rate
- ✓ Number of litters weaned / week
- ✓ Total pigs weaned / week

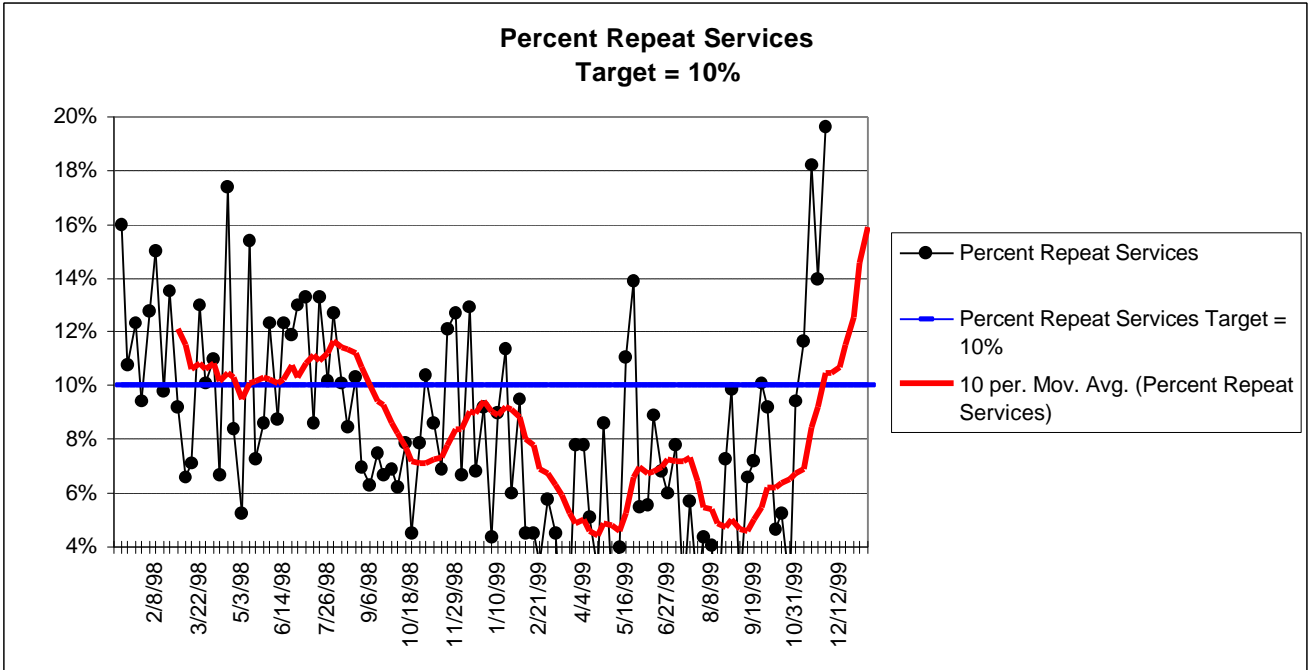
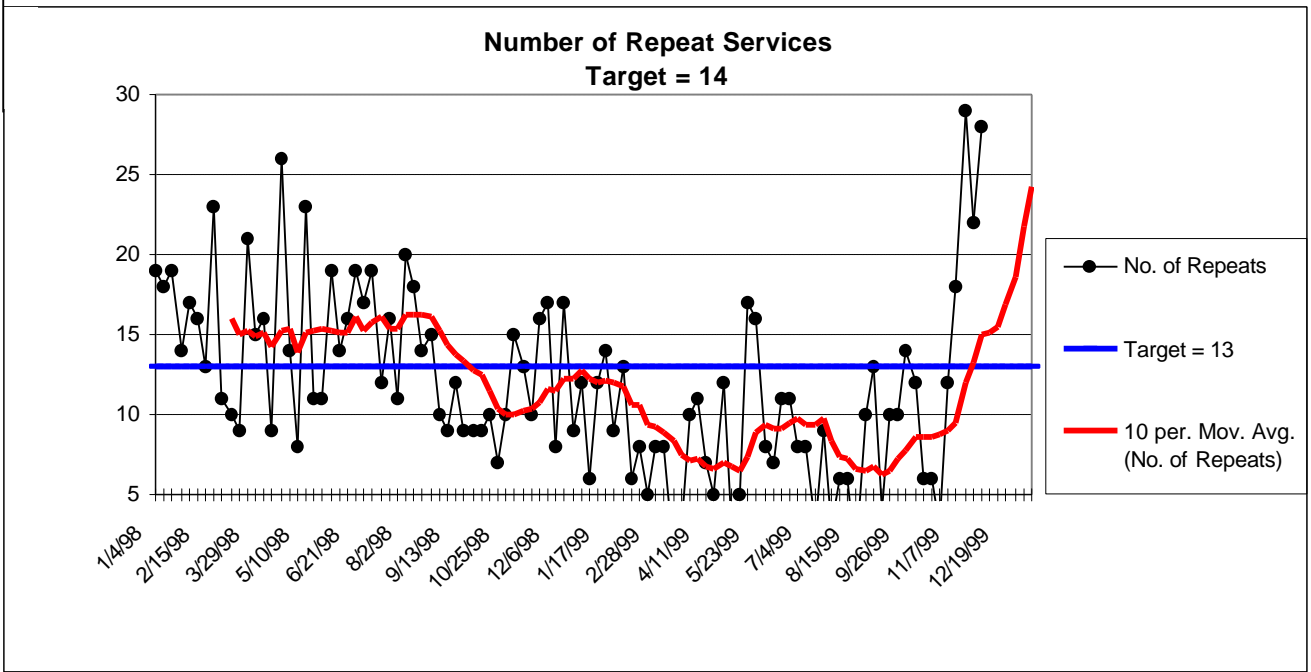
The other five areas of production that many managers want to include are:

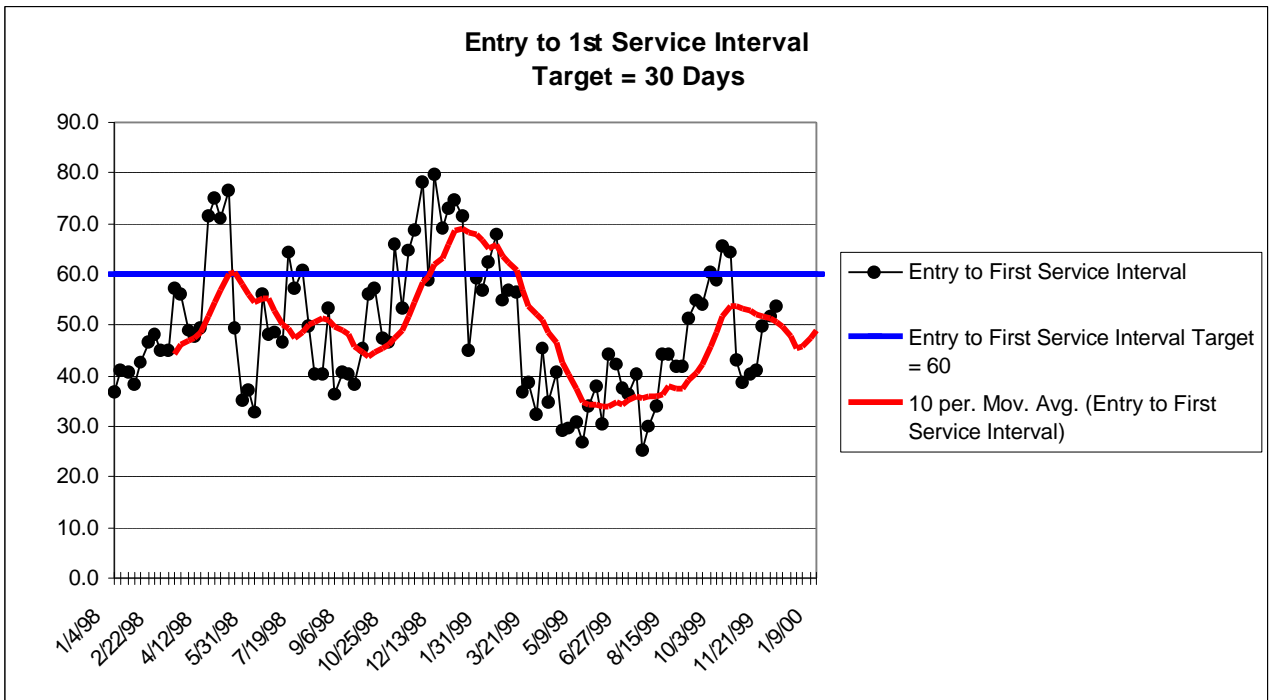
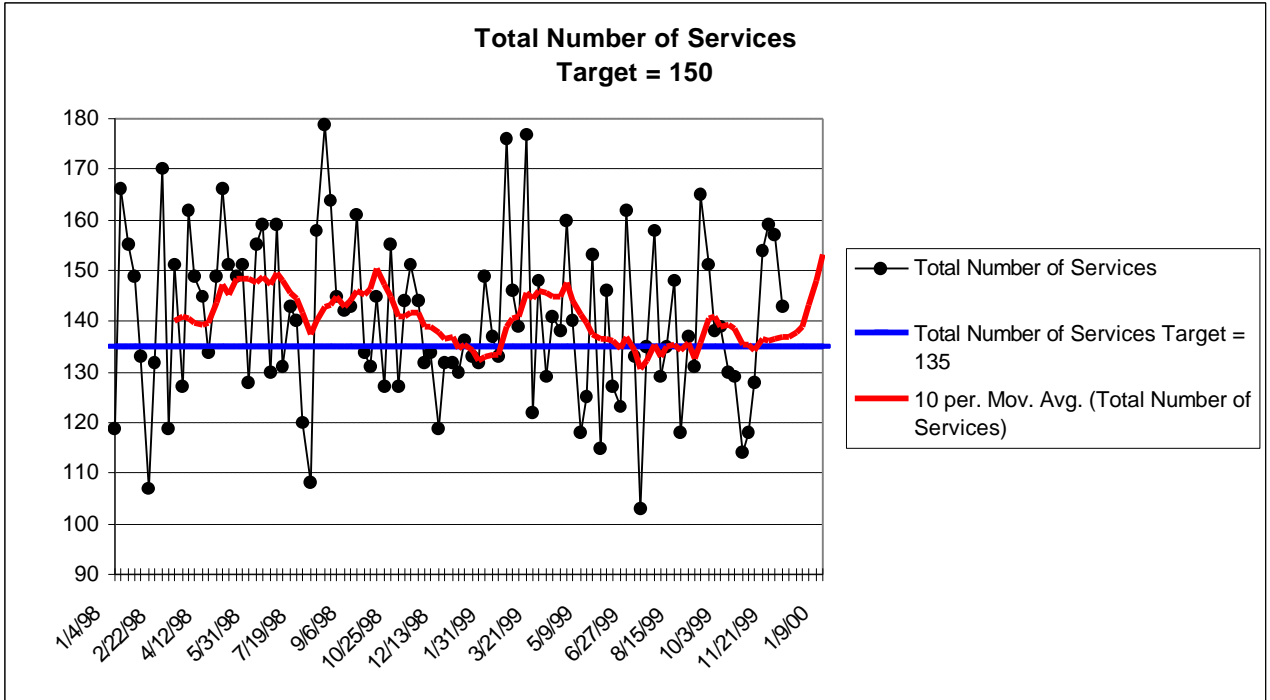
- ✓ Percent repeat services / week
- ✓ Entry to first service interval
- ✓ Weaning to first service interval
- ✓ Total pigs born alive / week
- ✓ Pre-weaning mortality

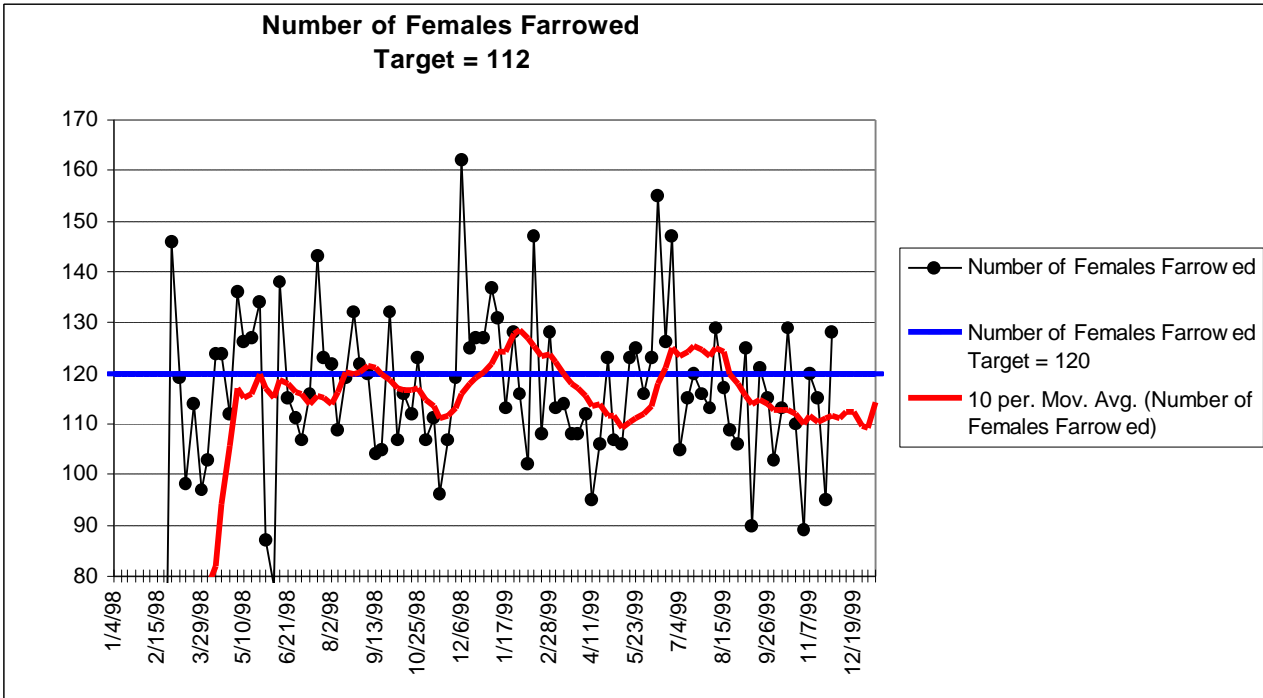
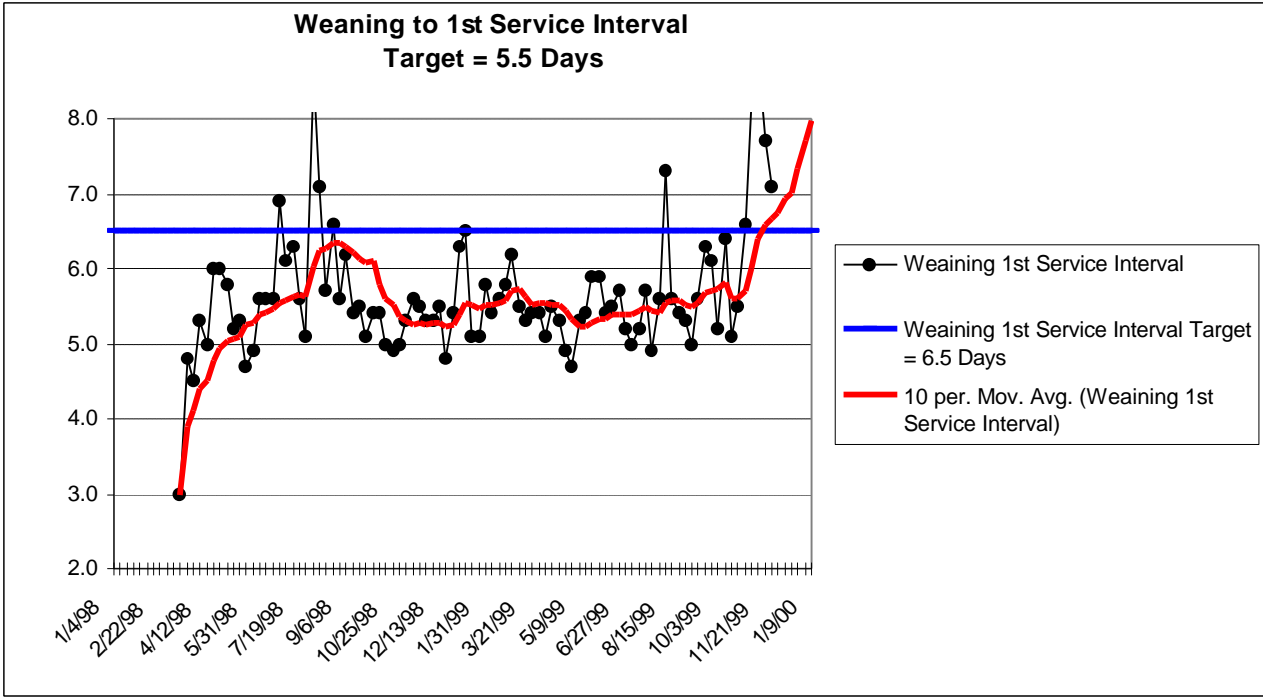
When helping employees focus on these ten areas of production, we can give them immediate feedback on the areas of production that are their main concern. If they are not meeting their targets in those areas, we then need to look at whether these targets are not being met because of the worker or the production system. If they are not being met because of the worker, then additional education needs to be provided so that they can reach their goals.

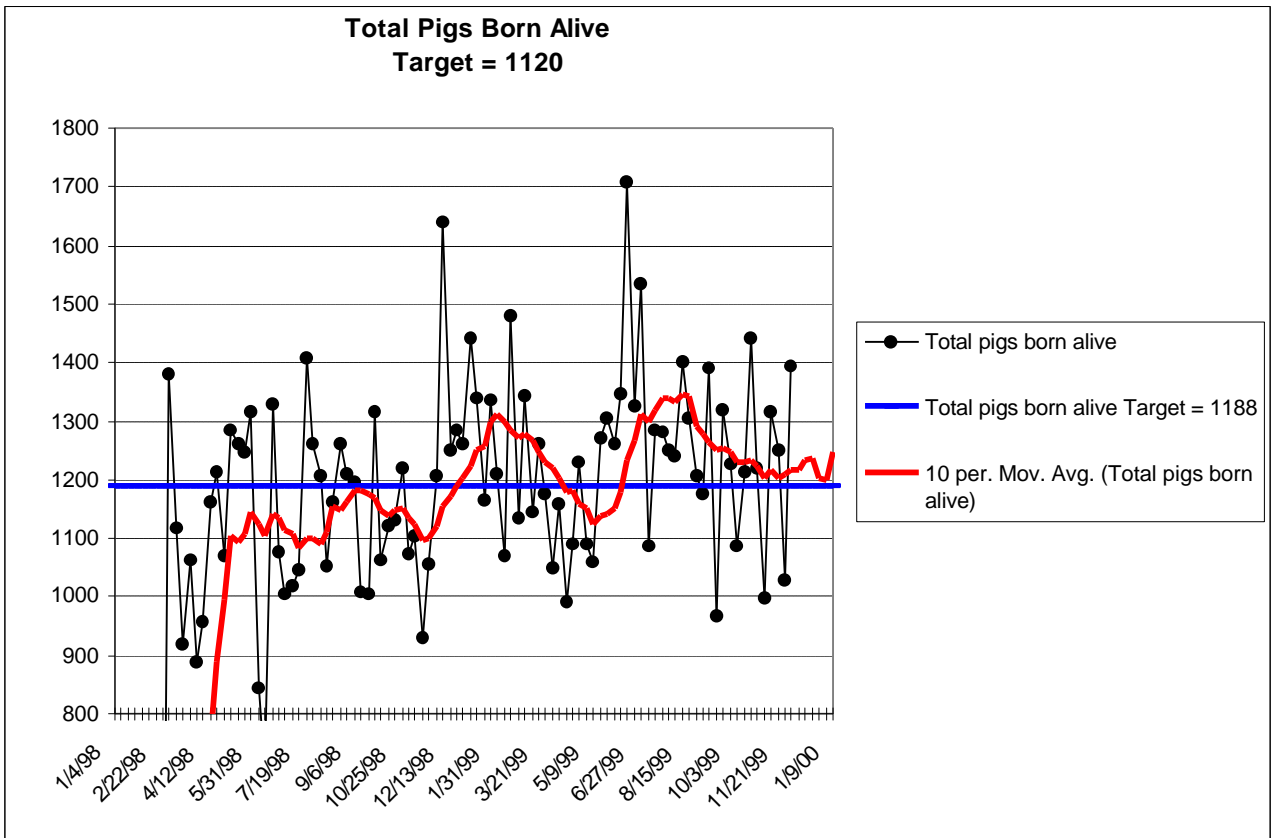
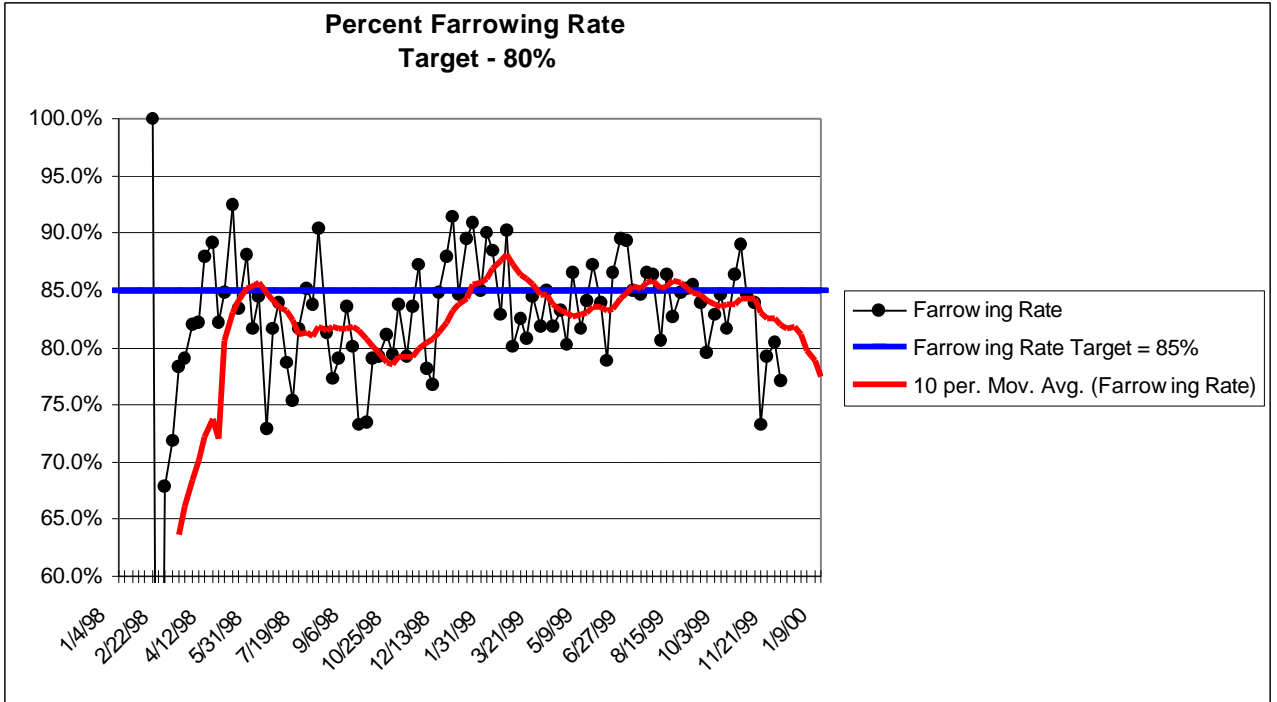
The number of pigs weaned per week results directly from the number of sows that farrowed to produce those pigs. The sows that farrowed, resulted from the number of sows that were bred 115 days prior. By using target graphs we can show the workers that over-breeding one-week does not compensate for under-breeding for six weeks.

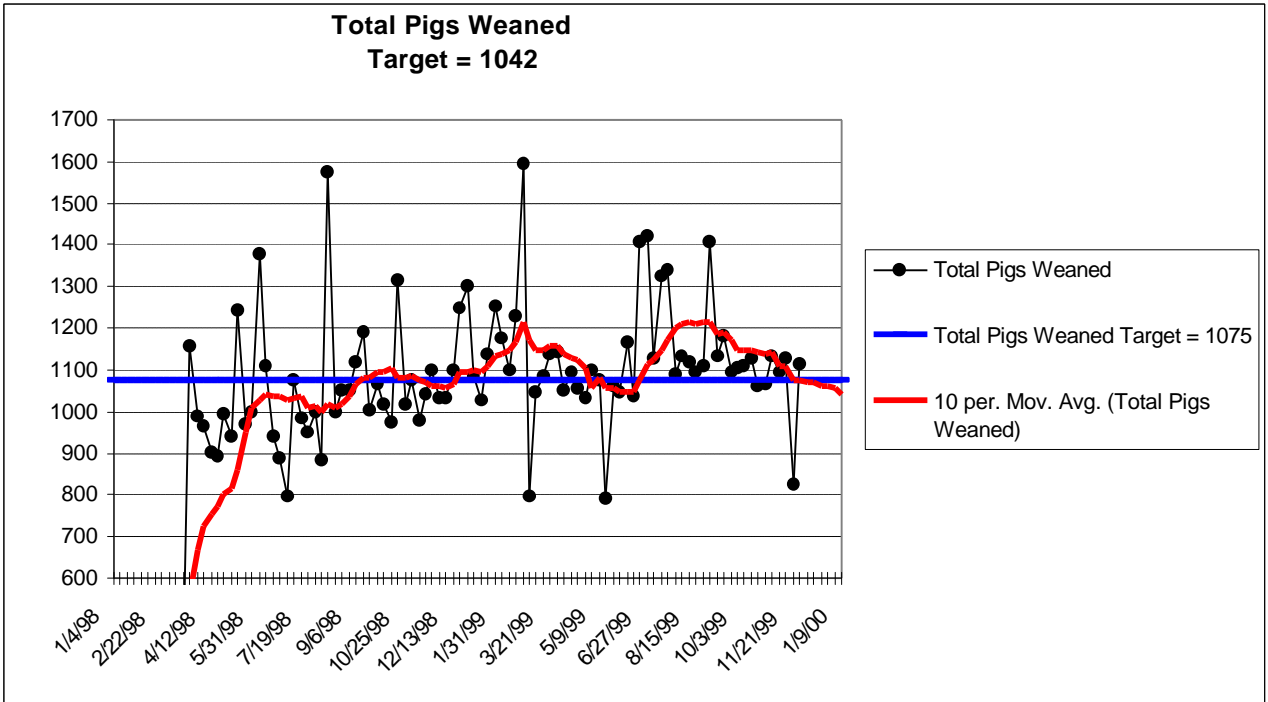
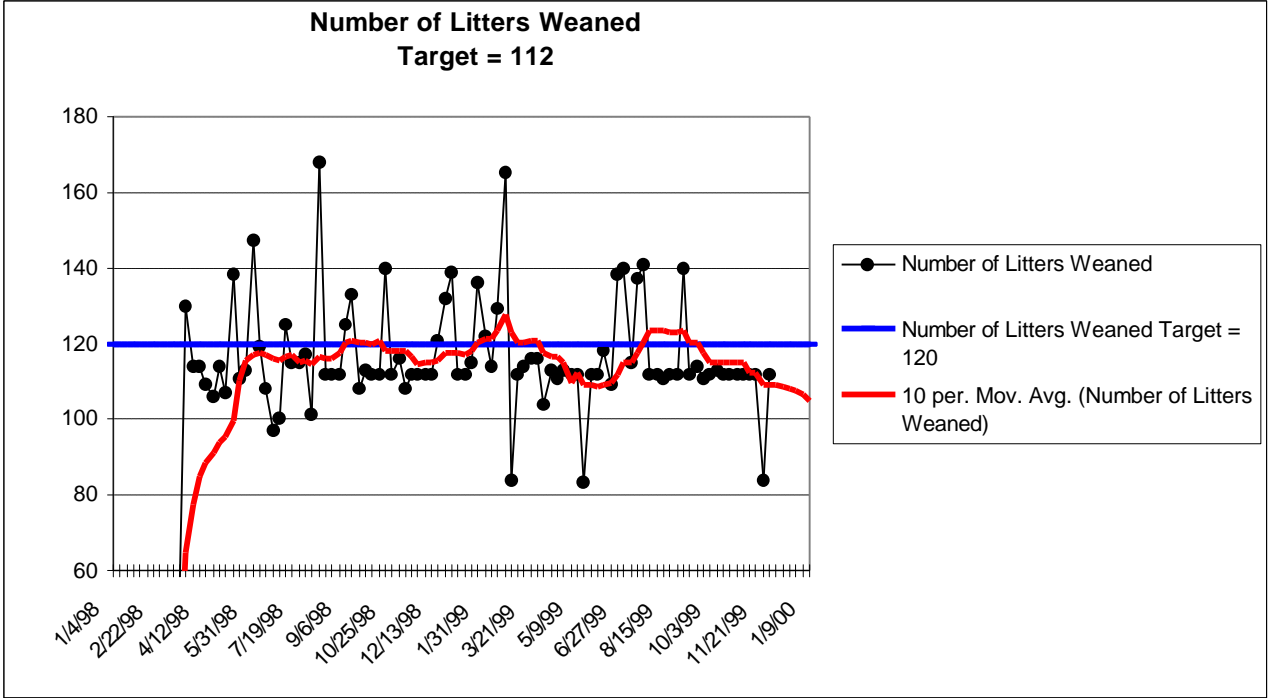
The PigCHAMP® data is transferred to a Microsoft Excel™ spreadsheet. We add a 10-week rolling average trend line to smooth-out the lines, and thus give us a better indication of the trends in the different production areas.

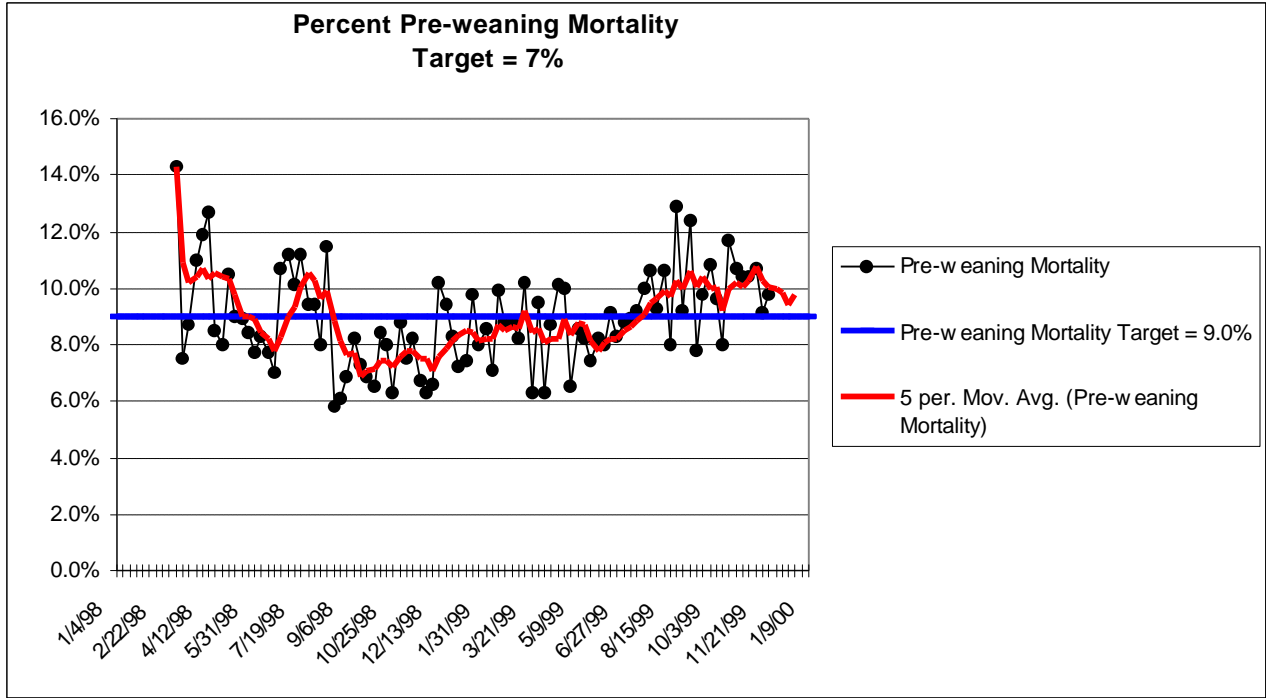












### Weekly Managers Report –

This report shows ten areas of production that the manager needs to stay focused on for both a weekly and a forecast for in the future. This report is broken down into three time periods. The first part is the production for the previous week, showing both the totals for the week, and the percent of goal for the production areas.

The second part shows the projections of the production numbers for the quarter, based on the numbers from the previous weeks in that quarter. The sample report to follow is for week 8 of the 4<sup>th</sup> quarter of 1999. Thus, based on the first eight weeks of the 4<sup>th</sup> quarter, the total number of services will be 1,791 for the quarter, which is 102% of the target.

The third part of this report shows the year-to-date totals for this farm, through week 47.

Note: Unless the farm is running 100 to 110% of breeding goals, it will not its farrowing goals, and therefore will not achieve the number of pigs weaned per week for the quarter.

**Weekly Managers  
Report  
Sample  
Farm**

Quarter Ends: 26-Dec-99

No. of Complete Weeks: 8

Thru  
Week  
47

Last Week

	Ending 28-Nov-99	Goal	Percent of Goal	Projections 4th Quarter	Goal	Percent of Goal	Year Totals
Percent Repeat Services	19.6%	10%	51.0%	14.6%	10%	68.5%	8.9%
Total Number of Services	143.0	135	105.9%	1791	1755	102.0%	6624
Entry to First Service Interval	53.8	60	111.5%	61	60	98.4%	57.0
Weaning to 1st Service Interval	7.1	6.5	91.5%	7.4	6.5	87.8%	6.7
No. of Females Farrowed	128.0	120	106.7%	1530	1560	98.1%	5368
Farrowing Rate	77.1%	85%	90.7%	79.4%	85%	93.4%	81.2%
Total Pigs Born Alive	1395.0	1188	117.4%	15565	15444	100.8%	57157
Number of Litters Weaned	112.0	120	93.3%	1436	1456	98.6%	5345
Total Pigs Weaned	1113.0	1075	103.5%	13829	13975	99.0%	51672
Pre-weaning Mortality	9.8%	9%	91.8%	9.1%	9%	98.9%	8.5%

## Balancing the Numbers –

### “Do the farm numbers match my records?”

When I am asked to consult with swine farms on their records, the most common problem is the fact that the farm numbers do not match the numbers on the computer. The farm says: “We know there were 152 females bred last week, but the performance monitor only shows 149.” The data entry person says: “I entered what they gave me and there were only 149.” After looking at this farm, I may find that three sows were listed twice, or that three were not entered due to wrong I.D. numbers or transposed numbers.

The key to good records is to have a check and balance system established that will result in balanced numbers. With a “Daily Production Balance Sheet” farms can eliminate the problem of numbers not balancing. With this sheet, the farm records the production for the day then after the data is entered into the records, the data entry person enters the totals for the computer. If there are differences, mistakes can be quickly corrected. The following is an example of the balance sheet we use.

DATE: \_\_\_\_\_

	FARM COUNT	PigCHAMP COUNT	DIFFERENCE (+) OR (-)	COMMENTS
SOWS BRED	_____	_____	_____	_____
GILTS BRED	_____	_____	_____	_____
TOTAL BRED	_____	_____	_____	_____
NO. FEMALES FARROWED	_____	_____	_____	_____
TOT. PIGS BORN ALIVE	_____	_____	_____	_____
TOT. STILLBORNS	_____	_____	_____	_____
TOT. MUMMIES	_____	_____	_____	_____
NO. FEMALES WEANED	_____	_____	_____	_____
TOT. PIGS WEANED	_____	_____	_____	_____
TOT. PIGS NURSED OFF	_____	_____	_____	_____
TOT. PIGLET DEATHS	_____	_____	_____	_____
NO. PREG CK NEG.	_____	_____	_____	_____
NO. PREG CK POS	_____	_____	_____	_____
NO. FEMALES NIP	_____	_____	_____	_____
NO. ABORTIONS	_____	_____	_____	_____
SOW DEATHS	_____	_____	_____	_____
GILT DEATHS	_____	_____	_____	_____
BOAR DEATHS	_____	_____	_____	_____
SOWS CULLED	_____	_____	_____	_____
GILTS CULLED	_____	_____	_____	_____
BOARS CULLED	_____	_____	_____	_____
GILTS ENTERED	_____	_____	_____	_____
BOARS ENTERED	_____	_____	_____	_____

The following is the Daily Inventory Sheet. We use this to balance the sows, gilts, boars, and piglets.

	<u>SOWS</u>	<u>GILTS</u>	<u>BOARS</u>	<u>PIGLETS</u>
BEGINNING INVENTORY	_____	_____	_____	_____
+ TRANSFERS IN	_____	_____	_____	_____
- TRANSFERS OUT	_____	_____	_____	_____
- MORTALITY	_____	_____	_____	_____
- CULLS	_____	_____	_____	_____
- SALES	_____	_____	_____	_____
= ENDING INVENTORY	_____	_____	_____	_____
PHYSICAL FARM COUNT	_____	_____	_____	_____
PigCHAMP COUNT	_____	_____	_____	_____
DIFF. FARM & PigCHAMP	_____	_____	_____	_____

**Conclusions –**

Use value-added reports to show workers where the production numbers are on a weekly basis to show where targets are being met and what areas need improvement. When there is variation in production, look at reports to see if this variation is under control of the worker or the system. Strive to make sure the numbers on the farm balance with the computer records.

**Acknowledgments –**

Matthew A. Ackerman, DVM, Swine Veterinary Services, Greensburg, IN.  
 “Generating Value Added Reports from PigCHAMP®”