

Automated Collection of Parlor Performance Data, Part II: Management Uses and Example Reports

Steven Stewart, DVM, University of Minnesota

Steven Eicker, DVM, Valley Ag Software

Paul Rapnicki, DVM, University of Minnesota

Introduction

Automated collection of parlor information can be used to monitor the cows, the parlor personnel, and the milking equipment. This paper will present examples of data usage for management purposes. A companion paper will discuss standardized definitions of the collected data.

General Goals of Parlor Management

The general goals of good parlor management can be stated as follows:

- Milk high producing cows cleanly, gently, rapidly, and completely
- Detach the milking unit as soon as possible after milk flow has ceased.
- Have the cow calmly exit the parlor in a timely manner
- Have another cow calmly occupy the same stall as quickly as possible
- Attach the unit immediately after proper pre-milking hygiene and stimulation

To determine if the above goals are being met, the following information needs to be collected for each cow during each milking. In some cases, a combination of data points must be used to derive the desired information:

1. Total milk weight
2. Length of time unit was attached
3. Parlor stall occupied
4. Time of day of unit attachment
5. Time of day of entrance into the parlor
6. Overall flow rate of milk
7. Highest (peak) flow rates during the milking
8. Flow rates at discrete time intervals or discrete phases
9. Presence of fall-off, kick-off, or other re-attachment
10. Presence of disabling or overriding automatic take-offs

General Monitors of Parlor Performance

Cows per Hour

The number of cows milked per hour is one of the most commonly used parlor performance measurements. To calculate for a given milking, divide the total number of cows milked in the parlor (including the fresh and sick pens) by the total time. It can also be applied to a single group rather than the whole herd.

Cows per hour has the advantage of being available on all parlors, regardless of size or degree of automation. It is also useful as a guideline when planning new parlors or upgrading old facilities. However, it is of more limited value when comparing efficiency of one size parlor to another. Note there is no information relating to either milk production, to patterns of cow movement, or to average milk flow rates of individual cows. It therefore can be quite high even in situations where the cows are milking at low levels and where the milkers are doing a poor job of udder hygiene.

Cows per Stall per Hour (Turns per Hour)

The number of times each parlor side is refilled per hour (turns per hour) is another commonly used measurement. It can be calculated from dividing the cows per hour calculation by the total number of parlor

stalls. It therefore has an additional advantage over cows per hour because it simplifies comparisons between different size parlors. It however still suffers from the other disadvantages listed under cows per hour and can be high in undesirable situations.

Milk per Hour

Milk per hour is less commonly calculated, but it offers the advantage of incorporating information on the main source of revenue from the parlor. It can be calculated by dividing the total milk harvested from the herd during the milking divided by the total time spent in the milking. It is still difficult to compare different size parlors.

Milk per Stall per Hour

Milk per stall per hour is calculated by dividing total milk by total parlor stalls by total time spent in the milking. This number will be highest in situations involving these factors: High producing cows, fast milking cows, and rapid turnover of parlor stalls. It has the advantages of reflecting the overall rate of milk output, removes effect of parlor size, and is not likely to be high with low milk/cow, mistreatment of animals, or poor let-down. It is likely the best readily available measure of overall parlor performance.

Specific Diagnostic Measures of Parlor Performance

Examining the following commercially available parameters (either for the overall herd or for a subgroup within the herd) can assist in identification of potential problems:

1. Average milk per cow
2. Average unit on-time (duration)
3. Average overall flow rate
4. Average peak flow rate (proxy: milk flow in second minute)
5. Estimated duration of peak flow
6. Average flow immediately post-attachement
 - a. 15 seconds post attach
 - b. 15-30 seconds post attach
 - c. 30-60 seconds post attach
7. Time spent in low (<2.2 lbs) flow/Percent of total in low flow
8. Time spent in high (>=2.2 lbs) flow/Percent of total in high flow
9. Pounds milk within first/second minute and percent of total milk
10. Percent of time units were attached
11. Start/Stop times of day and length of time to complete the milking
12. Count of reattachments

Example Summary Report

If the systems are properly configured, a summary of the milking can be produced. An example report is shown below.

Milking report for 10/22/00 Milking 3 at 1:15 AM P50K2 Settings: 19: 1

STRG	Total Milk	Milk /Hr	Milk /Cow	Cows	Cows /Hr	Total Time	Start Time	Stop Time	Avg #/m	Avg Dur	Avg Dev	Not ID
1	3999	4443	28	145	161	0:54	20:34	21:29	6.4	4.4	-2	0
2	4960	5511	35	141	156	0:54	21:28	22:23	7.3	5.0	-3	0
3	3710	4280	25	148	170	0:52	22:22	23:14	6.7	3.9	-3	0
4	2140	2675	16	133	166	0:48	23:17	0:06	5.0	3.3	-3	2
5	283	2122	17	17	127	0:08	0:08	0:17	5.4	3.1	-1	2
7	1159	2045	16	71	125	0:34	0:15	0:49	5.0	3.2	-3	3
6	288	2160	16	18	135	0:08	0:56	1:05	5.2	3.0	-3	-1
Total	16539	3675	25	673	149	4:30	20:34	1:05	6.2	4.0	-3	6

Units were attached 20 percent of the time 24 units were reattached

Milk / stall / hour 76

Cows / stall / hour 3.1

2.5 Flowrate 0 to 15 seconds

5.3 Flowrate 15 to 30 seconds

5.1 Flowrate 30 to 60 seconds

8.0 "Peak" Flowrate

12.5 Milk in the first 2 minutes

51 Percent milk in the first 2 minutes

13 Percent time in low flow

33 Seconds in low flow

Several months of data from multiple herds will be presented for each of the above parameters. This information has potential to serve as initial benchmarks for assessing parlor performance.

Monitoring the Details of Parlor Turnover

For best parlor performance, the units must be promptly removed upon completion of milking and be attached to the next cow in the stall as soon as possible after proper pre-milking hygiene and stimulation. Delays can occur for a variety of reasons:

1. Delays in cow entrance into the parlor from holding area.
2. Delays from entering parlor and occupying a parlor stall.
3. Delays between the time a cow occupies a stall and unit attachment.
4. Delays when exiting the parlor.
5. Delays due to an empty holding area, e.g., between 2 groups of cows.
6. Delays from attachment of first unit on a side to last unit on same side.
7. Delays due to long duration of on-time for 1 cow, delaying rest of side.
8. Delays due to equipment factors (e.g., vacuum & detacher settings).
9. Delays due to lower flow due to inadequate pre-milking stimulation.

An example report is shown below. Note the following:

1. Time to attach units on a side was 3 to 4 minutes.
2. Turn 2 Side 1 took 18 minutes from the time the first unit was attached to the final unit being removed. Since unit attachment time was relatively short, would indicate one or more cows had a prolonged duration. This could be documented by selecting duration to be displayed rather than order.
3. Turn 4 Side 1 & 2 had gaps from the previous sides of 13 and 17 minutes. Note that this is likely due to the fact that there was a change in groups, with the holding pen being empty for a period of time.
4. Turn 1 Side 2 was attached in reverse order.
5. Turn 3 Side 1 was attached in somewhat random order.

Milking 1									Order									
T	S	Pen	MY	Gap	Att	Det	FstAt		1	2	3	4	5	6	7	8	9	10
1	1	1	33	0	4	15	04:58		1	2	3	4	5	6	7	8	9	10
1	2	1	30	0	4	15	04:54		10	9	8	7	6	5	4	3	2	1
2	1	1	30	6	3	18	05:19		1	2	3	4	5	6	7	8	9	10
2	2	1	33	5	3	12	05:13		1	2	3	4	5	6	7	8	9	10
3	1	1	34	3	4	12	05:41		1	2	7	5	6	3	4	8	9	10
3	2	1	35	7	4	12	05:31		1	2	3	4	5	6	7	8	9	10
4	1	2	34	13	3	13	06:06		1	2	3	4	5	6	7	8	9	10
4	2	2	35	17	4	14	06:00		1	2	3	4	5	6	7	8	9	10
20	2		32	6	3	11												

T=Turn, S=Side, MY=Milk Yield.
 Gap Time first unit attachment minus time last detach same side previous turn.
 Att Time last attach minus first attach, same side same turn.
 Det Time final detach minus first attach, same side same turn.
 FstAt Time of day first unit attachment.

Another example would be the timing (in seconds from first unit on) of attachment of the units. In the below example the milker was supposed to prepare and attach in groups of five cows. On the first turn first side the order and timing are correct; on side two the order is correct, but units were attached without a break between stall 5 and 6, likely meaning the desired prep procedure was not followed.

Milking 1									Time of Attachment									
T	S	Pen	MY	Gap	Att	Det	FstAt		1	2	3	4	5	6	7	8	9	10
1	1	1	33	0	4	15	04:58		0	15	31	44	60	100	115	132	145	163
1	2	1	30	0	4	15	04:54		0	6	12	17	23	32	41	48	52	61

Reattachment Information

Below are examples of reattachment information from two different manufacturers.

Reattachment Example #1

10 Reattach Stall: 47; ATOD=21:58 Dur= 7.6 Dur1=3 Milk=35 Milk1=30 5
 21 Reattach Stall: 62; ATOD= 1:40 Dur=13.0 Dur1=7 Milk=57 Milk1=54 3
 43 Reattach Stall: 57; ATOD= 2:01 Dur= 4.0 Dur1=3 Milk=36 Milk1=31 1

Cow 10 was re-attached with the following information:

Occupied stall 47
 First attached at 9:58 PM (21:58)
 Overall duration of 7.6 minutes
 Milked 35 pounds total in the milking
 Milked for 3 minutes and milked 30 pounds before first detachment
 Was re-attached once, with 5 pounds given after the last reattachment

Cow 43 had 36 pounds total, 31 pounds of which occurred before the first detachment. She had 1 pound after the last re-attachment. While not shown, this would imply there were at least two re-attachments that occurred.

Reattachment Example #2

981 Reattach 1.8 min 11 pounds idle for 6.3 min then 10 pounds

2106 Reattach 2.6 min 6 pounds idle for 2.3 min then 17 pounds

1263 Reattach 4.2 min 16 pounds idle for 2.6 min then 2 pounds

1592 Reattach 4.9 min 27 pounds idle for 8.2 min then 2 pounds

This manufacturer reports all reattachments. A possible interpretation could be:

981 was a fall-off

2106 was a failure of initial milk letdown

1263 was an inappropriate reattachment (note: lowest increment reported by manufacturer is 2 pounds)

1592 was an inappropriate reattachment, also note how long unit was idle.

Summary

There is much potential for use of additional data to fine-tune parlor management. Managers of milking parlors are recognizing the value of this information and milking equipment manufacturers have begun to automate the capture of the needed data to send to management software. This paper discussed some of the possible uses of this information to monitor the cows, the parlor personnel, and the milking equipment.