Introduction to the Graphs

The graphs are generated from herd DHI data from Wisconsin AgSource and downloaded through the DairyNet system. They have been developed to present herd-level information about the productivity and health of dairy herds. There are several basic styles of graphs, as described below.

Line graphs over time

Most of these graphs show a herd summary trend over the past 24 DHI test dates and usually summarize a period of two years. However, in cases where the dairy does not test on a monthly basis, the time span of the graph can exceed the expected time period. Check the dates on the graphs routinely.

Checking the current herd performance against performance at the same month a year ago is often a useful test to measure progress. It removes the effect of season from the interpretation of the graph.

Occasionally, data errors appear after downloading from DairyNet. If values are received that are clearly out of the normal range, we recommend that you repeat the DairyNet request and download process. If the values remain abnormal, call AgSource and ask them to investigate the herd data file.

Scatterplots

The scatter plots are generated from individual cow data. Each dot usually represents one single cow. These graphs make it possible to look at variation within the herd.

Scatterplots may be useful in looking for outlier data points. Outliers would represent cows that have produced an extreme value that might have a substantial effect on a calculated average.

Several of the scatterplots show a performance value plotted against the current days in milk of the cow. Special attention should be paid to the graphs that plot “peak milk” and “ME305” against days in milk. We have developed these graphs to try to assess current performance of the early lactation cows, as the “herd-level” graphs of these items include the average of the entire lactating herds and respond relatively slowly to changes in fresh cow performance. These plots require careful and cautious interpretation as there may be effects of season, stage of lactation,
and management at play simultaneously and may be confounded by small populations of animals of different productive capability.

It is usually very difficult to evaluate a scatterplot in any quantitative way. Because of this, a regression line and formula is generated automatically in some of the graphs. With a large number of data points, the regression usually helps describe the central tendency of the data. However, individual points that lie far outside the general cluster can skew the regression, so take care in the interpretation.

The regression formula explains the relationship between the two variables on X and Y. The $r^2$ value indicates how much of the variation in “Y” is explained by variation in “X”. For example, if the $r^2$ of Sire PTA milk on ME305 milk of individual cows is 0.25, it means that the sire PTA milk explains about 25% of the variation in the cow’s ME305 milk production.

The regression formula is based upon the standard $Y = aX + b$, where $b$ is the intercept of the Y axis and $a$ is the constant. For example, if the regression formula in the Sires PTA milk versus Cow ME305 milk appears as $y = 1.01 x + 25,000$, this indicates that for each pound of Sire PTA milk the daughters produce 1.01 lbs of ME305 milk.

Histograms

Several of the graphs are displayed as histograms where each bar represents the number of animals that are characterized by some range of values. Some histograms will display a “normal” bell shaped curve and these populations are well described numerically by a mean (average) and standard deviation. Other histograms such as days to first breeding are skewed to the right and the central tendency is best described by the median value.

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**Graph: 2-Size Adult Cow Numbers**

**Purpose:**

To monitor size trends of total herd numbers, dry and lactating cows, and first and second and greater parity groups.

**Interpretive Comments:**

In a stable herd with year-around calving, approximately 15% of the herd is expected to be dry.

With average turnover rates in an established herd, 35% of the herd is expected to be first lactation.

**Questions:**

1. Note absolute herd size. Is the herd size stable, increasing or decreasing?

2. What is the approximate % of the herd that is first lactation cows?

3. If herd has expanded, was the expansion done with first lactation or older cows?

4. What is the approximate % of the herd that are dry cows? Is the % relatively constant or highly variable in this herd?

“Mellow Acres” has increased herd size from about 135 cows to over 180 in the last 5 months. While many herds expand with only heifers, this expansion was completed in a single month and was done primarily with mature cows and relatively few first lactation cows. The proportion of dry cows at 12% of the herd is currently less than on a typical dairy. It may be the result of purchasing lactating cows only.

“Grazier Dairy” tries to establish a seasonal dairy to match the grass growth curve. Many cows that do not fit the calving window of mid-March to May are sold from the herd as replacement cows to other farms. The proportion of dry cows is highly variable from month to month because of the seasonal calving.
Graph: 3-Cull  Turnover Summary (Last 12 Months)

Purpose:
To summarize the numbers and parity groups of cows entering and leaving the herd, as well as the reported reasons for their removal.

The box in the lower right contrasts the number of cows culled for each reason in your herd compared to the industry average number of culls in an equivalent sized herd. If the cull codes are used, it is a convenient way to identify herd success and problem areas.

Interpretive Comments:
Turnover rate equals number of cows leaving the herd divided by the rolling average number of cows in the herd.

Average annual turnover rate equals 37%, while goal annual turnover rate equals 25%.

For first lactation animals entering the herd, the goal is that less than 25% are culled in the first year.

The stated reason for culling is reported by dairy operator and is very subjective. For example, a cow may have several problems such as a high SCC and 200 days open before becoming pregnant. While each reason contributes to her removal, the operator has to choose one answer.

Some dairy operators report a default reason such as low production for all cows and do not complete reasons on an individual cow basis.

In an average herd, reproduction is the most common reason for culling, followed by mastitis.

Questions:
1. Review the in/out numbers. Did the herd expand or contract in the period of the last 12 tests?
2. What proportion of culls were first lactation cows? Of the first lactation cows that entered, approximately what proportion left the herd in the last 12 tests?
3. Did any mature cows enter the herd in the last year?
4. The stated reason for culling is sometimes very subjective. Does the distribution of reasons appear to be rational?
5. Are there any categories where culling is much lower or higher than industry averages?

"Sand Stall Dairy" has a turnover rate of 26%, very close to optimal. The distribution of stated reasons for removal appear to be rational and lower than industry averages in all categories except mastitis, which might be the next bottleneck to investigate as a herd health manager.

All cows entered the herd as first lactation cows.

"Mattress Dairy" reports a slightly higher turnover rate than the industry average, and more cows left than entered in the past year. All cows entering were first lactation cows. The stated reason for removal is "dairy", suggesting that the cows were sold as milk cows to other dairy farms. However, that is not the case. The current software interface between "on-farm" DairyComp records and DHI converts various reasons to a default "Dairy" reason for removal.

3-Cull  Example Herds:

Sand Stall Dairy  (11/04/02) Herd

Mattress Dairy  (12/28/02) Herd
Graph: 4-DimCull  Days in Milk Distribution of Culled Cows

Purpose:
To monitor the stage of lactation when cows are removed from the herd.

Interpretive Comments:
The histogram represents all cows that were sold or died in the past year. The y-scale indicates the percent of the herd, not the % of culled cows, that are removed during each 30-day interval. Please note that the range of the y-scale varies from graph to graph. While the y-scale reports % of herd, the number above each bar reports the total absolute number of cows removed in each period. The white lower portion of the bars indicates culled first-lactation cows and the gray upper portion represents cows in their second or greater lactation.

Cows removed from the herd in the first 30 days-in-milk usually represent fresh cow disease problems. These are also very costly because the cow will have been housed and fed through the dry period or through the heifer raising years, only to produce milk for a few weeks.

Our data suggests that the average herd removes about 9% of all cows in the herd within 60 days of calving, with a range from about 2-17%. The lowest removal quartile is less than 6%, and the highest quartile starts at over 12%. High removal rates in this period usually reflect problems with transition cow management.

Cows removed from the herd at greater than 450 days-in-milk usually represent good producing cows that are sold because of reproductive problems. Our data suggests that the industry removes about 4% of all cows after 450 DIM, with a range from about 2-7%.

Questions:
1. Is the removal rate during the first 60 days after calving higher or lower than the industry average?
2. What factors could be influencing the rate?
3. What is the rate of removal from the herd at 450 days in milk or greater?
4. If higher than average, does the herd also have poorer overall reproductive performance than average? If lower, does the herd have better overall reproductive performance?

“Big Easy Dairy” removed 4.5% of their cows within the first 60 DIM, which puts them in the best quartile of the industry. The dairy has excellent dry cow management and fresh cow health.

The 4.5% removal rate at greater than 450 DIM is approximately industry average.

“Easy Go” removed almost 15% of all calving cows within the first 60 days after calving, many of which died. The manager should work with advisors to identify the reasons for sick and injured fresh cows and take corrective actions.

The 6.0% removal rate after 450 DIM is also higher than average for the industry and usually reflects a higher than average rate of culling for reproductive failure.
**Graph: 5-Fresh Calving and Culling**

**Purpose:**

To monitor the number of calvings and subsequent culling on a monthly basis.

**Interpretive Comments:**

- The wide shaded bars represent the total number of calvings that occurred during the month, with gray representing the first lactation cows and the checked area representing the older cows.

- The narrow interior bars indicate the number of cows that were removed from the herd at less than 31 days-in-milk during the month, with black representing first lactation cows and white representing older cows.

- The reported % represents the percentage of all calvings during the month that resulted in culling within 30 days. The industry average is about 4%.

- The 6-month average removal within 30 DIM is reported in the text below. It may vary with the <30 day cull rate from the prior graph, as this represents the most recent 6 months whereas the prior graph summarizes the past year.

- The superimposed line represents the total number of cows removed, regardless of stage of lactation, during the month.

**Questions:**

1. Is the number of calvings per month very stable, moderate, or highly variable?
2. Is the loss of cows <30 DIM during the past 6 months higher or lower than the rate of the past year?
3. Were there any individual months that presented unusual problems?
4. Were there any individual months where an unusual number of cows were removed, regardless of stage of lactation?

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**Example Herds:**

- **“Sand Stall Dairy”** had almost 3 times as many cows calve during August as in May. Almost 7% of the herd was culled in September, perhaps because of crowding after the August calvings. The loss of fresh cows reached 6 and 7% during August and September, compared to almost none in the other months represented.

- **“Mattress Dairy”** has a steadier calving pattern and removal rate over the past 6 months, but the number of calvings does almost double. Virtually all of the cows removed within the first 30 DIM were older cows (white bar).
Purpose:
To monitor rolling herd average milk (RHA), as well as mature equivalent 305 day milk (ME305) of first lactation and mature cow groups.

Interpretive Comments:
ME305 values are developed by first projecting the expected total milk production for each cow through a 305-day lactation, and subsequently adjusting the total projected milk to standardize for parity (lactation number), age, season of calving date, and number of times milked per day. ME305 values allow individual cows to be compared fairly, regardless of age and the other factors.

There is more momentum in RHA than ME305, meaning that RHA resists changes in direction more than ME305.

ME305 is independent of herd calving intervals, whereas RHA is not. Long calving intervals will lower RHA and spread the difference between RHA and ME305.

ME305 includes a conversion to 2X milking, so RHA and ME305 tend to be closer in absolute value in herds milked 3 times a day.

In typical herds, first lactation ME305 milk is an average of 300-500 pounds greater than the ME305 of second and greater lactation cows.

Questions:
1. Based upon ME305, is herd production going up or down?
2. Relative to ME production, is there a difference between first lactation and mature cow ME’s?
3. Does either subgroup appear to be performing differently, better or worse, than the other?

“Guru Dairy” shows a very strong rise in average ME305 values and Rolling Herd Average Milk. The first lactation cows are performing tremendously and slightly better than expected relative to the older cows. The changes in ME305 precede the directional changes in RHA by a month or two.

“Diverging Dairy” shows declining RHA milk starting in September of 2000. The ME305 graph shows that the production problem lies exclusively with the mature cows in the 2nd or greater lactations, and that the first lactation cows are doing wonderfully. An investigation of herd production problems on the dairy would focus almost exclusively on problems with the mature cows.
**Purpose:**
To visualize the overall performance of fresh cows in the herd.

**Interpretive Comments:**
At the first test date after calving, an ME305 value is generated for each cow. If the cow has been sick prior to the first test, we expect her to have a lower 1st Test ME305. If she recovers well, we expect her 2nd Test ME305 value to go up.

Using data from AgSource, we have developed a system using information from prior lactations to predict what the 1st Test ME will be for each cow. The calculation takes into account the breed, prior ME305, prior lactation BST use, prior lactation DIM, milking frequency, days dry, 1st test SCC linear score, and 1st test DIM. This is why you are asked about BST use and milking frequency as WisGraph is being opened.

Once we know the actual 1st Test ME305 for each cow, this actual value is compared to our predicted value. If the cow does better than predicted, she is assigned a positive number of lbs. If she produces exactly as expected, she gets zero. If she does less than expected, her deviation is negative.

The graph shows each cow as a bar relative to zero. The zero line represents fresh cow performance typical of the average AgSource cow at her first test.

If the average deviation is +1,000 lbs or more, the herd has a transition management program in which fresh cows perform much better than average. It probably reflects excellent dry cow management where many fresh cow diseases are prevented and those cows that do get sick are identified early and treated correctly.

If the average deviation is -1,000 lbs or more, the herd has a transition management program in which fresh cows perform poorer than average. It probably reflects transition management problems that result in a significant proportion of fresh cows with disease problems or situations where it is difficult to identify and treat sick cows appropriately.

**Questions:**
1. What is the herd average deviation from predicted 1st Test ME?
2. Can you identify strengths or weaknesses in the herd transition management program that might explain the average deviation?

**Example Herds:**

**Mellow Acres** (02/09/05) Cow
- Average Deviation = 2009
- Percent Below Predicted = 19%
- The predominant breed is Holstein
- This herd is milked 2 times per day
- This herd is using no BST for Lactation 1 animals
- This herd is using no BST for Lactation 2+ animals

The average mature cow at “Mellow Acres” had a 1st Test ME305 value of over 2,000 lbs above expectations. This reflects exceptionally successful transition cow management in terms of preventing fresh cow disease, early detection and excellent treatment of cows with problems, and overall management of groupings and nutrition.

**Bumpy Road** (02/23/05) Cow
- Average Deviation = -1385
- Percent Below Predicted = 58%
- The predominant breed is Holstein
- This herd is milked 2 times per day
- This herd is using no BST for Lactation 1 animals
- This herd is using no BST for Lactation 2+ animals

The average mature cow at “Bumpy Road Dairy” had a 1st Test ME305 deviation of 1,385 lbs below predictions. Nine cows were more than 9,000 lbs below predictions. This reflects many transition cow management problems that could be found in dry cow housing, crowding, and ineffective detection and treatment of fresh sick cows.
**Graph: 8-DevDim Trend of 1st Test ME305 Deviations**

**Purpose:**
To visualize any trends in how fresh cows are performing over the past year.

**Interpretive Comments:**
The basis of the 1st Test ME305 Deviation is explained in the comments for Graph 7.

This graph shows the 1st test deviations for each cow as they have calved over the past year, where each dot represents one cow. Again, the zero line represents average first test performance.

On the top of the graph, the current days in milk of individual cows is shown. On the bottom of the graph, the approximate month of calving is shown. The cows represented by dots at less than 30 days in milk are cows that calved about 10 months ago. While such cows may be nearly 300 days in milk, the value plotted on the graph for that cow was generated at her first test which occurred about 285 days ago.

The line plotted down the middle of the graph shows the average 1st Test ME305 Deviation for all cows that calved in that particular month.

If improvements have been implemented in the transition cow program in the past months, the line should be going upward toward the left. Conversely, if the line is going down toward the left, recent fresh cow performance is getting poorer.

Small herds with very few cows calving in a single month will find that the line in the graph is of very little value for interpreting current performance.

**Questions:**
1. What is the minimal number of cows calving per month in this graph? If there are very few cows calving each month, the rolling average line has little value for interpreting trends.
2. Is there any recent change in direction of the line representing average performance by month? If so, is recent fresh cow performance getting better or worse?

While the overall performance of fresh cows at “Mellow Acres Dairy” is excellent, the current trend is even better. Among cows that have calved since October, currently less than 90 days in milk, only two cows have not met expectations at their first test. In contrast, a moderate proportion of cows calving in the months of July through September did not start out their lactations as well.

The trend line at “Bumpy Road Dairy” shows a recent upturn for cows that calved near January. While there are only 5 cows that figure into the January average, the direction of the monthly average line is certainly encouraging. Overall, the performance of fresh cows from April through December has been quite poor. It would probably be well worthwhile to investigate the problems and make the necessary changes to improve transition cow management.
Graph: 9-MEDIM Current ME305 vs. Days in Milk

Purpose:
To monitor peak milk of mature cows and obtain more current information than is available from the standard reported herd average ME305.

Interpretive Comments:
Each dot represents a single cow and is positioned over her days in milk on the current test and at the ME305 milk that she has achieved at her current stage of lactation. The month abbreviations below the x-axis suggest the approximate time of year that the cow calved.

ME305 milk standardizes individual animal production for age, lactation, 2x milking, and season. ME305 will respond to production changes that occur until 305 days in milk, after which it is fixed. ME305 is more sensitive to change in early lactation than late lactation. The ME305 of a cow who is more persistent than average will increase as the cow progresses through the lactation, while the ME305 of a cow who is less persistent than average will fall slightly as the lactation progresses.

Low production cows tend to be culled earlier in lactation than high producers, resulting in a selected group of higher producers on the right side of the graph.

The regression line and formula can give an indication of change between early and late lactation. The slope $A (y = Ax + \text{constant})$ indicates how much ME305 changes for each increasing day in milk. From a moderate number of farms, the typical value of $A$ ranges from about 5-15. In general, values approaching 20 or more are found in herds with relatively disappointing early lactation performance and good late lactation production.

Questions:
1. Should we expect to see a seasonal effect on the ME305 values of cows that calve in July?
2. How would you expect the use of BST in the herd affect this graph?

“Steady Dairy” shows a herd with stable, consistent performance of cows over the past year. The average ME305 goes up 11.26 lbs per day of lactation and the difference between the early and late groups is about 4,000 lbs. Culling has removed lower producers that are greater than 200 days in milk.

“Ketone Dairy” has a long-term problem of fresh cow health problems of ketosis and hepatic lipidosis in many cows, but most cows produce milk quite well after they have gotten through the early lactation period. BST is also used in the herd. The ME305 increases 26 lbs. Per day of lactation and the difference between the early and late group is about 6,000 lbs.
Graph: 10-Milk

Milk Production (Lbs/Cow/Day)

Purpose:
To monitor daily milk production per cow over time.

Interpretive Comments:
Milk per cow reflects productivity, but is confounded by days in milk and other factors such as age and parity of the herd.
Management level milk adjusts actual milk to standard 150 days in milk, constant fat %, protein %, and parity.

Questions:
1. Is the herd doing better at the current test than the previous test? Which monitor is best to make comparisons over time?
2. Is the herd doing better at the current test than a year ago?

“Steady Dairy” shows an increase in actual milk and MLM since the last test, and while actual milk is slightly increased from one year ago, MLM is down. Both indexes indicate a decline from the period in the spring of 1999.

Actual milk at “Grazier Dairy” shows the variation possible due to extreme ranges of days in milk. In the period from March through December, the average herd production looks like a lactation curve. Conversely, the MLM index remains relatively flat. The MLM index suggests that the cows are doing better than expected in December or January.
**Graph:  11-Peak-h “Rolling” Peak Milk Production**

**Purpose:**
To monitor average peak performance of separate parity groups over time.

**Interpretive Comments:**
Each dot represents the average peak of all animals currently lactating. There is much momentum in this index. The numbers printed represent first lactation peaks divided by later lactation peaks.

Peak milks are strongly dependent on early lactation nutritional management.

Peaks typically associated with various rolling herd averages are as follows:

<table>
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<tr>
<th>Herd Lactation Avg, Lbs</th>
<th>Peak, 1st Lactation</th>
<th>Peak, 2+ Lactation</th>
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<tr>
<td>27,000</td>
<td>87</td>
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The “normal ratio” of first lactation peaks to second and greater lactation peaks is 74 to 78%.

If the peak ratio is <74%, the first lactation cows are performing poorly relative to older cows.

Conversely, if the peak ratio is >78%, the older cows are performing poorly relative to first lactation cows.

**Questions:**
1. Is there a trend in peak milks?
2. Does the calculated “peak ratio” suggest any problems?
3. Is any subgroup doing better or worse than expected?

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**Example Herds:**

“Diverging Dairy” has an emerging problem with mature cows that began in early 2000. The average peak of the older cows has declined, whereas the first lactation cows have increased. In the short term, both groups have increased slightly in the last test interval. The peak ratio is now 84%. Similar trends are shown in the ME305 graph.

“Red Pencil Dairy” has improved average peaks for both groups over the past year compared to two years ago. Currently, there is a very small decline in both first lactation and older cow groups starting to appear at the last test.
Graph: 12-Peak-c Current Peak Milk vs. Days in Milk

Purpose:
To monitor peak milk and obtain more current information than is available from the standard reported average peak milk.

Interpretive Comments:
Peaks of 2nd and greater lactation cows are shown as solid circles, while peaks of first lactation cows are shown as open triangles.

A single dot represents a single cow and is positioned over her days in milk at the current test and at the level of the peak milk that she achieved at some undescribed point in her lactation. In general, the peak milk value is established by 60 days in milk, but the cow carries that value with her to the end of her lactation.

The month abbreviations below the x-axis suggest the approximate time of year that the cow calved.

Cows that calve in June through September are expected to peak at lower levels than if they had calved during cooler months of the year.

Because low producers tend to be culled earlier in lactation than high producers, culling practices remove low producing cows disproportionately from the lower right portion of the graph.

Questions:
1. Does season of year appear to affect peak milk in this herd?
2. How do the most recently fresh cows appear to be performing relative to herdmates who calved in past months?
3. How does the culling of low producers at mid-lactation affect the appearance of this graph?

"Easy Go Dairy" peaks appear to be quite steady over the past year, and the peaks of the first lactation cows have increased. Somewhat troubling is the appearance of a few mature cow peaks in the 70 lb range in the most recent 60 days. While it's too early to raise an alarm, close attention should be paid at the next test.

"Slipping Dairy" shows peak milk on a slight decline over the past year. There have been no mature cows that calved since August to peak above 150 lbs.
Graph: 13-1stFPR  Ration of 1st Test Fat % to 1st Test Protein %

Purpose:
To monitor milk components at the first DHIA test date over time.

Interpretive Comments:
Fresh cows with ketosis tend to have high milk fat %. If a fresh cow has 6% fat and 3% protein, that cow has a 1st test fat : protein ratio (FPR) of 2. There is research evidence that herds with high rates of ketosis, either clinical or subclinical, also have a high proportion of cows with a 1st Test FPR greater than 1.4. Our current guidelines suggest that if more than 40% of fresh cows exceed the 1.4 guideline, the herd is at risk of ketosis. Usually, this will be reflected in higher than average rates of clinical ketosis, displaced abomasums, and fatty liver disease.

In this graph, each dot represents the 1st Test FPR for one cow. Only cows in their second and greater lactations are shown in the graph. Although a cow may be 300 days in milk, the value plotted represents her 1st Test FPR that was collected about 9 months ago. This allows you to track fresh cow ketosis risk in the herd over the past year.

Questions:
1. Is the proportion of cows with 1st Test FPR in this herd greater than 40%? If so, are there other herd indicators that support the likelihood of fresh cow ketosis problems?
2. Are there any suggestions that the rate of high ratios in increasing or decreasing in recent months?
3. If so, is there a history of a change in management practices that might explain the change?

"Mellow Acres Dairy" appears to have very few cows with high first test FPR greater than 1.4. With only 29% above the 1.4 cutpoint, we would expect very few cows with ketosis, fatty liver, or displaced abomasum problems.
Graph: 14-%Fat  Milk Fat and Protein Tests

Purpose:
To monitor milk fat % and protein % over time.

Interpretive Comments:
Fat % and protein % vary with breed.  1998 Wisconsin DHI shows the following breed average milk components:

<table>
<thead>
<tr>
<th>Breed</th>
<th>Ayrshire</th>
<th>Brown Swiss</th>
<th>Guernsey</th>
<th>Holstein</th>
<th>Jersey</th>
<th>Milking Shorthorn</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fat %</td>
<td>4.0</td>
<td>4.1</td>
<td>4.6</td>
<td>3.7</td>
<td>4.8</td>
<td>4.0</td>
</tr>
<tr>
<td>Protein %</td>
<td>3.3</td>
<td>3.6</td>
<td>3.5</td>
<td>3.2</td>
<td>3.8</td>
<td>3.3</td>
</tr>
</tbody>
</table>

Fat % that is .3% higher than breed average suggests that the rations may be short on energy and that the herd would respond with increased milk if corrected.

Fat % that is .3% lower than breed average suggests that the herd may be short on fiber and may be experiencing rumen acidosis.

There are lactation fat % and protein % curves that are almost mirror images of the milk curve.  If the herd is seasonal, expect wide variation in component % as the herd changes from short days in milk to long days in milk.

Questions:
1. Are there any months where fat % is abnormally low or high?
2. Are these seasonal problems or not?
3. Are there any months where protein % is too low or too high?

“Guru Dairy” shows large fluctuations in fat % over the past 8 months, ranging from 3.2% to 3.9%. While the 3.2% test in July 2000 is alarming, the most recent test at 3.35% in February is even more alarming because of the season. The protein % shows the expected drop in May 2000 when testing methods changed.

“Ketone Dairy” shows an unusually high milk fat % for Holsteins, particularly over the past 3 months. The high fat % is suggestive of rations that are moderately low in energy. Usually ration manipulations to reduce fiber and increase energy in this situation will increase milk and reduce fat% to more typical ranges.
Graph: 15-DIM%Fat  DIM and Current Test Day Percent Fat

Purpose:
To display the individual cow fat % values by stage of lactation.

Interpretive Comments:
The fat % curve is almost opposite a lactation curve. Milk fat % is expected to be high in early lactation, decline to a low near 60 days in milk, and then gradually increase as the lactation progresses. The variation above and below is expected to be about 10% of the lactation average fat %.

Abnormal low fat % is suggestive of dietary fiber deficiency or dietary fat excess. For Holsteins we use a cut-point below 2.5% fat. If more than 10% of the herd has a fat% below 2.5, it suggests that the herd may be experiencing subacute ruminal acidosis.

Abnormal high fat % is suggestive of excess dietary fiber, inadequate ration energy, and sometimes ketosis. If more than 10% of Holstein cows less than 60 days in milk are above 5% fat, we suspect that fresh cows are at high risk of ketosis, fatty liver, and other fresh cow problems.

Questions:
1. Does the herd scatterplot resemble the expected fat % curve?
2. Estimate the overall average fat %.
3. Are there any cows that are either alarmingly low or high?

The overall average fat % at “Wild West Dairy” is 3.4%, there are many cows with abnormal fat %, both high and low, spread across all stages of lactation. The herd percentages of unusual fat % exceed our guidelines on both high fat % in the fresh cows, as well as low tests across lactation. If there are metabolic health problems in this herd, diagnostic testing for both ketosis and ruminal acidosis should be performed.

At “DA Dairy”, 21% of the cows less than 60 days in milk showed milk fat % greater than 5%. This is very suggestive of a fresh cow ketosis problem. Testing for ketones should be performed on both close-up dry cows and fresh cows to identify if either group is affected.
Graph: 16-Tank Bulk Tank Milk and DHI Milk

Purpose:
To monitor total milk sales from dairy and reconcile DHI and milk plant weights.

Interpretive Comments:
 Bulk tank milk is reported by the milk truck driver who records the amount before emptying the tank and hauling it away.

DHI milk pounds are expected to be equal or up to 3% higher than bulk tank weight. DHI measures milk from all cows, but some of that milk is discarded because of antibiotics, fed to calves, or used for other purposes. Therefore, bulk tank milk is expected to be slightly less than DHI.

DHI milk meters can malfunction resulting in variation.

Bulk tanks can shift resulting in errors in dipstick calibration.

Bulk tank pickup may not be synchronized with the completion of milking, resulting in variance.

Unequal milking intervals paired with am/pm testing can produce variance

Questions:
1. Review the absolute pounds over the past year. Estimate the high and low gross milk income per day in the last year.
2. Is there a difference between bulk tank and DHI milk? What would be some reasons for a difference in this herd?

“Painted Dairy” has sold more milk over the past year than DHI testing has measured. This usually reflects a problem with either the meters used for testing, or it may reflect a milking system inadequacy when the meters are introduced for testing.

“Grazier Dairy” shows less milk sold than found on DHI testing. This may reflect milk used for calves, milk withheld because of antibiotic withdrawal, or other uses. The disparity between bulk tank an DHI weights is greatest when the herd is milking the most and when calves would be consuming milk. In this seasonally calving herd, there is tremendous difference in milk income per month between the high and low production months.
Graph: 17-Age Age at First Calving Distribution

Purpose:
To evaluate the distribution of calving ages of first lactation cows in the herd.

Interpretive Comments:
The average age at first calving for all Wisconsin DHI herds is 27 months, while the standard industry goal is 24 months.

Very successful replacement rearing programs are capable of calving 80% of their replacements in a 2 month window.

A wide distribution of calving age can suggest inconsistent heifer growth rates, reproductive problems in the replacement herd, or inconsistent replacement management goals.

A small number of very old animals will have a greater effect on the average age than on the median age at calving.

Questions:
1. What is the average and median age at first calving?
2. Is the distribution pattern desirable?
3. What does the distribution histogram of calving age tell you about the replacement program?

“Steady Dairy” achieves 93% of heifers calving between 22 and 27 months of age. The rather tight distribution of ages reflects excellent breeding, and probably feeding, management of the heifers.

While the average heifer on “Relaxed Dairy” has a calf at 27 months, age is extremely varied with animals calving at a similar frequency from 22 to 36 months of age. There would be substantial economic benefits to this dairy in improving the management of the replacement herd.
**Graph: 18-DIM Days in Milk**

**Purpose:**
To monitor herd average days in milk.

**Interpretive Comments:**
- Herd average DIM can be very stable if similar numbers of cows freshen and are dried off each month.
- The 12 month rolling average DIM is quite dependent upon herd reproductive performance.
- Industry goal for rolling average DIM is about 160 days.
- Cows milk less with increasing DIM, and are expected to decline .12 to .17 pounds per cow per day for each day over 160.

**Questions:**
1. What is the rolling average DIM?
2. What factors cause the average day-in-milk to go down?
3. Do you view the 12-month rolling average days in milk for this herd as a problem?

**Example Herds:**

**Hilltopper (02/09/05) Herd**
- Average DIM at “Hilltopper Dairy” varies slightly through the year, ranging from 156 to 182 days. This reflects superb reproductive management and has become increasingly difficult to achieve with higher and higher production levels.

**Grazier (03/28/05) Herd**
- “Grazier Dairy” is a seasonal calving dairy that shows a similar repeating pattern each year. With a rolling average DIM of 182, the herd has ranged from 70 to 310 days in milk in the past year.

*The weighted average DIM value is valid only if the herd tests at regular intervals.*
Graph: 19-Dry Days Dry Distribution

Purpose:
To monitor distribution of dry day periods over time.

Interpretive Comments:
The average days dry for Wisconsin dairy herds is 64 days. Industry goal is 55 to 60 days dry.
The average Wisconsin herd has about 13% of cows <40 days dry and about 26%> than 70 days dry.
Recently, many herds have switched to a shortened dry period of 30 to 45 days. You may see this as an abrupt or gradual step up in the shaded area at the bottom of the graphs.

Dry periods greater than 70 days result in feed wasted in maintaining unproductive dry cows and in reduced milk sales from the farm. Losses are estimated in the range of $3.00 per dry day over 70 days.

Questions:
1. Is the distribution of dry periods normal?
2. Is there a trend and is it desirable or undesirable?
3. What management factors can create long dry periods?

"Guru Dairy" is doing an exemplary job of minimizing short dry periods, and average with long dry periods.

"Calendar Dairy" is making good progress since December 2000 in correcting a substantial problem with short dry periods. In contrast, the herd has always shown good control of long dry periods.
Graph: 20-ADO Days Open, Pregnant Cows

Purpose:
To visualize the distribution of days open in the herd.

Interpretive Comments:
An average days open of 100 days is required to maintain a 12.5 month calving interval, but the average DHI Holstein herd in Wisconsin currently realizes 130 days open. Benchmarks of excellent, average, and poor reproductive performance are listed below.

<table>
<thead>
<tr>
<th>Herd Performance</th>
<th>Less than 100 DIM</th>
<th>100-159 DIM</th>
<th>More than 160 DIM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Best, &lt;110 ADO</td>
<td>50</td>
<td>32</td>
<td>18</td>
</tr>
<tr>
<td>Average, 130 ADO</td>
<td>40</td>
<td>32</td>
<td>28</td>
</tr>
<tr>
<td>Poorest, &gt;160 ADO</td>
<td>30</td>
<td>32</td>
<td>38</td>
</tr>
</tbody>
</table>

Questions:
1. What is the average days open in the herd?
2. Does the distribution suggest inefficiency or other problems?

“Master Dairy” achieves an impressively short average days open with a very small proportion of cows exceeding 200 days.

“Sun Shade Dairy” experiences a long average days open and is characterized by highly variable days open. The herd distribution is spread almost evenly from 80 to 280 days in milk.
Graph: 21-D1B Days in Milk at First Breeding, All cows bred

Purpose:
To evaluate the distribution of days to first breeding in a herd.

Interpretive Comments:
The industry goal for average days to first breeding is usually about 75 days, but the average DHIA Holstein herd in Wisconsin now averages 97 days.

The primary factors in determining average days to first breeding are the voluntary waiting period and heat detection efficiency.

Questions:
1. Would you expect a normal bell-shaped distribution for this index? Why?
2. What is this herd’s average DIM at 1st breeding? What do you consider to be a reasonable goal?
3. Which do you think best describes the central tendency: average or median?
4. Make an estimate of the voluntary waiting period in this herd?

“Master Dairy” has average days to first breeding of 66 days, yet achieves an average days open of 108 days. An OvSynch program is used aggressively to achieve an extremely impressive profile of days to first breeding.

“Hiltopper Dairy” practices a conventional heat detection program, achieving a median days to first breeding of 86 days.
Graph: 22-S-C  Reported Services per Pregnancy, Pregnant Cows

Purpose:
To summarize services per conception in the herd.

Interpretive Comments:
The accuracy of this report is dependent on the completeness of the breeding information supplied by the dairy manager.

A reasonable target for average services per conception, pregnant cows, in higher producing herds is about 2.2.

Some record systems report average services per conception, all cows, which includes units of semen used on cows that did not become pregnant. That index should not be confused with the index reported by DHI in this report.

Questions:
1. Is herd services per conception better or worse than average?
2. Is there a change in services per conception over the past year?

“Master Dairy” experiences approximately average conception rates, and achieves better rates during the winter months than summer during the past year and a half.

“Sun Shade Dairy” has higher services per conception rate than average. This factor, combined with less effective heat detection, creates the long average days open seen on the dairy. Reviews of semen quality, semen handling, and insemination techniques should be performed.
Graph: 23-NM$h$  Net Merit Trends

Purpose:
To monitor current semen selection practices with service sires, and track relative genetic merit of parity groups over time.

Interpretive Comments:
Net Merit $ is an index that estimates the dollar value of the milk production, SCC, and longevity of daughters of AI bulls. Every 5 years, the NM$ values are reset to a new base, so major drops of all categories occur when the base adjustments occur. The next adjustment to base will occur in 2005. While the absolute values are not important, the difference between bulls is important.

Because of continuing genetic progress, the NM$ of the bulls used most recently should be the highest. Service sires are current and should be highest. Sires of first lactation cows represent semen used approximately 3 years previously, so should be of lower NM$ value. Sires of mature cows represents bulls used approximately 5 years ago, so they should be the lowest NM$ value.

Because of continuing genetic progress, each line should increase gradually from left to right as newer, higher genetic potential animals enter the herd or move from one of the subgroups into the next. A single animal can contribute her sire’s data to the first lactation line on the left side of the graph, but then contribute to the second and greater lactation line if she enters her second lactation at a date covered by the graph.

Questions:
1. How does the herd compare to current industry standards indicated on the graph?
2. Are the subgroups separated as expected, i.e., is there any subgroup that is clearly superior or inferior to industry standards?
3. Are current semen selection practices sufficient to keep the herd capable of performing like the better contemporary herds in the industry?

Net Merit $ values from “Hot August Dairy” show that it is selecting very high performance bulls of very high NM$ value and the breeding program shows steady improvement. This pattern is also shown in the sires of the lactating cows which also exceed benchmarks of the higher production herds in the industry.

NMS values from “Windblown Dairy” show a decline in the past 5 months in the average service sire (SVC) NM$ value of semen used to produce pregnancies. The spread between the service sires is closing with the NMS value of the sires of the currently lactating cows, reflecting a failure to stay with the genetic trends of the industry. Recent semen selection practices will start to hurt production in about 2 years time.
Graph: 24-PTAM Previous ME305 vs. Sire PTA

Purpose:
To display the data and evaluate the impact of sire PTA milk on daughters performance in this herd.

Interpretive Comments:
Each dot represents a cow that has completed a full lactation. The dot is located at the intersection of her previous ME305 milk and the PTA Milk of her sire. In general, the daughters of bulls with the highest PTA milk should have the higher ME305 milk.

A regression line is plotted and is expected to go upward as it goes to the right, meaning that higher producing cows are sired by higher PTA milk bulls.

The regression formula $y=ax+b$ supplies a value (a) which means that for every 1 pound of sire PTA milk, the herd realizes (a) pounds of ME305 milk.

Questions:
1. Is there a relationship between the individual cow performance and her sire’s PTA value in the herd?
2. Where on the graph would cows culled for low production most likely have appeared if they were still in the herd?

“Professor Dairy” shows a wide variation in response, but for each pound of sire PTA milk, the herd realizes 0.97 pounds of ME305 milk. This value comes from the regression formula below the graph.

“Wounded Knee Dairy” shows a very uncertain response to high milk bulls, with a loss of 0.13 pound ME305 milk for each pound of sire PTA milk. The regression suggests that the daughters of higher genetic value bulls milk less than the daughters of lower value bulls. This herd has had a long-term problem with hepatic lipidosis and ketosis. It is possible that the daughters with the greatest potential to produce milk are experiencing the most severe liver disease and ketosis, producing this very unusual result.
Graph: 25-Mast Subclinical Mastitis Data

Purpose:
To monitor herd SCC as well as linear scores of parity subgroups over time.

Interpretive Comments:
Average somatic cell count (SCC) in Wisconsin is about 300,000.

The average linear score of DHI herds is 3.1, with the lowest producing herds averaging 4.0 and the highest producers at 2.8.

The industry average for first lactation cows is 2.4 and second and greater lactation cows is 3.5.

Suggested goals for first lactation cows are 2.0 and older cows are 3.0.

Questions:
1. Characterize the SCC of this herd relative to industry averages.
2. Is the difference between first lactation and older cows normal or unusual?
3. Does there appear to be a seasonal effect?
4. Has the current herd status changed in any substantial way?

“Grazier” shows a range in SCC from about 100,000 to 350,000 over the past year. Through much of the past year and a half, the first lactation cows have shown linear scores very similar to the older cows, which is unusual in that older cows usually have higher linear scores. Overall SCC trends are quite stable over the past year and a half.

“Slipping Dairy” is steadily losing ground with mastitis control over the past year. In particular, the first lactation cows appear to be increasing dramatically, except for the downward change in the last test.
Graph: 26-Rates  Prevalence and New Infections

Purpose:
To monitor the prevalence of mastitis infections and the rate of new infections on each test date.

Interpretive Comments:
A cow is considered to be infected if the SCC is 200,000 or greater.
Cows that were infected on the prior test and again on the current test are counted in the upper colored band. These can be considered “chronic” infections.
Cows that were not infected at the previous test, but infected at the current test are counted in the striped bands and are called “new infections”.
Cows that were infected at the first test are indicated by the lower striped band. In practical terms, these can be considered to be primarily infections that were acquired or not cleared during the dry period or pregnant heifer phase.

Interpretive benchmarks for the herds with the best mastitis control are incorporated into the report on the bottom of the page.

Questions:
1. What is the overall prevalence of infection in the herd?
2. Are there more cows in the new infection group or the chronic group?
3. Of the new infections, do more of them appear to be coming from the dry or pregnant group or from the lactating herd?

While the overall prevalence at “Recent Problem Dairy” has been very good at 13%, there has been a dramatic increase in the past month. The graph suggests that the problem may have started with a sudden increase in fresh cow infections in January, and a big increase in the new lactating cow infections by the February test. They could be independent problems, or it could be a contagious problem introduced from the fresh cows. However, very few of the infections became chronic. A close look at dry cow management, as well as milking practices is in order.

While the overall prevalence of infected cows at “Old Chronics Dairy” has been kept at a good 22%, most of the infected cows are chronics. The risk of new infections is quite low. This dairy appears to have good mastitis prevention practice. Efforts to cure or cull the infected cows could yield impressive increases in somatic cell count premiums from the milk plant.
Graph: 27-DryCow  Dry Cow and Heifer Summary

Purpose:
To summarize the changes in mastitis status of cows during the dry period and the status of replacement heifers entering the herd.

Interpretive Comments:
Three groups of cows are summarized. As before, a SCC greater than 200,000 is considered to represent an infected cow.

First, the prevalence of infection in cows that were uninfected at their last test before going dry is reported. These would be new infections acquired during the dry period or during the first days of the lactation prior to the first test. The goal is less than 10%.

Second, the rate of uninfected cows at first test in the group of cows that were infected at the last test prior to their dry period represents the “cure” rate during the dry period. The goal is greater than 70% with appropriate dry treatment therapy and good environmental management.

Third, the prevalence of heifers entering their lactation infected is reported. The goal is less than 10%.

Questions:
1. Do “clean” cows appear to acquire mastitis during the dry period?
2. Do dry treatment practices appear to be effective at clearing infections?
3. Do heifers entering the herd meet our goal for low infection rates?

From the lower table, the increase in prevalence rate in February is related to an increase in new infection rate from 6% to 17%. Fresh cow infection rate at first test has exceeded target for the last 2 months and is contributing to the increase in somatic cell count.

Historically, the top table shows that over the past six months, this dairy was achieving targets for minimal infections at first test. The problem had a very recent onset.

The lower table shows that infection dynamics in this herd are dominated by chronic infections (cows greater than 200,000 SCC for the last 2 tests). New infection rate decreased last month, resulting in a reduction in the prevalence rate and somatic cell count.

Historically, 21% of the cows that entered the dry period uninfected had become infected by their first test date, compared to 15% of the heifers. This suggests that either dry cow treatment practices or the dry cow environment might be improved.
Graph: 28-Bulk Tank  Bulk Tank Contribution

Purpose:
To identify the cows making the greatest contribution to the bulk tank SCC.

Interpretive Comments:
Cows are arranged in order of total contribution to the bulk tank SCC at the latest test.

Other information is provided in order to make culling decisions including lactation number, days in milk, ME305 milk, milk on last test, and the number of times in the last 7 tests that the cows’s SCC has been over 200,000.

Major contributors to the bulk tank SCC that have a lower than herd average ME305 and have chronic infections should be evaluated carefully for culling.

Questions:
1. Are there any cows that should be removed immediately? Which ones?
2. If removed and nothing else changed, what would the new herd SCC become?

“Big Year Dairy” is a relatively low prevalence herd, relatively stable although there are more new infections than resolved, and the fresh cows are entering the current lactation free of infection.
**Graph:** 29-SCC  Individual SCC

**Purpose:**
To present individual cow SCC counts for detailed examination.

**Interpretive Comments:**
- Any SCC greater than 200,000 is shaded.
- "#NA" means not applicable and that the animal had not entered the herd at that test date. Usually these are first lactation cows that entered the herd in the past 6 months, but they can represent mature cows recently purchased. The lactation number is reported for each animal.
- "NT" means "not tested" and usually signifies that the cow was dry at the time of the herd test, or was not available due to sickness or other reasons.

**Questions:**

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