

## TOTAL PERFORMANCE INDEX (QUEBEC)

Valacta supplies its customers an index allowing them to evaluate the management level of their herd. Enterprises with a herd consisting of 75 % or more of the Holstein or Ayrshire breed, who have been Valacta clients for at least one year, receive this index.

The *Total Performance Index*, better known under its acronym TPI, is based on the analysis of nine parameters:

- Milk production per cow
- Fat production per cow
- Protein production per cow
- Calving Interval
- Dry period
- Heifer age at calving
- Heifer weight at calving
- Longevity (% animals in 3<sup>rd</sup> lactation or more)
- Somatic cells count

These parameters represent the annual herd averages (12 months).

### Principle of the TPI calculation

For each of the parameters, the first step consists in measuring the distance between the value of the herd and the provincial average of the breed. For the parameters related to production, as well as those associated to the weight, if the values of the herd are higher than the provincial values, we attribute a positive value to them. For the other parameters, calving interval, dry period, age of heifers at calving and somatic cell count, herd values higher than the provincial average, are attributed a negative value as a high value is not desirable. For example, we want a somatic cells count to be as low as possible.

The second step consists in normalizing the values. This is a statistical procedure which allows the difference between the herd value and the provincial average to be expressed in standard deviation units. This is a crucial stage as we will now have all of the differences expressed in the same unit of measure. We can now compare calving intervals (in number of days) with production (expressed in kg per cow).

Once the nine parameters are normalized, we are on our way to calculating the TPI value of the herd:

1. We establish the percentile rank for each normalized value.
2. We calculate the average of these 9 percentile ranks.
3. We establish the global percentile rank of this average. This is your TPI.

This global percentile rank situates the herd among all the herds of that breed and this for the combination of all the parameters considered. Given that each criterion is a sensitive indicator of the management of the herd, equal importance is given to all.

Table 1 shows an example of the data used in TPI calculation of a Holstein (1a) and Ayrshire (1b).

**Table 1a: Example of the data of a Quebec Holstein herd for 2009**

|  | <b>Herd<br/>Average</b> | <b>Quebec<br/>Average</b> | <b>Corresponding<br/>Percentile<br/>Rank</b> |
|--|-------------------------|---------------------------|--|
| Milk Production (kg)   | 10469                   | 8670                      | 94   |
| Fat Production (kg)  | 402                     | 334                       | 93   |
| Protein Production (kg)  | 335                     | 279                       | 92   |
| Calving Interval (d)   | 457                     | 428                       | 13   |
| Dry Period (d)   | 76                      | 69                        | 20   |
| Heifers Age at Calving (months)                                  | 25.2                    | 27.1                      | 84   |
| Heifers Weight (kg)  | 652                     | 597                       | 94   |
| Longevity(% 3+lactation)   | 34.8                    | 42.6                      | 18   |
| Somatic Cells Count (x 1,000/mL)                                 | 346                     | 258                       | 16   |
| <b>Average of these 9 percentile ranks</b>                       |                         |                           | <b>58</b>                                    |
| <b>Percentile rank of this average = Total Performance Index</b> |                         |                           | <b>68</b>                                    |

**Table 1b: Example of the data of an Quebec Ayrshire herd for 2009**

|  | <b>Herd<br/>Average</b> | <b>Quebec<br/>Average</b> | <b>Corresponding<br/>Percentile<br/>Rank</b> |
|--|-------------------------|---------------------------|--|
| Milk Production (kg)   | 7572                    | 6976                      | 73   |
| Fat Production (kg)  | 311                     | 281                       | 77   |
| Protein Production (kg)  | 260                     | 233                       | 80   |
| Calving Interval (d)   | 424                     | 416                       | 30   |
| Dry Period (d)   | 58                      | 77                        | 92   |
| Heifers Age at Calving (months)                                  | 27.5                    | 27.7                      | 46   |
| Heifers Weight (kg)  | 568                     | 519                       | 92   |
| Longevity(% 3+lactation)   | 33.2                    | 44.7                      | 6  |
| Somatic Cells Count (x 1,000/mL)                                 | 163                     | 208                       | 62   |
| <b>Average of these 9 percentile ranks</b>                       |                         |                           | <b>62</b>                                    |
| <b>Percentile rank of this average = Total Performance Index</b> |                         |                           | <b>75</b>                                    |

Items with a high percentile rank tend to indicate those management elements showing favorable results while those with a low rank indicate the management elements that deserve particular attention. A percentile rank of 94 as seen for milk production in Table 1a, indicates that herd production is higher than that of 94% of Holstein herds. Conversely, a percentile rank of 20, as found for the dry period, signifies that for this parameter the herd is higher than only 20% of the Holstein herds.

The percentile rank of each parameter thus makes it possible to evaluate the individual strengths and weaknesses of the herd management, while that of the TPI situates the entire herd management system within the population of herds of that breed.

What can one conclude from the total performance index? Table 2 presents the data for herds having various percentile ranks. One thing is certain – as the total performance index increases the better each value tends to be: the production increases, calving interval is shorter, milk is of better quality, etc. With an increasing TPI rank, we see an overall better herd management system. However, even within the higher groups there is still room for improvement within the individual elements, making the TPI a precious tool for setting herd goals.

**Table 2a: Average portrait of Quebec Holstein herds according to various TPI**

| Parameters                       | Percentile Rank |      |      |       |       |
|----------------------------------|-----------------|------|------|-------|-------|
|                                  | 20              | 40   | 60   | 80    | 99    |
| Milk Production (kg)             | 8334            | 8359 | 9028 | 10472 | 10197 |
| Fat Production (kg)              | 305             | 320  | 345  | 386   | 384   |
| Protein Production (kg)          | 265             | 258  | 292  | 335   | 334   |
| Calving Interval (d)             | 456             | 417  | 413  | 427   | 397   |
| Dry Period (d)                   | 66              | 73   | 89   | 60    | 50    |
| Heifers Age at Calving (months)  | 29.5            | 27.0 | 29.0 | 25.3  | 25.2  |
| Heifers Weight (kg)              | 540             | 557  | 572  | 571   | 600   |
| Longevity(% 3+lactation)         | 39.3            | 42.4 | 45.4 | 33.7  | 44.8  |
| Somatic Cells Count (x 1,000/mL) | 169             | 149  | 154  | 245   | 177   |

**Table 2b: Average portrait of Quebec Ayrshire herds according to various TPI**

| Parameters                       | Percentile Rank |      |      |      |      |
|----------------------------------|-----------------|------|------|------|------|
|                                  | 20              | 40   | 60   | 80   | 99   |
| Milk Production (kg)             | 6448            | 6418 | 7207 | 8113 | 8930 |
| Fat Production (kg)              | 263             | 262  | 291  | 328  | 365  |
| Protein Production (kg)          | 214             | 514  | 241  | 273  | 307  |
| Calving Interval (d)             | 427             | 413  | 415  | 413  | 381  |
| Dry Period (d)                   | 88              | 73   | 73   | 73   | 53   |
| Heifers Age at Calving (months)  | 28.8            | 27.2 | 27.0 | 25.6 | 24.8 |
| Heifers Weight (kg)              | 516             | 527  | 518  | 537  | 526  |
| Longevity(% 3+lactation)         | 43.7            | 50.5 | 42.1 | 41.0 | 42.9 |
| Somatic Cells Count (x 1,000/mL) | 293             | 211  | 150  | 185  | 85   |

Source : Valacta 2009 Database