

Consistency Index as a Dynamic Field Measure of BTSCC Variation

J. Lukas and J. K. Reneau
Department of Animal Science
University of Minnesota, St. Paul

Edward Deming said that reduction in variation is the key to process improvement. Statistical Process Control (SPC) is a series of statistical techniques used to measure process behavior. A capability index is one of the SPC tools used to measure the capability of a process to meet a specific standard. The concept of a capability index is not very intuitive and is not well known on dairy farms. However, all dairy personnel can relate to the idea that consistent performance of their work logically yields better results. Therefore, a consistency index (CI) was derived as a more field-friendly measure of milk quality process performance. Consistency index (CI) uses daily SPC control chart data to calculate the maximum allowable sigma (day-to-day BTSCC variation) needed to meet the SCC standard at a given mean BTSCC. Daily monitoring of the CI will indicate whether the processes that effect BTSCC are improving, staying the same or deteriorating. It will also inform the dairy farm manager, consultant and farm laborers as to whether the present performance is capable of meeting the desired BTSCC quality goal with statistical certainty. The objective of this study was to derive CI for each of the following SCC standards: 750,000; 600,000; 500,000; 400,000.

Materials and Methods

Bulk tank SCC data was collected daily or every other day for 6 months (January through June) from 269 Minnesota dairy farms. A consistency index (CI) was developed that calculates the maximum allowable sigma to meet the SCC standard at a given mean BTSCC. The CI for each herd was calculated from the bulk tank SCC data according to the following formula: $CI = (\text{standard} - \text{mean}) / 3$ where mean is the average BTSCC calculated from individual values of BTSCC. Four different standards were used to calculate four different CI indexes. CI400 was developed for the 400,000 SCC standard imposed in the EU. CI500 relates to the 500,000 SCC standard adopted in Canada. CI600 uses the 600,000 SCC limit implemented in California, while CI750 is based on the 750,000 SCC limit obligatory in other states.

Results and Conclusions

Routinely plotted BTSCC SPC process behavior charts can be used to monitor the compliance and consistency of those herd management processes that affect SCC level. Knowledge of the degree in variation (sigma) allows a quick assessment of process capability. Using this chart, dairy managers and milk plant field staff can assess the prospect of whether the BTSCC process capability of a dairy can meet one of the specified standards. They can also indicate what level of variation (consistency) will have to be achieved to meet a milk quality standard with statistical certainty. It is anticipated that the same kind of chart could also be used to assess the prospect of meeting quality premium goals and to encourage improvement in process consistency as a means of further BTSCC improvement.

