Determining the Relative Quality of a Model: F-750 Produce Quality Meter

Determining Model Quality

Several factors should be viewed when assessing the quality of a model. Ultimately, the accuracy and precision of the data can be assessed through statistical analysis. The most significant quality figures are:

Model RMSECV:

Indicates the expected average error for the instrument readings.

R-squared (Model Linearity)

Indicates the "goodness of fit", this in conjunction with the RMSECV explains how stable the model is. If the error is low and the R-squared is high the model should make accurate and precise predictions.

Reference Value Standard Deviation and Range:

Standard Deviation indicates if the population spans enough variation/maturity. Partial least Squares Regression results for Brix and Dry Matter are often improved by having the standard deviation larger than 1.5. The range indicates the highest and lowest values that the model can measure through interpolation. The model may work outside of this range but with larger error than is expected within the range.

Formula for Tying it all Together:

The Coefficient of Determination (R-squared, R^2) is the result of a linear regression analysis,

$$\text{Coefficient of determination} = 1 - [\ (\text{Standard error})^2 / (\text{Standard deviation of reference values})^2\ ]$$

Assuming the lowest possible error, the R-squared is dependent on the distribution of the reference values. Where the standard deviation of reference values and the standard error are calculated on the same sample set.

Other factors that are of interest include *n* (size of the population), and the number of principle components. These parameters are related to the model creation and not to the model's performance. The *n* size and principle components will not predict the performance or robustness of a model.