

240x The Role of Wavelet Denoising in Improving Reconciliation and Interpretation in Plant Performance Analysis

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Two important tools in plant performance analysis are reconciliation and interpretation. The former minimally adjusts process measurements to close the control volume constraints. The latter estimates model parameters which describe operations within the control volume. Interpretation requires proper reconciliation.

Two principal shortcomings in reconciliation are failure to account for operations within the control volume and sensitivity to the accuracy of the constraints. The former is a result of the focus only on material and energy streams which cross the control volume boundary, i.e. there is no fundamental connection among the streams. The latter is due to the imposition of macro-constraints, e.g. material balances, which may not instantaneously apply. Both lead to bias in the interpreted results.

An alternative method which removes noise and identifies systematic error, thus overcoming these shortcomings is wavelet denoising – a method originally developed for signal processing. This treats each measurement separately to estimate the true behavior of the measurement. The results are not prejudiced by the limitations of reconciliation. Wavelet denoising separates the functionality and the noise by analyzing short time segments in the measurements.

This paper discusses the role of denoising in plant performance analysis. Results show that: 1) Denoised measurements are better estimates of the true values than the measurements themselves; 2) Reconciliation of denoised measurements is a better estimate of true behavior than reconciliation of the actual measurements; 3) Analysis of denoised measurements identify bias in the constraints. The results presented are in the context of distillation operation.