

Data Driven Approaches to Variable Selection and Design of Soft-sensors for Industry

Ramesh Kadali

Extraction Process Engineering, Suncor Energy Inc.

P.O. Box 4001, Fort McMurray, AB, T9H 3E3, Canada

Abstract

Softsensors are being increasingly used in process industries where instruments for measuring some quality variables online are not available. Different numerical methods such as PLS, CVA, etc can be used for regression to identify a model between the quality variables contained in the Y-matrix and the process variables contained in the X-matrix. Collinearity of the variables in the X matrix needs to be removed before building the model. One of the critical parts of building the model for soft-sensors is the selection of process variables in the X-matrix. In this presentation we discuss some of the numerical techniques we have been using for building softsensors to provide real time inferential measurements of some quality variables in the oil sands extraction process.

The product streams of the unit operations in Extraction process have several components such as Bitumen, Diluent, Water and fine solids. Online measurement of composition is a difficult task due to the presence of fine solids. Quality variables, whose information is critical for operating the process, are not available in real time because of the delay caused by sample collection and laboratory analysis. Even though plant personnel need the composition of only one component such as Bitumen, lab assays typically provide composition of all the components in the stream. This additional information can be used in the selection of process variables in the X-matrix for building the softsensors.

Key words: soft-sensors, data-driven approaches, canonical variate analysis, partial least squares, quality variables, process variables, optimal variable selection.
