Data Reconciliation for Advanced Production Accounting

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About the Client

National Peroxide Limited (N.P.L) established in 1954 in Mumbai is one of the largest manufacturers of peroxygen chemicals in India. They are the largest manufacturer of Hydrogen Peroxide in India, with an installed capacity of 84,000 M.T.P.A on 50% w/w. basis. Their fully integrated manufacturing site for Hydrogen Peroxide is located at Kalyan in Maharashtra.

Motivation

Increasing market demand has forced process industries to re-assess their production capacities. The usual strategy to address the requirement of increased production is through capital investment into process units which act as bottle-necks of the entire plant's production. The identification of these is dependent on the data of process parameters measured across the plant. However, the measurements of the process parameters are often erroneous. If capital investments were to be made based on decisions driven by analyses done on such sensor data, it can prove to be financially disastrous. Faced with a similar conundrum, our client approached us with a requirement of providing a tailor-made software solution which would reconcile their existing sensor data, providing relatively error free data for performing mission critical decisions.

Problem

The biggest challenge in this project was to integrate our code with third party thermodynamic modules and an optimizer. Python was chosen as the language as it was suitable for rapid prototyping and testing. Though a python interface was available for the thermodynamic module it was not capable of handling chemical mixtures.

Another issue that had to be addressed was that the thermodynamic package provided properties for non-reacting systems which was not valid for application in a reacting system such as the client's. We observed that there were multiple flow sensors located on the same stream, which was not applicable for use in the existing reconciliation framework.

Solution

The existing interface for the thermodynamic package was modified to handle mixtures. Since the reliability of the solution was dependent on the robustness of the optimizer, it was run through several test cases and appropriate modifications were made to handle edge case scenarios.

The problem of reacting systems was addressed by computing the offset term that need to be added to the enthalpy provided by the package. The additional sensors were incorporated into the existing reconciliation framework by creating virtual streams, on which each of the additional sensors were mounted.

The client had a request for making the solution more accessible. Presently, the software solution provides an Excel interface for configuring the plant. Upon execution of the program the reconciled results are written into a similar excel sheet.

This allows for off-line use of the data reconciliation framework. **Gyan Data** is currently working on developing a full-fledged G.U.I for easy on-the-fly plant configuration and data reconciliation, allowing seamless integration into the client's on-line operations.