SCAN

Process Supervision and Control

Advanced Statistical Techniques for the Analysis of Variability in Processes

KNOWLEDGE IS AT HAND

The simple observation of process variables in time can usually help us to identify basic cause-effect relationships and to detect strong disturbances in plant's behavior by the use, for example, of fixed boundaries for data trends.

However, many real and complex processes cannot be fully understood by the use of this supervision scheme, since the relationships that explain most of plant's dynamic remain hidden in data unless a deeper analysis can be performed.

Thus, the real challenge –once the problem of data acquisition is solved– is to transform all this hidden information into knowledge about the process. The selection of the proper method to obtain and to use this knowledge will allow you to improve not only plant supervision, but also your control strategies!

ANALYSIS OF VARIABILITY: A NEW POINT OF VIEW.

The existence of highly correlated variables in any complex process and the relatively stable performance of plant's dynamic leads to the assumption that the study of variability patterns offers a valuable tool for the analysis of hidden cause-effect relationships and the design of supervisory statistical indexes or predictors.

For instance:

- The variability pattern method is able to obtain an important reduction in the number of indexes needed for plant supervision, resuming highly correlated data in a few pseudo-variables which describe the inner relationships between process variables.
- The deviations from previously determined variability patterns is always correlated with different operational conditions.
- Some deviations results as a direct consequence of control actions and they can indicate how the entire process reacts to these actions.
- An increasing "variability" of some process attributes such as quality, efficiency or stability can be predicted from the modification

The use of this methodology results in a wide range of applications including characterization of processes, early fault detection, variable prediction and the design of control strategies.

TRY US

We offer you a "proof of concept" in order to evaluate the potential of these tools at your industry. An off-line analysis will be made for a data set containing historical information about the plant, expected results at that time, control actions, etc. Our experience in several applications indicates that this solely study is enough to obtain immediate benefits!

Questions? Please e-mail to:

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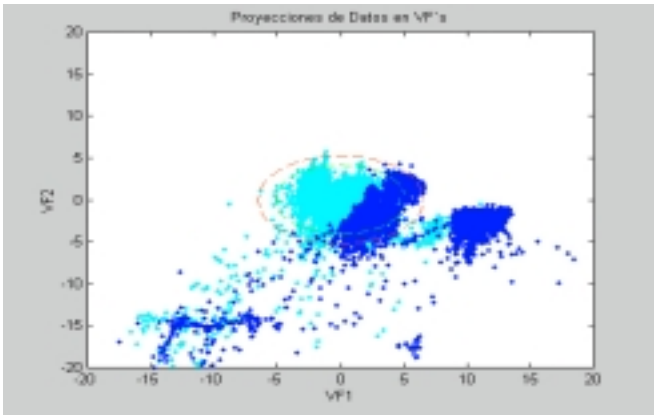
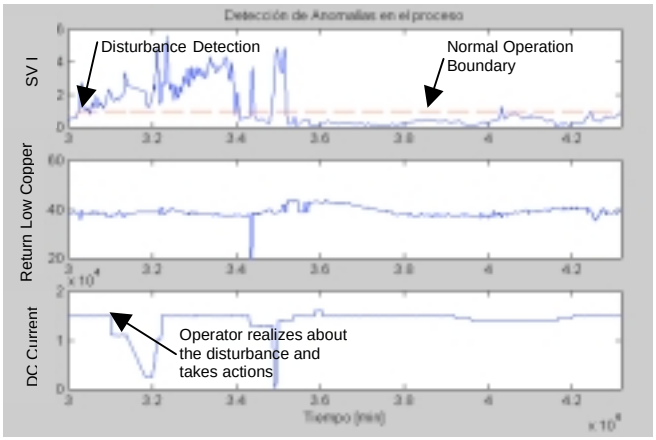
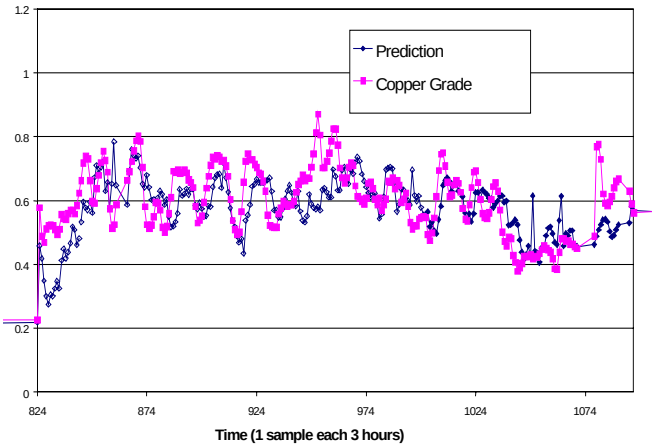


- Use the power of variable reduction to create new visualization maps. Compare the performance of similar plants under the same operational conditions like in this example where the effect of the weariness in a SAG mill's revetment is analyzed. The map also easily indicates the existence of disturbances by the definition of statistical boundaries for normal SAG's operation.

- Variable reduction avoids redundant information and helps process monitoring, as in this example where 8 variables that define the behavior of a SAG mill are summarized in only 4 pseudo-variables, explaining the 90% of the whole variability.



- In an Chilean Electrolytic Copper Plant, DC current is manually adjusted using the return low copper ion content as a controlled variable. The Statistical Variability Index (SVI), allows to obtain an earlier disturbance detection in this complex process showing an upset, sometimes hours before the operator takes the corrective action on the current value because of an existing disturbance.



- Dynamic analysis of data was done through SCAN Dynamic Modeling tools for a Electrolytic Copper plant. The obtained model allowed to predict the variation of the Copper grade even 9 hours before they take place, by using a sample time of 3 hours. The model not only helps in the prediction, but also determines the correlation structure and identifies the main explicative variables among a large set of candidates.