

Geometric Process Control Improves Process Operation and Alarm Management

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Abstract

The paper describes the results of the first two Field Trials at IneosChlor and Mallinckrodt Chemicals of the new Geometric Process Control (GPC) method for improving the quality of both process operations and product by providing Process Alarms and Alerts of much high quality than before. The advance arises from a new mathematical treatment of alarms that, for the first time, considers them as multi-variable interactions between variables.

The paper describes the Trials, the methods used, a much more effective and cheaper method for Alarm Rationalisation that quickly delivers sets of Consistent Alarm Limits, and the extension to full Alert Management.

Using geometrical methods it fully solves the multivariable quality control problems, previously only partially addressed by statistical methods, and introduces a new Process Operator Display that uses only existing variables to fully describe the multi-variable operating space.

A novel Alarm Advisory Algorithm has been trialed also. Using a geometric algorithm it advises operators on process moves to reduce the number of outstanding alarms. It has proved surprisingly good at deducing process moves that make considerable sense from an engineering and operations perspective but without the expense of explicitly creating and then maintaining a knowledge base of Rules.

The principles by which the integration of conventional and model-based process control with process alarm management and product quality management has been achieved will be described.

The multi-variable operating zone at the heart of the method is derived from existing historical data using equation-free methods. It does not require a first-principles process model or an expensive series of process identification experiments. This makes it an affordable and maintainable solution for small plants and single items of equipment as well as for the largest plants.