# ASPECT

## Methodology for Inferential Sensing and Assessment of Quality Control

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For: ACC '99

## ABSTRACT

ASPECT is an acronym for Advanced Statistical Process Estimation and Control Technology. DuPont has developed ASPECT as a prototype to help better understand the application of inferential sensing and how it applies to "quality" control. ASPECT is:

•An application methodology that provides a structured approach to the problem of quality control.

•Software tools developed in support of that methodology.

ASPECT helps plant engineers evaluate the merits of various quality control approaches. It also provides a means to quantify and understand the opportunity for moving from one level of quality control to the next. The ASPECT software is a complete, simple to use, integrated environment for data gathering, empirical modeling and inferential sensing applications.

This short presentation will discuss ASPECT's role in evaluating alternative approaches to quality control approaches and will cover ASPECT's capabilities with respect to inferential sensing. It will briefly cover several application of ASPECT in support process analitical applications.

## Quality Control

The goal of most quality control systems is to reduce or eliminate variability in final product properties in order to delight the customer. There are various methods employed to accomplish this. Traditionally, industry has used the two classic technologies: Statistical Process Control (SPC), and Automatic Process Control (APC). SPC and APC approach the problem of achieving or maintaining quality from two different points of views. SPC assumes that once the problems are detected, procedures will be initiated to find and fix those problems. APC seeks to counteract the effect of problems in the process rather than eliminate them. Both APC and SPC are widely used in the process industries. The question frequently asked is: When do I use which method? Why am I using SPC methods for regulation?

The following figure depicts the question ASPECT is atempting to adress. What level of reduced variability is required to satisfy the customer and what tools are appropriate. The Y axis of this chart is calibrated in performance relative to customer needs. The column on the far left, *Current Practice*, indicates where many process industries currently fall. This state is characterized by infrequent laboratory analysis and the use of SPC technologies such as CUSUM or Shewart charts to trigger process adjustments. The next column, *Lab APC*, indicates some improvement over *Current Practice*. Here better feedback algorithms are used to achieve the improvement, but the improvement is limited by laboratory feedback frequency. The Pp level indicated by Cp(Lab) would imply minimum variance control at lab feedback frequency. This maybe adquate for your customer needs. The ultimate reduction would be attainable by continuous measure of the quality variable *Continuous APC*. The *Inferential APC* approaches this.

Answering the question of; how and when to use the appropriate method, is the primary goal of ASPECT.

Quality Control Performance as Measured by $Pp = \dfrac{\text{Spec Range}}{6 \text{ Stdev}}$
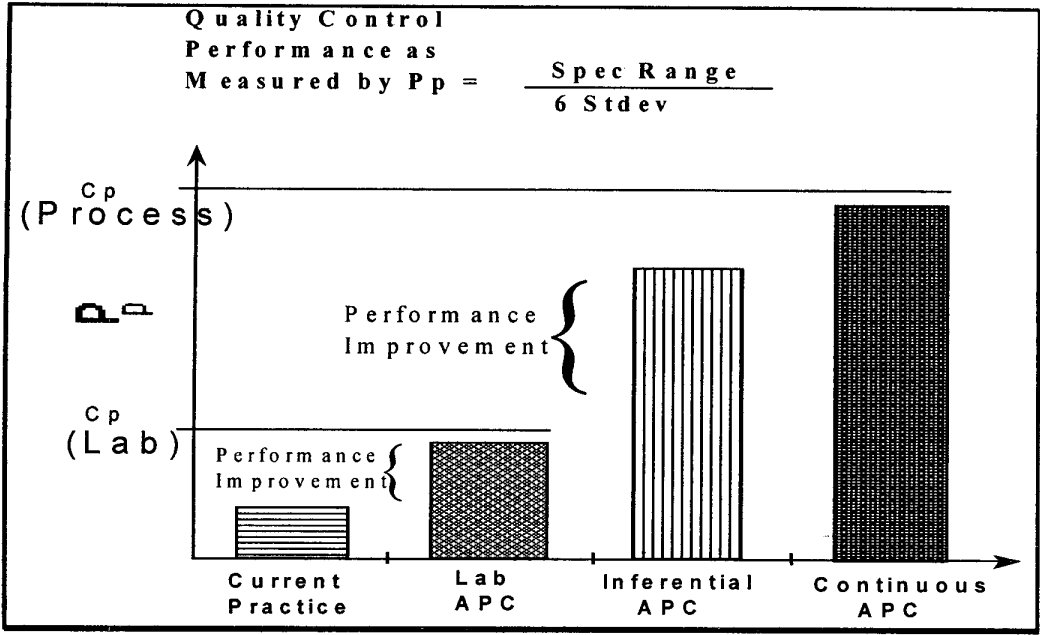
A schematic model of ASPECT is shown below. The individual elements of this model will be discussed, and several real world case studies will be briefly reviewed.