Implementing Statistical Process Control for Your Urea Product

Introduction

Statistical Process Control is a good way to check, but more-over control your product quality, and reduce the amount of complaints and overdosing of formaldehyde, and avoid caking and dust in the warehouse.

Typically one wants to do quality control on the Size Guide Number (SGN) and Uniformity Index (UI), because these parameters determine how ones fluid bed granulation or prilling plant is running.

One can also opt to apply Statistical Process Control on the load-out product, to enable a product certification and happy customers.

Requirements

One needs active feedback control to stay within the upper and lower control limits (3 sigma), eg settings on feed capacity, cooling capacity, amount of UF, melt temperature etc.

The required measurement frequency of SGN/UI (to enable control action), will be 4 times per hour or every load-out batch of 5 ton or continuously at discharge of prilling tower is of paramount importance.

There are various principles of analysers, depending on the required sample size and frequency, and degree of automation you want to achieve.

Basic setup up for implementing Statistical Process Control:
1) Automatic product sampler
2) Product sample splitter
3) Automatic video image analyser, including image software of PC-processor with data storageor semi-automatic sieve analyser gradex type, including own PLC and interface, with data storage
4) Signal RS232 converter and software to plant control system DCS or even in some cases to Pneumatic or Electronic control system

The batch type particle size analysers are capable of screening (& retaining) more than 8 screen sizes.

The continuous image analysers are in fact indefinite (concerning particle size) screen sizes, in parallel to the process, after calibration between your required size span.

References:

There are, to our present knowledge, about 12 in-line systems running systems, of which 6 systems semi-batch gradex type and the 6 other camera image processing.

The plants, which have installed it, are secretive about it, because they make a premium product, with almost exactly what a customer wants.

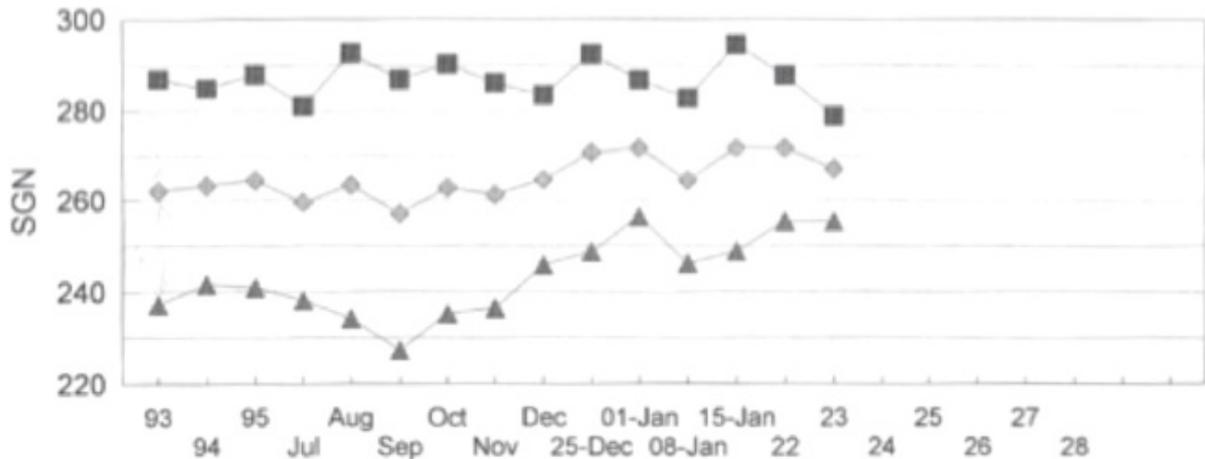It's not only use for urea, but for other fertiliser products as well.

The graph above shows the positive effect of implementing Statistical Process Control. Until November 1995 there was no Statistical Process Control and the average SGN was around 260, with a relatively large variation. After the implementation of Statistical Process Control in this urea fluid bed granulation plant in November 1995, the average SGN increased to about 270, while the variation reduced significantly. Also the Uniformity Index significantly improved, leading to less complaints and a premium product.

To show the benefits of Statistical Process Control (SPC) of SGN/UI in your plant, we need some more plant specific information, to enable some quantifications. If you want to implement such SPC SGN/UI system, we suggest to co-operate in the following steps.

Step 1: Feasibility Study phase
Quick scan of process and unit operations, present analysis errors or off-spec, present process quality controls, applicability of Statistical Process Control with DCS, indicative investment cost figure, Go-NoGo advice report.

Step 2: EPC phase
- System design criteria, performance parameters, pfd, generic setup drawing, generic equipment & analyser specifications, tender assistance and selection vendor.
- Check vendors progress, judge SPC methods, suggested, SPC software and network integration, supervise vendor documentation and factory acceptance test.
- Construction on-site supervision, assistance dry-run, commissioning with hands-on training, system performance and site acceptance test, prove of UCL-LCL automation works.

UreaKnowHow.com has the expertise and experience to support you in each of these steps.

In case of interest please contact Mark Brouwer via mark.brouwer@UreaKnowHow.com, so we can prepare for you're a customized technical/commercial offer.

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