On Line Quality Control of Fly Ash According to the European Standards

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The Problem:

The main objective at 3 power stations of the German Utility e-on is to assure the fly ash quality, especially the compliance with the certification guidelines of the European standard EN 450. The main parameters for quality control are:

LOI content
Fineness (particle size)
Free Lime content

The key variable is the LOI content as this is subject to boiler operation, mill condition, load etc.

The key issue was, that the tight control regime required to control the fly ash quality (especially in regard to LOI) was too labor intensive to be efficiently maintained. The solution to the problem was to split up the internal quality control on one hand (which does not have to follow the formal procedures of EN 450) and the external approval of the fly ash quality according to EN 450 which on the other hand formally does not require a tight sampling regime as long as the fly ash quality is under control.

The control regime before:

Manual sampling > 2 times per day (sometimes every hour). Samples were used to control the fly ash quality and at the same time as proof of compliance with upper LOI limit.

The NEW control regime:

Automated On line measurement every 5-10 minutes per sampling location.
Manual sampling only several times per weeks as proof of compliance and cross check of system accuracy.

LOI versus UBC:

First it has to be recognized that there is a fairly good correlation between the LOI and the unburned carbon (UBC). This correlation allows the use of commercially available on line UBC measurement techniques as long as compliance with the LOI limits is checked frequently. Also the Particle size is a function of the UBC so that the on line UBC measurement can be used in order to CONTROL the fly ash quality. The ASSESSMENT of the fly ash quality is then a formal process which has to be undertaken from time to time in accordance with the fly ash customer as well as with the external auditor according to EN 450.

Location of the on line UBC System:

The system has to take a measurement which is representative of the total stream of fly ash being discharged from the precipitators to the ash silo. For this special measurement locations were selected in the bulk ash stream downstream of the precipitator. The sampling location in the flue gas stream proved to be unsuitable for the desired accuracies in the application.

System architecture:

The system was applied in 3 power stations burning international coal and producing a total of over 120 000 tons of fly ash per month. The system data can be communicated to a central laboratory in order to direct the ash flows to optimize the amount of sellable quality ash.

Results:

The accuracies proved to be sufficient in order to use the system for the internal quality control and enhance fly ash sales. Also the representivity of the sampling in the bulk stream showed sufficiently high enough to use the on line system for internal quality control that produced ash qualities acceptable by the external auditors.

Conclusion:

The total of 30 sensors and 7 sub systems working as integrated on line UBC measurement system in 3 power stations has helped the western power generation group of e on to enhance fly ash sales and reduce labour cost for the internal quality control as well as for the QA procedures as required by the European standard EN 450.