Case Studies of Some Typical SCR Commissioning Issues and Their Resolutions-

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Introduction

In response to the SIP Call Rule, SCR retrofit is a priority environmental project in the USA. A total of over 100 to 150 GW coal fired units have been estimated to need NO_x control by SCR by 2004.Advanced knowledge of commissioning issues and teething problems and how they were resolved can save valuable time and hence cost of retrofit.

This paper attempts to provide a snapshot of the common commissioning problems encountered by the earlier SCR retrofits. The experiences of seven early SCR installations during start up are reviewed. Also included are some general items, which should be watched for.

Case Histories

The units are labeled alphabetically.

Units A, B & C are all PC fired ranging in sizes from 265, 330 and 225 MW.
These are the earliest installations and their start up highlights are: -
1.None of them achieved the desired outlet NOx level, caused by the under performance of their burners and over fire air, which were not identified immediately before start up. A burner optimization, over fire air port adjustment and balancing were carried out 'after the event'. This also reduced the LOI.
2.The ammonia injection control system needed redesigning for automatic mode operation.
3.Numerous problems were encountered with the analyzers for NOx & ammonia slip.
4.SO_3 in the flue gas condensed in the sample tubing corroded the system. The configuration needed to be re-designed to allow for proper drainage of condensate needing several drains and vents.
5.The control system of Unit B needed modification to utilize the NO_x emission level in the stack. A PID controller was installed to compare actual stack NO_x to a set point to adjust the required ammonia flow. The controller utilized the SCR NOx inlet analyzer as a trim control and fuel flow for feed forward.
6.Steam soot blowers experienced considerable problems, which will be avoided by Monroe's sonic horns.
7. The air heater and SCR dPs under full load were monitored to provide an advanced plan for air heater washing.

Unit D is Cyclone fired. The problems encountered during its start up were:
1.NOx monitors required modification to seal air gaskets.
2. Original ammonia transfer pump with single mechanical face seals was replaced with sealless canned motor pumps.
3 Limit switch of bypass bumpers had problem leading to mechanical damage, when the switch failed. Problem was resolved by the installation of a second set of switches and a torque-limiting switch on the drive.
4.Ammonia distribution at catalyst inlet suffered due to dilution air system pluggage by ABS. This was caused by the traces of SO_3 in the dilution air from air heater leakage as the air heater outlet temperature was below the formation temperature of ABS. Re-routing the dilution air system inlet from the air preheater outlet to the FD fan discharge solved the problem.

Unit E is **a** 745MW corner fired plant.
The problems were: -
1.NOx monitors, requiring modifications to their seal air gaskets. (same as Merrymack)
2 The piping arrangement of the dilution air steam coil heat exchangers caused flow stratification entering the heat exchangers, limiting their effectiveness. Guide vanes and perforated plates corrected this.
3. Leaks in the hydraulic systems of dampers required rework in the field. The next Unit had welded joints.

Unit F is 675 MW PC fired.
The start up difficulties included: -
1.NOx analyzer repair, requiring operation in manual mode during repair time.
2. The ammonia evaporators had to be returned to the manufacturer for repair.

Unit G is a 468 MW PC plant.
It experienced severe premature catalyst deactivation due to arsenic poisoning, controlled by chemical injection. The cause of the problem was severe underestimation of the arsenic content of coal, as an incorrect method (ASTM D4606) was used for measurement, where the arsenic mostly vaporizes during sample preparation.
ASTM D6357 or EPA 3051 must be used for arsenic measurement**.**

Summary
The common commissioning problems included achieving specified NO_x removal, NO_x analyzer, NH_3 distribution, airheater pluggage, premature catalyst deactivation and I & C issues.