Lessons Learned from SCR Experience of Japan, Europe and USA; Are These Enough?

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Summary

Up to 1997, there were 8 coal-fired units with SCR in the USA having a total capacity of under 3,000 MW. Currently over 100,000 MW of coal fired units in the USA might need SCR retrofit in response to EPA's SIP Call rule. These compare with around 50,000 MW in Europe and around 60 coal fired plants with SCR in Japan.

Evolved from two generations of design in the late 70s to early 80s in Japan and mid 80s in Germany, 2 x 265 MW of Carney's Point and 375 MW unit 2 of Merrimack are seen to be the pioneers of coal fired SCR installations in the USA. Since then, SCR technology has made great strides attaining 93% NOx removal efficiency, 3 ppm of ammonia slip and 0.5% SO_2 to SO_3 conversion. SCR units on boilers with all three firing modes - cyclone, wall and corner, dry as well as wet bottom, have been successfully commissioned and are in commercial operation. High dust application of SCR technology has been demonstrated on units firing bituminous coal with nearer to 4% sulfur and PRB coal containing over 25% calcium oxide.

Carney's Point and Merrimack have now completed eight years of operation following resolution of their teething problems.

The Japanese and European experience of SCR installations has been documented. The ammonia slip, space velocity, NOx removal efficiency, airheater design and operation, etc. have been improved both in Japan and Europe. However their experience with regard to unit design, catalyst life/geometry and poisoning, process conditions, ammonia/NOx ratios, and especially coal quality is not adequately transferable in relation to the service conditions posed by some of the SCR specifications in the USA.

Catalyst poisoning by arsenic has been experienced and mitigating measures by the use of chemicals have been adopted in Japan and Europe. The US coal quality presents a greater challenge. The features of high sulfur and high arsenic bituminous and the high level of coal- bound calcium in PRB coal are unique. Use of coals of this nature, individually or in blends, presents technical and commercial challenges. These issues have not been experienced in Europe or Japan.

Elimination of acid-aerosol plume formation firing high sulfur bituminous coal in units with wet FGD presents an additional challenge.

Improved understanding, validation and Utility's recognition of the mechanism of arsenic poisoning and catalyst blockage by calcium oxide in fly ash are necessary. Role of additives as a mitigating measure merits serious consideration.

Validation of vanadium based SCR catalyst's reported ability to oxidize elemental mercury would add a new dimension to SCR technology utilization in the wake of imminent multi-pollutant control requirement.

Development of non-vanadium- based catalyst compositions for high dust application and improved C & I by application of neural network based software will benefit industry worldwide.