UP-GRADATION of POLLUTION CONTROL DEVICES

by R Somasundaram

Emission *regulations have become more stringent with the latest Notification issued by Ministry of Environment and Forest in Dec.'2015. Many operating power plants need to revamp their flue gas pollution control devices to meet the prescribed environmental norms. The most commonly used pollution control device in India to regulate particulate emission is electrostatic precipitator (ESP). The ESPs in many operating plants need upgrade to enhance their particulate collection efficiency in order to meet the latest pollution control norms. Upgrading collection efficiency of ESP in an operating plant needs customized solution as the challenges in terms of enhancement in collection efficiency requirement, gap in design & operating parameters, site constraints are unique to each and every plant. As such selection of optimum method for refurbishment of the existing ESP needs thorough understanding of ESP design & operation coupled with the knowledge on overall plant design & performance so that revamping of ESP can be viewed holistically from overall plant performance perspective.*

Majority of the electric power is generated by thermal power plants, utilizing coal as the fuel. There are various methods available to limit the emission of suspended particulate matter viz., cyclone separators, bag filters and electrostatic precipitators (ESP). Out of all these, ESP offers specific advantages such as ability to handle large gas flows, less pressure drop, high collection efficiency specially on capturing submicron particles, low operating costs. ESP also offers flexibility in handling varied sizes of ash particles and withstand fluctuations in flue gas volume. Due to these advantages, ESP is the preferred pollution control device to other control devices for thermal power plants. The size of the ESPs is ever increasing continuously in order to meet prescribed lower emission limits.

ESP operates satisfactorily only when the ash resistivity lies within an optimum range between (10^7 to 10^{10} ohm-cm). Resistivity beyond this acceptable range would have an adverse effect on the ESP performance. Ash resistivity shall be maintained within this range for good collection efficiency. The resistivity of fly ash varies with flue gas temperature, constituents and its composition. Among many constituents, it primarily depends on the amount of sodium content in ash and suplhur content in coal. As an example, ash resistivity gets affected due to change of fuel to low sulphur coals to minmise SO_2 emissions.

Flue gas conditioning (FGC) technique can be adopted to bring the electrical resistivity of the ash particles within the required range. FGC requires addition of different type of chemicals to increase the size and to correct the electrical condition of fly ash particles in ESP for enhanced collection efficiency. Best suitable FGC shall be selected considering improvement in collection efficiency, ability to achieve the required changes on surface properties of ash particles, chemical consumption, its influence on the environment, health of the equipment/ person.

Changing the coal feed, varying its influence parameters, employing methods to reduce re-entrainment and adopting suitable FGC method are some of the ways by which performance of an ESP can be improved.

The latest Notification issued by "Ministry of Environment, Forest and Climate Change" (MoEF) on 7th December, 2015 calls for all units installed before 31st December 2003 to restrict the

SPM to 100 mg/Nm3, units installed after 1st January 2003, up to 31st December to 50 mg/Nm3, and units to be installed from 1st January 2017 to 30 mg/Nm3. To satisfy the stringent emission norms stipulated by the MoEF, the plants needs to upgrade the existing pollution control devices.

Normally the existing ESPs will have space and layout constraints. Every plant is unique as such selection of best suitable method for refurbishment needs proper understanding of ESP design / operation and knowledge on overall plant design and performance. TCE has experience in design of both equipment and overall plant and also involved in various such up-gradation projects.

In one of the projects engineered, TCE did first undertake a site visit, had discussions with Client to understand their requirements and operational issues. Considering all these, an optimum solution was arrived at to reduce the emission levels from 100 mg/Nm3 to 50 mg/Nm^3.The power station consists of three units each with unique constraints. The suggested recommendations are different for each unit. The solutions are ranging from 'addition of one ESP' to 'increase in collecting zone area by increasing the ESP height'.

Successful execution of such up-gradation projects demonstrates the TCE's capability and expertise in the field.

Reference:

i) MoEF Notification dated 07Dec' 2015