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CASE STUDY

Emission Reduction with ESP Upgrade at Coal-Fired Power Plant

Application

4 units ESP for Coal-Fired Power Boiler Plant in Indonesia

Problem

This ESP has been operating since 1994, the capacity is 65 MW each unit. After certain of service life, the ESP started to be deteriorated and caused high emission. The emission is higher than the government regulation which is more than 230 mg/Nm^3 caused a lot of dust come out from the stack, and the people live around complained about the emission. Most of ESP part were mostly deteriorated.

Solution

During shutdown period, ESP inspection has been done and some abnormal conditions were observed, which may reduce the performance of the ESP due to high spark and arc rate when the controller try to reach high kV and mA level and eventually cause high emission. Therefore, whole ESP mechanical

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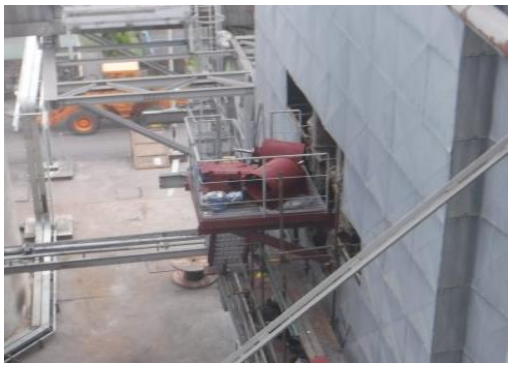
refurbishment was recommended to bring back the ESP efficiency at least to its design level, which includes:

1. To separate the rapping system into two to reduce the load on one motor and to separate one big field into two bus sections. The original design with one big bus section was often having problem and caused emergency shutdown.
2. Collecting Electrode (CE) was changed to more common design, easy for future replacement if needed, but without sacrificing any collecting area.
3. Renew the key mechanical parts which were deteriorated and damaged to new ones with same design.

Collecting Plate Installation

Installing DE Frames



Installing New Platform and additional CE & DE Rapping Motors

DE Rapping System Installation

kV/mA (after)	Field 1	Field 2

Besides of above in-kind rebuilt, some strategies to improve ESP collecting efficiency were also planned, including:

1. Discharge Electrode (DE) is replaced from the original saw-band type to rigid discharge electrode type (RDE).
2. Conventional T/R set was upgraded by high frequency T/R set (HFTR) or called Switch Mode Power Supply (SMPS).

Conventional Transformer Rectifier (T/R set) Before Retrofit

SMPS Installation

With above two phases, the ESP was able to perform better with the emission level below government's regulation for 150 mg/nm^3. The application of new design is believed to not only bring back ESP to its original operating condition, but also increases the performance and efficiency of the ESP.

Benefit

The commissioning after installation including CE DE alignment measurement, CE DE GD rapping test, no-load test and load test on both fields. The T/R Set Rating is 70kV/1370mA and below is the result:

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No-load Test	46kV/1370mA	45kV/1370mA
Load Test	43kV/1296mA	41kV/1358mA

This ESP refurbishment project was done successfully in term of time (finished in 30 days as the plant shutdown period) and emission level (lower than government's regulation based on emission test done). RDE and PowerPlus implementation is proved to be beneficial improving ESP performance thus reducing ESP emission level. The ESP refurbishment project is always tough due to pressure from limited time and space constraints but it will be a good consideration if the ESP has been aged and a lot of problems happened because of it.

Unit	4	4	3
Condition	Before Rehabilitation	After Rehabilitation	After Rehabilitation
Load	37-40 MW	46 – 50 MW	48 – 55 MW
Efficiency	80.9%	92.0%	96.0%
Inlet Particulate	inlet A: 1951.6 mg/m^3	inlet A:1617.6 mg/m^3	inlet A: 3183.0 mg/m^3
	inlet B:1053.8 mg/m^3	inlet B: 1555.4 mg/m^3	inlet B: 4230.8 mg/m^3
Outlet Particulate	Outlet A: 314.9 mg/STDm^3	Outlet A: 136.9 mg/STDm^3	Outlet A: 148.0 mg/STDm^3
	Outlet B: 232.5 mg/STDm^3	Outlet B: 127.7 mg/STDm^3	Outlet B: 132.5 mg/STDm^3

Emission Test Summary

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