Project Report

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U. S. Steel Corporation Edgar Thomson Works
BOP Scrubber Emission System Evaluation

Project Study Plan

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1. Background

The ET facility operates a two-vessel BOP shop that includes the following emission systems:

- BOP primary emission system consisting of a full-combustion type water-cooled hood system at each vessel, a quencher, venturi scrubber, gas cooler, fan/motor system, as well as waste-water treatment system with pumps and controls.
- BOP secondary baghouse system utilized to control emissions generated from the BOP charging, tapping and slagging operations. The system consists of a charge hood at each vessel and a scavenger duct system at the BOP roof to collect fugitive emissions.
- Auxiliary baghouse systems utilized to control fume generated from other BOP steelmaking operations, such as hot metal transfer and desulfurization (Mixer), and the ladle metallurgical furnace (LMF).

In accordance with the requirements of a Consent Decree between United States Steel Corporation (USS) and the Allegheny County Health Department (ACHD), USS is required to obtain a third-party evaluation of the BOP Shop Scrubber System at their Edgar Thomson (ET) facility in Braddock, PA. As part of the third-party study, a plan is required to be developed and approved by the United States Environmental Protection Agency in consultation with the ACHD prior to starting the plan.

2. Plan Objectives

The overall objective of this plan is to ensure that the various emission systems provide reliable and consistent compliance with the emission limits as outlined in Article XXI requirements of the Allegheny County Health Department Rules and Regulations for Air Pollution Control and provide potential improvements to the BOP Shop Scrubber System and operating and maintenance procedures as necessary. Key emission limits from Article XXI are highlighted below.

2.1 Regulatory Requirements

The applicable regulatory requirements for the subject source areas, and which will be used to evaluate the performance of the systems are as follows:

- Visible emissions from the BOP Shop scrubber stacks at less than 20% opacity as a 3-minute aggregate.
- Visible stack emissions always less than 60% opacity.

3. Study Plan - Scope of Work

The plan for evaluation and assessment of the BOP Shop Scrubber System shall include the following key items:

- Review the design basis for the BOP scrubber system.
- Document key process inputs and operating procedures that impact emissions including discussions with key operating/maintenance personnel.
- Assess the current condition and performance of the existing scrubber system via site investigations to evaluate the overall capture performance of particulate matter, including field measurements of system flows, pressures, and temperatures. damper positioning, fan and pump motor ramp ups and downs, and cleaning cycle sequencing of both the gas stream and scrubbing fluid.
- Identify issues that have the potential to negatively impact meeting applicable emission limits, including the fan switching procedure.
- Document the BOP Shop Scrubber stack emissions during various steelmaking events, thereby identifying which operation(s) contribute to the potential stack opacity excursions.
- Evaluate potential options to upgrade the various system equipment to address potential problems identified during the system observation and assessment.

3.1 Field Study Plan including Observations and Investigations

During the site investigation, Hatch will gather information and observe operations as necessary to evaluate the various emission systems, including the following tasks:

- Review of normal operating procedures and controls associated with the BOP primary control system including data relevant to damper positioning, fan motor ramp ups and downs, emission minimization during fan switching procedures and cleaning cycle of the gas and scrubbing fluid.
- Evaluation of all BOP Shop operations that impact the scrubber stack.
- Discussions with key USS personnel to confirm understanding of key BOP steelmaking operations. This would include operating parameters and inputs into the various steelmaking operations, like O2 blowrate, desulf reagents, hot metal charge rates, etc.
- Investigate the operation of the scrubber system, including key operating parameters such as scrubber pressure drops, various damper positions, fan current, gas temperatures, static pressures, etc.
- Review scrubber system information, including design documents/drawings, as well as previous engineering reports and performance test results.
- Gather key reference drawings verifying the design and layout of the existing equipment systems. Obtain operating data from the plant information (PI) system where necessary.

3.2 Equipment Inspections

During the site investigation, visual inspections of the primary emission system will be performed. These inspections will consist of the following tasks:

- Discussions with key USS personnel to identify any maintenance issues associated with the equipment system, including material build-ups, equipment plugging, pump and fan wear, etc. Key findings will be documented.
- An external equipment inspection will be performed to determine that all system components are operational and operating properly.
- Evaluate preventative maintenance practices for the emission system equipment. Identification of opportunities for improvement in these areas.

3.3 Visible Emission Observations

The visible emission observations shall be performed in accordance with EPA Method 9 and shall include the following tasks:

- Hatch shall coordinate the opacity readings with shop operations via radio contact with the visible emissions observer. Specific time and shop operation shall be recorded and coordinated with the visible emission observations.
- Visible emission observations at the BOP Shop Scrubber stack (EPA Method 9) shall be correlated with the various steelmaking operations to determine which operations cause stack opacity excursions.
- Visible emissions observer shall identify emission excursions at the stack in a timely manner via radio contact to an in-shop observer to identify the cause of the emissions. Shop operations shall be identified, noted, and linked to the opacity readings at the stack.
- It is anticipated that the visible emission readings shall be collected for a total of 5 days to be conducted over two separate observation periods. This will ensure that the key emission intensive activities are identified, observed, and documented.
- Investigation of root cause(s) of visible opacity in excess of the applicable standards.
- Operations monitored shall include BOP primary steelmaking activities.

4. Conceptual Engineering Analysis

Based on the site investigations, visible emission observations and overall assessment of the scrubber emission control system, Hatch will provide a conceptual engineering analysis covering the emissions system dedicated to the BOP primary steelmaking operations.

This conceptual engineering analysis shall include an assessment of the design, operation, current condition, and effectiveness in meeting applicable opacity limits. The objective of this analysis is to identify problems, operating procedures, and equipment deficiencies that have the potential to cause compliance issues with emission limits outlined in Section 2.1

The engineering analysis shall also include providing recommendations for changes to operating and maintenance procedures, as well as equipment upgrades necessary to improve the performance, reliability, and compliance of the various emission systems.

4.1 BOP Primary System Engineering Analysis

The evaluation of the BOP primary system will include the following:

- A process model of the BOP primary system will be developed based on BOP steelmaking parameters/inputs, operating data, and previous test results. Hatch's experience with other similar systems will be utilized to fine tune the model.
- All equipment systems shall be incorporated into the process model, including the primary hoods, quencher venturi, secondary venturi scrubber, gas cooler and exhaust fan/motor. Key operating parameters shall be identified such as gas flowrates, pressure drops, gas temperatures, liquid-to-gas ratios, fan current, etc.
- Wastewater Treatment Plant (WWTP) system shall be briefly reviewed to confirm scrub water rates to the quencher and secondary venturis are acceptable (L/G ratios are reasonable), solids removal and scaling issues (chemistry) are under control, blowdown is acceptable, etc.
- Recommendations to upgrade to the WWTP shall be provided as necessary to ensure reliable and consistent performance necessary to supply acceptable water flowrates and water quality to the various scrubber systems.
- Ductwork sizing and layouts shall be reviewed based on the required gas volumes to determine whether the duct is reasonably sized for the ventilation volume. Issues with ductwork plugging, excessive pressure drop, and leakage shall be identified.
- Gas cooler system shall be evaluated to confirm that the gas cooling system is efficient and effective in minimizing the gas temperature to the exhaust fan.
- Exhaust fan and motor equipment shall be reviewed to verify that the equipment can operate at the design volume, temperature and static pressure required for the various emission control requirements.
- Instrumentation and control system components will be reviewed to determine any potential improvements for monitoring and controlling the various equipment systems.
- Information utilized in the process model shall be compared with visible emission observations, recorded operating data from the PI system and previous test results to determine if there are any deficiencies in current operation.

4.2 Recommended Equipment Upgrades

Based on the process analysis, VE observations, recommendations will be developed to improve the performance or reliability of the scrubber emission control system.

- Equipment upgrade concepts will be developed where necessary, outlining key equipment modifications, operating parameters, and layout considerations.
- Ductwork and damper physical upgrades will be identified where necessary to incorporate new equipment into the existing system equipment layouts.
- Instrumentation and controls upgrade will be developed where necessary to improve the monitoring and control of the various equipment systems and meet emission limits.
- Based on previous equipment quotations and historical cost information, a conceptual cost estimate (AACE Class 4: +/- 30%) will be developed for the recommended upgrades.
- Cost estimate shall include costs for the identified major project direct costs (e.g. equipment, materials and construction), as well as other indirect project costs such as detailed engineering, procurement activities, project/construction management, etc.
- Preliminary milestone project schedule will be prepared, including milestones dates for engineering, equipment procurement, installation, and outage requirements.

4.3 Third-Party Report

The report will include the following:

- Methodology
- Observations, including root causes of any applicable standard exceedance
- Data and other information reviewed
- Study findings
- Potential and recommended improvements to the capture and control systems, as well as operating and maintenance procedures of the BOP Primary Emissions Control System.
- Certification by U. S. Steel and Hatch that the study was performed on accordance with the provisions of the Consent Decree.