United States Steel Corporation
Mon Valley Works – Edgar Thomson Plant
13th and Braddock Avenues
Braddock, PA 15104

Kurt Barchick
Vice President, Mon Valley Works

August 14, 2023

EES Case Management Unit
Environmental and Natural Resources Division
U.S. Department of Justice
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Re: DJ#90-5-2-12083

Environmental Protection Agency
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Re: U.S. et al. v U. S. Steel Corporation (W.D. Pa.)

Air Quality Program Manager
Allegheny County Health Department
301 Thirty-Ninth Street, Bldg. #7
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AQReports@AlleghenyCounty.us

SUBJECT: *United States, et al v. United States Steel Corporation (W.D.Pa.)*
Case No. 2:22-cv-0079
U. S. Steel Edgar Thomson Plant – Maintenance Practices Audit Report

Per the requirements of Paragraph V.A.52 of the above referenced Consent Decree, U. S. Steel is submitting for EPA and ACHD approval (pursuant to Paragraph V.57) the report of the Maintenance Practices Audit of the U. S. Steel Edgar Thomson Plant.

On behalf of U. S. Steel Edgar Thomson Plant, I certify that this audit was performed in accordance with the provisions of the Consent Decree as outlined for Civil Case No. 2:22-cv-00729-CB-CRE, Section V, Subsection C, Paragraphs 50 and 5.

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I have no personal knowledge that the information submitted is other than true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

If you have any questions, please contact Coleen Davis at cdavis@uss.com or 412-273-4730.

Sincerely,

Kurt Barshick
Vice President, Mon Valley Works

Attachment

Maintenance Practices Audit of the U. S. Steel Edgar Thomson Plant
Recommendation Summary

Casthouse Baghouse

R1 Provide more clarity on the specific issue and the corrective action

USS Proposal for implementation – The turn end report comments on issues are one step in the process. In some instances, the issue can be or must be corrected as a "go do" corrective action. In other cases, more planning is required. In those cases, a work order will be entered. All corrective action details are documented in our Works Management System (WMS). The turn end reports will be revised to indicate "go do" or work order within 6 months of approval.

R2 As the dust quantity for the dust boxes typically ranges from ¼ to ½ full, they should be emptied at least once a week so that dust does not fill the collection box and start to accumulate into the module hopper.

USS Proposal for implementation – Dust collection occurs twice per week unless circumstances dictate otherwise. A procedure will be developed to document this practice and appropriate personnel will be trained within 1 year of approval.

R3 The fan impellers should be visually inspected at least twice a year with photographs to provide historical documentation of material build up and/or wear

USS Proposal for implementation – Continuous vibration monitoring is done on all fans. The vibration switch will shut down the module until it can be inspected and repaired if necessary. Monthly vibration checks are also done by a vibration technician and annually by a 3rd party. These will be documented in the O&M Plan.

R4 While the air pressure for bag cleaning was generally over 80 psi, the turn report calls for 70 and above. That value is marginal and should be changed to 80 psi

USS Proposal for implementation – The turn end reports will be revised with 6 months of approval.

R5 Further investigation regarding roof leaks is required as water entering the module is problematic.

USS Proposal for implementation – The roof leaks have been repaired since the completion of the audit.

R6 The filter was not inspected internally but comments in the turn reports and high DP would indicate that holes in the roof of the walk-in plenums may still present and should be addressed if so

USS Proposal for implementation – The audit report indicates that no leaks were found however, further investigations will be done to confirm that there are no plenum leaks within 6 months of approval. A corrective action plan will be developed for any leaks discovered.

BOP Shop Fugitive Baghouse

R7 Investigate the cause of dust blowing from #5 and implement the appropriate corrective action.

USS Proposal for implementation – When these issues are identified and communicated, they are inspected, corrected, and documented via the WMS. The O&M Plan will be revised as needed.

R8 The fan impellers should be visually inspected at least twice a year with photographs to provide historical documentation of material build up and/or wear

USS Proposal for implementation - Continuous vibration monitoring is done on all fans. The vibration switch will shut down the module until it can be inspected and repaired if necessary. Monthly vibration checks are also done by a vibration technician and annually by a 3rd party. These will be documented in the O&M Plan.

R9 Further definition of the sticking #9 damper issue would be helpful. Presumably it was able to open/close with some assistance to close it for cleaning as there was no abnormal pressure drop in this period and no indication that it was not available for filtering.

USS Proposal for implementation - The turn end report comments on issues are one step in the process. In some instances, the issue can be or must be corrected as a "go do" corrective action. In other cases, more planning is required. In those cases, a work order will be entered. All corrective action details are documented in our Works Management System (WMS). The turn end reports will be revised to indicate "go do" or work order within 6 months of approval.

R10 Establish a list of critical spares, such as fan bearings, and ensure they are inventoried on site.

USS Proposal for implementation – The evaluation of required spare parts and their management is an ongoing process.

R11 Establish a consistent designation for the turn reports so chronological order can be clearly established for any future review by an outside entity.

USS Proposal for implementation – The turn end reports will be revised to use consistent time frame within 6 months.

R12 Provide further description of noted issues and list the corrective action implemented.

USS Proposal for implementation - The turn end report comments on issues are one step in the process. In some instances, the issue can be or must be corrected as a "go do" corrective action. In other cases, more planning is required. In those cases, a work order will be entered. All corrective action details are documented in our Works Management System (WMS). The turn end reports will be revised to indicate "go do" or work order within 6 months of approval.

R13 Continue replacing the inlet baffles during the next complete filter bag change to

alleviate the filter bag abrasion issue.

USS Proposal for implementation – This has been completed and will be added to the scope of work to future filter bag changes as required.

BOP Shop Mixer Baghouse

R14 Implement a procedure that any time bins are empty for two (2) consecutive vacuum service visits, an inspection of the module hopper should be conducted for bridging or material handling issue

USS Proposal for implementation - A procedure will be developed to document this practice and appropriate personnel will be trained within 1 year of approval.

R15 Given the number of fans on this elevated structure, vibration has always been an issue, so spare bearings, isolation springs and perhaps spare rotating element should be on site

USS Proposal for implementation - The evaluation of required spare parts and their management is an ongoing process.

R16 While there is better explanation for any issues compared to other issues, it would be appropriate to do so for all action items.

USS Proposal for implementation - The turn end report comments on issues are one step in the process. In some instances, the issue can be or must be corrected as a "go do" corrective action. In other cases, more planning is required. In those cases, a work order will be entered. All corrective action details are documented in our Works Management System (WMS). The turn end reports will be revised to indicate "go do" or work order within 6 months of approval.

BOP Shop LMF Baghouse

R17 As the dust quantity for the dust boxes typically ranges from 1/8 to 1/4 full, it is not good practice to go six (6) weeks without dust removal. In the case of dust hopper 2, that should be investigated to ensure that the dust does not accumulate in the module hopper and damage the filter bags

USS Proposal for implementation - A procedure will be developed to document this practice and appropriate personnel will be trained within 1 year of approval.

R18 Similarly, better housekeeping practices should be adopted to allow access for the vacuum service to access all dust hoppers on a regular basis

USS Proposal for implementation - A procedure will be developed to document this practice and appropriate personnel will be trained within 1 year of approval.

R19 Reformat the report so that all seven (7) days of information can be viewed in the scanned document and allow more area for better defining any issues and their corrective action to allow for more efficient management review of the scanned document

USS Proposal for implementation – The turn end report will be reformatted to be consistent with other area turn end reports within 6 months.

R20 The acceptable range of compressed air is given as 70 psi. While the actual recorded pressure is typically around 90 psi, the low range should be limited to 80 psi

USS Proposal for implementation - The turn end reports will be revised with 6 months of approval.

BOP Shop Primary Emissions System/BOP Scrubber

R21 Reformat the inspection forms to provide space for delineating what actions were taken and the timeframe of the repairs

USS Proposal for implementation - The turn end report comments on issues are one step in the process. In some instances, the issue can be or must be corrected as a "go do" corrective action. In other cases, more planning is required. In those cases, a work order will be entered. All corrective action details are documented in our Works Management System (WMS). The turn end reports will be revised to indicate "go do" or work order within 6 months of approval.

Slag Pits

R22 The use of braided hose or expansion joints should be avoided to the extent possible as they tend to be the weak link in piping systems. However, they are often required to eliminate loads from mechanical equipment, prevent vibration transmission, accommodate thermal movements, and allow for slight misalignment. As the permanent system is installed, the use of a properly designed expansion joint for the application should be considered

USS Proposal for implementation – This recommendation will be considered.

R23 Level floats should be scheduled for routine maintenance, if applicable, or replacement based on operational history

USS Proposal for implementation – A proposed procedure was submitted per the Consent Decree requirements on May 15, 2023, for approval. The procedure will be revised as appropriate and the appropriate maintenance.

R24 While it understood, there is still ongoing evaluation regarding the ideal flows and hydrogen peroxide addition, these values should be documented once the appropriate values are determined

USS Proposal for implementation – A proposed procedure was submitted per the Consent Decree requirements on May 15, 2023, for approval. The procedure will be revised as appropriate.

R25 Develop more specific guidelines as to what is an acceptable spray pattern for the turn inspections

USS Proposal for implementation – A procedure will be developed, and appropriate personnel will be trained with 18 months of approval.

R26 Add the relevant pumps to this report with proper identification.
USS Proposal for implementation – The report will be revised within 6 months.

US Steel Edgar Thomson Works

Maintenance Practices Audit

GCT Report: T8631-PR-REP-001 Rev 0

August 14, 2023

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Disclaimer

This report has been prepared partially based upon information provided by U.S. Steel. Gas Cleaning Technologies, LLC has relied upon this information in the preparation of this report and has not independently verified that the information is accurate or complete. This report was prepared under contract to U.S. Steel for their use and benefit and under the terms and conditions of that contract and cannot be used by or relied upon by any other party for any other purpose. Except with respect to the express warranties contained within the contract, GCT provides no other warranty, either express or implied, under any theory of law, for the information, conclusions or recommendations provided herein.

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APPENDIX 5 - BOP SHOP PRIMARY SYSTEM SCRUBBER REFERENCE

APPENDIX 6 - SLAG PITS PM CONTROL REFERENCE

1. EXECUTIVE SUMMARY

U.S. Steel (USS) operates the Edgar Thomson Steel Works in Braddock, PA. As a part of a consent decree with the United States Department of Justice, Environmental Protection Agency, and Allegheny County Health Department, USS has agreed to conduct an audit to analyze the operation and maintenance practices for the following emissions control systems:

a) Casthouse Baghouse
b) BOP Shop Fugitive Baghouse
c) BOP Shop Mixer Baghouse
d) BOP Shop LMF Baghouse
e) BOP Shop Primary System Scrubber
f) Slag Pits

USS directed Gas Cleaning Technologies, LLC (GCT) to conduct this maintenance practices audit. GCT personnel conducted multiple site visits to the facility for inspections and discussions with plant personnel, as well as collection and review of available documentation.

GCT's findings indicate the following:

- USS largely complies with the requirements of the Operation and Maintenance (O&M) plans in terms of documenting the required task daily, weekly, or monthly. The only instances when documentation was not available were during severe weather periods or during unplanned outages. Action was taken on the significant problems identified in the inspections, such as after the thorough baghouse inspections completed in 2019 for the cast house, fugitive and mixer baghouses. Specific issues and non-compliance items are identified in the individual audit sections.
- Most of the key baghouse operating criteria such as module differential pressure (DP), fan amps, compressed air pressure is available continuously through the electronic data management (EDM) system. Having operators walk through each area once or twice a shift, as they currently do, is good operating practice but there is room for improvement on these turn checklists.
    - Develop a consistent shift terminology so that an outside concern can easily identify the chronological order of these reports. For example, some reports use 1st turn while others use a time period such as 6A to 2P. This inconsistency creates confusion as to whether an extended shift of 6P to 6A on 6/12/2023 is the 3rd shift on 6/12 or the first shift on 6/13.
    - Provide additional clarity on the problems identified and what corrective action was implemented. This is not to suggest that an issue is glossed over in all cases as they may not appear in subsequent reports. Questioning management on selective issues reveals that the operator conveyed the issue to a shift manager who issued a work request, and the work was completed in a timely fashion. However, it would be much easier if this was documented on the turn checklist or summarized in some other fashion, perhaps weekly or monthly.
    - The operators are trained to initiate their own work requests when issues are identified. Some do but others pass it along to the turn foreman or shift manager. In the interest of efficiency and time, the operators should be encouraged to put in the work requests and document on the turn report when the work is completed in the absence of some periodic summary report.

- While the baghouse cleaning system is part of the routine checklist, if not as a specific line item, then by checking module DP, improvement in this area is recommended. The typical “pulse-on” time should be 90-120 milliseconds. During the cursory walk through of each baghouse area, it was noted that each had valves that were pulsing longer either due to a set point issue or mechanical malfunction requiring repair or replacement. Given the operator’s total duties it may not be practical to check every valve daily, but they should be checked monthly at a minimum and repaired or replaced.
- An opportunity for improvement is the availability of spare parts for each of these baghouses. Specific instances include:
    - Fugitive baghouse module 10 was down from March 8, 2023, when a bad bearing was identified during the monthly vibration check and remained idle, until April. Discussions with the plant personnel revealed bearings were not available in plant inventory or available in vendor inventory and took over one (1) month to deliver them with expediting. There were no deviations during this period.
    - LMF module went down in late March due to a broken bag alarm and remained down well into April presumably due to the lack of filter bags on hand. There were no deviations during this period.
    - During discussions with plant personnel, it was also revealed that filter bags are not on hand for some baghouses.

      For baghouses of this size, the recommended spares list would consist of:
        - One (1) module worth of spare filter bags
        - 10% of cages for each baghouse
        - One (1) spare of dust handling equipment – screw conveyor, rotary air valve, or double dump valve as applicable
        - One (1) set of fan bearings for each fan.
        - One (1) spare shaft/impeller for all dirty side fans. For the mixer, it is also recommended to have one (1) rotating assembly given the historical vibration issues on that structure.
        - One (1) set of belts/sheaves for each belt drive fan at a minimum.
        - One (1) spare broken bag detector where applicable
        - Five (5) minimum spare diaphragm valves/solenoids for each baghouse.
        - One (1) spare damper actuator of each type.

      A review of availability from the respective vendors would determine if these quantities required adjustment.
- Another area where improvement could be made routine inspection of electrical/instrumentation functionality. As an example, a faulty thermocouple in the fugitive system results in dampers nearest to the baghouse being open continuously, due to a faulty temperature reading, which decreases available flow to the other branches. A detailed evaluation of all instruments was beyond the scope of the audit however, plant personnel indicated this is an isolated instance and was corrected.

From the standpoint of maximizing maintenance effectivity of the environmental equipment, consideration should be given to dedicating resources to this task. This would allow more hands-on time with the equipment

and direct responsibility for exacting repairs in a timely fashion. Items such as faulty pulse valves or slag pit spray nozzles could be repaired immediately. The current structure places these responsibilities as one of many within a given operating area in the utilities or area maintenance department. While the current maintenance structure is better than some, it is not as effective as facilities that have a dedicated environmental group that handle all preventative and routine maintenance of their respective areas.

2. INTRODUCTION

US. Steel operates the Edgar Thomson Steel Works in Braddock, PA. The plant operates blast furnaces and basic oxygen process (BOP) furnaces to produce up to approximately 3.5 MTPY of steel. The plant process operations include various emissions control systems that include baghouses, wet scrubbers and water quenching systems (slag pits).

USS has entered into a consent decree with the United States Department of Justice, Environmental Protection Agency, and Allegheny County Health Department for which USS has agreed to conduct an audit to analyze the operation and maintenance practices for emissions controls, including the adequacy of the O&M plans and USS' implementation of the O&M plans. The emissions controls to be covered by the Maintenances Practices Audit include:

a) Casthouse Baghouse
b) BOP Shop Fugitive Baghouse
c) BOP Shop Mixer Baghouse
d) BOP Shop LMF Baghouse
e) BOP Shop Primary System Scrubber
f) Slag Pits

USS has retained the services of Gas Cleaning Technologies, LLC, to support them in the execution of the audit. This report provides a summary of the audit process, findings from each area including adequacy of existing plans/practices, areas of noncompliance and recommendations.

3. AUDIT CERTIFICATION

GCT declares that this audit was performed in accordance with the provisions of the Consent Decree as outlined for Civil Case No. 2:22-cv-00729-CB-CRE, Section V, Subsection C, Paragraph 50 and 51.

The document, with a revision date of December 16, 2022, was provided by USS to GCT for review and guidance in performing the audit.

X _____

GCT Representative

Amandeep S. Randhawa, VP Process Engineering

X _____

USS Representative

Coleen M. Davis, Coordinating Manager, Environmental

4. CASTHOUSE BAGHOUSE

The casthouse baghouse ventilates tapping emissions from blast furnaces 1 and 3. The original system was installed in 1981, consisting of four (4) positive pressure, pulsejet modules – Wheelabrator Model 3015-168, SO 2932, with 9891 SF cloth area per module. It is believed, based on an excerpt from a Wheelabrator document, that the system was designed for 200,000 ACFM at an air with a cloth ratio of 5.06:1.

Each module has its own belt driven 250 HP motor fan, rated for 71,500 acfm at 14", 150°F. Presumably, this was to maintain the 200,000 acfm ventilation rate with one (1) module/fan idle but would result in a net air: cloth ratio of 7.22: 1.

Title 40 CFR 63 Subparts A and FFFF in the code of federal regulations require the development and implementation of the following for the casthouse baghouse system:

- Operation and maintenance plan
- Site specific monitoring plan

The O&M plan of the casthouse baghouse system consists of the following elements:

- Monthly inspection of capture systems for BF 1 and BF 3
- Preventative maintenance of control device for BF 1 and BF 3
- Operating Limits for BF 1 and BF 3 baghouse

The site-specific monitoring plans consists of:

- Continuous parametric monitoring systems (CPMS)
- Inspection specific to the baghouses

Records for each of these inspections and activities were reviewed for last six (6) months approximately.

4.1 O&M Plan

4.1.1 Monthly Inspection of Capture Systems for BF 1 and BF 3

This program requires monthly inspections of the following system components:

1. Ductwork to isolation dampers (external)
2. Air curtain system integrity
3. Emission gas lances
4. Emission Hood
5. External ductwork from isolation damper
6. Isolation damper and actuator
7. Baghouse fan Integrity

Items 1 through 4 are performed by blast furnace maintenance and are documented on USS form BFM0018 (Appendix 1: Exhibit A). Items 5 through 7 are the responsibility of Utilities and are documented on USS form ETSUM00016 (Appendix 1: Exhibit B)

Document BFM 0018 is completed monthly and individually for each furnace and submitted for October 2022 through March 2023 though. BF 3 was idle for several of those months. Comments or corrective actions were

limited to the March 2023 document and included a missing shroud on the BF 1 air curtain fan, missing fan inlet grill on BF 3 air curtain and “damage” to the external shroud of BF 3 emission hood. This document does not quantity functionality of system performance and is limited to the mechanical and structural integrity of the system components that, if left unaddressed, could lead to reduced system performance. Over the review period, it appears that any such issues are addressed in a timely manner.

Document ETSUM0016 was submitted for the month of July 2022 through December 2022. A single monthly document covers the inlet duct from isolation damper for each furnace through the fabric filter. Comments over this time frame were minimal and limited a leak at the fan 2 door hinge in December and a “known problem with the boxes” in August. While this problem should be better defined, it does not appear in subsequent inspections. Plant personnel confirmed that this has been addressed.

R1

Recommendation: Provide more clarity on the specific issue and the corrective action.

4.1.2 Preventative Maintenance of Control Devices for BF 1 and BF 3

This program consists of the following activities:

1. Monthly confirm of fan bearing lube system
2. Semi- annual motor bearing lubrication
3. Semi-annual hopper motor conveyor lubrication
4. Monthly conveyor lubrication
5. Monthly vibration testing
6. Semi-annual thermography readings
7. Calibrate key environmental instruments.

No documents were provided or reviewed as part of this scope of work for the actual lubrication activities (items 1-4) but suitable lubrication is covered in the monthly document ETSUM0016 where no issues were identified indicating that lubrication is performed regularly. Lubrication is performed weekly according to plant personnel.

Item 5, monthly fan and motor vibration testing is performed by an outside party and is part of the overall vibration testing performed in the Gas Washer area (Appendix 1: Exhibit C – Gas Washer 2023 monthly BF vibration). Additionally, a summary report is provided for all work performed during that month (Appendix 1: Exhibit D). The only item of note is vibration issue on Fan 1 related to the fan motor baseplate which was replaced in March 2023

Item 6, semiannual thermography readings, was not reviewed and its purpose for the functionality of the fume collection system is unclear as these are not hot systems other than bearing temperature which is addressed in item 5.

Item 7, calibration of key environmental instruments, was also not provided or reviewed as a part of this scope of work.

4.1.3 Operating Limits for BF 1 and BF 3

The operating limits for BF 1 and BF 3 are total fan amps >568 amps for compartments in operation and isolation damper position feedback, both of which are part of the Site-Specific Monitoring Plan/CPMS in the following section and are addressed there.

4.2 Site Specific Monitoring Plan

4.2.1 Continuous Parametric Monitoring Plan

The CPMS consists of:

1. Hourly average of total fan amps which is recorded in the EDM system continuously.
2. Open/close isolation damper position for each blast furnace and also recorded in the EDM system.

Historical information for each of these can be accessed through the facility EDM system for any desired time and deviations from appropriate operation are contained in the MACT alarm summary issued daily. These were reviewed and summarized for the audit timeframe (Appendix 1: exhibit E).

Over the audit period, there were no significant issues of low fan amps during furnace operation.

During the same period, there were a few instances of damper position transmitter failures for each furnace but nothing that occurred with alarming frequency or duration.

4.2.2 Inspection specific to the baghouses

These inspections are confined to operating items specific to fabric filter operation.

1. Daily module DP visual (5-16” w.c.)
2. Weekly verification of dust being removed from hopper
3. Daily monitor of compressed air supply
4. Daily monitor of cleaning cycles
5. Monthly check of bag cleaning mechanism
6. Quarterly visual leak check
7. Quarterly fan inspection for wear, build up via vibration analysis

Item 2 is performed via Dust Collection sheets that are submitted via a 3rd party who removes the dust from the collection boxes, twice a week (Appendix 1: Exhibit F). Issues of note in the dust collection sheets were muddy or wet dust for module 3 on 1/16/23 and module 1 and 2 on 1/19/23. There were no subsequent notes on this matter afterwards. Module 1 was not emptied from 3/23/23 to 4/13/23 due to safety reasons and moisture in the hopper and dump valve. This situation has been resolved.

R2

Recommendation: As the dust quantity for the dust boxes typically ranges from ¼ to ½ full, they should be emptied at least once a week so that dust does not fill the collection box and start to accumulate into the module hopper.

Item 7, quarterly fan inspections are part of the monthly vibration check as changes in vibration readings should lead to a more thorough inspection of the fan.

R3

Recommendation: The fan impellers should be visually inspected at least twice a year with photographs to provide historical documentation of material build up and/or wear.

Items 1, 3, 4, 5, and 6 are captured in the turn reports performed twice a day. Module DP and air pressure are also captured in the facility EDM and can be accessed continuously or for any historical time period.

Turn reports were provided for the period of 2/15/23 to 4/15/23 and 5/7 to 5/23/23. (Appendix 1: Exhibit G Document E-76540-50-001). The only items of note were:

- Comment on high DP for module 1 on 2/24/23 due to roof leaks and high DP on 3/2/23
- Need to tighten belts on 3/1/23, which did not appear on subsequent reports.

R4

Recommendation: While the air pressure for bag cleaning was generally over 80 psi, the turn report calls for 70 and above. That value is marginal and should be changed to 80 psi consistent with industry standards.

R5

Recommendation: Further investigation regarding roof leaks is required as water entering the module is problematic. The DP for module 1 is frequently 3-4 inches higher than other modules. While always within limits, it gets up to 13-14 inches for several days, presumably related to weather conditions, until everything dries out. Fortunately, the collected dust is not tremendously hydroscopic, and the filter recovers in time.

4.3 Visual Inspection

As part of the audit, a cursory visual inspection of the fume systems externals was performed and compared to the 3rd party baghouse inspection performed in August 2019 (Appendix 1: Exhibit H)

There was no current evidence of inlet plenum leaks.

Fans 1, 2 and 3 have been replaced, including outlet dampers, so there was no evidence of housing leaks, damper stub shaft leaks or holes in fan bases. Fans were replaced in March 2022, December 2020, and July 2020 respectively.

There was no evidence that the fan outlet duct was replaced but there was no evidence of leaks during the visit.

The housing leak on module 4 appears to have been addressed.

R6

Recommendation: The filter was not inspected internally but comments in the turn reports and high DP would indicate that holes in the roof of the walk-in plenums may still be present and should be addressed if that is the case.

4.4 Summary

The cast house baghouse is in better overall condition than it was in 2019, other than confirming the identified walk-in plenum roof leaks have been repaired. Where comments or actions items are given, further description of the issue would help in understanding the issue in more detail. Additionally, the corrective actions and follow-up activities should be documented in such a way they are tied to the inspection documents to confirm that matter was addressed.

5. BOP SHOP FUGITIVE BAGHOUSE

The BOP fugitive baghouse ventilates the charging and tapping operations from the two (2) BOP vessels as well as collecting any fumes escaping the primary hood. The original system was installed in 1981, consisting of seven (7) positive pressure, pulsejet modules – Wheelabrator Model 3015-168, SO 3049, with 9900 SF cloth area per module and rated for 350,000 cfm at 5.05 A:C ratio. Air was delivered to each module by its own FD fan, rated for 50,000 cfm.

In 2007, the system was modified with the addition of three (3) “duplicate” modules, Model 3015-168, Jet III, SO 7120. At that time, ten (10) new arrangement 8, FD fans were installed rated for 61,000 acfm at 22” w.c., 150°F, running at 1180 RPM. The new modules were “duplicates” of the original.

Title 40 CFR 63 Subparts A and FFFF in the code of federal regulations require the development and implementation of the following for the BOP shop fugitive baghouse system:

- Operation and maintenance plan
- Site specific monitoring plan

The O&M plan of the fugitive baghouse system consists of the following elements:

- Monthly inspection of capture systems for the F and R BOP vessel fugitive emissions baghouse
- Preventative maintenance of control device for the F and R BOP vessel fugitive emissions baghouse
- Operating Limits for the F and R BOP vessel fugitive emissions baghouse

The site-specific monitoring plans consists of:

- Continuous parametric monitoring systems
- Inspection specific to the baghouses

Records for each of these inspections and activities were reviewed for last six (6) months approximately.

5.1 O&M Plan

5.1.1 Monthly Inspection of Capture Systems for the F and R BOP Vessel Fugitive Emissions Baghouse

This program requires monthly inspections of the following system components:

1. Ductwork from roof to isolation dampers - BOP
2. Ductwork from isolation dampers to fan inlets - Utilities
3. Isolation dampers and actuators - BOP
4. Baghouse fan Integrity - Utilities
5. Charge hood - BOP
6. Ductwork from charge hood to charge dampers - BOP
7. Charge isolation dampers, seals and actuators - BOP

Items 2 and 4 are the responsibility of Utilities and are documented on USS form ETSUM00016 (Appendix 2: Exhibit A). The remaining items are the responsibility of BOP maintenance and are documented on form E-30600-45-001 (Appendix 2: Exhibit B)

Document ETSUM0016 was submitted for the month of July 2022 through December 2022. This document covers the fans, dampers, modules, and dust handling equipment. There were no comments or action items over this time frame indicating that any maintenance items are addressed as they arise throughout the month.

Document E-30600-45-001 is completed covering the BOP maintenance responsibilities for the BOP Primary and Fugitive Emission systems. These documents were reviewed for time September 2022 through March 2023. Comments or corrective actions were non-existent and, from discussions with plant personnel, any issues associated with the hoods, dampers and ducting are dealt with as they arise.

5.1.2 Preventative Maintenance of Control Devices for the F and R BOP Vessel Fugitive Emissions Baghouse

This program consists of the following activities:

1. Monthly confirm of fan bearing lube system – gas cleaning
2. Semi- annual motor bearing lubrication – gas cleaning
3. Semi-annual hopper motor conveyor lubrication – gas cleaning
4. Monthly conveyor lubrication - gas cleaning
5. Monthly vibration testing
6. Semi-annual thermography readings - utilities
7. Calibrate key environmental instruments.

Lubrication is performed on a weekly basis per plant personnel.

Item 5, monthly vibration testing, is performed by an outside party and is part of the overall vibration testing performed in the BOP area including fugitive and mixer fans as well as the BOP primary fans and pumps. (Appendix 2: Exhibit C – BOP GC Monthly fugitive and mixer vibration). Additionally, a monthly summary report is provided for all work performed during that month (Appendix 2: Exhibit D). From April 2022 through March 2023 the fugitive fans were largely fine other than a recurring mechanical looseness for the outboard bearing on Fan 3 and new issue on the inboard bearing for fan 10 that was identified for replacement on March 8, 2023.

Item 6, semiannual thermography readings, was not reviewed and its purpose for the functionality of the fume collection system is unclear as these are not hot systems other than bearing temperature which is addressed in item 5.

Item 7, Calibration of key environmental instruments, was also not provided or reviewed.

5.1.3 Operating Limits for BOP Secondary (Fugitive) Baghouse

The operating limits for the fugitive emissions baghouse are total fan amps >305 amps for compartments in operation and isolation damper position feedback, both of which are part of the Site-Specific Monitoring Plan/CPMS in the following section and are addressed there.

5.2 Site Specific Monitoring Plan

5.2.1 Continuous Parametric Monitoring Plan

The CPMS consists of:

1. Hourly average of total fan amps which is recorded in the facility EDM continuously.
2. Open/close isolation damper position for each BOP vessel is also recorded in the EDM system.

Historical information for each of these can be accessed through EDM for any period and deviations from appropriate operation are contained in the MACT alarm summary issued daily. These were reviewed and summarized for the audit timeframe (Appendix 2: exhibit E).

Over the review period, there were no instances of low fan amps lasting more than an hour.

During the same period, there were no instances of damper position transmitter failures.

5.2.2 Inspection specific to the baghouses

These inspections are confined to operating items specific to fabric filter operation.

1. Daily module DP visual (3-25” w.c.)
2. Weekly verification of dust being removed from hopper
3. Daily monitor of compressed air supply
4. Daily monitor of cleaning cycles
5. Monthly check of bag cleaning mechanism
6. Quarterly visual leak check
7. Quarterly fan inspection for wear, build up via vibration analysis

Item 2 is performed via Dust Collection sheets that are submitted via a 3rd party who removes the dust from the collection boxes, twice a week (Appendix 2: Exhibit F). The only issue of not is a recurring matter of dust blowing out the collection boxes when the door is open for dust removal especially for module 5, which was noted through this time frame.

R7

Recommendation: Investigate the cause of dust blowing from #5 and implement the appropriate corrective action.

Item 7, quarterly fan inspection is part of the monthly vibration check as changes in vibration readings should lead to a more thorough inspection of the fan.

R8

Recommendation: The fan impellers should be visually inspected at least twice a year with photographs to provide historical documentation of material build up and/or wear.

Items 1, 3, 4, 5, and 6 are captured in the turn reports performed twice a day. Module DP and air pressure are also captured in EDM and can be accessed for any time period.

Turn reports were provided for 12/3 to 12/15/22, 12/24-26/22, 3/10/23, 3/16 to 3/31/23, 4/1 to 4/5/23 and 5/18 to 5/30/23. (Appendix 2: Exhibit G Document E-76510-50-002). Items of note include:

- The 12/3/22 report referenced a #9 damper sticking closed and this was noted on subsequent reports through 12/7/22, when it was noted that the “Beck was bad”. The 12/15 report indicates that the actuator was repaired. Looking at earlier/later reports – nothing prior to 12/3 or after 12/7 until 12/15 when the actuator was worked on.
- The 12/4/22 report notes #3 module DP=0 with no mention of cause or corrective action.
- The 3/10/23 report shows #10 module down which continues beyond the 4/5/23 report, with no indication as to why the module is down but presumably due to the bad bearing on the ID fan identified on the vibration report from 3/8/23. The baghouse minimum fan amps was achieved during this period.
- The 5/18-to 5/30/23 reports indicate various modules down in this time period – module 3 from 5/18 to 5/22, module 4 from 5/23 to 5/25 and module from 5/29 through at least 5/30. There is no indication on this report as to the cause or corrective action. Plant personnel indicated that maintenance such as bag changes and pulse valve changes were being performed.

R9

Recommendation: Further definition of the sticking #9 damper issue would be helpful. Presumably it was able to open/close with some assistance to close it for cleaning as there was no abnormal pressure drop in this period and no indication that it was not available for filtering.

R10

Recommendation: Establish a list of critical spares, such as fan bearings, and ensure they are inventoried on site.

R11

Recommendation: Establish a consistent designation for the turn reports so chronological order can be clearly established for any future review by an outside entity.

R12

Recommendation: Provide further description of noted issues and list the corrective action implemented.

5.3 Visual Inspection

As part of the audit, a cursory visual inspection of the fume systems externals was performed and compared to the 3rd party baghouse inspection performed in June 2019 (Appendix 2: Exhibit H)

As a result of the inspection USS internally clad the dirty side housing with ¼” plate in starting in the summer of 2020, with all modules completed in the spring 2021. Starting in Mary 2023, USS started the replacement of the inlet baffle with modules 3 and 4 completed. The expected completion date is August 2023.

The leaks noted around the dampers and fan outlet ducting during the June 2019 inspection were not noted during this brief walk through.

Several of the modules have peeling paint on the backside and should be inspected for any cracking. While the internal cladding is containing the dust, this should be addressed at some point.

R13

Recommendation: Continue replacing the inlet baffles to alleviate the filter bag abrasion issue.

5.4 Summary

The fugitive baghouse is in better overall condition than it was in 2019. The internal recladding addressed the recurring leaks through the module housings. The ongoing inlet baffle replacement should address the persistent abrasion of the near inlet filter bags, which appears to be the most significant issue currently. However, the collector is over (40) years old so continued diligence on the O&M plan and implementation of the recommendations, especially maintaining an appropriate inventory of spare parts, is suggested for continued operation.

6. BOP SHOP MIXER BAGHOUSE

The metal mixer baghouse ventilates the molten iron transfer to ladle and desulfurization operations in the BOP shop, The existing dust collector is a 12-module, negative pressure, pulsejet installed in 1996. Each module has its own 100 HP, belt driven, ID fan rated for 22,000 CFM at 20" w.c., with a design volume of 264,000 CFM with all modules in operation.

Each module has (192) 6" diameter x 192-1/2" long filter bags for module cloth area of 4823 square feet, yielding a gross air:cloth ratio of 4.56. Filter bag cleaning is accomplished by compressed air when the modules are off-line.

Regulatory citation 63.7800 (b) does not require an O&M plan for the BOP shop mixer baghouse and only a Site-Specific Monitoring plan is in place.

The site-specific monitoring plans consists of:

- Continuous parametric monitoring systems
- Inspection specific to the baghouses

Records for each of these inspections and activities were reviewed for last six (6) months approximately.

6.1 Site Specific Monitoring Plan

6.1.1 Continuous Parametric Monitoring Plan

The CPMS consists of filter bag leak detectors installed on each of the twelve (12) modules and capable of detecting emissions of particulate matter at concentrations of 10 mg/m^3 (0.0044 gr/acf). The output of these devices is stored continuously in the EDM system and deviations from appropriate are contained in the MACT alarm summary issued daily, which is summarized for audit time frame of October 22 to April 13, 2022 (Appendix 3: Exhibit A)

There were recurring alarms due to uptime < 95% for broken bag detectors.

- Module 1 from 11/10/22 through 12/13/22
- Module 11 from 1/1/23 through 1/25/23

Plant personnel advised that these alarms were due to an upgrade in system sensitivity and the resulting communication. All probes were operating and there were no broken bags.

There were also several instances of less than ten (10) modules in operation, which is a USS internal requirement.

- 1-2 hours in duration on 12/4/22, 12/6/22 and 12/7/22 with only the 12/4/23 being documented on the turn report as a "no fault alarm".
- Multiple hour insufficient modules on 12/24/22 through 12/26/22 with no reason documented on the turn reports but presumably due to the extreme weather conditions on those days.
- A (2) hour incident on 3/12/23 with no reason documented though module 11 was down for extended period from at least 3/10/23 until 3/23/23

- A multi hour incident on 3/29 related to a cleaning system failure on module 11 and bad cylinder on module 8.

6.1.2 Inspection specific to the baghouses

These inspections are confined to operating items specific to fabric filter operation.

1. Daily module DP visual (1.5-12" w.c.)
2. Weekly verification of dust being removed from hopper
3. Daily monitor of compressed air supply
4. Daily monitor of cleaning cycles
5. Monthly check of bag cleaning mechanism
6. Quarterly visual leak check
7. Quarterly fan inspection for wear, build up via vibration analysis

Item 2 is performed via Dust Collection sheets that are submitted via a 3rd party who removes the dust from the collection boxes, twice a week (Appendix 3: Exhibit B). The only issue of note was bins 7 and 11 being empty from 3/16/23 through 3/23/23. Module 11 was down for that period but module 7 was operating and therefore should have dust in the bin.

R14

Recommendation: Implement a procedure that any time bins are empty for two (2) consecutive vacuum service visits, an inspection of the module hopper should be conducted for bridging or material handling issue.

Item 7 quarterly fan inspection via vibration analysis is conducted by a 3rd party on a monthly basis as part of the overall vibration analysis for the BOP area (Appendix 3: Exhibit C BOP GC 2023 monthly vibration). This document covers the period of March 2022 through February 2023. While this report shows a number of issues over the preceding periods, all are addressed other than a recurring issue on Fan 8 that appeared resolved in November but is re-occurring.

A monthly area vibration summary report is issued (Appendix 3: Exhibit D) and summarizes the month's significant issues.

R15

Recommendation: Given the number of fans on this elevated structure, vibration has always been an issue, so spare bearings, isolation springs and perhaps spare rotating element should be on site.

Items 1, 3, 4, 5, and 6 are captured in the turn reports performed twice a day. Module DP and air pressure are also captured in EDM and can be accessed continuously or for any historical period.

Turn reports were provided for multiple days in the months from December 2022, and March to May 2023 (Appendix 3: Exhibit E Document E76510-50-002). The items of note were:

- Module 11 was down from 3/10 to 3/30/23 with no explanation
- Modules 2, 8 and 11 were down on 12/24/22 with no explanation
- Compared to similar reports for the other baghouses, there was more description as to the cause of other issues and corrective actions

R16

Recommendation: While there is better explanation for any issues compared to other issues, it would be appropriate to do so for all action items.

6.2 Visual Inspection

As part of this audit, a cursory inspection of the baghouse externals was conducted to compare to the 3rd party inspection performed in June 2019 (Appendix 3: Exhibit F – USS Metal Mixer inspection summary).

Since that time, USS has repaired all fans with new rotating assemblies (impeller, shaft, bearings, and driven sheave) and new spring bases resulting in a substantial reduction in vibration at the fan level. Stiffener to housing weld cracks is still present but not of significant concern given the relatively small module size and heavy plate thickness.

6.3 Summary

The mixer baghouse is in overall better condition than it was in 2019. Many of the issues identified in the previous inspection have been addressed.

However, as indicated, due to the location of the fans, impact of excessive vibration on the fans and other baghouse system components will continue to be an issue. Sufficient spares should be maintained and currently two (2) rotating assemblies are in stock.

7. BOP SHOP LMF BAGHOUSE

The LMF baghouse was installed in 1991 with the construction of the dual slab caster. The original design was a 4-module baghouse, rated at 70,000 CFM with each module having its own roof mounted ID fan, to ventilate the LMF hood and associated alloy additive equipment. In 2009, two (2) additional modules were added along with (6) new roof mounted, direct driven fans, rated at 20,000 CFM, increasing the exhaust volume to 120,000 CFM

Regulatory citation 63.7800 (b) does not require an O&M plan for the LMF fume system and only a Site-Specific Monitoring plan is in place.

The site-specific monitoring plans consists of:

- Continuous parametric monitoring systems
- Inspection specific to the baghouses

Records for each of these inspections and activities were reviewed for last six (6) months approximately.

7.1 Site Specific Monitoring Plan

7.1.1 Continuous Parametric Monitoring Plan

The CPMS consists of filter bag leak detectors installed on each of the six (6) modules and capable of detecting emissions of particulate matter at concentrations of 10 mg/m^3 (0.0044 gr/acf). The output of these devices is stored continuously in EDM and deviations from appropriate are contained in the MACT alarm summary issued daily, which is summarized for audit time frame of October 22 to April 13, 2022 (Appendix 4: Exhibit A)

There was a recurring alarm related to uptime less than 95% for module 3 broken bag detector from 4/6 to 4/14/23 and the module was down for that period with documented indication as to the cause. Plant personnel indicated that the module was out of service to replace the filter bags and cages.

The other alarms were very intermittent and of limited duration, indicating they were dealt with immediately.

7.1.2 Inspection specific to the baghouses

These inspections are confined to operating items specific to fabric filter operation.

1. Daily module DP visual (1.5-25” w.c.)
2. Weekly verification of dust being removed from hopper
3. Daily monitor of compressed air supply
4. Daily monitor of cleaning cycles
5. Monthly check of bag cleaning mechanism
6. Quarterly visual leak check
7. Quarterly fan inspection for wear, build up via vibration analysis

Item 2 is performed via Dust Collection sheets that are submitted via a 3rd party who removes the dust from the collection boxes, twice a week (Appendix 4: Exhibit B). There were two (2) matters of concern identified.

- A dust hopper was not emptied as the door was blocked from 2/27/23 through 4/3/23
- During the same time frame, dust hopper 2 was noted as being empty.

R17

Recommendation: As the dust quantity for the dust boxes typically ranges from 1/8 to 1/4 full, it is not good practice to go six (6) weeks without dust removal. In the case of dust hopper 2, that should be investigated to ensure that the dust does not accumulate in the module hopper and damage the filter bags.

R18

Recommendation: Similarly, better housekeeping practices should be adopted to allow access for the vacuum service to access all dust hoppers on a regular basis.

Item 7, quarterly fan inspection via vibration analysis, is conducted by a 3rd party monthly as part of the overall vibration analysis for the caster area (Appendix 4: Exhibit C Caster WX 2023 monthly LMF vibration). This document covers the period of March 2022 through February 2023. The only item of note is fault detected on LMF 3 fan in September 2022 resulting in “new fan and bearings” installed in January 2023 and the fan returning to acceptable operating conditions in February 2023.

A monthly area vibration summary report is issued (Appendix 4: Exhibit D) and is attached for reference only.

Items 1, 3, 4, 5, and 6 are captured in the turn reports performed twice a day. Module DP and air pressure are also captured in EDM and can be accessed continuously or for any historical period.

Turn reports were provided for multiple days in the months from October 2022 to May 2023 (Appendix 4: Exhibit E Document C.W.Q.C Turn Checklist). The items of note were:

- October 2022
  - Module 3 shut off 10/20/22, BOP systems restarted, and it is on-line cleaning 4:45 pm with no cause given.
  - Module 3 repair completed at 10A with no description of repair.
  - Modules 2 and 4 shut down on 3rd turn. BOP systems restarted which matches MACT alarm on this day. Reason for shut down not given.
- November 2022
  - Nothing noted.
- December 2022
  - Nothing noted.
- March 2023
  - Multiple MACT alarms on 3/30/23 via broken bag detector on module 3.
- April 2023
  - Module 3 remains down through 4/13/23 presumably awaiting bag change.
- May 2023
  - Nothing noted.

The turn reports are structured to provide a week’s worth of information for all caster water equipment including the LMF baghouse resulting in a document that is cut off from in its form leaving the last day plus off the scanned document. Hard copies are available in the Caster Water pulpit.

R19

Recommendation: Reformat the report so that all seven (7) days of information can be viewed in the scanned document and allow more area for better defining any issues, their corrective action and allow more efficient management review of the scanned document.

R20

Recommendation: The acceptable range of compressed air is given as 70 psi. While the actual recorded pressure is typically around 90 psi, the low range should be limited to 80 psi to match industry standards.

7.2 Visual Inspection

A very brief walk through of the LMF performed was as part of this audit with no major issues noted other than some pulse valves not firing properly and dust/debris accumulating on horizontal surfaces and around the dust handling area.

7.3 Summary

No significant issues were noted on this collector that would affect long term performance with diligent adherence to the O&M plan and implementation of the recommendations.

8. BOP SHOP PRIMARY SCRUBBER

The primary gas cleaning system for the 'F' and 'R' BOP vessels include individual water-cooled hoods with hood sprays, and individual quenchers. The captured emissions are then ducted to the Kinpactor, followed by the gas cooler. One operating and one standby fan ensures the delivery of volume to the gas cleaning system. The water-cooled hoods provide the local capture and cooling of the emissions while the quenchers cool the gases and remove large particulate. The Kinpactors, which are variable throat venturi scrubbers, are the primary particulate removal devices which introduce spray water droplets with a large pressure drop across the unit to remove small particulates. The gas cooler helps remove the water droplets and cools the gases to enable a reduction of fan horsepower. The Fans provide the volume necessary at the hoods for collection of the emissions and the pressure necessary for particulate removal. The recirculating water system is required to both cool and clean the gases form each BOP Vessel.

Title 40 CFR 63 Subparts A and FFFF in the code of federal regulations require the development and implementation of the following for the BOP shop primary scrubber system:

- Operation and maintenance plan
- Site specific monitoring plan

The O&M plan of the fugitive baghouse system consists of the following elements:

- Bi-shift inspection of capture systems for the "F" and "R" BOP vessel primary emissions system
- Preventative maintenance of control device for the F and R BOP vessel primary emissions system
- Operating Limits for the "F" and "R" BOP vessel primary emissions system

The site-specific monitoring plans consists of:

- Continuous parametric monitoring systems
- Inspection specific to the scrubbers

Records for each of these inspections and activities were reviewed for last six (6) months approximately.

8.1 O&M Plan

8.1.1 Bi Shift Inspection of Capture Systems for the F and R BOP Vessel Primary Emission System

This program requires bi-turn inspections of the following system components:

1. Kinpactor System
2. ID Fan System
3. Quench Water System
4. Hood Spray System
5. Recycle Water System
6. Thickener and Belt Press System
7. Hood Closed Loop Cooling Water System
8. Hood Open Cooling Water System
9. Blowdown Lamella

10. Gas Cooling Water System
11. Misc. Environmental Systems (Primarily clarifier area)

Items are the responsibility of Utilities and are documented on USS BOP Gas Cleaning Turn Checklist Form E-76510-50-002. The remaining items are the responsibility of BOP maintenance and are documented on form E-30600-45-001 (Appendix 5: Exhibit A)

Document E-30600-45-001, pages 1 and 2, are completed covering the BOP maintenance responsibilities for the BOP Primary and Fugitive Emission systems. These documents were reviewed for time September 2022 through March 2023. Comments or corrective actions were non-existent and, from discussions with plant personnel, any issues associated with the hoods, dampers and ducting are dealt with as they arise.

8.1.2 Preventative Maintenance of Control Devices for the F and R BOP Vessel Primary Emission System

This program consists of the following activities:

1. Monthly confirm of fan bearing lube system – gas cleaning
2. Semi- annual motor bearing lubrication – gas cleaning
3. Semi-annual hopper motor conveyor lubrication – gas cleaning
4. Monthly vibration testing
5. Semi-annual thermography readings - utilities
6. Calibrate key environmental instruments.

No documents were provided for the actual lubrication activities (items 1-4) but suitable lubrication is covered in the monthly document ETSUM0016 where no issues were identified indicating that lubrication is performed regularly.

Item 4, monthly vibration testing, is performed by an outside party and is part of the overall vibration testing performed in the BOP area including fugitive and mixer fans as well as the BOP primary fans and pumps. (Appendix 5: Exhibit B). Additionally, a monthly summary report is provided for all work performed during that month (Appendix 5: Exhibit C).

Item 5, semiannual thermography readings, was not reviewed and its purpose for the functionality of the fume collection system is unclear as these are not hot systems other than bearing temperature.

Item 6, Calibration of key environmental instruments, was also not provided or reviewed.

In addition to the above, twice during each turn, a BOP Gas Cleaning Checklist is prepared that outlines the critical maintenance and operational tasks of each sub system to the gas cleaning system. Included is the Kinpactor System, ID Fan System, Quencher water system, Hood Spray System, Recycle Waste System, Thickener and Belt Spray System, Hood Closed Loop Cooling Water System, Hood Open Loop Cooling Water System and Blowdown System. Critical components of each system are observed twice a shift. Any open breakdown reports are also noted.

After reviewing the reports, it becomes apparent that all systems are reviewed on a regular basis. However, the actions taken to repair deficiencies and timing is not shown on the daily or monthly reports. As an example, the failure of the blowdown system was listed for several days without the remedial actions and timing planned to get the system back in operation. While not immediately critical to the operation of the gas

cleaning system, a prolonged outage could lead to build-up in critical pumps and pipes that could have an effect on the particulate removal form the gas stream.

R21

Recommendation: Reformat the inspection forms to provide space for delineating what actions were taken and the timeframe of the repairs.

8.1.3 Operating Limits for F and R BOP Vessel Primary Emission System

The MACT reportable requirements for the primary Gas Cleaning system are for the Kinpactor water flow to be above 3300 GPM based on a 1-hour average. The other reportable requirement is that the Kinpactor DP is above 66 Inches WG on 1-hour average. Inspection requirements include Water flow transmitter out of range, and DP transmitters out of range. All of these are part of the Site-Specific Monitoring Plan/CPMS in the following section and are addressed there.

8.2 Site Specific Monitoring Plan

8.2.1 Continuous Parametric Monitoring Plan

In addition to the manually copied parameters in the bi-turn BOP Gas Cleaning Checklist described above, all major system waterflows, Kinpactor Pressure Drop and Critical system pressures are monitored continuously and stored in the EDM system. This also includes Fan pressures, fan/liquid drive speeds and fan amperage. This allows a comprehensive system evaluation if an exceedance or breakdown occurs.

8.2.2 Inspection Specific to the Scrubbers

The Kinpactor (scrubber) is inspected twice per turn to ensure that the sprays are cleaned, and none have been by-passed. This in conjunction with the pressure loss readings and water flow provide a reasonably good prediction of scrubber efficiency. Example forms for all inspections are listed below and provided in Appendix 5.

- Exhibit A – Document E-30600-45-001
- Exhibit B – Monthly Vibration Report
- Exhibit C – Overall Monthly Summary Report

8.3 Visual Inspection

A very brief walk through of the Primary performed was as part of this audit with no major issues noted.

8.4 Summary

The BOP Primary gas cleaning system for “F” and “R” Vessel are the most computer controlled and monitored emission systems in the plant. Also, they have the most frequent manual inspections. However, they are one of the most complex emission systems in the plant when the fans, water and cooling systems are considered.

The monitoring and maintenance practice employed at USS is appropriate for the primary gas cleaning system to work at peak performance within their design limitations.

9. SLAG PITS

The consent decree accepts the current practice of wetting Blast Furnace slag to control PM emissions to atmosphere and requires the addition of an oxidizing agent for H_2S control. USS submitted a procedure to the regulatory agency on May 15, 2023, and is awaiting approval.

A temporary system went into service in February 2023 utilizing hydrogen peroxide as the oxidizing agent. Installation of a permanent system is in process with foundations already poured, storage tanks on order and has a target completion date of July 2023.

Daily inspection of the existing slag pit quench system is part of the Gas Washer Daily Checklist (Appendix 6: Exhibit A Document E-76540-50-001), and were reviewed for the period of 2/15/23 to 4/15/23 and 5/7/23 to 5/23/23. Items of note were:

- A leak on the braided hose for #3 slag pit ground pump which was noted on 3/1/23, 3/6/23 and 3/19/23 reports, the latter indicating it had been replaced and was failing again.
- Recurring issues with level floats on both slag pits on (4) occasions.

R22 **Recommendation:** The use of braided hose or expansion joints should be avoided to the extent possible as they tend to be the weak link in piping systems. However, they are often required to eliminate loads from mechanical equipment, prevent vibration transmission, accommodate thermal movements, and allow for slight misalignment. As the permanent system is installed, the use of a properly designed expansion joint for the application should be considered.

R23 **Recommendation:** Level floats should be scheduled for routine maintenance, if applicable, or replacement based on operational history.

In May 2023, additional fields were added to the Gas Washer Daily Checklist (Appendix 6: Exhibit B Document E-76540-50-001), to account for the peroxide metering pump and add “flows” to #1 and #3 to pipes and sprays. In the May reports, actual flows were documented on only two (2) occasions – 5/9/23 7P to 7A and 5/14/23, 7P to 7A.

R24 **Recommendation:** While it understood, there is still ongoing evaluation regarding the ideal flows and hydrogen peroxide addition, these values should be documented once the appropriate values are determined.

Another factor critical to the proper functioning of the hydrogen peroxide addition system is the proper functioning of the spray nozzles to achieve the ideal spray distribution. This is not a clean solution so fouling of the nozzles is inevitable though testing of various nozzles styles is ongoing.

R25 **Recommendation:** Develop more specific guidelines as to what is an acceptable spray pattern for the turn inspections.

Review of the monthly vibration report for the Gas Washer area (Exhibit C – Gas Washer 2023 Monthly BF vibration) does not appear to contain the pumps associated with the slag cooling and peroxide metering systems. This document provides an efficient means of quickly assessing the history of rotating equipment.

R26 **Recommendation**: Add the relevant pumps to this report with proper identification.

Appendix 1 - Casthouse Baghouse Reference

Exhibit A

Environmental Key Equipment Maintenance Checklist
Casthouse Emissions Equipment Preventive Maintenance – Mechanical / Monthly

Date: 3-29-23

Furnace: 1

Mechanical Repairman: N. Gowa / S. Myers

CASTHOUSE EQUIPMENT	DONE	COMMENTS
Emission Hood:		
1. Hood clear of obstructions and structurally OK.	☑	
2. Inspect duct from hood to damper for structural integrity and visible leakage.	☑	
Air Curtain:		
1. Check for excessive vibration.	☑	
2. Check fan inlet grill for damage or blockage.	☑	
3. Check air flow damper for operation and lubricate.	☑	
4. Inspect ductwork for visible damage.	☑	
5. Check air curtain for obstructions and flow.	☑	
6. Inspect for structural integrity and missing guarding.	☑	
7. Check motor base bolts.	☑	
8. Check blower housing and seal areas.	☑	SOUTH FAN SHROUD MISSING BOLTS/STUDS
Emission Gas Lances:		
1. Check that all spouts have two operational lances.	☑	
2. Check condition of gas valves.	☑	
3. Check lance ends for slag buildup.	☑	

Comments: _____

12109698

Exhibit B

Organization Type: Corporate Maintenance Document	**Doc # ETSUM00016**
Document Type: Maintenance Procedure	**Issued Date:** 12/31/2021
Description: Preventive Maintenance (PM)	**Approved Date:** 12/31/21
Location: Mon Valley Works Primary - ET Utilities Maintenance and Services	

EMISSION CONTROL BAGHOUSE PM/ INSPECTION MECHANICAL – MONTHLY

BLAST FURNACE

SAFETY: **SIGN BOARD AT OPERATION SHANTY, LOCKOUT / TRYOUT, TAKE A RADIO**

	DONE	ADDITIONAL COMMENTS
1. COMPARTMENTS – Inspect and repair:		
A. Check for leaks on all compartments, seals, and joints.	☑	#2 (fan) inspection door has a leak at the hinge
B. Observe areas with dust build or visible emissions up for for possible leak areas.	☑	
C. Check compressed air for differential pressure.	☑	
D. Observe cycle for each compartment component to ensure proper function of each fan, dump valve, cleaning cycle, louver, screw conveyor	☑	
2. Fan and Motor – Inspect and repair:		
A. Check fan and motor for vibration and noise. Look for evidence of damage or deterioration.	☑	
B. Check all grease/lube/oil systems.	☑	
C. Clean and Lubricate.	☑	
D. Check all drive belts for wear and tension. Look for any sign of Deterioration or damage on belt guard assembly.	☑	
E. Look for any evidence of looseness on the base. Missing bolts. Tighten if necessary. Replace any missing bolt.	☑	
3. Rotary Valve/Plattco – Inspect and repair:		
A. Check conditions and operation of the rotary valve.	☑	
B. Check for loose, broken, missing bolts and parts.	☑	
C. Ensure rotary valve and rotating units are getting lubricated.	☑	
D. Look for evidence of damage or deterioration.	☑	
E. Observe chain and sprockets assemblies.	☑	

	DONE	ADDITIONAL COMMENTS
4. Screw Conveyor – Inspect and repair:		
A. Check for loose, broken, missing bolts and parts.	☑	
B. Ensure motor, drive and rotating units are getting lubricated and inspected.	☑	
C. Look for evidence of damage or deterioration.	☑	
D. Observe chain and sprockets assemblies.	☑	
5. Damper System – Inspect and repair:		
A. Check for loose, broken, missing bolts and parts.	☑	
B. Observe Condition / operation of Beck Drive.	☑	
C. Check condition / operation of Electric Actuator.	☑	
D. Observe condition / operation of dampers for freedom of movement. Shafts, bearings, pivot points, driver lever and linkage assembly. Use a nut and bolt buster solution to break any stuck connection and ease the damper assembly movement.	☑	

Additional Comments (Use this box to write comments or defect explanation drawings):

Comments, Follow ups, or recommendations:

U. S. Steel	Title: **EMISSION CONTROL BAGHOUSE PM/ INSPECTION MECHANICAL – MONTHLY**	Page 3 of 3

Organization Type: Corporate Maintenance Document	**Doc # ETSUM00016**
Document Type: Maintenance Procedure	**Issued Date:** 12/31/2021
Description: Preventive Maintenance (PM)	**Approved Date:** 12/31/21
Location: Mon Valley Works Primary - ET Utilities Maintenance and Services	

Employee(s) Name(s): Frank Todd	***Date:*** 12-18-23	***Duration:***
For Planner use:	***WO#***	

Exhibit C

U.S. Steel Monthly Vibration Readings - Gas Washer

	USS Priority Codes
1	Immediate Attention/Action Required
2	Fault Detected
3	Acceptable Operating Conditions
4	Baseline Readings - work Performed
5	Equipment not Running

	Equipment	Inspection Date	Apr 22	May 22	Jun 22	Jul 22	Aug 22	Sep 22	Oct 22	Nov 22	Dec 22	Jan 23	Feb 23	Mar 23	Notes/Fixes Suggestions
1	1 (West) Underflow Pump - 1 Fce	2/14/2023	4	1	2	2	5	2	2	2	2	2	2	5	Loose Belts and a High 1X @ Motor - Structural issues
2	2 (East) Underflow Pump - 1 Fce	3/6/2023	2	5	5	5	2	5	5	5	5	5	5	4	Installed a new Pump - Pump looks good
3	North Venturi Pump - 1 Fce	9/7/2022	3	2	2	3	5	3	5	5	5	5	5	5	
4	South Venturi Pump - 1 Fce	3/6/2023	5	5	5	5	4	5	3	3	3	3	3	3	
5	North Tuyere Pump - 1 Fce	1/9/2023	3	3	3	3	5	5	3	4	3	3	5	5	
6	South Tuyere Pump - 1 Fce	3/6/2023	5	5	5	5	3	2	5	5	5	5	2	2	Fault Frequencies & Mechanical Seal at IB Pump - below alarm levels
7	1 Medium Pressure Pump - 1 Fce	3/6/2023	3	3	5	5	5	5	5	5	5	5	3	3	
8	2 Medium Pressure Pump - 1 Fce	1/9/2023	5	5	3	2	2	2	2	2	2	2	5	5	Casing/Impellers are bad
9	3 Medium Pressure Pump - 1 Fce	1/9/2023	5	5	3	4	3	3	3	3	3	3	5	5	
10	4 Medium Pressure Pump - 1 Fce	3/6/2023	3	3	5	5	5	5	5	5	5	5	3	3	Mechanical Seal OB Pump
11	1 Quick Dump Sump Pump - 1 Fce	8/4/2015	5	5	5	5	5	5	5	5	5	5	5	5	
12	2 Quick Dump Sump Pump - 1 Fce		5	5	5	5	5	5	5	5	5	5	5	5	
13	3 Quick Dump Sump Pump - 1 Fce	9/7/2022	5	5	5	5	5	1	5	5	5	5	5	5	High 1X - Mud on impellers or Structural
14	Electric Medium Pressure Pump - 3 Fce	3/3/2023	3	3	3	3	4	5	5	5	5	3	3	3	
15	Electric High Pressure Pump - 3 Fce	3/3/2023	3	3	4	3	3	5	5	5	5	3	3	3	
16	Steam Medium Pressure Pump - 3 Fce	10/4/2018	5	5	5	5	5	5	5	5	5	5	5	5	
17	Steam High Pressure Pump - 3 Fce		5	5	5	5	5	5	5	5	5	5	5	5	
18	East Venturi Pump - 3Fce	3/3/2023	5	5	5	3	5	5	5	5	5	5	3	3	Packing needs adjusted
19	West Venturi Pump - 3 Fce	8/3/2022	3	3	3	5	3	5	5	5	5	5	5	5	
20	North Underflow Pump - 3 Fce	3/3/2023	3	3	3	3	3	5	3	3	3	3	3	3	
21	South Underflow Pump - 3 Fce	8/3/2022	5	5	5	5	3	5	5	5	5	5	5	5	
22	North Quick Dump Sump Pump - 3Fce	2/2/2023	3	3	5	3	3	5	5	5	5	5	3	5	
23	South Quick Dump Sump Pump - 3 Fce	1/8/2021	5	5	5	5	5	5	5	5	5	5	5	5	
24	1 (West) New Blue Pump	1/6/2023	5	5	5	5	5	5	5	5	3	3	5	5	
25	2 (Middle) New Blue Pump	11/2/2022	3	5	3	3	3	3	3	3	5	5	5	5	
26	3 (East) New Blue Pump	3/2/2023	5	3	5	5	5	5	5	5	5	5	3	3	
27	1 Closed Loop Pump - Electric	11/2/2022	5	5	4	2	2	2	2	2	5	5	5	5	Cooling Fan issues on Motor - Running hot
28	2 Closed Loop Pump - Electric	2/2/2023	5	5	5	3	3	3	5	5	3	3	3	5	
29	3 Closed Loop Pump - Steam	3/3/2023	3	3	3	3	5	5	3	3	4	5	5	3	New Turbine installed - looks good
30	4 Closed Loop Pump - Steam	3/3/2023	3	3	5	5	5	5	5	5	3	3	3	3	
31															

U.S. Steel Monthly Vibration Readings - Gas Washer

	USS Priority Codes
1	Immediate Attention/Action Required
2	Fault Detected
3	Acceptable Operating Conditions
4	Baseline Readings - work Performed
5	Equipment not Running

	Equipment	Inspection Date	Apr 22	May 22	Jun 22	Jul 22	Aug 22	Sep 22	Oct 22	Nov 22	Dec 22	Jan 23	Feb 23	Mar 23	Notes/Fixes Suggestions
32	Coldwell Pump 129	3/7/2023	3	3	3	3	3	3	5	3	3	3	3	3	
33	Coldwell Pump 130	7/7/2021	5	5	5	5	5	5	5	5	5	5	5	5	High 1X - Mud on Impellers
34	Coldwell Pump 131	2/15/2023	3	3	3	3	3	3	5	5	3	3	3	5	
35	Coldwell Pump 132	1/11/2016	5	5	5	5	5	5	5	5	5	5	5	5	
36	Coldwell Pump 133	3/7/2023	5	5	5	5	5	5	2	2	5	5	5	2	High 1X - Mud on Impellers
37	Hotwell Pump 106	12/6/2022	3	3	3	3	3	5	5	3	3	5	5	5	
38	Hotwell Pump 107	3/7/2023	5	5	5	5	5	2	3	5	5	3	3	3	
39	Hotwell Pump 108	10/4/2022	2	2	2	2	2	2	2	5	5	5	5	5	High 1X - Mud on Impellers
40	Hotwell Pump 109	3/7/2023	5	5	5	5	5	5	3	3	3	3	2	2	High 1X - Mud on Impellers
41	Hotwell Pump 110	3/7/2023	3	3	3	3	3	3	3	3	3	3	3	3	
42	1 BF Baghouse Fan	3/6/2023	1	4	3	3	4	3	3	3	3	2	1	4	Installed a new Motor Baseplate - looks good
43	2 BF Baghouse Fan	3/6/2023	3	3	3	3	3	3	3	3	3	3	3	3	
44	3 BF Baghouse Fan	3/6/2023	3	3	3	3	3	3	3	3	3	3	3	3	
45	4 BF Baghouse Fan	3/6/2023	3	3	3	3	3	3	3	3	3	3	3	3	
46	1 BF Cooling Twr Fan	12/6/2022	5	3	3	3	3	3	3	3	3	5	5	5	
47	2 BF Cooling Twr Fan	3/7/2023	5	3	3	3	3	1	2	2	2	2	5	2	Coupling or Laminates are bad/Concrete Base is Broken
48	3 BF Cooling Twr Fan	3/7/2023	3	3	4	3	4	3	3	3	3	3	3	3	
49	4 BF Cooling Twr Fan	2/15/2023	3	3	3	3	3	3	3	3	3	3	3	5	
50	5 BF Cooling Twr Fan	3/7/2023	3	3	3	3	3	3	3	3	3	3	3	3	
51	6 BF Cooling Twr Fan	3/7/2023	3	3	3	3	3	3	3	3	3	3	3	3	
52	7 BF Cooling Twr Fan	3/7/2023	3	3	3	3	3	2	2	5	4	3	3	3	
53	8 BF Cooling Twr Fan	12/6/2022	3	3	3	3	3	3	3	3	3	5	5	5	
54	1 Closed Loop Booster Pump	12/6/2015	5	5	5	5	5	5	5	5	5	5	5	5	
55	2 Closed Loop Booster Pump		5	5	5	5	5	5	5	5	5	5	5	5	
56	E Slurry Pump - 3 Fce	8/30/2022						2	5	5	5	5	5	5	High 1X - Mud on Impellers
57	W Slurry Pump - 3 Fce	8/30/2022						2	5	5	5	5	5	5	High BPF Reading - Mud Build up on Casing
58	1 BF Clarifier	3/6/2023											3	3	
59	3 BF Clarifier - East Drive	3/3/2023											3	3	
60	3 BF Clarifier - West Drive	3/3/2023											3	3	
61	7 Clarifier - South Drive	3/7/2023											3	3	
62	7 Clarifier - North Drive	3/7/2023											3	3	

Exhibit D

Gas Washer

March 2023 Monthly Vibration Report

Pump Room 1

1. East Underflow Pump had a **new Pump installed**. The Pump looks good. There is still a **high 1X reading** at the **Motor**. This is a **Structural issue**. The readings are at .66 IPS.
2. South Tuyere Pumps **IB Pump Bearing** is showing **Fault Frequencies** and **slight Impacting**. **Both Mechanical Seals** are **Leaking**. The readings are below alarm levels.
3. West Underflow Pump There is a **high 1X (Motor Speed)** reading at the **Motor.** This could be a **Structural or flow issue**. The **Belts are loose**. The readings are down to .45 IPS. **Not Running**
4. 2 Medium Pressure Pumps **IB Pump Bearing** is showing a **high BPF** reading. This is a **Casing/Impeller issue**. The readings are staying steady at .32 IPS. **Not Running**
5. **3 Quick Dump Sump Pump** has a **high 1X at Motor**. Most likely from **Mud on Impellers** but could be a **Structural issue**. The readings are at .91 IPS. **Not Running**

Pump Room 3

6. East Slurry Pump has a **high 1X at Motor**. Most likely from **Mud on Impellers. The readings are .7 IPS. Not Running**
7. West Slurry Pump has a high **BPF reading**. This is an **Impeller issue** or **build up on the Casing**. **Not Running**

8. 2 BF Cooling Tower Fans has a **Coupling/Laminate** issue. **Concrete Base is broken** causing **high vibrations at the Motor.The readings are down a little to .47 IPS.**
9. 109 Hotwell Pump has a **high 1X reading**. This is from **Mud** on the **Impellers**. The readings are staying steady at .34 IPS.
10. 1 Closed Loop Pumps **Cooling Fan** on the **Motor** isn't Blowing enough air. The Motor is running hot. **Not Running**
11. 108 Hotwell Pump has a **high 1X reading**. This is from **Mud** on the **Impellers**. The readings are up a little to .43 IPS. **Not Running**
12. 130 Coldwell Pump has a **high 1X reading**. This is from **Mud** on the **Impellers**. The readings are steady at .43 IPS. **Not Running**
13. 133 Coldwell Pump has a **high 1X reading**. This is from **Mud** on the **Impellers**. The readings are steady at .6 IPS. **Not Running**

Notes: 1 BF BH Fan had a **new Motor Baseplate installed.** Everything looks good.

3 Closed Loop Pump had the **Turbine rebuilt**. Looks good.

3 Medium Pressure Pumps End Cap at the **OB Pump Bearing** is **leaking Grease.**

4 Medium Pressure Pumps OB Mechanical Seal is **Leaking.**

East Venturi Pumps Packing needs **adjusted** at the **OB Pump Bearing**

Exhibit E

Cast House MACT Alarm Summary

10/20/22	BF 1 casting low amps 559.1 <568
11/30/22	BF 1 damper failed close (3) times – 2:43, 5:17, 8:14
12/1/22	BF 1 damper failed close 7:10
12/20/22	BF 3 damper open failed when casting, 6:03
2/3/23	BF 1 damper open failed when casting, 10:33
	BF 3 damper open failed when casting 16:33
3/24/23	BF 1 casting low amps 480.2 <568 hour 11
	BF 1 casting low amps 383.8 < 568 hour 12
	BF 1 casting low amps 380.2 < 568 hour 13
	BF 1 casting low amps 382.6 < 568 hour 14

Exhibit F

Vacuum Service Dumping Authorization

Vac Service Company: MAS

Vac Service Crew Supervisor: George Bayhaw

Date: 2-2-23

BRI
14 640

Area/ Source Vac'd from: Lab, Logistics, mixer, GAS washer

Material Vac'd: [ ] Wet [X] Dry

Description: vac Dust collection

GAP Pit
17 340

Volume of material: 31,980

USS Manager Requesting: Frank Agostino - Dwayne Hixon

Dump Location:

- [X] Gap Pit/ CD7
- [ ] 2 Mill [ ] North Side [ ] South side
- [X] BRI
- [ ] C&D Pit
- [ ] Other _____

Date and time of dump: 2-2-23 Thru out DAY

Dump Location authorized by: Coleen DAVIS

Notes/ Comments: _____

Return completed form to ET Environmental Dept - Coleen Davis - cdavis@uss.com or fax to 412-278-7099 to deposit in the Environmental mailbox in GOB

2-7-23
Tues

Evergreen North America
INDUSTRIAL SERVICES

USS ET DUST COLLECTIONS CHECK LIST

FUGITIVE:

1	1/8	5	1/8	9	1/4
2	1/8	6	1/8	10	1/8
3	1/4	7	1/4		
4	1/4	8	1/4	Weight	9560

BRI 14640

LMF:

1	1/8	5	1/8	9	
2	1/8	6	1/4	10	
3	1/4	7	1/4	11	
4	1/4	8	1/4	Weight	5080

MIXER:

1	1/4	5	1/4	9	1/4	13	1/4
2	1/4	6	1/4	10	1/4		
3	1/4	7	1/4	11	1/4		
4	1/4	8	1/4	12	1/4	Weight	15100

GAS WASHER:

1	1/4		
2	1/8		
3	1/8		
4	3/4	Weight	2240

Crew JOHN NIEDZIELKA
Crew WILLIAM SMITH
Crew MATT BRADY
MISTY DAVIS

GAP 12340

SUPERVISOR George BAUGHMAN

Exhibit G

Gas Washer Daily Checklist

#1 Gas Washer	
Recycle Pmps Oper.	1, 2
Recycle Pressure	104
Recycle Flow	N/A
Venturi Pump Oper.	P&A
Venturi H_2O Press.	36
Venturi H_2O Flow	1647
Bleeder Stack OK	✓
Venturi Gas DP	91
#1 Q.D. Sump OK	✓
Water / gas dif temp	N/A
HP Press	157
HP Flow	1825
Loop Seals	✓

#3 Gas Washer	
HP Electric Pmp. OK	✓
MP Electric Pmp. OK	✓
HP Steam OK	✓
MP Steam OK	✓
Venturi Pump Oper.	P3
Venturi H_2O Press.	N/A
Venturi H_2O Flow	1202
Venturi Gas DP	34
#3 Q.D. Sump OK	✓
Water / gas dif temp	16
Loop Seals	✓

#1 Clarifier	
Clarifier Rake OK	✓
Clarifier rake Amps	3.5
U-flow Pump OK	✓
U-flow Pump Oper.	2

Cooling Tower	
Coldwell Pmps Oper.	29, 33
Coldwell Level	N/A
Hotwell Pumps Oper.	6, 9/10
Hotwell Level	8.9
C-Tower Fans OK	✓
Flow / GPM	N/A

Belt Press	
Belt Press	✓
Recip Rake	✓

#3 Clarifier	
Classifier Rake OK	✓
Clarifier rake OK	✓
U-flow Pump Oper.	2
U-flow Pump ok	✓

WSAC	
WSAC Temp In	82
WSAC Temp Out	84
Basin Level	18
Closed Loop Pumps On	3, 4
Storage tank Level	26.25
Storage Tank Temp	88
WSAC Pumps 1, 2, 3,	2 of
WSAC Fans Unit 1	✓
WSAC Fans Unit 2	✓
WSAC Fans Unit 3	✓

Slag Pits	
#1 Pit Levels OK	✓
#1 Pit Pumps OK	✓
#1 Pipe/Sprays Flows	✓
#3 Pit Levels OK	✓
#3 Pit Pumps OK	✓
#3 Pipe/Sprays Flows	✓

PEROXIDE METERING PUMPS RUNNING	YES	NO
	✓	

Baghouse		* Enter "C" if cleaning and "X" if offline	1	2	3	4
Main Draft (3.0 or above)						
#1 FCE Draft	N/A	DP (5 - 16) *	10	7	7, 3	7
#3 FCE Draft	N/A	Belts	✓	✓	✓	✓
Fan Amps		1F (160 - 280)	162	210	285	C
		2F (200 - 280)				

Bag House Air Pressure (70 or above)	92
Hoppers/Conveyors OK	✓
Cleaning Cycle OK	✓
FAX TO x4839	

Compartment Exhaust Visual Emissions DAYLIGHT TURN ONLY! Enter Y for Yes, N for No Compartment	1	2	3	4
	N	N	N	N

Comments or Corrective Action Taken: Wire Gang Needs to look At South High Pressure Switch on 1. Will Not start Pump when in Remote. It will start when you switch it to local And Push the button At the Pump.

Operator: Jeff Arnold Turn: 2P-7P Date: 5-9-23

Title: Gaswasher Daily Checklist
Document #: E-76540-50-001
Location: Mon Valley Works Primary - ET Blast Furnace Maint and Services

Exhibit H

MikroPul Pittsburgh
2591 Wexford Bayne Rd.
Sewickley, PA 15143, U.S.A.
Tel 724-934-3910
Fax 704-998-2603

Mikropul Headquarters
4404 Chesapeake Dr.
Charlotte, NC 28216, USA
Tel 704-998-2600
Fax 704-998-2601

August 26, 2019

U.S. Steel
13th Street and Braddock Avenue
Braddock, PA

Attention: Mr. Rich Minda

Subject: Casthouse Baghouse Evaluation – August 2019
Draft Report

Dear Rich:

During the week of August 12, 2019, Mikropul conducted an inspection of the blast furnace cast house dust collector at the USS ET plant. This unit ventilates casting emissions from blast furnaces 1 and 3.

Background

The original system was installed in 1981, consisting of four (4) positive pressure, pulsejet modules – Wheelabrator Model 3015-168, SO 2932, with 9891 SF cloth area per module. It is believed based on an excerpt from a Wheelabrator document (Appendix A) that the system was designed for 200,000 ACFM at an air: cloth ratio of 5.06:1.

Each module has its own Garden City Fan #54 RT-14.6-1 with a 250 HP motor rated for 71,500 acfm at 14", 150F (Appendix B). Presumably, this was to maintain the 200,000 acfm ventilation rate with one (1) module/fan idle but would result in a net air: cloth ratio of 7.22: 1.

While no specific historical documentation was found, it is believed these are duplicate to the original BOP fugitive modules with the following general construction:

- 3/16" hoppers
- 1/8" tube sheets
- 10-gauge housings stiffened for 10" w.c.

Inspection Results

- Housings
    - The housings are in fair condition with evidence of bowing, surface rusting and minor deformation but the only housing leak noted was on the east side of module 4, where the hopper and housing bolt together
    - There are a couple of cracks at the tube sheet level requiring repair:
        - Module 1 has a significant crack, approximately 6" long, where the tube sheet meets the back wall between bags 5 and 6 below the discharge louver. (Fig. 1)

        - Module 2 has a minor leak behind valve 17. (Fig 2)
        - Module 3 has a leak behind valves 3 and 4. Fig (3)
        - Module 4 has a crack underneath the air header at valves 15 and 16. (Fig 4)
        - Module 4 – daylight is visible from the clean air penthouse below the discharge louver at bag 3 and 4.
    - Tube sheets are somewhat bowed and wavy but due to limited hopper access could not determine if the bags are hanging evenly.
    - There is some build up on the tube sheets along the walls and evidence of water getting into the penthouse (Fig 5)
    - Tubesheet thickness measurements range from 0.119" to 0.126" which are ln line with original design of 0.125" thick.
    - Hoppers appeared to be in reasonable condition externally and thickness readings ranged from 0.166" to 0.178" for modules 2 and 4. Module 1 was significantly thinner at 0.121" thick.
    - Inspection of the hopper internals and inlet baffle were not performed due to continued high CO levels as BF# 3 was casting.
    - Penthouse roofs are developing holes, especially in Module 4. (Fig. 6 and 7)
    - Penthouse access doors were difficult to open/close due to corroded door hardware. (Fig. 8)

- Bags/cages
    - In general, filter bags and cages are in fair to good condition. Again, access to the hopper area was not available as mentioned above.
    - Several leaking filter bags were identified (Row 1 is the first row entering the clean air plenum and bag 1 is the bag nearest the valve)
        - Module 2 – row 1, bag 14 (Fig. 9)
        - Module 3
            - Significant leak row 1, bags 1 and 2 (Fig. 10)
            - Minor leaks-Row 1 and 2, bags 1-8; row 3, bags 1-4; row 4-8, bags 1-2
        - Module 4 – minor leaks row 1, bags 1 and 2; row 6, bag 4
    - With the drawn cuff tube sheet design, the top of the filter bag should sit flush with the top of the tube sheet, but many bags were slightly raised.
    - Most of the cages appeared slightly rusted and were likely not replaced during the most recent bag change. Module 1 had several new epoxy cages.
    - Module 3 – row 4, bag 6 has a severely bent venturi flange. (Fig 11)

- Cleaning System
    - The system does not allow local pulsing of the valves when the module is isolated, which is problematic in determining which valves are not operating correctly

- The local pressure gauge read 85 psi which is lower than the recommended pulsing pressure of 90-100 psi.
- Module 2 had not been cleaned for some time due to a compressed air leak. The inspection revealed this was nothing more than a couple of broken hose clamps which were replaced during the inspection and the module was returned to operation. (Fig 12 and 13)
- Module 3 – blow pipe 18 was disconnected but was re-installed with a new rubber insert during the inspection. (Fig 14)
- Cleaning is prohibited during casting, which allows baghouse DP to reach 9-10" during the inspection but quickly drops to around 3" once cleaning occurs.

- Dampers
  - There is substantial leaking through all damper stub shafts. (Fig 15 and 16)
  - Fan damper 3 – the outside stub shafts wobble with the fan in operation
  - Fan damper 4 – (3) of the stub shaft housings are not tightened to damper frame.
  - The dampers provide no sealing for personnel protection as CO levels were high in all hoppers with the fans off and dampers closed.

- Dust Handling
  - Module 2 and 3 have an issue with the chain drive or sprocket so the rotary valve is not turning smoothly, and dust is not being conveyed from the hopper.

- Fans
  - Fan 1 - There is a significant crack at the bottom of the access door. (Fig 17)
  - Fan 2 – there is a significant hole on the north side of the fan sub-base. (Fig 18 and 19)
  - Fan 3 – there is approximately ¼" hole on the drive side of the fan scroll towards the bottom. Given the amount of dust under the fan, there may also be a hole on the inlet side at the bottom of the scroll. (Fig 20)
  - While the fans were off and BF# 3 was casting, leakage was noted where the fan shaft penetrates the fan housing. (Fig 21)

- Inlet plenum and fan outlet ducting
  - The inlet plenum is in poor condition. Many cracks/holes were noted on the north side of the plenum along the bottom third of the plenum. It appears that the lower section may have been internally relined. (Fig 22-24)
  - While the fans were idle, and BF 3 was casting multiple leaks were noted on the top half of the north side of the plenum across its length. (Fig 25)
  - The fan outlet ducting is also in poor condition with general surface rusting/scaling and many leaks noted:
    - Module 1
      - Damper flange

        - Module inlet flange – upper east and west corner (Fig 26)
    - Module 2
        - Module inlet flange – upper west corner (Fig 27)
        - Inlet duct at patch plate on horizontal surface near module inlet (Fig 28)
    - Module 3
        - Module inlet flange – upper west corner (Fig 29)
        - Inlet duct – upper east corner near elbow (Fig 30)
        - Inlet duct – top of duct on east side near module inlet
    - Module 4
        - Module inlet flange – east side (Fig 31)
        - Open test port at module inlet

- Miscellaneous
    - With the fans idle and BF3 casting, several leaks were noted outside the baghouse area:
        - At the shaft for BF 3 isolation damper (Fig 32)
        - At the platform, in the horizontal duct north of the isolation damper believe to be an open inspection door (Fig 33)
        - Further towards the furnace in the same horizontal duct.
    - The grating on the west side of the fan platform Is badly deteriorated as if it was exposed to highly corrosive substance (Fig 34)
    - There is an uncovered electrical receptacle on the handrail near module 4. (Fig 35)
    - Spare venturis and filter bags are left out in the elements (Fig 36 and 37)

Recommendations

The following are the items that should be addressed immediately

- Repair all tube sheet leaks noted above
- Repair leak at hopper/housing flange on east side of Module 4
- Repair holes in module penthouse roofs
- Replace leaking filter bags noted above
- Install air pressure regulators to control air pressure to pulse system
- Replace all hose clamps on compressed air hose – two (2) clamps per hose
- Repair or replace fan outlet dampers. If replaced, consider packing gland seals at shaft penetrations.
- Repair chain drive sprocket on rotary valve – modules 2 and 3
- Fan items
    - Repair fan base 2. Clean other bases and inspect.
    - Repair fan scroll 3
    - Repair leak at fan 1 access door
    - Replace fan shaft seals

- Repair leaks in fan outlet/module inlet duct
- Repair/replace grating on west side of fan deck
- Store baghouse maintenance parts indoors and local to the baghouse

At the conclusion of the GCT study, this report will be re-issued with long term recommendations.

If you have any questions, please feel free to contact me.

Sincerely,

Timothy J. Kern
Nederman MikroPul
Cell: 412-860-3132

Appendix A

GENERAL DESCRIPTION
FOR
WHEELABRATOR-FRYE INC. DUST COLLECTOR

UNITED STATES STEEL CORPORATION

EDGAR THOMSON WORKS

This system is designed by Wheelabrator-Frye Inc. for United States Steel Edgar Thomson Works for combined ventilation volume of Casthouses, #1, #2 and #3.

The volume of dust entering the collector is 200,000 ACFM at a normal operating temperature between 90°F and 160°F (250°F) maximum.

The dust collector is designated as a four (4) Module, Size 3015 Jet III Dust Collector. Each Module contains 9,891 sq. ft. of filter cloth for a total cloth area of 39,564 (Four) Modules. The air to cloth ratio of the unit, based on 71,508 ACFM per Module, is 7.22:1.

In normal operation the dust laden air enters the collector through the inlet plenum. Four (4) large fans are attached to the plenum that distribute the air throughout each Module. The dust laden air moves through the Module inlet where it strikes a baffle plate that drops the heavier particulate into the hopper. The dust laden air now moves to the fabric filter where the dust is retained on the outside of the filter bags while allowing the clean air to pass through to the Module outlet.

The dust collectors' cleaning system uses controlled bursts of compressed air to clean the filter bags. These momentary pulses of compressed air dislodge the dust deposits on the filter tubes. This system operates on a row by row basis within each Module, therefore, only a fraction of the total filter media is interrupted during the cleaning process.

The dust that has been dislodge from the filter bags falls into the hopper where it is removed by dust conveying system. The system consists of, rotary airlocks, slide valves and screw conveyors. The screw conveyors transport the dust from each Module hopper to a U.S. Steel supplied storage bin.

Appendix B

FAN SPECIFICATIONS & INSTRUCTIONS

14 #54 RT-14.6-3, 105% SINGLE WIDTH, SINGLE INLET, 100% WHEEL DIAMETER
ARRANGEMENT #1 FANS FOR V-BELT DRIVE.
COUNTERCLOCKWISE ROTATION.
UPBLAST DISCHARGE.
3-15/16" DIAMETER SHAFT AND HEAVY DUTY LINK BELT, SPHERICAL ROLLER BEARINGS WITH WEATHER COVERS OVER EACH BEARING.
COMPLETE WITH FLANGED INLET AND OUTLET, HINGED AND GASKETED QUICK OPENING INSPECTION DOOR, DRAIN CONNECTION AT LOW POINT IN SCROLL, TEFLON SHAFT SEAL AND OSHA SHAFT AND V-BELT DRIVE GUARDS (FOR OUTDOOR APPLICATION). FAN HOUSING SPLIT FOR WHEEL REMOVAL, FAN AND MOTOR MOUNTED ON COMMON BASE.

DAMPERS BEING FURNISHED ON SO.O. 106187. 250 HP, 1800 RPM, 3/60/460 VOLT, FRAME 449T TEFC GENERAL ELECTRIC ALUMINUM FRAME MOTOR WITH F-2 CONDUIT BOX POSITION AND SLIDE BASE, SUPPLIED BY OTHERS. SLIDE BASE IS TO BE SHIPPED TO GCF FOR MOUNTING, MOTOR WILL BE MOUNTED BY OTHERS. 250 HP, CONSTANT SPEED V-BELT DRIVE, 1800/1208 RPM CONSISTING OF 6 GROOVE, 8V20.0 FAN SHEAVE AND 8V14.0 MOTOR SHEAVE WITH (6) - 8V2000 V-BELTS, SUPPLIED BY GCF, MOUNTED BY CUSTOMER (EXCEPT FAN SHEAVE, GCF TO MOUNT). FANS TO BE STATICALLY AND DYNAMICALLY BALANCED PRIOR TO SHIPMENT.

MAXIMUM OPERATING TEMPERATURE: 300° F
MAXIMUM RECOMMENDED SPEED: 1210 RPM @ 300° F
FIRST CRITICAL SPEED: 2339 RPM
WR^2: 2160 LBS. $Ft.^2$
MAXIMUM ALLOWABLE TORQUE: 5365 FT. LBS.

T.B. PERFORMANCE: 71,500 ACFM, 14.0" SP, 1208 RPM
278.6 BHP @ 150° F & 700' ELEVATION

71,500 ACFM, 16.1" SP, 1208 RPM
251.7 BHP @ 70° F & 700' ELEVATION

BHP @ -20° F & 700' WITH CLOSED OUTLET DAMPER BASED ON 20% DAMPER LEAKAGE: 129.6 BHP

APPROXIMATE WEIGHT: 7200# EACH (LESS MOTOR)

NOTES:
1. PRICE OF THE ORDER IS FIRM FOR SHIPMENT BY AUGUST 31, 1980 AND NOT SUBJECT TO ESCALATION.

2. TESTING AND INSPECTION OF THE FANS ON THIS ORDER IS TO BE IN ACCORDANCE WITH WHEELABRATOR'S "INSPECTION AND TEST INSTRUCTIONS" SPECIFICATIONS #78-F-3000 (COPY ATTACHED). ORDER IS SUBJECT TO INSPECTION AND IS NOT TO BE SHIPPED UNTIL RELEASED BY WHEELABRATOR-FRYE. WHEELS TO BE INSPECTED BY CUSTOMER PRIOR TO ASSEMBLY OF COMPLETE FAN UNITS.

CONT'D ON PG 3 ...

GARDEN CITY FAN & BLOWER CO.
niles, michigan, U.S.A.

SYM	DATE	REVISION	BY

DESCRIPTION
(14) #54 RT-14.6-3 SWST FANS

CUSTOMER
WHEELABRATOR-FRYE INC.

CUSTOMERS ORDER	DWN.	DATE
06-2932-009	CHK'D.	DATE
SCALE	DWG. NO.	
G.C.F. NO. 105481	105481-1	

Appendix 2 - BOP Shop Fugitive Baghouse Reference

Exhibit A

Organization Type: Corporate Maintenance Document	**Doc # ETSUM00016**
Document Type: Maintenance Procedure	**Issued Date:** 12/31/2021
Description: Preventive Maintenance (PM)	**Approved Date:** 12/31/21
Location: Mon Valley Works Primary - ET Utilities Maintenance and Services	

EMISSION CONTROL BAGHOUSE PM/ INSPECTION MECHANICAL – MONTHLY

FUGITIVE

SAFETY: **SIGN BOARD AT OPERATION SHANTY, LOCKOUT / TRYOUT, TAKE A RADIO**

	DONE	ADDITIONAL COMMENTS
1. COMPARTMENTS – Inspect and repair:		
A. Check for leaks on all compartments, seals, and joints.	☑	
B. Observe areas with dust build or visible emissions up for for possible leak areas.	☑	
C. Check compressed air for differential pressure.	☑	
D. Observe cycle for each compartment component to ensure proper function of each fan, dump valve, cleaning cycle, louver, screw conveyor	☑	
2. Fan and Motor – Inspect and repair:		
A. Check fan and motor for vibration and noise. Look for evidence of damage or deterioration.	☑	
B. Check all grease/lube/oil systems.	☑	
C. Clean and Lubricate.	☑	
D. Check all drive belts for wear and tension. Look for any sign of Deterioration or damage on belt guard assembly.	☑	
E. Look for any evidence of looseness on the base. Missing bolts. Tighten if necessary. Replace any missing bolt.	☑	
3. Rotary Valve/Plattco – Inspect and repair:		
A. Check conditions and operation of the rotary valve.	☑	
B. Check for loose, broken, missing bolts and parts.	☑	
C. Ensure rotary valve and rotating units are getting lubricated.	☑	
D. Look for evidence of damage or deterioration.	☑	
E. Observe chain and sprockets assemblies.	☑	

	DONE	ADDITIONAL COMMENTS
4. Screw Conveyor – Inspect and repair:		
A. Check for loose, broken, missing bolts and parts.	☑	
B. Ensure motor, drive and rotating units are getting lubricated and inspected.	☑	
C. Look for evidence of damage or deterioration.	☑	
D. Observe chain and sprockets assemblies.	☑	
5. Damper System – Inspect and repair:		
A. Check for loose, broken, missing bolts and parts.	☑	
B. Observe Condition / operation of Beck Drive.	☑	
C. Check condition / operation of Electric Actuator.	☑	
D. Observe condition / operation of dampers for freedom of movement. Shafts, bearings, pivot points, driver lever and linkage assembly. Use a nut and bolt buster solution to break any stuck connection and ease the damper assembly movement.	☑	

Additional Comments (Use this box to write comments or defect explanation drawings):

Comments, Follow ups, or recommendations:

Organization Type: Corporate Maintenance Document	**Doc # ETSUM00016**
Document Type: Maintenance Procedure	**Issued Date:** 12/31/2021
Description: Preventive Maintenance (PM)	**Approved Date:** 12/31/21
Location: Mon Valley Works Primary - ET Utilities Maintenance and Services	

Employee(s) Name(s): FH JH	*Date:* 12-4	*Duration:*
For Planner use:	*WO#* 11436734	

Exhibit B

BOP PRIMARY SYSTEM MONTHLY MACT INSPECTIONS

Inspection Date: 28 Dec 2022 Inspector: John Marriott

VESSEL QUENCHER DUCTS:

Perform a visual condition inspection of the Quencher and associated duct from the Quencher to and including the Vessel Isolation Damper looking for indications of ductwork deterioration, any visible emissions, or other structural deficiencies. Note on this form whether 'OK' or 'Needs Attention'. If needing attention, indicate in the 'Comments' line.

"R" VESSEL

	Condition (circle one)		Comments
QUENCHER	OK	Needs Attention	
DUCT	OK	Needs Attention	
ISOLATION DAMPER	OK	Needs Attention	

"F" VESSEL

	Condition (circle one)		Comments
QUENCHER	OK	Needs Attention	
DUCT	OK	Needs Attention	
ISOLATION DAMPER	OK	Needs Attention	

VESSEL E-STACKS:

Perform a visual condition inspection of the E-Stack and associated duct looking for indications of ductwork deterioration, any visible emissions, or other structural deficiencies. Note on this form whether 'OK' or 'Needs Attention'. If needing attention, indicate in the 'Comments' line.

"R" VESSEL

	Condition (circle one)		Comments
STACK CONDITION	OK	Needs Attention	
SEAL CONDITION	OK	Needs Attention	

"F" VESSEL

	Condition (circle one)		Comments
STACK CONDITION	OK	Needs Attention	
SEAL CONDITION	OK	Needs Attention	

BOP SECONDARY SYSTEM MONTHLY MACT INSPECTIONS

Inspection Date: 28 Dec 2022 Inspector: John Marriot

Secondary Emissions Collection System Roof Dampers & Ductwork:

Perform a visual condition inspection of the individual roof damper ductwork and dampers from the roof to the main duct looking for indications of ductwork deterioration, any visible emissions, or other structural deficiencies. Note on this form whether 'OK' or 'Needs Attention'. If needing attention, indicate in the 'Comments' line.

Damper ID	Condition (circle one)		Comments
101			
Duct & Boot Condition	OK	Needs Attention	
Damper Drive Condition	OK	Needs Attention	
102			
Duct & Boot Condition	OK	Needs Attention	
Damper Drive Condition	OK	Needs Attention	
103			
Duct & Boot Condition	OK	Needs Attention	
Damper Drive Condition	OK	Needs Attention	
104			
Duct & Boot Condition	OK	Needs Attention	
Damper Drive Condition	OK	Needs Attention	
105			
Duct & Boot Condition	OK	Needs Attention	
Damper Drive Condition	OK	Needs Attention	
106			
Duct & Boot Condition	OK	Needs Attention	

Damper Drive Condition OK Needs Attention _____

107
Duct & Boot Condition OK Needs Attention _____

Damper Drive Condition OK Needs Attention _____

108
Duct & Boot Condition OK Needs Attention _____

Damper Drive Condition OK Needs Attention _____

Secondary Emissions Collection System Roof Dampers & Ductwork:

Perform a visual condition inspection of the individual roof damper ductwork and dampers from the roof to the main duct looking for indications of ductwork deterioration, any visible emissions, or other structural deficiencies. Note on this form whether 'OK' or 'Needs Attention'. If needing attention, indicate in the 'Comments' line.

Damper ID	Condition (circle one)	Comments
109		
Duct & Boot Condition	OK Needs Attention	_____
Damper Drive Condition	OK Needs Attention	_____
110		
Duct & Boot Condition	OK Needs Attention	_____
Damper Drive Condition	OK Needs Attention	_____
111		
Duct & Boot Condition	OK Needs Attention	_____
Damper Drive Condition	OK Needs Attention	_____
112		
Duct & Boot Condition	OK Needs Attention	_____
Damper Drive Condition	OK Needs Attention	_____
113		
Duct & Boot Condition	OK Needs Attention	_____
Damper Drive Condition	OK Needs Attention	_____
114		
Duct & Boot Condition	OK Needs Attention	_____

Damper Drive Condition OK Needs Attention _____

115
Duct & Boot Condition OK Needs Attention _____

Damper Drive Condition OK Needs Attention _____

116
Duct & Boot Condition OK Needs Attention _____

Damper Drive Condition OK Needs Attention _____

Secondary Emissions Collection System Charge Hood, Dampers & Ductwork:

Perform a visual condition inspection of the individual charge hoods, dampers, and ductwork from the charge hood to the main duct looking for indications of ductwork deterioration, any visible emissions, or other structural deficiencies. Note on this form whether 'OK' or 'Needs Attention'. If needing attention, indicate in the 'Comments' line.

"R" VESSEL

	Condition (circle one)		Comments
CHARGE HOOD	OK	Needs Attention	_____
DUCT	OK	Needs Attention	_____
SEAL PLATES	OK	Needs Attention	_____
ISOLATION DAMPER	OK	Needs Attention	_____

"F" VESSEL

	Condition (circle one)		Comments
CHARGE HOOD	OK	Needs Attention	_____
DUCT	OK	Needs Attention	_____
SEAL PLATES	OK	Needs Attention	_____
SOUTH ISOLATION DAMPER	OK	Needs Attention	_____
NORTH ISOLATION DAMPER	OK	Needs Attention	_____

Exhibit C

U.S. Steel Monthly Vibration Readings - BOP GC

	USS Priority Codes
1	Immediate Attention/Action Required
2	Fault Detected
3	Acceptable Operating Conditions
4	Baseline Readings - Work Performed
5	Equipment not Running

	Equipment	Inspection Date	Apr 22	May 22	Jun 22	Jul 22	Aug 22	Sep 22	Oct 22	Nov 22	Dec 22	Jan 23	Feb 23	Mar 23	Notes/Fixes Suggestions
1	A Fan	12/9/2022	5	5	4	3	3	3	3	3	3	5	5	5	
2	B Fan	3/17/2023	3	3	5	5	5	5	5	5	5	3	3	3	
3	East Kinpactor Pump	3/17/2023	3	3	5	3	3	5	2	2	4	5	3	3	
4	West Kinpactor Pump	9/16/2022	4	5	3	5	5	3	5	5	5	5	5	5	
5	1 (West)Quencher Pump	2/17/2023	3	3	5	5	5	5	5	3	3	5	3	5	
6	2 Quencher Pump	10/13/2022	5	5	3	3	3	3	3	5	5	5	5	5	
7	3 (East)Quencher Pump	3/17/2023	5	5	5	5	5	5	5	5	5	3	4	3	New Motor installed - looks good
8	1 (South) Lance Pump														
9	2 (North) Lance Pump	7/10/2020													
10	3 (West) Lance Pump	7/10/2020													
11	South Hood Spray Pump	2/17/2023	3	5	5	5	5	5	5	5	5	5	3	5	
12	North Hood Spray Pump	11/11/2021	5	5	5	5	5	5	5	5	5	5	5	5	
13	1 Fugitive BH Fan	3/16/2023	3	3	3	3	3	3	4	3	3	3	3	3	
14	2 Fugitive BH Fan	3/16/2023	3	3	3	3	3	3	3	3	3	3	3	3	
15	3 Fugitive BH Fan	3/16/2023	2	2	2	2	2	2	5	2	2	2	5	2	OB Fan Bearing is showing mechanical looseness and impacting
16	4 Fugitive BH Fan	3/16/2023	3	5	3	3	3	3	3	4	3	3	3	3	
17	5 Fugitive BH Fan	3/16/2023	3	3	3	3	3	3	3	3	3	4	3	3	
18	6 Fugitive BH Fan	3/16/2023	3	3	3	3	3	3	3	3	3	3	3	3	
19	7 Fugitive BH Fan	3/16/2023	3	3	3	3	3	3	3	3	4	3	3	3	
20	8 Fugitive BH Fan	3/16/2023	2	2	4	3	3	3	3	3	3	3	3	3	
21	9 Fugitive BH Fan	3/16/2023	2	2	4	3	3	3	3	3	3	3	3	3	
22	10 Fugitive BH Fan	3/8/2023	3	3	3	3	3	3	3	3	3	3	3	1	IB Fan Bearing is bad and needs replaced
23	1 Mixer BH Fan	3/20/2023	3	3	3	3	3	3	3	4	3	3	3	3	
24	2 Mixer BH Fan	3/20/2023	3	3	3	3	3	3	3	3	3	3	3	3	
25	3 Mixer BH Fan	3/20/2023	1	2	4	3	3	5	3	3	3	4	3	3	
26	4 Mixer BH Fan	3/20/2023	3	3	3	3	3	2	4	3	3	3	3	3	
27	5 Mixer BH Fan	3/20/2023	3	3	2	1	1	1	1	1	4	3	3	3	
28	6 Mixer BH Fan	3/20/2023	3	3	2	3	1	4	3	3	3	3	2	2	High 1X reading at Motor- Motor baseplate
29	7 Mixer BH Fan	3/20/2023	3	3	3	3	3	3	3	4	3	3	3	3	
30	8 Mixer BH Fan	3/20/2023	3	3	2	2	1	1	1	3	1	1	1	1	High 1X reading at Fan and possibly Damper issues
31	9 Mixer BH Fan	3/20/2023	3	3	2	2	3	1	1	3	3	3	3	3	

U.S. Steel Monthly Vibration Readings - BOP GC

	USS Priority Codes
1	Immediate Attention/Action Required
2	Fault Detected
3	Acceptable Operating Conditions
4	Baseline Readings - work Performed
5	Equipment not Running

	Equipment	Inspection Date	Apr 22	May 22	Jun 22	Jul 22	Aug 22	Sep 22	Oct 22	Nov 22	Dec 22	Jan 23	Feb 23	Mar 23	Notes/Fixes Suggestions
32	10 Mixer BH Fan	3/20/2023	3	3	3	3	3	3	3	3	3	3	3	3	
33	11 Mixer BH Fan	2/16/2023	3	3	3	5	3	3	1	3	3	3	3	5	
34	12 Mixer BH Fan	3/20/2023	3	3	3	5	3	3	3	2	2	4	3	3	
35	North Cooling Twr Fan	3/14/2023	3	3	3	3	3	3	3	3	3	3	3	3	
36	South Cooling Twr Fan	3/14/2023	3	3	3	3	3	3	3	3	3	3	3	3	
37	North Recycle Pump	3/17/2023	3	3		3	5	3	3	3	3	3	3	3	
38	Mid Recycle Pump	3/17/2023	5	5		5	4	5	5	5	3	5	3	3	
39	South Recycle Pump	1/18/2023	3	4		3	5	2	2	3	5	2	5	5	1X reading - Mud
40	1 (North) Gas CleanVertical Pump	5/11/2021	5	5	5	5	5	5	5	5	5	5	5	5	
41	2 Gas Clean Vertical Pump	2/17/2023	3	3	5	5	5	5	2	3	3	2	2	5	High BPF Reading - Mud/Impeller issue
42	**3 (South) Gas Clean Vertical Pump**	3/17/2023	5	5	3	3	3	3	5	5	5	5	5	3	**Mechanical Seal is Leaking**
43	1 Hotwell Pump	2/19/2023	4	3	3	3	3	3	3	5	5	5	3	5	
44	2 Hotwell Pump	3/19/2023	3	3	3	3	3	5	3	5	3	3	3	3	
45	3 Hotwell Pump	3/19/2023	5	5	5	5	5	3	5	5	3	3	5	3	
46	1(North) Trunnion Pump	8/7/2022	5	3	3	5	3	5	5	5	5	5	5	5	
47	2(South) Trunnion Pump	3/14/2023	3	5	5	3	5	3	3	3	3	3	3	3	
48	**1 CL Pump**	3/14/2023	3	3	3	3	3	3	3	3	3	3	3	3	**Mechanical Seal is Leaking @ OB Pump**
49	2 CL Pump	11/14/2022	5	3	3	3	3	5	3	3	5	5	5	5	
50	3 CL Pump	3/14/2023	3	5	5	3	5	5	5	5	3	3	3	3	
51	4 CL Pump	3/14/2023	5	3	3	5	3	3	3	3	3	3	3	3	
52	1(East) Open Loop Cooling Twr Pump	2/17/2023	5	5	5	5	3	5	3	3	3	3	3	5	
53	**2 Open Loop Cooling Twr Pump**	3/14/2023	5	5	5	3	5	3	5	5	5	5	5	3	**Mechanical Seal is Leaking**
54	3(West) Open Loop Cooling Twr Pump	6/7/2022	3	3	3	5	5	5	5	5	5	5	5	5	
55	East Underflow Pump	1/18/2023	5	5	5	3	3	3	3	3	3	3	5	5	
56	West Underflow Pump	3/17/2023	3	3	3	5	5	5	5	5	5	5	3	3	
57	**1 Coldwell Pump**	2/19/2023	3	3	3	3	3	5	3	5	5	5	3	5	**Mechanical Seal is Leaking**
58	**2 Coldwell Pump**	3/19/2023	3	3	3	3	3	3	3	5	3	3	3	3	**Mechanical Seal is Leaking**
59	3 Coldwell Pump	3/19/2023	4	5	5	5	5	3	5	5	2	3	5	3	
60	BOP Thickner - East Drive	3/17/2023											3	3	
61	BOP Thickner - West Drive	3/17/2023											3	3	

Exhibit D

BOP GC

March 2023 Monthly Vibration Report

1. **6 Mixer BH Fans** has a **high 1X reading** at the **Motor**. The readings are steady at .76 IPS. I shot the Motor Feet and the Motor Baseplate. The IB (Sheave Side) of the Motor Feet and Baseplate is over 1IPS. I think that the **Baseplate** either has a **Crack** or is **Fatigued**.
2. **8 Mixer BH Fan** has a **high 1X reading** at the **IB Fan Bearing**. This is a **Structural/Balance issue.** The readings stayed steady at .98 IPS. It also sounds like we might have a **Damper issue.**
3. **3 Fugitive BH Fan -** The **OB Fan Bearing** is showing **Slight Impacting** and **Mechanical Looseness**. The readings are staying steady at .37 IPS.
4. **10 Fugitive BH Fans** **IB Fan Bearing is bad**, and **needs replaced.** It's running at 200 Degrees F (Usually 100-120 Degrees) and is showing **Fault Frequencies**.
5. **South Recycle Pump** has a high **1X reading**. This is most likely from **Mud on the Impellers**. The readings are up to .48 IPS. **NOT RUNNING**
6. **2 GC Vertical Pump** has a **high BPF reading**. This is most likely from **Mud/Debris or a Broken Impeller**. The readings are up again this month to .62 IPS. **NOT RUNNING**
7.

NOTES: **1 Coldwell Pumps Mechanical Seal is bad.**
2 Coldwell Pumps Mechanical Seal is bad.
1 Closed Loop Pumps Mechanical Seal is **leaking** at the **OB Pump.**
2 OL Vertical Pumps Mechanical Seal is bad.
3(South) GC Vertical Pumps Mechanical Seal is bad.
3 (East) Quencher Pump had a **new Motor installed.** Everything looks good

Exhibit E

Fugitive MACT Alarm Summary

10/16/22	Module 00 amps 296.2 < 305, hour 11
10/17/22	Module 00 amps 298.2 < 305 hour 13
10/222/22	Low amps 298.3 < 305, hour 9
12/8/22	Low amps 304.4 < 305, hour 7
1/3/23	Low amps 294.2 < 305, hour 9

Exhibit F

Vacuum Service Dumping Authorization

Vac Service Company: MAS

Vac Service Crew Supervisor: George Bayhaw

Date: 2-2-23

BRI
14 640

Area/ Source Vac'd from: Lab, Logistics, mixer, GAS washer

Material Vac'd: [ ] Wet [X] Dry

Description: vac Dust collection

GAP Pit
17 340

Volume of material: 31,980

USS Manager Requesting: Frank Agostino - Dwayne Hixon

Dump Location:

- [X] Gap Pit/ CD7
- [ ] 2 Mill [ ] North Side [ ] South side
- [X] BRI
- [ ] C&D Pit
- [ ] Other _____

Date and time of dump: 2-2-23 Thru out DAY

Dump Location authorized by: Coleen DAVIS

Notes/ Comments: _____

Return completed form to ET Environmental Dept - Coleen Davis - cdavis@uss.com or fax to 412-278-7099 to deposit in the Environmental mailbox in GOB

2-7-23
Tues

Evergreen North America
INDUSTRIAL SERVICES

USS ET DUST COLLECTIONS CHECK LIST

FUGITIVE:

1	1/8	5	1/8	9	1/4
2	1/8	6	1/8	10	1/8
3	1/4	7	1/4		
4	1/4	8	1/4	Weight	9560

BRI 14640

LMF:

1	1/8	5	1/8	9	
2	1/8	6	1/4	10	
3	1/4	7	1/4	11	
4	1/4	8	1/4	Weight	5080

MIXER:

1	1/4	5	1/4	9	1/4	13	1/4
2	1/4	6	1/4	10	1/4		
3	1/4	7	1/4	11	1/4		
4	1/4	8	1/4	12	1/4	Weight	15100

GAS WASHER:

1	1/4		
2	1/8		
3	1/8		
4	3/4	Weight	2240

Crew JOHN NIEDZIELKA
Crew WILLIAM SMITH
Crew MATT BRADY
MISTY DAVIS

GAP 12340

SUPERVISOR George BAUGHMAN

Exhibit G

BOP Gas Cleaning Turn Checklist

Note: *Operators will complete 2 rounds per shift. Items with "xxxxx" or that are related to equipment availibility only need to be completed once per shift.

*If anything on this sheet is not operating, not functional or down, a reason needs to be entered LEGIBLY under comments. Form is to be completed in full(no boxes left blank)

Kinpactor System	Round 1	Round 2
Water Flow (GPM) (>3202GPM)	3470	3458
Sprays Cleaned (Y/N) *9	Y / N	Y / N
Kinpactor Dp (iwc) (>75.96)	76.54	78.57
Any Sprays Bypassed (Y/N)	Y / N	Y / N

ID Fan System		
'A' Fan/Motor Vibration (mils)	Fan- 2.83	Mtr- 1.00
'B' Fan/Motor Vibration (mils)	Fan- 2.55	Mtr- 1.20
A or B Fan Online	B	XXXXX
Fluid Drive Oil System OK (Y/N) *5	Y / N	Y / N
Lube Oil System OK (Y/N) *5	Y / N	Y / N
Draft in IWC when system idle *10	7.71	9.89

Quencher Water System		
F Vessel Flow (GPM) (in blow)	3327	3295
R Vessel Flow (GPM) (in blow)	3765	3771
Pump Operating	1 | 2 | 3	
Seal Water Flowing (Y/N)	Y / N	Y / N
Hood Spray System		
Vessel Flow during Blow(GPM)	F = 112	R = 125
Header Pressure (PSI)	325	280
Pump Operating (N or S)	S	S
Recycle Water System		
Recycle Pumps OK (Y/N) *1	Y / N	Y / N
Which Pumps are Operating	2,3	2,3
Dumped Cone Time(s)	4	4
Any water going into the Chropek box? *11	Yes	NO
BGC Thickener and Belt Press System		
Classifier & Recip Rake OK/ Rake Torque*3	Y / 11	Y 11
Thickener OK (Y/N)/Rake Torque *2	Y 10	Y 10
Belt Press Operating *8	Y / ON	Y / N
Sludge Judge (daylight shift only)	15"	XXXXX
Underflow Marcy	31	36
Underflow Tunnel OK?	Y / N	Y / N
Operating Underflow Pump (E/W); Pump OK? *1	W | Y	W | Y
Thickener pH handheld	10.23	XXXXX
CO2 Feeding (Y/N)	Y / N	N / N

Hood Closed Loop CW System	Round 1	Round 2
Pumps Available	All | 1 | 2 | 3 | 4	
Pumps Operating	1 | 2 | 3 | 4	
West Strainer OK (Y/N) / DP *4	Y 1.10	Y 1.10
East Strainer OK (Y/N) / DP *4	Y 1.3	Y 1.3

Hood Open Cooling Water System		
Open Loop Pumps Available	All | 1 | 2 | 3	
Open Loop Pump Operating	1 | 2 | 3	
Cooling Tower Fans OK (Y/N) *6	Y / N	Y / N
Trunion Pump Operating (1/2)	2	2
Strainers Pressure IN/OUT (PSI)	20 | 15	20 | 15
Strainers OK (Y/N) / DP *4	Y 5	Y 5
Available Heat Exchangers	All | 1 | 2 | 3 | 4	
Operating Heat Exchangers	1 | 2 | 3 | 4	

Blowdown Lamella (If down, list reason in comments)		
System Flow Rate	55.0	55.0
Turbidity	5.1	5.2
Handheld Turbidity	9.83	XXXXX
pH in T4	7.1	7.2
Handheld pH from T5	7.59	XXXXX
Level of acid in tote / %		

Open Breakdown Reports
Fugitive Baghouse
Mixer Baghouse
Gas Cleaning

Fugitive Baghouse	Round 1	Round 2
What Compartment #'s Are Down?	10	10
Visible Emissions?	Y / N	Y / N
Compressor Air Pressure (psi)	82	80
Are all modules initating cleaning?	Y / N	Y / N
All DPs >3 <15 IWC?	Y / N	Y / N
Screw Conveyors Operating	1|2|3|4|5|6|7|8|9|10	

Mixer Baghouse		
What Compartment #'s Are Down?	11	11
Air Duct Draft (7-11)	7.3	9.8
Visible Emissions?	Y / N	Y / N
Compressor Air Pressure (psi)	82	82
All DPs >1.5 <15 IWC?	Y / N	Y / N

Gas Cooling Water System		
Gas CT Fans OK (Y/N) *6	Y / N	Y / N
Gas CT Pumps Available	All | 1 | 2 | 3	
Gas CT Pump Operating and Flow (GPM)	1 | 2 | 3	12,926
Gas CT Pumps OK (Y/N) *1	Y / N	Y / N

Misc Environmental and #7		
Any Flooding in the area?	Y / N	Y / N
Any Excessive Mud on Ground?	Y / N	Y / N
#7 Clarrifier level 88%(Y/N) / Record%	Y 65	Y 177
#7 Clarrifier OK (Y/N)/Rake Torque *2	Y 10	Y 10
#7 UnderflowPump Operating(Y/N)/(N/S)	Y W	Y W
#7 Underflow Tunnel OK?	Y / N	Y / N
Housekeeping/What Areas Cleaned?	Dirty out	

(1) Pump OK - No vibration felt, no leaks, no noises, proper power/flow, oil level good
(2) Thickener OK - Rake turning, water flowing over weir, drop in level between bowl and weir
(3) Classifier & Recip Rake - No vibration felt, no leaks, no noises, good material being pulled, oil level good, Rake turning, water flowing over weir, drop in level between bowl and weir; Write down
(4) Strainer OK - no leaks, DP within range, proper flow
(5) Fluid Drive/Lube Oil System OK - oil temperature within range, no leaks, pumps running
(6) Fans OK - no oil leaks, can run in slow and fast, no noises, able to operate
(7) Dryer OK - Online, Filters OK, No Leaks, Towers Cycle
(8) Belt press is to run out everyday. No exceptions. Sludge Judge will be less than 12" when press has run out properly
(9) If kinpactor flow under 3400 GPM, operator must rod out nozzles
(10) If draft is lower than 0.7 IWC rod out transmitter
(11) If water is flowing into the Chropek box, scrape, beat and clean the grizzlies until water stops flowing into the Chropek box

Scan and email this report to janderson2@uss.com, mjostovich@uss.com, dehixson@uss.com & cdavis@uss.com

Comments/Issues: (Any dicrepancies above need reasons added here and need to be legible)

* changed Bags on southside of Blowdown
* changed bags Northside of Blowdown
* PRESS RAN out at Turn 3 mainly - Bottom Belt was Changed
* PUT PRESS BACK on at 2 with a 36 marcy
* Division trench bag

Operator Paul Pounds Turn 6am 6pm Date 03-16-2023 Operator shift turnover acknowledgment initials PP

Exhibit H

MIKROPUL
Nederman

MikroPul Pittsburgh
2591 Wexford Bayne Rd.
Sewickley, PA 15143, U.S.A.
Tel 724-934-3910
Fax 704-998-2603

Mikropul Headquarters
4404 Chesapeake Dr.
Charlotte, NC 28216, USA
Tel 704-998-2600
Fax 704-998-2601

June 26, 2019

U.S. Steel
13th Street and Braddock Avenue
Braddock, PA

Attention: Mr. Rich Minda

Subject: BOP Fugitive Baghouse Evaluation – June 2019

Dear Rich:

During the week of June 3, 2019, Mikropul conducted an inspection of the BOP Secondary dust collector at the USS ET plant. This unit ventilates secondary emissions from the BOP process during charging and tapping operations.

Background

The original system was installed in 1981, consisting of seven (7) positive pressure, pulsejet modules – Wheelabrator Model 3015-168, SO 3049, with 9900 SF cloth area per module and rated for 350,000 cfm at 5.05 A:C ratio. Air was delivered to each module by its own FD fan, rated for 50,000 cfm.

In 2007, the system was modified with the addition of three (3) "duplicate" modules, Model 3015-168, Jet III, SO 7120. At that time, ten (10) new arrangement 8, FD fans were installed rated for 61,000 acfm at 22" w.c., 150F, running at 1180 RPM. The new modules were "duplicates" of the original with:

- 3/16" hoppers
- 1/8" tubesheets
- 10-gauge housings stiffened for 10" w.c.

Inspection Results

- Housings
  - The housings are in very poor condition with deformed side walls, peeling paint and multiple cracks
  - Tubesheets are bowed towards the middle of the collector which does not allow the filter bags to hang evenly
  - Cracks in several tubesheets were identified
    - Module 2 in left hand side as facing air header
    - Module 5 between valves 17 and 18
    - Module 6 at valve 18 and a potential crack at row 1
  - Identification of exact housing crack locations is difficult as they are predominantly on the long side of housings.

  - There is a very large crack in Module 10 on the side wall behind rows 9 and 10, of sufficient size you can clearly see the adjoining module
  - Hoppers appear in reasonable condition with thickness measurements ranging from 0.177" to 0.188" so no appreciable thinning of the original 3/16" construction
  - Tubesheet thicknesses were also in line with the original design, ranging 0.119" to 0.133"
  - Thickness readings on the housings were not possible due to accessibility
  - Inlet baffles are partially plugged, and most have cracked welds and/or are missing pieces

- Bags/cages
  - In general, filter bags and cages are in fair to good condition
  - A number of leaking filter bags were identified (Row 1 is the first row entering the clean air plenum and bag 1 is the bag nearest the valve)
    - Module 2 – rows 1 and 2, bags 1 and 2
    - Module 3 – rows 1 and 2, bag 1
    - Module 4 – row 2, last 4 bags appear clogged as no leak powder went onto them
    - Module 5 – multiple rows of bags showing evidence of no flow through them
    - Module 6 – rows 1, 2, and 3 – bags 8 through 15
    - Module 7 – rows 23 and 30, multiple bag leaks
    - Module 9 – row 1, bags 12 through 20
    - Module 10 – multiple bag leaks

- Cleaning System
  - The system does not allow pulsing of the valves when the module is isolated, which is problematic in determining which valves are not operating correctly
  - A number of blow pipes were disconnected
    - Module 1 – pipes 25 and 30 were disconnected
    - Module 4 - #2 pipe was disconnected
    - Module 5 - #23 pipe was disconnected
    - Module 7 – pipes 1, 9, 13, 16, 25 and 27
  - Module 7 – there is a significant air leak on valve 24 that caused the entire cleaning system to be shut down allowing the baghouse DP to reach 21". In turn, this caused air to leak out of the access hatch on the dust bin below the double dump valve
  - Module 9 has compressed air leaks in the header at valves 12 and 13

- Dampers
  - There is substantial leaking through most damper stub shafts.
  - Module 2 inlet damper is not sealing effectively as high CO readings forced evacuation of the module during the inspection
  - Module 3 inlet damper is not sealing effectively as gas infiltration was noticeable during the inspection

- Dust Handling
    - Module 2 screw conveyor was not running due to a broken drive chain, which resulted in the hopper being filled with dust.

- Fans
    - An attempt was made to internally inspect fan #1 during module isolation. However, opening the access door causes the impeller to speed up from the draft in the fan inlet plenum. There was not enough maintenance labor to close the blank to allow a thorough visual inspection
    - Before the impeller started to speed up, it was noted that the gap between the impeller and inlet cone seemed a little large but as the impeller was still turning no measurement was made. This could account for a couple of percent in performance reduction.
    - Some build up was noted on the fan housing and impeller but nothing severe enough to be of major concern.

- Inlet ducting
    - Holes or cracks were noted on all module inlet ducts EXCEPT modules 1, 9 and 10.
    - There is a large crack as seem from the upper walkway between module 7 and 9.
- Operations
    - During a 80 minute period, module pressure drop ranged from 6.4" to 11.3" except for
        - Module 2 at 5.25" but the hopper was full due to an inoperative screw conveyor
        - Module 7 at 21" due to compressed air being disabled
        - Module 8 at 0" due to fan being down for maintenance
    - The modules cleaned down to approximately 2" but quickly returned to the normal DP once the module came back on-line, which is not particularly surprising given the amount of air being put through them
    - Fan set points range from 41 on modules 1, 2, and 3 to 43 and 45 amps on the other modules which is an attempt to balance the flow evenly to each module.

Recommendations

- The most urgent need is to return all modules to normal operation to maximize available ventilation rate from the shop
    - Repair Fan #8
    - Repair compressed air leak on Module #7
    - Repair screw conveyor drive on Module #2 and empty hopper

- The second area of focus is to repair all leak sources on the positive pressure side of the system from the fan discharge through the tube sheet which include:

  - Fan outlet duct – holes were clearly identified on the tops of all inlet ducts other than 1, 9 and 10 which require repair
  - Dampers – should be refurbished or replaced to address the leaks through the stub shafts and gas leaking into the module during isolation
  - Module housings – repair existing cracks as identified in the report. Given the age of the unit, the construction and the current operation, a long-term solution(s) should be identified which will be dependent on the results of the GCT findings
  - Tubesheets – all cracks in the tubesheets require repair. In the longer term, replacement of the tubesheets should be considered.
  - Hopper baffles should be repaired or replaced.
  - Filter bags should be re-seated in the tubesheet or replaced.
  - Re-install all disconnected pulse pipes
  - Repair all non-operating pulse valves

- Filter bag test – pending
- Modify pulse control system to allow pulsing of valves while module is isolated to troubleshoot valves.
- During the next outage, a thorough inspection of the fan internals is recommended to assess build-up, wear, and impeller clearance.

Given the age of this unit and it's relatively aggressive sizing, it is critically important to stay on top of the routine maintenance activities associated with the cleaning and dust handling system to keep it operating in top condition. The age of the unit coupled with the relatively light construction and amount of air going through each module will continue to be an ongoing challenge in terms of keeping things sealed gas tight. Once GCT completes their analysis of required flows in the BOP shop, we can discuss long term options for the fugitive system.

The detailed inspection sheets are attached for further information

If you have any questions, please feel free to contact me.

Sincerely,

Timothy J. Kern
Nederman MikroPul
Cell: 412-860-3132

Appendix 3 - BOP Shop Mixer Baghouse Reference

Exhibit A

Mixer MACT Alarm Summary

11/10/22	Uptime is 94.8% for Mixer mod 1 BDD
11/11/22	Uptime is 94.8% for Mixer mod 1 BDD
11/12/22	Uptime is 94.7% for Mixer mod 1 BDD
11/13/22	Uptime is 94.8% for Mixer mod 1 BDD
11/14/22	Uptime is 94.8% for Mixer mod 1 BDD
11/15/22	Uptime is 94.8% for Mixer mod 1 BDD
11/16/22	Uptime is 94.9% for Mixer mod 1 BDD
11/17/22	Uptime is 94.8% for Mixer mod 1 BDD
11/18/22	Uptime is 94.9% for Mixer mod 1 BDD
11/19/22	Uptime is 94.7% for Mixer mod 1 BDD
11/20/22	Uptime is 94.7% for Mixer mod 1 BDD
11/21/22	Uptime is 94.8% for Mixer mod 1 BDD
11/22/22	Uptime is 94.7% for Mixer mod 1 BDD
11/23/22	Uptime is 94.6% for Mixer mod 1 BDD
11/24/22	Uptime is 94.5% for Mixer mod 1 BDD
11/25/22	Uptime is 94.5% for Mixer mod 1 BDD
11/26/22	Uptime is 94.5% for Mixer mod 1 BDD
11/27/22	Uptime is 94.4% for Mixer mod 1 BDD
11/28/22	Uptime is 94.4% for Mixer mod 1 BDD
11/29/22	Uptime is 94.4% for Mixer mod 1 BDD
11/30/22	Uptime is 94.5% for Mixer mod 1 BDD
12/1/22	Uptime is 94.5% for Mixer mod 1 BDD
12/2/22	Uptime is 94.6% for Mixer mod 1 BDD
12/3/22	Uptime is 94.6% for Mixer mod 1 BDD
12/4/22	Uptime is 94.4% for Mixer mod 1 BDD
	Not enough modules (0), hour 17
12/5/22	Uptime is 94.7% for Mixer mod 1 BDD

12/6/22	Uptime is 94.7% for Mixer mod 1 BDD
	Not enough modules (0) hour 5
	Not enough modules (2) hour 10
12/7/22	Uptime is 94.8% for Mixer mod 1 BDD
	Not enough modules (8), hour 11
12/8/22	Uptime is 94.8% for Mixer mod 1 BDD
12/9/22	Uptime is 94.8% for Mixer mod 1 BDD
12/10/22	Uptime is 94.9% for Mixer mod 1 BDD
12/11/22	Uptime is 94.9% for mixer mod 1 BDD
12/12/22	Uptime is 95.0% for Mixer mod 1 BDD
12/13/22	Uptime is 95.0% for Mixer mod 1 BDD
12/20/22	Not enough modules (8), hour 9
12/24/22	Not enough modules (2), hour 11
	Not enough modules (8), hour 12
	Not enough modules (8), hour 13
	Not enough modules (8), hour 15
	Not enough modules (8), hour 16
12/25/22	Not enough modules (8), hour 13
	Not enough modules (8), hour 14
	Not enough modules (8), hour 15
	Mixer mod 11 BDD 73.5 >50, hour 13
12/26/22	Not enough modules (8), hour 1
1/1/23	Uptime is 54.2% for mixer mod 11 BDD
1/2/23	Uptime is 54.2% for mixer mod 11 BDD
1/3/23	Uptime is 62.5% for mixer mod 11 BDD
1/4/23	Uptime is 70.8% for mixer mod 11 BDD
1/5/23	Uptime is 74.2% for mixer mod 11 BDD
1/6/23	Uptime is 78.5% for mixer mod 11 BDD
1/7/23	Uptime is 81.52% for mixer mod 11 BDD

1/8/23	Uptime is 83.9% for mixer mod 11 BDD
1/9/23	Uptime is 85.6% for mixer mod 11 BDD
1/10/23	Uptime is 87.1% for mixer mod 11 BDD
1/11/23	Uptime is 88.3% for mixer mod 11 BDD
1/12/23	Uptime is 89.2% for mixer mod 11 BDD
1/13/23	Uptime is 90.1% for mixer mod 11 BDD
1/14/23	Uptime is 90.8% for mixer mod 11 BDD
1/15/23	Uptime is 91.4% for mixer mod 11 BDD
1/16/23	Uptime is 91.9% for mixer mod 11 BDD
1/17/23	Uptime is 92.4% for mixer mod 11 BDD
1/18/23	Uptime is 92.8% for mixer mod 11 BDD
1/19/23	Uptime is 93.2% for mixer mod 11 BDD
1/20/23	Uptime is 93.5% for mixer mod 11 BDD
1/21/23	Uptime is 93.8% for mixer mod 11 BDD
1/22/23	Uptime is 94.1% for mixer mod 11 BDD
1/23/23	Uptime is 94.4% for mixer mod 11 BDD
1/24/23	Uptime is 94.6% for mixer mod 11 BDD
1/25/23	Uptime is 94.8% for mixer mod 11 BDD
3/12/23	Not enough modules (0) hour 2
	Not enough modules (0), hour 3
3/29/23	Not enough modules (8), hour 6
	Not enough modules (0) hour 7-19

Exhibit B

4-24-23

Evergreen North America
INDUSTRIAL SERVICES

USS ET DUST COLLECTIONS CHECK LIST

FUGITIVE:

#5 BLOWING DUST WHEN DOOR IS OPEN.

1	1/2	5	1/3	9	1/2
2	1/2	6	1/2	10	1/2
3	1/2	7	5/8		
4	1/2	8	1/2	Weight	12980

LMF:

WE VAC THE FLOOR AROUND INSIDE WEST BOXES 9 & 10 VAC TO OF BOX TOO.

1	1/2	5	1/4	9	1/16	south inside west
2	1/3	6	1/3	10	1/3	North
3	1/4	7	0	11	0	ALLEY
4	1/2	8	0 inside EAST	Weight	9100	

MIXER:

1	1/2	5	5/8	9	5/8	13	5/8
2	1/2	6	5/8	10	1/2		
3	1/2	7	1/2	11	1/2		
4	1/2	8	5/8	12	1/2	Weight	22406

GAS WASHER:

1	1/3	#4 is blowing DUST BAD WHEN DOOR is OFF!	Crew M. BRADY
2	1/2		Crew C. BRAZIL
3	1/2		Crew N. HAYES
4	1/2	Weight 3120	

SUPERVISOR ERIC LINKE

25520 @ GAP

22,080 @ BRI

Exhibit C

U.S. Steel Monthly Vibration Readings - BOP GC

	USS Priority Codes
1	Immediate Attention/Action Required
2	Fault Detected
3	Acceptable Operating Conditions
4	Baseline Readings - Work Performed
5	Equipment not Running

	Equipment	Inspection Date	Apr 22	May 22	Jun 22	Jul 22	Aug 22	Sep 22	Oct 22	Nov 22	Dec 22	Jan 23	Feb 23	Mar 23	Notes/Fixes Suggestions
1	A Fan	12/9/2022	5	5	4	3	3	3	3	3	3	5	5	5	
2	B Fan	3/17/2023	3	3	5	5	5	5	5	5	5	3	3	3	
3	East Kinpactor Pump	3/17/2023	3	3	5	3	3	5	2	2	4	5	3	3	
4	West Kinpactor Pump	9/16/2022	4	5	3	5	5	3	5	5	5	5	5	5	
5	1 (West)Quencher Pump	2/17/2023	3	3	5	5	5	5	5	3	3	5	3	5	
6	2 Quencher Pump	10/13/2022	5	5	3	3	3	3	3	5	5	5	5	5	
7	3 (East)Quencher Pump	3/17/2023	5	5	5	5	5	5	5	5	5	3	4	3	New Motor installed - looks good
8	1 (South) Lance Pump														
9	2 (North) Lance Pump	7/10/2020													
10	3 (West) Lance Pump	7/10/2020													
11	South Hood Spray Pump	2/17/2023	3	5	5	5	5	5	5	5	5	5	3	5	
12	North Hood Spray Pump	11/11/2021	5	5	5	5	5	5	5	5	5	5	5	5	
13	1 Fugitive BH Fan	3/16/2023	3	3	3	3	3	3	4	3	3	3	3	3	
14	2 Fugitive BH Fan	3/16/2023	3	3	3	3	3	3	3	3	3	3	3	3	
15	3 Fugitive BH Fan	3/16/2023	2	2	2	2	2	2	5	2	2	2	5	2	OB Fan Bearing is showing mechanical looseness and impacting
16	4 Fugitive BH Fan	3/16/2023	3	5	3	3	3	3	3	4	3	3	3	3	
17	5 Fugitive BH Fan	3/16/2023	3	3	3	3	3	3	3	3	3	4	3	3	
18	6 Fugitive BH Fan	3/16/2023	3	3	3	3	3	3	3	3	3	3	3	3	
19	7 Fugitive BH Fan	3/16/2023	3	3	3	3	3	3	3	3	4	3	3	3	
20	8 Fugitive BH Fan	3/16/2023	2	2	4	3	3	3	3	3	3	3	3	3	
21	9 Fugitive BH Fan	3/16/2023	2	2	4	3	3	3	3	3	3	3	3	3	
22	10 Fugitive BH Fan	3/8/2023	3	3	3	3	3	3	3	3	3	3	3	1	IB Fan Bearing is bad and needs replaced
23	1 Mixer BH Fan	3/20/2023	3	3	3	3	3	3	3	4	3	3	3	3	
24	2 Mixer BH Fan	3/20/2023	3	3	3	3	3	3	3	3	3	3	3	3	
25	3 Mixer BH Fan	3/20/2023	1	2	4	3	3	5	3	3	3	4	3	3	
26	4 Mixer BH Fan	3/20/2023	3	3	3	3	3	2	4	3	3	3	3	3	
27	5 Mixer BH Fan	3/20/2023	3	3	2	1	1	1	1	1	4	3	3	3	
28	6 Mixer BH Fan	3/20/2023	3	3	2	3	1	4	3	3	3	3	2	2	High 1X reading at Motor- Motor baseplate
29	7 Mixer BH Fan	3/20/2023	3	3	3	3	3	3	3	4	3	3	3	3	
30	8 Mixer BH Fan	3/20/2023	3	3	2	2	1	1	1	3	1	1	1	1	High 1X reading at Fan and possibly Damper issues
31	9 Mixer BH Fan	3/20/2023	3	3	2	2	3	1	1	3	3	3	3	3	

U.S. Steel Monthly Vibration Readings - BOP GC

	USS Priority Codes
1	Immediate Attention/Action Required
2	Fault Detected
3	Acceptable Operating Conditions
4	Baseline Readings - work Performed
5	Equipment not Running

	Equipment	Inspection Date	Apr 22	May 22	Jun 22	Jul 22	Aug 22	Sep 22	Oct 22	Nov 22	Dec 22	Jan 23	Feb 23	Mar 23	Notes/Fixes Suggestions
32	10 Mixer BH Fan	3/20/2023	3	3	3	3	3	3	3	3	3	3	3	3	
33	11 Mixer BH Fan	2/16/2023	3	3	3	5	3	3	1	3	3	3	3	5	
34	12 Mixer BH Fan	3/20/2023	3	3	3	5	3	3	3	2	2	4	3	3	
35	North Cooling Twr Fan	3/14/2023	3	3	3	3	3	3	3	3	3	3	3	3	
36	South Cooling Twr Fan	3/14/2023	3	3	3	3	3	3	3	3	3	3	3	3	
37	North Recycle Pump	3/17/2023	3	3		3	5	3	3	3	3	3	3	3	
38	Mid Recycle Pump	3/17/2023	5	5		5	4	5	5	5	3	5	3	3	
39	South Recycle Pump	1/18/2023	3	4		3	5	2	2	3	5	2	5	5	1X reading - Mud
40	1 (North) Gas CleanVertical Pump	5/11/2021	5	5	5	5	5	5	5	5	5	5	5	5	
41	2 Gas Clean Vertical Pump	2/17/2023	3	3	5	5	5	5	2	3	3	2	2	5	High BPF Reading - Mud/Impeller issue
42	**3 (South) Gas Clean Vertical Pump**	3/17/2023	5	5	3	3	3	3	5	5	5	5	5	3	**Mechanical Seal is Leaking**
43	1 Hotwell Pump	2/19/2023	4	3	3	3	3	3	3	5	5	5	3	5	
44	2 Hotwell Pump	3/19/2023	3	3	3	3	3	5	3	5	3	3	3	3	
45	3 Hotwell Pump	3/19/2023	5	5	5	5	5	3	5	5	3	3	5	3	
46	1(North) Trunnion Pump	8/7/2022	5	3	3	5	3	5	5	5	5	5	5	5	
47	2(South) Trunnion Pump	3/14/2023	3	5	5	3	5	3	3	3	3	3	3	3	
48	**1 CL Pump**	3/14/2023	3	3	3	3	3	3	3	3	3	3	3	3	**Mechanical Seal is Leaking @ OB Pump**
49	2 CL Pump	11/14/2022	5	3	3	3	3	5	3	3	5	5	5	5	
50	3 CL Pump	3/14/2023	3	5	5	3	5	5	5	5	3	3	3	3	
51	4 CL Pump	3/14/2023	5	3	3	5	3	3	3	3	3	3	3	3	
52	1(East) Open Loop Cooling Twr Pump	2/17/2023	5	5	5	5	3	5	3	3	3	3	3	5	
53	**2 Open Loop Cooling Twr Pump**	3/14/2023	5	5	5	3	5	3	5	5	5	5	5	3	**Mechanical Seal is Leaking**
54	3(West) Open Loop Cooling Twr Pump	6/7/2022	3	3	3	5	5	5	5	5	5	5	5	5	
55	East Underflow Pump	1/18/2023	5	5	5	3	3	3	3	3	3	3	5	5	
56	West Underflow Pump	3/17/2023	3	3	3	5	5	5	5	5	5	5	3	3	
57	**1 Coldwell Pump**	2/19/2023	3	3	3	3	3	5	3	5	5	5	3	5	**Mechanical Seal is Leaking**
58	**2 Coldwell Pump**	3/19/2023	3	3	3	3	3	3	3	5	3	3	3	3	**Mechanical Seal is Leaking**
59	3 Coldwell Pump	3/19/2023	4	5	5	5	5	3	5	5	2	3	5	3	
60	BOP Thickner - East Drive	3/17/2023											3	3	
61	BOP Thickner - West Drive	3/17/2023											3	3	

Exhibit D

BOP GC

March 2023 Monthly Vibration Report

1. **6 Mixer BH Fans** has a **high 1X reading** at the **Motor**. The readings are steady at .76 IPS. I shot the Motor Feet and the Motor Baseplate. The IB (Sheave Side) of the Motor Feet and Baseplate is over 1IPS. I think that the **Baseplate** either has a **Crack** or is **Fatigued**.
2. **8 Mixer BH Fan** has a **high 1X reading** at the **IB Fan Bearing**. This is a **Structural/Balance issue.** The readings stayed steady at .98 IPS. It also sounds like we might have a **Damper issue.**
3. **3 Fugitive BH Fan -** The **OB Fan Bearing** is showing **Slight Impacting** and **Mechanical Looseness**. The readings are staying steady at .37 IPS.
4. **10 Fugitive BH Fans** **IB Fan Bearing is bad**, and **needs replaced.** It's running at 200 Degrees F (Usually 100-120 Degrees) and is showing **Fault Frequencies**.
5. **South Recycle Pump** has a high **1X reading**. This is most likely from **Mud on the Impellers**. The readings are up to .48 IPS. **NOT RUNNING**
6. **2 GC Vertical Pump** has a **high BPF reading**. This is most likely from **Mud/Debris or a Broken Impeller**. The readings are up again this month to .62 IPS. **NOT RUNNING**
7.

NOTES: **1 Coldwell Pumps Mechanical Seal is bad.**
2 Coldwell Pumps Mechanical Seal is bad.
1 Closed Loop Pumps Mechanical Seal is **leaking** at the **OB Pump.**
2 OL Vertical Pumps Mechanical Seal is bad.
3(South) GC Vertical Pumps Mechanical Seal is bad.
3 (East) Quencher Pump had a **new Motor installed.** Everything looks good

Exhibit E

BOP Gas Cleaning Turn Checklist

Note: *Operators will complete 2 rounds per shift. Items with "xxxxx" or that are related to equipment availibility only need to be completed once per shift.

*If anything on this sheet is not operating, not functional or down, a reason needs to be entered LEGIBLY under comments. Form is to be completed in full(no boxes left blank)

Round	1	2
Kinpactor System		
Water Flow (GPM) (>3202GPM)	3577	3510
Sprays Cleaned (Y/N) *9	Y / N	Y / N
Kinpactor Dp (iwc) (>75.96)	77.26	77.61
Any Sprays Bypassed (Y/N)	Y / N	Y / N
ID Fan System		
'A' Fan/Motor Vibration (mils)	Fan-330	Mtr-317
'B' Fan/Motor Vibration (mils)	Fan-1.10	Mtr-1.46
A or B Fan Online	B	XXXXX
Fluid Drive Oil System OK (Y/N) *5	Y / N	Y / N
Lube Oil System OK (Y/N) *5	Y / N	Y / N
Draft in IWC when system idle *10	1.62	1.24
Quencher Water System		
F Vessel Flow (GPM) (in blow)	3370	3308
R Vessel Flow (GPM) (in blow)	3796	3725
Pump Operating	1 | 2 | 3	
Seal Water Flowing (Y/N)	Y / N	Y / N
Hood Spray System		
Vessel Flow during Blow(GPM)	F = 114	R = 148
Header Pressure (PSI)	307	360
Pump Operating (N or S)	S	S
Recycle Water System		
Recycle Pumps OK (Y/N) *1	Y / N	Y / N
Which Pumps are Operating	2,3	2,3
Dumped Cone Time(s)	1	1
Any water going into the Chropek box? *11	N	N
BGC Thickener and Belt Press System		
Classifier & Recip Rake OK/ Rake Torque*3	Y / 1	Y / 1
Thickener OK (Y/N)/Rake Torque *2	Y | 0	Y | 0
Belt Press Operating *8	Y / N	Y / N
Sludge Judge (daylight shift only)	12"	XXXXX
Underflow Marcy	40	38
Underflow Tunnel OK?	Y / N	Y / N
Operating Underflow Pump (E/W); Pump OK? *1	E | Y	E | Y
Thickener pH handheld	10.25	XXXXX
CO2 Feeding (Y/N)	Y / N	Y / N

Round	1	2
Hood Closed Loop CW System		
Pumps Available	All | 1 | 2 | 3 | 4	
Pumps Operating	1 | 2 | 3 | 4	
West Strainer OK (Y/N) / DP *4	Y |	Y |
East Strainer OK (Y/N) / DP *4	Y |	Y |
Hood Open Cooling Water System		
Open Loop Pumps Available	All | 1 | 2 | 3	
Open Loop Pump Operating	1 | 2 | 3	
Cooling Tower Fans OK (Y/N) *6	Y / N	Y / N
Trunion Pump Operating (1/2)	2	2
Strainers Pressure IN/OUT (PSI)	70 | 50	70 | 60
Strainers OK (Y/N) / DP *4	Y |	Y |
Available Heat Exchangers	All | 1 | 2 | 3 | 4	
Operating Heat Exchangers	1 | 2 | 3 | 4	
Blowdown Lamella (If down, list reason in comments)		
System Flow Rate	55.6	55.4
Turbidity	5.8	4.7
Handheld Turbidity	9.18	XXXXX
pH in T4	7.8	7.8
Handheld pH from T5	7.96	XXXXX
Level of acid in tote / %	75%	75%
Open Breakdown Reports		
Fugitive Baghouse		
Mixer Baghouse	NONE	
Gas Cleaning		

Round	1	2
Fugitive Baghouse		
What Compartment #'s Are Down?	#10	#
Visible Emissions?	Y / N	Y / N
Compressor Air Pressure (psi)	85	82
Are all modules initating cleaning?	Y / N	Y / N
All DPs >3 <15 IWC?	Y / N	Y / N
Screw Conveyors Operating	1 2 3 4 5 6 7 8 9 10	
Mixer Baghouse		
What Compartment #'s Are Down?	0	0
Air Duct Draft (7-11)	6.9	7.5
Visible Emissions?	Y / N	Y / N
Compressor Air Pressure (psi)	82	83
All DPs >1.5 <15 IWC?	Y / N	Y / N
Gas Cooling Water System		
Gas CT Fans OK (Y/N) *6	Y / N	Y / N
Gas CT Pumps Available	All | 1 | 2 | 3	
Gas CT Pump Operating and Flow (GPM)	1 | 2 | 3	12562
Gas CT Pumps OK (Y/N) *1	Y / N	Y / N
Misc Environmental and #7		
Any Flooding in the area?	Y / N	Y / N
Any Excessive Mud on Ground?	Y / N	Y / N
#7 Clarrifier level 88%(Y/N) / Record%	Y | 73%	Y | 80%
#7 Clarrifier OK (Y/N)/Rake Torque *2	Y | 0	Y | 0
#7 UnderflowPump Operating(Y/N)/(N/S)	Y | N	Y | N
#7 Underflow Tunnel OK?	Y / N	Y / N
Housekeeping/What Areas Cleaned?	Truck Shop Area	

(1) Pump OK - No vibration felt, no leaks, no noises, proper power/flow, oil level good
(2) Thickener OK - Rake turning, water flowing over weir, drop in level between bowl and weir
(3) Classifier & Recip Rake - No vibration felt, no leaks, no noises, good material being pulled, oil level good, Rake turning, water flowing over weir, drop in level between bowl and weir; Write down
(4) Strainer OK - no leaks, DP within range, proper flow
(5) Fluid Drive/Lube Oil System OK - oil temperature within range, no leaks, pumps running
(6) Fans OK - no oil leaks, can run in slow and fast, no noises, able to operate
(7) Dryer OK - Online, Filters OK, No Leaks, Towers Cycle
(8) Belt press is to run out everyday. No exceptions. Sludge Judge will be less than 12" when press has run out properly
(9) If kinpactor flow under 3400 GPM, operator must rod out nozzles
(10) If draft is lower than 0.7 IWC rod out transmitter
(11) If water is flowing into the Chropek box, scrape, beat and clean the grizzlies until water stops flowing into the Chropek box

Scan and email this report to janderson2@uss.com, mjostovich@uss.com, dehixson@uss.com & cdavis@uss.com

Comments/Issues: (Any dicrepancies above need reasons added here and need to be legible)

Operator Kovacs Turn 6A-2P Date 3-25-23 Operator shift turnover acknowledgment initials JK

Exhibit F

MIKROPUL
Nederman

MikroPul Pittsburgh
2591 Wexford Bayne Rd.
Sewickley, PA 15143, U.S.A.
Tel 724-934-3910
Fax 704-998-2603

Mikropul Headquarters
4404 Chesapeake Dr.
Charlotte, NC 28216, USA
Tel 704-998-2600
Fax 704-998-2601

June 26, 2019

U.S. Steel
13th Street and Braddock Avenue
Braddock, PA

Attention: Mr. Rich Minda

Subject: BOP Metal Mixer Baghouse Evaluation – June 2019

Dear Rich:

During the week of June 3, 2019, Mikropul conducted an inspection of the metal mixer fabric filter at USS ET plant. This filter ventilates the hot iron transfer and desulfurization operations in the BOP shop.

Background

The existing collector consists of (12) negative pressure, pulsejet modules installed in 1996, supplied by Merrick. Each module has its' own Norther Blower fan, size 2700, Design 6570 with 100 HP motor and rated for 22,000 cfm @ 20", 0.075 PCF density, operating at 2986 RPM. The system design volume is 264,000 cfm with all modules in operation.

Each module has (192) 6" diameter x 192-1/2" long filter bags for a module cloth area of 4823 SF, which yields an air:cloth ratio of 4.56:1.

Cleaning via compressed air is initiated by closing the inlet poppet damper, which reduces the total system volume by 22,000 cfm, when cleaning off-line.

Inspection Results

The significant findings of this inspection include the following:

- Housing
  - There is significant cracking of the stiffener to housing attachment welds on all modules. There is no noticeable deformation of the module housing most likely due to their relatively small size and 5/16" thick construction.
  - There is water infiltration through the roof doors as evidenced by water stains in the clean air plenum, general surface rust on the tube sheet and rusting of the cages/venturis
  - Several of the hopper access doors could not be opened even after lubrication and the use of a pry bar. The hinges are a pipe design that makes them rather difficult to lubricate
  - There are hammer marks on the hoppers but no indication of bridging or material flow problems
  - Material thickness is good

- Original tube sheet thickness was ¼" and ranges from 0.239 to 0.247
- Housing construction was believed to be 5/16" thick and is currently:
  - Clean air plenum: 0.308" to 0.318"
  - Sidewalls: 0.319" to 0.349"
  - Hoppers: 0.308" to 0.322"

- Bags/Cages
  - As mentioned above, the cages/venturis are generally rusted, due to the water infiltration and most likely age.
  - Many cages do not sit flush on the tubes sheet and therefore are not completely seated inside the filter bag
  - The filter bags visually appear in fair condition
  - One bag is leaking – module 9, row 6, bag 3

- Cleaning System
  - The control panel says the dwell time between pulses is 10 seconds but is closer to 14 seconds
  - There is no means for manually pulsing the valves from the control panel for troubleshooting
  - Blow pipes are seized and very difficult to remove
  - Four (4) blow pipes are disconnected
  - Solenoid boxes are badly rusted and very difficult to open
  - Three (3) solenoids are not firing
  - There are several air leaks at the pulse valve unions
  - Two (2) pulse valves are pulsing weakly
  - Ten (10) compressed air gauges are broken or missing

- Dampers
  - There are (3) damper limit switches that are not functioning properly such as showing open on the control panel when physically closed or the like – inlet dampers 3,4, and 6.

- Dust Handling
  - There is no evidence of material bridging other than hammer marks on the hopper
  - Module 8 rotary valve motor end cover is not installed leaving cooling fan open which is a safety concern

- Fans
  - The fan isolation springs are in generally poor (rusted, cracked, etc). but it's our understanding spring replacement is planned by USS

- USS is in the process of purchasing new impeller/shaft/bearing/driven sheave assemblies to return all fans to the original design operating point.

Recommendations

- Housing
  - Roof access doors should have new rubber seals installed and the knife edge should be cleaned to prevent water infiltration into the housing
  - All stiffener welds should be repaired
  - Re-condition/replace hopper access door hinges – modules 1,3,5,7, 8 and 11

- Bags/cages
  - During next bag change, all venturis/cages should be replaced
  - Replace leaking bag – Module 9, row 6, bag 3

- Cleaning system
  - Consider control modifications to control system to allow local firing of pulse valves for troubleshooting
  - Re-install disconnected blow pipes
    - Module 2, pipe 16
    - Module 5, pipes 10 and 12
    - Module 8, pipe 2
  - During next bag change, allow ample time to recondition pulse pipes by wire brushing pipe couplings and adding anti-seize grease
  - Consider replacement of solenoid boxes which are badly rusted and difficult to open
  - Replace solenoids which are currently not working
    - Module 1, valve 1
    - Module 2, valve 16
    - Module 4, valve 10
  - Repair compressed air leaks at pulse valve unions
    - Module 1, valves 11 through14
    - Module 5, valve 8
    - Module 7, valve 14
    - Module 8, valves 3 and 4
  - Replace pulse valves diaphragms
    - Module 5, valve 1
    - Module 7, valve 9
  - Replace compressed air gauges
    - Module 3, left header
    - Module 4, right header
    - Module 5, right header

  - Module 7, both headers
  - Module 8, left header
  - Module 9, both headers
  - Module 11, both headers

- Dampers
  - Repair/replace limit switches on dampers 3,4, and 6

- Dust Handling
  - Re-install end cover on rotary valve 8 motor

- Fans
  - Continue with replacement of fan springs and returning the fans to the original design point. Once completed, evaluate vibration of the supporting structure

Summary

Overall, the collector appears to be operating reasonably well with pressure drops in the 2.7 to 6.1" w.c. range and is structurally sound, other than cracked stiffener welds, which may be due to excessive platform vibration. Other than addressing the current instrumentation and pulse valves issues, the priority should be addressing the roof and hopper access doors. The former should be addressed as soon as possible to prevent any further deterioration of the clean air plenum.

The detailed inspection sheets will be provided under separate cover.

If you have any questions, please feel free to contact me.

Sincerely,

Timothy J. Kern
Nederman MikroPul
Cell: 412-860-3132

Appendix 4 - BOP Shop LMF Baghouse Reference

Exhibit A

LMF MACT alarm summary

10/13/22	LMF pulse air pressure low 10:20
10/20/22	Not enough LMF modules (4)
10/23/22	Not enough LMF modules (4)
11/15/22	LMF pulse air pressure low 9:20
12/23/22	LMF damper position is too low 14:06
4/1/23	LMF pulse air pressure low 13:41
4/5/23	Uptime is 94% for LMF mod 3 BDD
4/6/23	Uptime is 93.8% for LMF mod 3 BDD
4/7/23	Uptime is 83.4% for LMF mod 3 BDD
4/8/23	Uptime is 92.9% for LFM mod 3 BDD
4/9/23	Uptime is 91.7% for LMF mod 3 BDD
4/10/23	Uptime is 90.5% for LMF mod 3 BDD
4/11/23	Uptime is 89.3% for LMF mod 3 BDD
4/11/23	Uptime is 88.0% for LMF mod 3 BDD
4/13/23	Uptime is 87.4% for LMF mod 3 BDD

Exhibit B

4-24-23

Evergreen North America
INDUSTRIAL SERVICES

USS ET DUST COLLECTIONS CHECK LIST

FUGITIVE:

#5 BLOWING DUST WHEN DOOR IS OPEN.

1	1/2	5	1/3	9	1/2
2	1/2	6	1/2	10	1/2
3	1/2	7	5/8		
4	1/2	8	1/2	Weight	12980

LMF:

WE VAC THE FLOOR AROUND INSIDE WEST BOXES 9 & 10 VAC TO OF BOX TOO.

1	1/2	5	1/4	9	1/16	south inside west
2	1/3	6	1/3	10	1/3	North
3	1/4	7	0	11	0	ALLEY
4	1/2	8	0 inside EAST	Weight	9100	

MIXER:

1	1/2	5	5/8	9	5/8	13	5/8
2	1/2	6	5/8	10	1/2		
3	1/2	7	1/2	11	1/2		
4	1/2	8	5/8	12	1/2	Weight	22406

GAS WASHER:

1	1/3	#4 is blowing DUST BAD WHEN DOOR is OFF!	Crew M. BRADY
2	1/2		Crew C. BRAZIL
3	1/2		Crew N. HAYES
4	1/2	Weight 3120	

SUPERVISOR ERIC LINKE

25520 @ GAP

22,080 @ BRI

Exhibit C

U.S. Steel Monthly Vibration Readings - Caster WQ

	USS Priority Codes
1	Immediate Attention/Action Required
2	Fault Detected
3	Acceptable Operating Conditions
4	Baseline Readings - Work Performed
5	Equipment not Running

	Equipment	Inspection Date	Mar 22	Apr 22	May 22	Jun 22	Jul 22	Aug 22	Sep 22	Oct 22	Nov 22	Dec 22	Jan 23	Feb 23	Notes/Fixes Suggestions
1	1 IM Pump	2/21/2023	5	2	5	2	5	2	2	5	2	3	3	3	
2	2 IM Pump	11/17/2022	4	3	3	5	3	3	2	2	2	2	2	2	BPF reading at Pump/Mechanical Seals
3	3 IM Pump	2/21/2023	3	2	3	3	3	2	2	3	2	2	2	2	High BPF Readings at Pump
4	1 Spray Water Pump	12/16/2022	5	2	2	4	3	3	2	2	2	2	5	5	Coupling/Sructural issue
5	2 Spray Water Pump	2/21/2023	4	5	5	5	3	3	5	3	5	3	3	3	
6	3 Spray Water Pump	2/21/2023	2	3	4	3	5	5	3	5	3	5	3	3	
7	1 Mold Water Pump	2/21/2023	5	5	3	5	5	3	5	5	3	3	3	3	
8	**2 Mold Water Pump**	2/21/2023	4	3	5	3	3	3	3	3	5	3	3	3	**Grease coming out of OB Pump Bearing**
9	3 Mold Water Pump	11/17/2022	3	3	3	3	3	5	3	3	3	5	5	5	
10	1 Make Up Pump	2/21/2023	3	5	3	5	3	5	3	5	3	5	3	3	
11	2 Make Up Pump	12/16/2022	5	3	5	3	5	3	5	3	5	3	5	5	
12	1 LMF BH Fan	2/23/2023	3	3	3	3	3	3	3	3	3	3	3	3	
13	2 LMF BH Fan	2/23/2023	3	3	3	3	3	3	3	3	3	3	3	3	
14	3 LMF BH Fan	2/23/2023	3	3	3	3	3	3	2	2	2	2	4	3	
15	4 LMF BH Fan	2/23/2023	3	3	3	3	3	3	3	3	3	3	3	3	
16	5 LMF BH Fan	2/23/2023	3	3	3	3	3	3	3	3	3	3	3	3	
17	6 LMF BH Fan	2/23/2023	3	3	3	3	3	3	3	3	3	3	3	3	
18	1 WSAC Pump	2/21/2023	5	3	3	5	5	3	3	3	3	3	3	3	
19	2 WSAC Pump	7/19/2022	3	5	5	3	3	5	5	5	5	5	5	5	
20	1 Backwash Pump		5	5	5	5	5	5	5	5	5	5	5	5	
21	2 Backwash Pump		5	5	5	5	5	5	5	5	5	5	5	5	
22	1 WSAC Fan	2/21/2023	3	3	5	3	3	3	3	5	5	5	5	3	
23	2 WSAC Fan	2/21/2023	3	3	3	3	3	3	5	5	5	5	5	3	
24	3 WSAC Fan	2/21/2023	3	3	3	3	3	3	5	5	5	5	5	3	
25	4 WSAC Fan	8/22/2022	3	3	3	3	3	3	5	5	5	5	5	5	

Exhibit D

Caster WQ/Compressor

February 2023 Monthly Vibration Report

Caster WQ

1. **2 IM Pump** has a high **BPF reading** at the **Pump.** The readings are up to .47 IPS. **NOT RUNNING**
2. **3 IM Pump** has a high **BPF reading** at the **Pump.** There is also **Grease coming out** of the **OB Pump Bearing**. The readings are staying steady at .39 IPS.
3. **1 Spray Water Pump** has a **high 2X reading at the Pump.** This is a **Structural issue. The Pump** is also **Thrusting** indicating a **Coupling issue.** I think that the **Structural issue** is causing the **Thrusting/Coupling issue**. The readings are down to .36 IPS. **NOT RUNNING**

Compressors

4. **PH Elliot** has **fault frequencies** at both **Motor Bearings**. The readings are steady at .22 IPS.
5.

Notes: **2 Mold Pump has Grease coming out of the OB Pump Bearing**.

Exhibit E

C.W.Q.C. Turn Checklist

Week of 5-14-23

	Sunday 14			Monday 15			Tuesday 16			Wednesday 17			Thursday 18			Fr
	1st Turn	2nd Turn	3rd Turn	1st Turn	2nd Turn	3rd Turn	1st Turn	2nd Turn	3rd Turn	1st Turn	2nd Turn	3rd Turn	1st Turn	2nd Turn	3rd Turn	1st Turn	2nd
Air Mist Compressors	46699	47479	16054	46699	46916	16054	46699	46916	46916	46699	46916	47479	16054	46916	47479	16054	46
Operating Comps.	1-2	1-2	1-2	1-2	1-2	1-2	1-2	1-2	1-2	1-2	1-2	1-2	1-2	1-2	1-2	1-2	1-
System Pressure	56.1	56	56	55.2	56	55	55.8	55.8	56	56	55.3	55	56	55.9	56	56	56
System Flow	15039	12699	13995	14978	15027	13109	14193	14313	14148	14428	15594	15214	13572	14811	15331	9187	13
Comp. Filters OK	✓	✓		✓	✓		✓	✓	✓	✓	✓	✓		✓	✓		
LMF Baghouse																	
Main Draft (5 or above)	15	14	14	9.5	11		11.5	12	11	15	12	14	15	13.5	14	14	1
Hoppers OK	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
Rotary Valves OK	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
Fans OK	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
Direct Drive OK	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
Air Press (70-100)	93	94	93	94	93	91	90	91	91	90	91	91	92	92	92	96	9
DP's 1.5 - 12 IWC																	
#1 Compartment DP	4.3	4.2	5.3	5.7	4.3	5.0	3.7	4.6	5.0	CLN	2.7	2.7	3.7	5.9	4.7	5.6	4
#2 Compartment DP	1.5	1.6	1.6	1.8	1.6	2.0	1.8	2.0	1.4	2.0	1.0	1.4	1.2	1.7	1.4	1.4	1.
#3 Compartment DP	1.0	1.1	1.5	1.1	0.8	2.1	1.0	1.0	1.2	1.9	0.4	0.5	0.9	1.4	1.3	2.6	1.
#4 Compartment DP	3.2	3.3	4.1	5.6	2.7	3.9	2.8	3.3	3.6	5.2	2.1	2.3	2.7	4.4	5.6	3.3	3.
#5 Compartment DP	2.3	3.6	2.6	CLN	1.6	2.4	1.4	2.2	2.2	3.5	1.1	1.3	1.2	2.8	3.4	4.3	2
#6 Compartment DP	3.0	3.4	3.6	3.9	2.9	3.2	2.5	3.2	3.2	4.5	1.7	1.9	2.8	3.9	3.6	3.5	3
AMPS 60 or above																	
#1 Compartment AMPS	71	67	66	46	67	68	68	65	67	CLN	66	66	68	66	68	64	6
#2 Compartment AMPS	59	63	67	55	65	62	67	62	58	56	64	67	68	57	57	54	5
#3 Compartment AMPS	68	69	70	67	69	68	67	67	66	69	70	66	67	65	66	69	6
#4 Compartment AMPS	67	69	68	66	68	65	68	66	68	67	68	65	70	67	CLN	66	6
#5 Compartment AMPS	80	79	80	CLN	79	80	80	79	80	81	78	80	74	78	78	80	7
#6 Compartment AMPS	79	80	79	79	78	79	80	79	80	82	79	79	80	79	81	77	8
Visible outlet dust emissions by observing the LMF Baghouse discharge ducts when the LMF is in operation. Enter Y for Observation of Visible Emission from discharge ducts or N for No Observation of Visible Emis																	
#1 Compartment STACK	N	N	N	N	N	N	N	N	N	N	N	N		N	N		N
#2 Compartment STACK	N	N	N	N	N	N	N	N	N	N	N	N		N	N		N
#3 Compartment STACK	N	N	N	N	N	N	N	N	N	N	N	N		N	N		
#4 Compartment STACK	N	N	N	N	N	N	N	N	N	N	N	N		N	N		N
#5 Compartment STACK	N	N	N	N	N	N	N	N	N	N	N	N		N	N		
#6 Compartment STACK	N	N	N	N	N	N	N	N	N	N	N	N		N	N		
Comments or Corrective Action Taken: Spray ph	8.19	8.28	8.25	8.31	8.29	8.35	8.38	8.3	8.28	8.35	8.28	8.31	8.25	8.19	8.34	8.43	8

Appendix 5 - BOP Shop Primary System Scrubber Reference

Exhibit A

BOP PRIMARY SYSTEM MONTHLY MACT INSPECTIONS

Inspection Date: 28 Dec 2022 Inspector: John Marriott

VESSEL QUENCHER DUCTS:

Perform a visual condition inspection of the Quencher and associated duct from the Quencher to and including the Vessel Isolation Damper looking for indications of ductwork deterioration, any visible emissions, or other structural deficiencies. Note on this form whether 'OK' or 'Needs Attention'. If needing attention, indicate in the 'Comments' line.

"R" VESSEL

	Condition (circle one)		Comments
QUENCHER	OK	Needs Attention	
DUCT	OK	Needs Attention	
ISOLATION DAMPER	OK	Needs Attention	

"F" VESSEL

	Condition (circle one)		Comments
QUENCHER	OK	Needs Attention	
DUCT	OK	Needs Attention	
ISOLATION DAMPER	OK	Needs Attention	

VESSEL E-STACKS:

Perform a visual condition inspection of the E-Stack and associated duct looking for indications of ductwork deterioration, any visible emissions, or other structural deficiencies. Note on this form whether 'OK' or 'Needs Attention'. If needing attention, indicate in the 'Comments' line.

"R" VESSEL

	Condition (circle one)		Comments
STACK CONDITION	OK	Needs Attention	
SEAL CONDITION	OK	Needs Attention	

"F" VESSEL

	Condition (circle one)		Comments
STACK CONDITION	OK	Needs Attention	
SEAL CONDITION	OK	Needs Attention	

BOP SECONDARY SYSTEM MONTHLY MACT INSPECTIONS

Inspection Date: 28 Dec 2022 Inspector: John Marriot

Secondary Emissions Collection System Roof Dampers & Ductwork:

Perform a visual condition inspection of the individual roof damper ductwork and dampers from the roof to the main duct looking for indications of ductwork deterioration, any visible emissions, or other structural deficiencies. Note on this form whether 'OK' or 'Needs Attention'. If needing attention, indicate in the 'Comments' line.

Damper ID	Condition (circle one)		Comments
101			
Duct & Boot Condition	OK	Needs Attention	
Damper Drive Condition	OK	Needs Attention	
102			
Duct & Boot Condition	OK	Needs Attention	
Damper Drive Condition	OK	Needs Attention	
103			
Duct & Boot Condition	OK	Needs Attention	
Damper Drive Condition	OK	Needs Attention	
104			
Duct & Boot Condition	OK	Needs Attention	
Damper Drive Condition	OK	Needs Attention	
105			
Duct & Boot Condition	OK	Needs Attention	
Damper Drive Condition	OK	Needs Attention	
106			
Duct & Boot Condition	OK	Needs Attention	

Damper Drive Condition OK Needs Attention _____

107
Duct & Boot Condition OK Needs Attention _____

Damper Drive Condition OK Needs Attention _____

108
Duct & Boot Condition OK Needs Attention _____

Damper Drive Condition OK Needs Attention _____

Secondary Emissions Collection System Roof Dampers & Ductwork:

Perform a visual condition inspection of the individual roof damper ductwork and dampers from the roof to the main duct looking for indications of ductwork deterioration, any visible emissions, or other structural deficiencies. Note on this form whether 'OK' or 'Needs Attention'. If needing attention, indicate in the 'Comments' line.

Damper ID	Condition (circle one)	Comments
109		
Duct & Boot Condition	OK Needs Attention	_____
Damper Drive Condition	OK Needs Attention	_____
110		
Duct & Boot Condition	OK Needs Attention	_____
Damper Drive Condition	OK Needs Attention	_____
111		
Duct & Boot Condition	OK Needs Attention	_____
Damper Drive Condition	OK Needs Attention	_____
112		
Duct & Boot Condition	OK Needs Attention	_____
Damper Drive Condition	OK Needs Attention	_____
113		
Duct & Boot Condition	OK Needs Attention	_____
Damper Drive Condition	OK Needs Attention	_____
114		
Duct & Boot Condition	OK Needs Attention	_____

Damper Drive Condition OK Needs Attention _____

115
Duct & Boot Condition OK Needs Attention _____

Damper Drive Condition OK Needs Attention _____

116
Duct & Boot Condition OK Needs Attention _____

Damper Drive Condition OK Needs Attention _____

Secondary Emissions Collection System Charge Hood, Dampers & Ductwork:

Perform a visual condition inspection of the individual charge hoods, dampers, and ductwork from the charge hood to the main duct looking for indications of ductwork deterioration, any visible emissions, or other structural deficiencies. Note on this form whether 'OK' or 'Needs Attention'. If needing attention, indicate in the 'Comments' line.

"R" VESSEL

	Condition (circle one)		Comments
CHARGE HOOD	OK	Needs Attention	_____
DUCT	OK	Needs Attention	_____
SEAL PLATES	OK	Needs Attention	_____
ISOLATION DAMPER	OK	Needs Attention	_____

"F" VESSEL

	Condition (circle one)		Comments
CHARGE HOOD	OK	Needs Attention	_____
DUCT	OK	Needs Attention	_____
SEAL PLATES	OK	Needs Attention	_____
SOUTH ISOLATION DAMPER	OK	Needs Attention	_____
NORTH ISOLATION DAMPER	OK	Needs Attention	_____

Exhibit B

U.S. Steel Monthly Vibration Readings - BOP GC

	USS Priority Codes
1	Immediate Attention/Action Required
2	Fault Detected
3	Acceptable Operating Conditions
4	Baseline Readings - Work Performed
5	Equipment not Running

	Equipment	Inspection Date	Apr 22	May 22	Jun 22	Jul 22	Aug 22	Sep 22	Oct 22	Nov 22	Dec 22	Jan 23	Feb 23	Mar 23	Notes/Fixes Suggestions
1	A Fan	12/9/2022	5	5	4	3	3	3	3	3	3	5	5	5	
2	B Fan	3/17/2023	3	3	5	5	5	5	5	5	5	3	3	3	
3	East Kinpactor Pump	3/17/2023	3	3	5	3	3	5	2	2	4	5	3	3	
4	West Kinpactor Pump	9/16/2022	4	5	3	5	5	3	5	5	5	5	5	5	
5	1 (West)Quencher Pump	2/17/2023	3	3	5	5	5	5	5	3	3	5	3	5	
6	2 Quencher Pump	10/13/2022	5	5	3	3	3	3	3	5	5	5	5	5	
7	3 (East)Quencher Pump	3/17/2023	5	5	5	5	5	5	5	5	5	3	4	3	New Motor installed - looks good
8	1 (South) Lance Pump														
9	2 (North) Lance Pump	7/10/2020													
10	3 (West) Lance Pump	7/10/2020													
11	South Hood Spray Pump	2/17/2023	3	5	5	5	5	5	5	5	5	5	3	5	
12	North Hood Spray Pump	11/11/2021	5	5	5	5	5	5	5	5	5	5	5	5	
13	1 Fugitive BH Fan	3/16/2023	3	3	3	3	3	3	4	3	3	3	3	3	
14	2 Fugitive BH Fan	3/16/2023	3	3	3	3	3	3	3	3	3	3	3	3	
15	3 Fugitive BH Fan	3/16/2023	2	2	2	2	2	2	5	2	2	2	5	2	OB Fan Bearing is showing mechanical looseness and impacting
16	4 Fugitive BH Fan	3/16/2023	3	5	3	3	3	3	3	4	3	3	3	3	
17	5 Fugitive BH Fan	3/16/2023	3	3	3	3	3	3	3	3	3	4	3	3	
18	6 Fugitive BH Fan	3/16/2023	3	3	3	3	3	3	3	3	3	3	3	3	
19	7 Fugitive BH Fan	3/16/2023	3	3	3	3	3	3	3	3	4	3	3	3	
20	8 Fugitive BH Fan	3/16/2023	2	2	4	3	3	3	3	3	3	3	3	3	
21	9 Fugitive BH Fan	3/16/2023	2	2	4	3	3	3	3	3	3	3	3	3	
22	10 Fugitive BH Fan	3/8/2023	3	3	3	3	3	3	3	3	3	3	3	1	IB Fan Bearing is bad and needs replaced
23	1 Mixer BH Fan	3/20/2023	3	3	3	3	3	3	3	4	3	3	3	3	
24	2 Mixer BH Fan	3/20/2023	3	3	3	3	3	3	3	3	3	3	3	3	
25	3 Mixer BH Fan	3/20/2023	1	2	4	3	3	5	3	3	3	4	3	3	
26	4 Mixer BH Fan	3/20/2023	3	3	3	3	3	2	4	3	3	3	3	3	
27	5 Mixer BH Fan	3/20/2023	3	3	2	1	1	1	1	1	4	3	3	3	
28	6 Mixer BH Fan	3/20/2023	3	3	2	3	1	4	3	3	3	3	2	2	High 1X reading at Motor- Motor baseplate
29	7 Mixer BH Fan	3/20/2023	3	3	3	3	3	3	3	4	3	3	3	3	
30	8 Mixer BH Fan	3/20/2023	3	3	2	2	1	1	1	3	1	1	1	1	High 1X reading at Fan and possibly Damper issues
31	9 Mixer BH Fan	3/20/2023	3	3	2	2	3	1	1	3	3	3	3	3	

U.S. Steel Monthly Vibration Readings - BOP GC

	USS Priority Codes
1	Immediate Attention/Action Required
2	Fault Detected
3	Acceptable Operating Conditions
4	Baseline Readings - work Performed
5	Equipment not Running

	Equipment	Inspection Date	Apr 22	May 22	Jun 22	Jul 22	Aug 22	Sep 22	Oct 22	Nov 22	Dec 22	Jan 23	Feb 23	Mar 23	Notes/Fixes Suggestions
32	10 Mixer BH Fan	3/20/2023	3	3	3	3	3	3	3	3	3	3	3	3	
33	11 Mixer BH Fan	2/16/2023	3	3	3	5	3	3	1	3	3	3	3	5	
34	12 Mixer BH Fan	3/20/2023	3	3	3	5	3	3	3	2	2	4	3	3	
35	North Cooling Twr Fan	3/14/2023	3	3	3	3	3	3	3	3	3	3	3	3	
36	South Cooling Twr Fan	3/14/2023	3	3	3	3	3	3	3	3	3	3	3	3	
37	North Recycle Pump	3/17/2023	3	3		3	5	3	3	3	3	3	3	3	
38	Mid Recycle Pump	3/17/2023	5	5		5	4	5	5	5	3	5	3	3	
39	South Recycle Pump	1/18/2023	3	4		3	5	2	2	3	5	2	5	5	1X reading - Mud
40	1 (North) Gas CleanVertical Pump	5/11/2021	5	5	5	5	5	5	5	5	5	5	5	5	
41	2 Gas Clean Vertical Pump	2/17/2023	3	3	5	5	5	5	2	3	3	2	2	5	High BPF Reading - Mud/Impeller issue
42	**3 (South) Gas Clean Vertical Pump**	3/17/2023	5	5	3	3	3	3	5	5	5	5	5	3	**Mechanical Seal is Leaking**
43	1 Hotwell Pump	2/19/2023	4	3	3	3	3	3	3	5	5	5	3	5	
44	2 Hotwell Pump	3/19/2023	3	3	3	3	3	5	3	5	3	3	3	3	
45	3 Hotwell Pump	3/19/2023	5	5	5	5	5	3	5	5	3	3	5	3	
46	1(North) Trunnion Pump	8/7/2022	5	3	3	5	3	5	5	5	5	5	5	5	
47	2(South) Trunnion Pump	3/14/2023	3	5	5	3	5	3	3	3	3	3	3	3	
48	**1 CL Pump**	3/14/2023	3	3	3	3	3	3	3	3	3	3	3	3	**Mechanical Seal is Leaking @ OB Pump**
49	2 CL Pump	11/14/2022	5	3	3	3	3	5	3	3	5	5	5	5	
50	3 CL Pump	3/14/2023	3	5	5	3	5	5	5	5	3	3	3	3	
51	4 CL Pump	3/14/2023	5	3	3	5	3	3	3	3	3	3	3	3	
52	1(East) Open Loop Cooling Twr Pump	2/17/2023	5	5	5	5	3	5	3	3	3	3	3	5	
53	**2 Open Loop Cooling Twr Pump**	3/14/2023	5	5	5	3	5	3	5	5	5	5	5	3	**Mechanical Seal is Leaking**
54	3(West) Open Loop Cooling Twr Pump	6/7/2022	3	3	3	5	5	5	5	5	5	5	5	5	
55	East Underflow Pump	1/18/2023	5	5	5	3	3	3	3	3	3	3	5	5	
56	West Underflow Pump	3/17/2023	3	3	3	5	5	5	5	5	5	5	3	3	
57	**1 Coldwell Pump**	2/19/2023	3	3	3	3	3	5	3	5	5	5	3	5	**Mechanical Seal is Leaking**
58	**2 Coldwell Pump**	3/19/2023	3	3	3	3	3	3	3	5	3	3	3	3	**Mechanical Seal is Leaking**
59	3 Coldwell Pump	3/19/2023	4	5	5	5	5	3	5	5	2	3	5	3	
60	BOP Thickner - East Drive	3/17/2023											3	3	
61	BOP Thickner - West Drive	3/17/2023											3	3	

Exhibit C

BOP GC

March 2023 Monthly Vibration Report

1. **6 Mixer BH Fans** has a **high 1X reading** at the **Motor**. The readings are steady at .76 IPS. I shot the Motor Feet and the Motor Baseplate. The IB (Sheave Side) of the Motor Feet and Baseplate is over 1IPS. I think that the **Baseplate** either has a **Crack** or is **Fatigued**.
2. **8 Mixer BH Fan** has a **high 1X reading** at the **IB Fan Bearing**. This is a **Structural/Balance issue.** The readings stayed steady at .98 IPS. It also sounds like we might have a **Damper issue.**
3. **3 Fugitive BH Fan -** The **OB Fan Bearing** is showing **Slight Impacting** and **Mechanical Looseness**. The readings are staying steady at .37 IPS.
4. **10 Fugitive BH Fans** **IB Fan Bearing is bad**, and **needs replaced.** It's running at 200 Degrees F (Usually 100-120 Degrees) and is showing **Fault Frequencies**.
5. **South Recycle Pump** has a high **1X reading**. This is most likely from **Mud on the Impellers**. The readings are up to .48 IPS. **NOT RUNNING**
6. **2 GC Vertical Pump** has a **high BPF reading**. This is most likely from **Mud/Debris or a Broken Impeller**. The readings are up again this month to .62 IPS. **NOT RUNNING**
7.

NOTES: **1 Coldwell Pumps Mechanical Seal is bad.**
2 Coldwell Pumps Mechanical Seal is bad.
1 Closed Loop Pumps Mechanical Seal is **leaking** at the **OB Pump.**
2 OL Vertical Pumps Mechanical Seal is bad.
3(South) GC Vertical Pumps Mechanical Seal is bad.
3 (East) Quencher Pump had a **new Motor installed.** Everything looks good

Appendix 6 - Slag Pits PM Control Reference

Exhibit A

Gas Washer Daily Checklist

#1 Gas Washer	
Recycle Pmps Oper.	1+4
Recycle Pressure	104
Recycle Flow	N/A
Venturi Pump Oper.	P9A
Venturi H_2O Press.	37
Venturi H_2O Flow	1661
Bleeder Stack OK	✓
Venturi Gas DP	89
#1 Q.D. Sump OK	✓
Water / gas dif temp	34
HP Press	153
HP Flow	1805

#3 Gas Washer	
HP Electric Pmp. OK	✓
MP Electric Pmp. OK	✓
HP Steam OK	✓
MP Steam OK	✓
Venturi Pump Oper.	P3
Venturi H_2O Press.	55
Venturi H_2O Flow	1280
Venturi Gas DP	N/A
#3 Q.D. Sump OK	✓
Water / gas dif temp	25

Cooling Tower	
Coldwell Pmps Oper.	33, 29
Coldwell Level	4.5
Hotwell Pumps Oper.	10, 9, 7
Hotwell Level	9.1
C-Tower Fans OK	✓
Flow / GPM	N/A

Belt Press	
Belt Press	✓
Recip Rake	✓

WSAC	
WSAC Temp In	89
WSAC Temp Out	81
Basin Level	18
Closed Loop Pumps On	3 + 4
Storage tank Level	26
Storage Tank Temp	85
WSAC Pumps 1, 2, 3,	✓
WSAC Fans Unit 1	ON
WSAC Fans Unit 2	ON
WSAC Fans Unit 3	ON

#1 Clarifier	
Clarifier Rake OK	✓
Clarifier rake Amps	3.6
U-flow Pump OK	✓
U-flow Pump Oper.	2

#3 Clarifier	
Classifier Rake OK	✓
Clarifier rake OK	✓
U-flow Pump Oper.	1
U-flow Pump ok	✓

Slag Pits	
#1 Pit Levels OK	✓
#1 Pit Pumps OK	✓
#1 Pipe/Sprays OK	✓
#3 Pit Levels OK	✓
#3 Pit Pumps OK	✓
#3 Pipe/Sprays OK	✓

Baghouse		* Enter "C" if cleaning and "X" if offline			
		1	2	3	4
Main Draft					
#1 FCE Draft	CAST	DP (5 - 16) *	14.2	8.3	9.1	9.9
#3 FCE Draft	CAST	Belts	✓	✓	✓	✓
Fan Amps		1F (160 - 280)				
		2F (200 - 280)	171	199	240	186

Bag House Air Pressure (70 or above)	88
Hoppers/Conveyors OK	✓
Cleaning Cycle OK	✓
FAX TO x4839	

Compartment Exhaust Visual Emissions							
DAYLIGHT TURN ONLY!							
Enter Y for Yes, N for No							
Compartment							
1		2		3		4	
N		N		N		N	

Comments or Corrective Action Taken:

Small Leak on Braided hose ~~Submersible~~ Ground pump 3 Slag pit

Operator: D. Rhodes Turn: 7A-7P Date: 3-1-23

Title: Gaswasher Daily Checklist	Page 1 of 1
Document #: E-76540-50-001	Last Revision Date: : 7/28/2015
Location: Mon Valley Works Primary - ET Field Services & Utilities - ET BF WQC	

Exhibit B

Gas Washer Daily Checklist

#1 Gas Washer	
Recycle Pmps Oper.	1,2
Recycle Pressure	104
Recycle Flow	N/A
Venturi Pump Oper.	P9
Venturi H_2O Press.	37
Venturi H_2O Flow	1656
Bleeder Stack OK	✓
Venturi Gas DP	91.5
#1 Q.D. Sump OK	✓
Water / gas dif temp	N/A
HP Press	159
HP Flow	1826
Loop Seals	✓

#3 Gas Washer	
HP Electric Pmp. OK	✓
MP Electric Pmp. OK	✓
HP Steam OK	✓
MP Steam OK	✓
Venturi Pump Oper.	P3
Venturi H_2O Press.	N/A
Venturi H_2O Flow	1178
Venturi Gas DP	N/A
#3 Q.D. Sump OK	✓
Water / gas dif temp	22
Loop Seals	✓

#1 Clarifier	
Clarifier Rake OK	✓
Clarifier rake Amps	3.3
U-flow Pump OK	✓
U-flow Pump Oper.	2

Cooling Tower	
Coldwell Pmps Oper.	3,3,2,9
Coldwell Level	4.5
Hotwell Pumps Oper.	10,9,6
Hotwell Level	8.9
C-Tower Fans OK	✓
Flow / GPM	N/A

Belt Press	
Belt Press	✓
Recip Rake	✓

#3 Clarifier	
Classifier Rake OK	✓
Clarifier rake OK	✓
U-flow Pump Oper.	2
U-flow Pump ok	✓

WSAC	
WSAC Temp In	94
WSAC Temp Out	87
Basin Level	18.01
Closed Loop Pumps On	3,4
Storage tank Level	26.3
Storage Tank Temp	91
WSAC Pumps 1, 2, 3,	ON
WSAC Fans Unit 1	ON
WSAC Fans Unit 2	ON
WSAC Fans Unit 3	ON

Slag Pits	
#1 Pit Levels OK	✓
#1 Pit Pumps OK	✓
#1 Pipe/Sprays FLOWS	✓
#3 Pit Levels OK	✓
#3 Pit Pumps OK	✓
#3 Pipe/Sprays FLOWS	✓

PEROXIDE METERING PUMPS RUNNING	YES	NO
	✓	

Baghouse		* Enter "C" if cleaning and "X" if offline				
		1	2	3	4	
Main Draft (3.0 or above)	DP (5 - 16) *	11.0	7.1	8.1	11.9	
#1 FCE Draft CAST	Belts	✓	✓	✓	✓	
#3 FCE Draft CAST	1F (160 - 280)	176	217	224	206	
Fan Amps	2F (200 - 280)					

Bag House Air Pressure (70 or above)	✓
Hoppers/Conveyors OK	✓
Cleaning Cycle OK	✓

FAX TO x4839

Compartment Exhaust Visual Emissions DAYLIGHT TURN ONLY! Enter Y for Yes, N for No							
Compartment	1		2		3		4
	N		N		N		N

Comments or Corrective Action Taken:
30 MARCY, 3,160 AMPS, 0 TORQUE, 3 INCHES 0 CLASSIFER TORQUE - 5

Operator: MCELHOSE Turn: 7A - 7P Date: 5/7/23

Last Revision Date: :3/28/2018

Title: Gaswasher Daily Checklist
Document #: E-76540-50-001
Location: Mon Valley Works Primary - ET Blast Furnace Maint and Services

Exhibit C

U.S. Steel Monthly Vibration Readings - Gas Washer

	USS Priority Codes
1	Immediate Attention/Action Required
2	Fault Detected
3	Acceptable Operating Conditions
4	Baseline Readings - work Performed
5	Equipment not Running

	Equipment	Inspection Date	Apr 22	May 22	Jun 22	Jul 22	Aug 22	Sep 22	Oct 22	Nov 22	Dec 22	Jan 23	Feb 23	Mar 23	Notes/Fixes Suggestions
1	1 (West) Underflow Pump - 1 Fce	2/14/2023	4	1	2	2	5	2	2	2	2	2	2	5	Loose Belts and a High 1X @ Motor - Structural issues
2	2 (East) Underflow Pump - 1 Fce	3/6/2023	2	5	5	5	2	5	5	5	5	5	5	4	Installed a new Pump - Pump looks good
3	North Venturi Pump - 1 Fce	9/7/2022	3	2	2	3	5	3	5	5	5	5	5	5	
4	South Venturi Pump - 1 Fce	3/6/2023	5	5	5	5	4	5	3	3	3	3	3	3	
5	North Tuyere Pump - 1 Fce	1/9/2023	3	3	3	3	5	5	3	4	3	3	5	5	
6	South Tuyere Pump - 1 Fce	3/6/2023	5	5	5	5	3	2	5	5	5	5	2	2	Fault Frequencies & Mechanical Seal at IB Pump - below alarm levels
7	1 Medium Pressure Pump - 1 Fce	3/6/2023	3	3	5	5	5	5	5	5	5	5	3	3	
8	2 Medium Pressure Pump - 1 Fce	1/9/2023	5	5	3	2	2	2	2	2	2	2	5	5	Casing/Impellers are bad
9	3 Medium Pressure Pump - 1 Fce	1/9/2023	5	5	3	4	3	3	3	3	3	3	5	5	
10	4 Medium Pressure Pump - 1 Fce	3/6/2023	3	3	5	5	5	5	5	5	5	5	3	3	Mechanical Seal OB Pump
11	1 Quick Dump Sump Pump - 1 Fce	8/4/2015	5	5	5	5	5	5	5	5	5	5	5	5	
12	2 Quick Dump Sump Pump - 1 Fce		5	5	5	5	5	5	5	5	5	5	5	5	
13	3 Quick Dump Sump Pump - 1 Fce	9/7/2022	5	5	5	5	5	1	5	5	5	5	5	5	High 1X - Mud on impellers or Structural
14	Electric Medium Pressure Pump - 3 Fce	3/3/2023	3	3	3	3	4	5	5	5	5	3	3	3	
15	Electric High Pressure Pump - 3 Fce	3/3/2023	3	3	4	3	3	5	5	5	5	3	3	3	
16	Steam Medium Pressure Pump - 3 Fce	10/4/2018	5	5	5	5	5	5	5	5	5	5	5	5	
17	Steam High Pressure Pump - 3 Fce		5	5	5	5	5	5	5	5	5	5	5	5	
18	East Venturi Pump - 3Fce	3/3/2023	5	5	5	3	5	5	5	5	5	5	3	3	Packing needs adjusted
19	West Venturi Pump - 3 Fce	8/3/2022	3	3	3	5	3	5	5	5	5	5	5	5	
20	North Underflow Pump - 3 Fce	3/3/2023	3	3	3	3	3	5	3	3	3	3	3	3	
21	South Underflow Pump - 3 Fce	8/3/2022	5	5	5	5	3	5	5	5	5	5	5	5	
22	North Quick Dump Sump Pump - 3Fce	2/2/2023	3	3	5	3	3	5	5	5	5	5	3	5	
23	South Quick Dump Sump Pump - 3 Fce	1/8/2021	5	5	5	5	5	5	5	5	5	5	5	5	
24	1 (West) New Blue Pump	1/6/2023	5	5	5	5	5	5	5	5	3	3	5	5	
25	2 (Middle) New Blue Pump	11/2/2022	3	5	3	3	3	3	3	3	5	5	5	5	
26	3 (East) New Blue Pump	3/2/2023	5	3	5	5	5	5	5	5	5	5	3	3	
27	1 Closed Loop Pump - Electric	11/2/2022	5	5	4	2	2	2	2	2	5	5	5	5	Cooling Fan issues on Motor - Running hot
28	2 Closed Loop Pump - Electric	2/2/2023	5	5	5	3	3	3	5	5	3	3	3	5	
29	3 Closed Loop Pump - Steam	3/3/2023	3	3	3	3	5	5	3	3	4	5	5	3	New Turbine installed - looks good
30	4 Closed Loop Pump - Steam	3/3/2023	3	3	5	5	5	5	5	5	3	3	3	3	
31															

U.S. Steel Monthly Vibration Readings - Gas Washer

	USS Priority Codes
1	Immediate Attention/Action Required
2	Fault Detected
3	Acceptable Operating Conditions
4	Baseline Readings - work Performed
5	Equipment not Running

	Equipment	Inspection Date	Apr 22	May 22	Jun 22	Jul 22	Aug 22	Sep 22	Oct 22	Nov 22	Dec 22	Jan 23	Feb 23	Mar 23	Notes/Fixes Suggestions
32	Coldwell Pump 129	3/7/2023	3	3	3	3	3	3	5	3	3	3	3	3	
33	Coldwell Pump 130	7/7/2021	5	5	5	5	5	5	5	5	5	5	5	5	High 1X - Mud on Impellers
34	Coldwell Pump 131	2/15/2023	3	3	3	3	3	3	5	5	3	3	3	5	
35	Coldwell Pump 132	1/11/2016	5	5	5	5	5	5	5	5	5	5	5	5	
36	Coldwell Pump 133	3/7/2023	5	5	5	5	5	5	2	2	5	5	5	2	High 1X - Mud on Impellers
37	Hotwell Pump 106	12/6/2022	3	3	3	3	3	5	5	3	3	5	5	5	
38	Hotwell Pump 107	3/7/2023	5	5	5	5	5	2	3	5	5	3	3	3	
39	Hotwell Pump 108	10/4/2022	2	2	2	2	2	2	2	5	5	5	5	5	High 1X - Mud on Impellers
40	Hotwell Pump 109	3/7/2023	5	5	5	5	5	5	3	3	3	3	2	2	High 1X - Mud on Impellers
41	Hotwell Pump 110	3/7/2023	3	3	3	3	3	3	3	3	3	3	3	3	
42	1 BF Baghouse Fan	3/6/2023	1	4	3	3	4	3	3	3	3	2	1	4	Installed a new Motor Baseplate - looks good
43	2 BF Baghouse Fan	3/6/2023	3	3	3	3	3	3	3	3	3	3	3	3	
44	3 BF Baghouse Fan	3/6/2023	3	3	3	3	3	3	3	3	3	3	3	3	
45	4 BF Baghouse Fan	3/6/2023	3	3	3	3	3	3	3	3	3	3	3	3	
46	1 BF Cooling Twr Fan	12/6/2022	5	3	3	3	3	3	3	3	3	5	5	5	
47	2 BF Cooling Twr Fan	3/7/2023	5	3	3	3	3	1	2	2	2	2	5	2	Coupling or Laminates are bad/Concrete Base is Broken
48	3 BF Cooling Twr Fan	3/7/2023	3	3	4	3	4	3	3	3	3	3	3	3	
49	4 BF Cooling Twr Fan	2/15/2023	3	3	3	3	3	3	3	3	3	3	3	5	
50	5 BF Cooling Twr Fan	3/7/2023	3	3	3	3	3	3	3	3	3	3	3	3	
51	6 BF Cooling Twr Fan	3/7/2023	3	3	3	3	3	3	3	3	3	3	3	3	
52	7 BF Cooling Twr Fan	3/7/2023	3	3	3	3	3	2	2	5	4	3	3	3	
53	8 BF Cooling Twr Fan	12/6/2022	3	3	3	3	3	3	3	3	3	5	5	5	
54	1 Closed Loop Booster Pump	12/6/2015	5	5	5	5	5	5	5	5	5	5	5	5	
55	2 Closed Loop Booster Pump		5	5	5	5	5	5	5	5	5	5	5	5	
56	E Slurry Pump - 3 Fce	8/30/2022						2	5	5	5	5	5	5	High 1X - Mud on Impellers
57	W Slurry Pump - 3 Fce	8/30/2022						2	5	5	5	5	5	5	High BPF Reading - Mud Build up on Casing
58	1 BF Clarifier	3/6/2023											3	3	
59	3 BF Clarifier - East Drive	3/3/2023											3	3	
60	3 BF Clarifier - West Drive	3/3/2023											3	3	
61	7 Clarifier - South Drive	3/7/2023											3	3	
62	7 Clarifier - North Drive	3/7/2023											3	3	