# IOWA DEPARTMENT OF NATURAL RESOURCES

## ADMINISTRATIVE CONSENT ORDER

| IN THE MATTER OF:<br><br>CLIMAX MOLYBDENUM COMPANY | ADMINISTRATIVE CONSENT ORDER<br><br>NO. 2024-AQ- 15 |
|---|---|

To: Climax Molybdenum Company
David Caskey, Environmental Manager
2598 Highway 61
Fort Madison, Iowa 52627

Climax Molybdenum Company
Registered Agent
Registered Agency Solutions, Inc.
400 East Court Avenue
Des Moines, Iowa 50209

Climax Molybdenum Company
David Caskey, Environmental Manager
P.O. Box 220
Fort Madison, Iowa 52627

Climax Molybdenum Company
Todd Weaver
Sr. Counsel – Environmental,
Freeport-McMoRan Copper & Gold, Inc.
333 N Central Avenue
Phoenix, Arizona 85004

## I. SUMMARY

This administrative consent order is entered into between the Iowa Department of Natural Resources (DNR) and Climax Molybdenum Company (Climax Molybdenum) for the purpose of resolving air quality violations. In the interest of avoiding litigation, the parties have agreed to the provisions below.

Any questions regarding this administrative consent order should be directed to:

**Relating to technical requirements:**
Lucas Tenborg
Iowa Department of Natural Resources
6200 Park Avenue
Suite 200
Des Moines, Iowa 50321
Phone: 515-443-9508

**Relating to legal requirements:**
Anne Preziosi, Attorney for the DNR
Iowa Department of Natural Resources
6200 Park Avenue
Suite 200
Des Moines, Iowa 50321
Phone: 515-238-3429

**Payment of penalty to:**
Director of the Iowa DNR
6200 Park Avenue

Suite 200
Des Moines, Iowa 50321

## II. JURISDICTION

This administrative consent order is issued pursuant to the provisions of Iowa Code sections 455B.134(9) and 455B.138(1), which authorize the director to issue any order necessary to secure compliance with or prevent a violation of Iowa Code chapter 455B, Division II (air quality), and the rules promulgated or permits issued pursuant to that part; and Iowa Code section 455B.109 and 567 Iowa Administrative Code (IAC) chapter 10, which authorize the director to assess administrative penalties.

## III. STATEMENT OF FACTS

Climax Molybdenum Company neither admits nor denies
the Statement of Facts stated herein.

1. The Climax Molybdenum facility, which is located at 2598 Highway 61 in Fort Madison, Iowa, produces molybdenum products. Processes at the facility are a source of air pollutant emissions to the outside atmosphere. Sulfur dioxide gas is generated from the processes at the facility. Climax Molybdenum then converts the sulfur dioxide ($SO_2$) to sulfuric acid through an on-site acid plant for emissions control . Unreacted $SO_2$ is released to the atmosphere. The Climax Molybdenum facility is classified as a major source of emissions and subject to Title V Operating Permit requirements. Climax Molybdenum is an indirect subsidiary of Freeport-McMoRan Inc, which is an American mining company based in Phoenix, Arizona.

2. Construction Permit No. 95-A-273-S2 was issued by DNR to Climax Molybdenum on July 23, 2008, for molybdenum roasters #1 and #2 (Emission Point (EP) ST20). This permit was issued as part of Project 08-300. Climax Molybdenum has failed to comply with Condition 6 (*Excess Emissions*) and Condition 10 (*Emission Limits*) of Construction Permit No. 95-A-273-S2 (EP ST20). The control equipment required by this construction permit is the sulfuric acid plant.

**Climax Molybdenum has failed to comply with the emission limits for $SO_2$ contained in Construction Permit No. 95-A-273-S2 (EP ST20).**

3. Construction Permit No. 95-A-273-S2 (EP ST20), Condition 10 (*Emission Limits*), establishes an emission limit of 105.0 lb/hr for $SO_2$. Stack testing conducted on October 30, 2019, resulted in 135.25 lb/hr of $SO_2$, in

violation of the permitted emission limit. This stack testing occurred using an EPA-approved method (Method 8).

**Climax Molybdenum has failed to comply with Construction Permit No. 95-A-273-S2 (EP ST20), Condition 6 , and the conditions of 567 IAC 21.8(1) regarding excess emissions.**

4. Climax Molybdenum has failed to maintain and operate the equipment and control equipment at the facility at all times in a manner consistent with good practice for minimizing emissions, as required by 567 IAC 21.8(1). This requirement also is contained in construction permits issued to the facility, including Construction Permit No. 95-A-273-S2 (EP ST20), Condition 6.

5. On September 26, 2023, Climax Molybdenum submitted information to the DNR related to the cause of the excess $SO_2$ emissions from the sulfuric acid plant from 2012 through 2022. Climax Molybdenum provided information that the increase in $SO_2$ emissions from EP ST20 was a result of degradation of converter efficiency of the sulfuric acid plant. This degradation of the converter efficiency resulted in 920 tons of $SO_2$ emissions above the calculated Projected Actual Emissions (PAE) from Project Number 08-300. The calculated difference between the PAE and the Baseline Actual Emissions (BAE) was submitted by Climax Molybdenum as part of Project Number 08-300.

6. Table A contains a list of the Climax Molybdenum excess emissions and unreported emissions per calendar year.

**Table A**

| CY | Actual Annual $SO_2$ emissions using 10/04/2011 test results (tons/yr) | Excess EP ST20 Annual $SO_2$ Emissions (ton/yr) above the calculated PAE from Project Number 08-300 | Climax Molybdenum reported Annual $SO_2$ emissions (tons/yr) | Unreported $SO_2$ emissions (tons/yr)* |
|---|---|---|---|---|
| 2010 | 122.7 | N/A | 122.7 | N/A |
| 2011 | 149.9 | N/A | 131.5 | 18.4 |
| 2012 | 206.0 | 47 | 130.5 | 75.5 |
| 2013 | 209.6 | 51 | 132.7 | 76.9 |
| 2014 | 209.0 | 50 | 132.3 | 76.7 |

| | | | | |
|---|---|---|---|---|
| 2015 | 207.8 | 49 | 131.6 | 76.2 |
| 2016 | 185.9 | 27 | 117.4 | 68.5 |
| 2017 | 198.6 | 40 | 125.4 | 73.2 |
| 2018 | 194.8 | 36 | 122.7 | 72.1 |
| 2019 | 258.4 | 99 | 173.8 | 84.6 |
| 2020 | 401.3 | 242 | 401.3 | N/A |
| 2021 | 345.5 | 187 | 345.5 | N/A |
| 2022 | 251.4 | 92 | 251.4 | N/A |
| Total | | 920 | | 622 |

*Due to calculating annual emissions without employing the October 4, 2011, $SO_2$ test results

The unpaid emission fees are stated in Attachment A, which is attached.

7. DNR Field Office 6 has received 68 excess emission reports from Climax Molybdenum since 2011. Each excess emission event is a violation per 567 IAC 21.7(4), as well as construction permits issued to the facility. Table B contains a chronology of the excess emissions events reported from 2010 through 2023.

**Table B**

| Year | Number of reported excess emission events |
|---|---|
| 2010 | 1 |
| 2011 | 5 |
| 2012 | 2 |
| 2013 | 3 |
| 2014 | 3 |
| 2015 | 1 |
| 2016 | 2 |
| 2017 | 4 |
| 2018 | 7 |
| 2019 | 14 |
| 2020 | 9 |
| 2021 | 5 |
| 2022 | 5 |

| | |
|---|---|
| 2023 | 8 |

**Climax Molybdenum has failed to comply with the requirement to report actual annual emissions in its Title V emissions inventories and to pay the required annual fee based on the total tons of actual emissions of each regulated pollutant.**

8. Climax Molybdenum has failed to comply with the provisions of 567 IAC 24.106(2) [*Emissions inventory and documentation due dates*] and 567 IAC 30.4(2) [*Payment of Title V annual emissions fee*]. Climax Molybdenum is required to report actual annual emissions in a Title V emissions inventory and to pay an annual fee based on the total tons of actual emissions of each regulated air pollutant. Climax Molybdenum has failed to meet these requirements.

- Climax Molybdenum failed to employ the tested $SO_2$ results of the October 4, 2011, stack test to report actual annual $SO_2$ emissions from 2011 through 2019. Reporting $SO_2$ emissions employing the incorrect emissions factor from the August 19, 2010, testing led to a total of 622 tons of unreported $SO_2$ emissions from 2011 through 2019.
- Climax Molybdenum failed to accurately report and pay fees on 622 tons of $SO_2$ emissions from 2011 through 2019.

**Chronology**

9. On August 18, 2010, a stack test was conducted for $SO_2$ on EP ST20. Construction Permit 95-A-273-S2 (EP ST20) contains a 105 lb/hr $SO_2$ emission limit. The $SO_2$ test results during this testing were 27.95 lbs/hr and 1.9 lbs/ton. DNR issued a letter stating that the facility was in compliance on October 6, 2010.

10. On October 4, 2011, stack testing was conducted for $SO_2$ on EP ST20in response to an EPA March 11, 2011, Clean Air Act section 114 information request. The $SO_2$ test results during this testing were 47.04 lbs/hr and 3.0 lb/ton. DNR received the 2011 test results on November 23, 2021, as part of Climax Molybdenum's response to a September 22, 2021, Letter of Inquiry from DNR to Climax Molybdenum. DNR issued a Notice of Violation (NOV) on February 23, 2022, for failure to accurately report annual $SO_2$ emissions from 2011 through 2019.

11. On October 13, 2019, stack testing was conducted for $SO_2$ on EP ST20. The $SO_2$ test results during this testing were 135.25 lbs/hr and 8.1 lbs/ton. DNR issued a NOV on December 20, 2019, for violations of the permitted $SO_2$ limits.

12. On January 21, 2020, stack testing was conducted for $SO_2$ on EP ST20. The $SO_2$ test results during this testing were 96.6 lbs/hr and 6.8 lbs/ton. DNR issued a Letter of Noncompliance on February 25, 2020, for testing below the maximum continuous output of the equipment. Climax Molybdenum reported the facility was operating at 340 tons/day when the capacity of the source is 409.9 ton/day.

13. On July 2, 2020, stack testing was conducted for $SO_2$ on EP ST20. The $SO_2$ test results during this testing were 94.41 lbs/hr and 6.7 lbs/ton. DNR issued a Letter of Noncompliance on September 15, 2020, for testing below the maximum continuous output of the equipment. Climax Molybdenum reported the source was operating at 337 ton/day when the capacity of the source is 409.9 ton/day.

14. On December 16, 2020, Climax Molybdenum submitted a pre-application request through Iowa EASY Air (submittal ID 50149). This submittal was assigned Project Number 20-360. On December 20, 2020, a video conference call was held between representatives of Climax Molybdenum, Trinity Consultants, and DNR Construction Permit staff to discuss upcoming projects at the Fort Madison facility. The sulfuric acid plant at Climax Molybdenum was built in 1976. Climax Molybdenum stated it was planning to make the following changes:

- Replacing the acid plant converter due to its age;
- External Heat Exchangers 2 and 3 would be replaced and converted to internal converters;
- The $SO_2$ cooler would be replaced; and
- Associated ductwork would also be replaced.

Climax Molybdenum stated the $SO_2$ stack emissions were about 230 ppm and the new equipment could reduce the $SO_2$ concentration at the stack to 60 ppm. The capacity of the sulfuric acid plant would be increased as part of the project partly due to the equipment being so old that it could not be replaced with the same sized equipment. Overall, the emissions were expected to go down because the plant would be more efficient after the changes.

Climax Molybdenum also stated it was conducting testing in April or May of 2021, and it might decide to change additional components based on that testing. Climax Molybdenum and DNR did not discuss the stack tests that had already occurred in October 2019, January 2020, and July 2020 during the December 2020 meeting. On May 2, 2020, Climax Molybdenum informed the DNR Air Quality Bureau Construction Permit Section the pre-application project (Project

Number 20-360) could be closed out as Climax Molybdenum was going a different direction.

15. As stated above, on September 22, 2021, DNR issued a Letter of Inquiry, requesting additional information related to the increase in $SO_2$ emissions from EP ST20.

16. On November 23, 2021, Climax Molybdenum provided to DNR information related to the September 22, 2021, Letter of Noncompliance. This information included a stack test report from October 4, 2011, for $SO_2$ on EP ST20.

17. On June 15, 2021, stack testing was conducted on EP ST20 for $SO_2$. The stack test results for $SO_2$ were 74.7 lb/hr and 4.7 lb/ton.

18. On February 23, 2022, DNR issued a NOV to Climax Molybdenum for failure to report annual $SO_2$ emissions using the results of the October 4, 2011, stack test results to calculate emissions.

19. On August 10, 2022, RATA testing was completed on EP ST20 for an $SO_2$ analyzer system. The results for $SO_2$ were 36.3 lb/hr and 2.3 lb/ton. Climax has stated that the facility has entered into a contract to install a permanent CEMS and has, at this time, installed a temporary CEMS unit.

20. From April 2022 through December 2023, DNR and Climax Molybdenum engaged in several meetings and information sharing exchanges to determine the cause of the $SO_2$ emission increases on EP ST20.

21. On October 31, 2023, DNR issued a NOV for failure to maintain equipment in response to Climax Molybdenum providing additional information. In that NOV, DNR agreed that the $SO_2$ increases above the PAE were related to a degradation of the sulfuric acid plant converter efficiency. As a result, DNR rescinded the PSD claims in the February 23, 2022, NOV. In addition, several excess emission events have been reported at the facility over the years that these $SO_2$ issues were ongoing.

22. On February 1, 2024, Climax Molybdenum submitted a maintenance plan. DNR and Climax Molybdenum have had meetings since the submission, and the maintenance plan which has been agreed upon between Climax Molybdenum and DNR, is attached as Attachment B.

**Past Enforcement History**

23. Climax Molybdenum has a history of air quality violations.

- A NOV was issued on February 17, 1989, for failure to orally report excess emissions.
- A NOV was issued on July 11, 1996, for failure to report hazardous conditions relating to excess emissions.
- An Administrative Consent Order was issued on October 21, 1999, which included a $5,000 penalty.
- A NOV was issued on September 17, 2002, for constructing a storage tank without a permit.
- A NOV was issued on April 12, 2005, for a recordkeeping deviation noted in the facility's Title V Annual Compliance Certification.
- A NOV was issued on March 23, 2011, for construction without a permit.

## IV. CONCLUSIONS OF LAW

Climax Molybdenum Company neither admits nor denies the Conclusions of Law stated herein.

1. Iowa Code section 455B.133 provides that the Environmental Protection Commission (Commission) shall establish rules governing the quality of air and emission standards. The Commission has adopted 567 IAC chapters 20-35 relating to air quality.

2. Iowa Code section 455B.134(3) provides that the director of DNR shall grant, modify, suspend, terminate, revoke, reissue or deny permits for the construction or operation of new, modified, or existing air contaminant sources and for related control equipment.

3. 567 IAC 22.1(1) states unless exempted in subrule 22.1(2) or to meet the parameters established in paragraph *"c"* of this subrule, no person shall construct, install, reconstruct or alter any equipment, control equipment without first obtaining an air quality construction permit.

4. 567 IAC 22.3(3) states that an air quality construction permit may be issued subject to conditions which shall be specified in writing, and may include, but are not limited to, emission limits, operating conditions, fuel specifications, compliance testing, continuous monitoring, and excess emission reporting. As stated above, Climax Molybdenum failed to comply with the provisions of Construction Permit No. 95-A-273-S2 (EP ST20).

5. 567 IAC 21.8(1) requires that the owner or operator of any equipment or control equipment shall maintain and operate the equipment or control equipment at all times in a manner consistent with good practice for minimizing emissions. As stated above, Climax Molybdenum has failed to conduct ongoing

maintenance and repairs to equipment and control equipment, as required by 567 IAC 21.8(1).

6. 567 IAC 21.10(7)(a) requires that results of stack tests shall be submitted to DNR within six weeks of completion of the testing. As stated above, Climax Molybdenum has failed to comply with this rule.

7. 567 IAC 24.106(2) and 567 IAC 30.4(2) require Climax Molybdenum to report annual emissions in a Title V emissions inventory and to pay an annual fee based on the total tons of actual emissions of each regulated air pollutant. As stated above, Climax Molybdenum failed to meet these requirements.

## V. ORDER

THEREFORE, DNR orders and Climax Molybdenum agrees to the following:

1. Climax Molybdenum shall comply with the maintenance plan attached as Attachment B. Any proposed changes to Attachment B shall be submitted by Climax Molybdenum in writing to DNR for DNR approval.

2. Within 180 days of the date this Administrative Consent Order is signed by the director, Climax Molybdenum shall install, certify and operate a permanent $SO_2$ CEMs monitoring system, $CO_2$ or $O_2$ monitoring system, and flow meter on the EP ST20 stack, that is capable of measuring $SO_2$ on a mass basis (lb/hr or lb/ton).

3. In the future, Climax Molybdenum shall comply with the provisions of its construction permits, and within 30 days of the date this administrative consent order is signed by the director, Climax Molybdenum shall submit to DNR a construction permit application to amend the provisions of Construction Permit No. 95-A-273-S2 (EP ST20) to incorporate the requirements of this ordering clause, paragraphs 1 and 2.

4. In the future, Climax Molybdenum shall comply with the provisions of 567 IAC 21.8(1), which requires the maintenance and operation of equipment and control equipment at all times in a manner consistent with good practice for minimizing emissions, and which requires that the facility remedy any cause of excess emissions in an expeditious manner.

5. Within 30 days of the date this administrative consent order is signed by the director, Climax Molybdenum shall electronically submit in SLEIS the corrected Title V emission inventories for years 2011 through 2019 to include the 622 tons of unreported $SO_2$ emissions; and shall pay Title V emission fees for the

622 tons of unreported $SO_2$ emissions. The fees shall be paid using the emission rate applicable for each year that has unreported and unpaid emissions. A table of the unreported $SO_2$ emissions and unpaid fees is included in Attachment B.

6. Within 60 days of the date this order is signed by the director, Climax Molybdenum shall pay a penalty of $10,000.00, as set forth in Section VI, below.

## VI. PENALTY

Pursuant to the provisions of Iowa Code section 455B.109 and 567 IAC chapter 10, which authorize the director to assess administrative penalties, a penalty of $10,000.00 is assessed by this administrative consent order. The penalty must be paid within 60 days of the date this order is signed by the director. The administrative penalty is determined as follows:

Iowa Code section 455B.146 authorizes the assessment of civil penalties of up to $10,000.00 per day of violation for the air quality violations involved in this matter. More serious criminal sanctions are also available pursuant to Iowa Code section 455B.146A.

Iowa Code section 455B.109 authorizes the Commission to establish by rule a schedule of civil penalties up to $10,000.00 that may be assessed administratively. The Commission has adopted this schedule with procedures and criteria for assessment of penalties through 567 IAC chapter 10. Pursuant to this rule, DNR has determined that the most effective and efficient means of addressing the above-cited violations is the issuance of an administrative consent order with a penalty. The administrative penalty assessed by this order is determined as follows:

Economic Benefit – 567 IAC chapter 10 requires that DNR consider the costs saved or likely to be saved by noncompliance. 567 IAC 10.30(1) states that where the violator received an economic benefit through the violation or by not taking timely compliance or corrective measures, DNR shall take enforcement action which includes penalties to offset the economic benefit. 567 IAC 10.30(1) further states that reasonable estimates of economic benefit should be made where clear data are not available.

Climax Molybdenum has gained economic benefit by failing to report emissions properly. Climax Molybdenum under reported $SO_2$ emissions from 2011 through 2019 due to failure to apply the correct emission factor. Climax Molybdenum gained economic benefit by, at a minimum, delaying paying for the unreported $SO_2$ emissions for several years. Economic benefit was also gained by not spending additional funds to properly maintain equipment and facilities based on the increased number of excess emission events. Climax Molybdenum reported increased emissions from EP ST20 have been attributed to degradation of the sulfuric acid plant converter efficiency.

For the reasons stated above, $4,000.00 should be assessed for this factor.

Gravity of the Violation –Substantial civil penalties are authorized by statute for the type of violations cited in this Administrative Consent Order. Despite the high penalties authorized, DNR has decided to handle the violations administratively at this time, as the most equitable and efficient means of resolving the matter.

Climax Molybdenum has released large amounts of $SO_2$ into the atmosphere. Short-term exposures to $SO_2$ can harm the human respiratory system and make breathing difficult. People with asthma, particularly children, are sensitive to these effects of $SO_2$. $SO_2$ emissions that lead to high concentrations of $SO_2$ in the air generally also lead to the formation of other sulfur oxides ($SO_x$). $SO_x$ can react with other compounds in the atmosphere to form small particles. These particles contribute to particulate matter (PM) pollution. Small particles may penetrate deeply into the lungs and in sufficient quantity can contribute to health problems. At high concentrations, gaseous SOx can harm trees and plants by damaging foliage and decreasing growth. $SO_2$ and other sulfur oxides can contribute to acid rain, which can harm sensitive ecosystems. $SO_2$ and other sulfur oxides can react with other compounds in the atmosphere to form fine particles that reduce visibility (haze) in parts of the United States. The harmful effects of $SO_2$ add to the gravity of Climax Molybdenum's $SO_2$ emissions.

Climax Molybdenum failed to apply stack test results to reflect its actual emissions when reporting emissions from 2011 through 2019. This resulted in a total of 622 tons of unreported $SO_2$ emissions. It is important that Title V facilities submit accurate emission inventories. DNR must calculate the statewide Title V emissions and provide this information to the public by April 30 of each year. Additionally, the DNR relies on emission inventories to set the Title V fees. These fees are required to administer the air programs required under the Clean Air Act. Emission inventories are one of the basic, minimum reporting requirements under Iowa's Title V Operating Permit program. The inventories allow industry, citizens, and regulatory agencies to be informed about actual emissions. Climax Molybdenum's actions threaten the integrity of the DNR's air quality program.

For the reasons stated above, $3,000.00 should be assessed for this factor.

Culpability – Climax Molybdenum conducted $SO_2$ stack testing on October 4, 2011, using an EPA-approved method (Method 8). Climax Molybdenum failed to use known $SO_2$ emission results from the October 4, 2011, $SO_2$ test when calculating and reporting actual $SO_2$ emissions to the DNR from October 4, 2011, until October 29, 2019. Continued excess emissions events have been reported as recently as August 2023 caused by issues discovered in the sulfuric acid plant. Climax Molybdenum failed to timely address ongoing excess emissions. All of the excess $SO_2$ emissions referenced in this order are evidence that Climax Molybdenum has failed to properly maintain equipment or control equipment at the facility to minimize emissions.

For the reasons stated above, $3,000.00 should be assessed for this factor.

## VII. WAIVER OF APPEAL RIGHTS

This administrative consent order is entered into knowingly and with the consent of Climax Molybdenum. For that reason, Climax Molybdenum waives its right to appeal this order or any part thereof.

## VIII. NONCOMPLIANCE

Failure to comply with this administrative consent order, including failure to timely pay any penalty, may result in the imposition of further administrative penalties or referral to the attorney general to obtain injunctive relief and civil penalties pursuant to Iowa Code section 455B.146. Compliance with Section "V. Order" of this administrative consent order constitutes full satisfaction of all requirements pertaining to the specific violations described in Section "IV. Conclusions of Law" of this administrative consent order.

Kayla Lyon — Digitally signed by Kayla Lyon
Date: 2024.08.23 16:30:41 -05'00'

Kayla Lyon, Director
Iowa Department of Natural Resources

Douglas Currault — Digitally signed by Douglas Currault
Date: 2024.08.15 09:18:17 -07'00'

Name: Douglas N. Currault II, Executive Vice President
Climax Molybdenum Company

Dated this ______ day of

_______________, 2024.

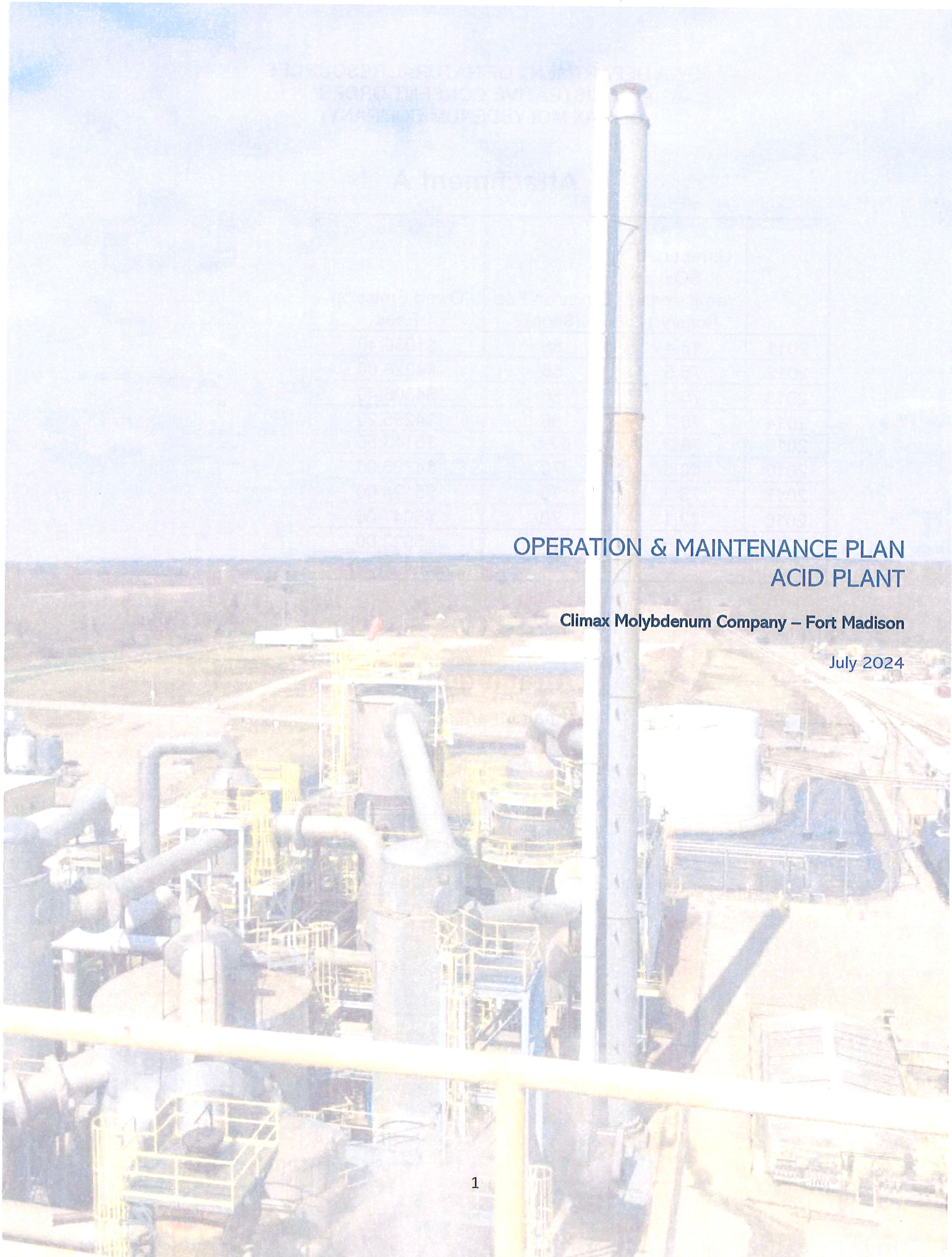
DNR Air Quality Bureau; Field Office 6

# Attachment A

| | Unreported $SO_2$ emissions (tons/yr) | Emission Fee ($/ton) | Owed Emission Fees |
|---|---|---|---|
| 2011 | 18.4 | 56 | $1030.40 |
| 2012 | 75.5 | 56 | $4228.00 |
| 2013 | 76.9 | 56 | $4306.40 |
| 2014 | 76.7 | 56 | $4295.20 |
| 2015 | 76.2 | 67.5 | $5143.50 |
| 2016 | 68.5 | 70 | $4795.00 |
| 2017 | 73.2 | 70 | $5124.00 |
| 2018 | 72.1 | 70 | $5047.00 |
| 2019 | 84.6 | 70 | $5922.00 |
| Total | | | $39891.50 |

# Attachment B

**(maintenance plan)**



# OPERATION & MAINTENANCE PLAN
# ACID PLANT

**Climax Molybdenum Company – Fort Madison**

July 2024

Table of Contents

# 1. Overview

This Maintenance Plan sets forth the practices and procedures to be used by Climax Molybdenum Company (CMC) personnel to ensure proper maintenance of the Acid Plant equipment and systems used at the Fort Madison facility. The Plan is based on the manufacturer's or engineer's recommendations, CMC operating experience, and the maintenance plan requirements under 567 IAC 24.2(2).

## 2. Equipment Description

CMC operates a double contact/double absorption sulfuric acid plant (Acid Plant) as a control device for sulfur dioxide ($SO_2$) emissions from its two twelve-hearth molybdenum roasters (Roasters). During operations, the process off-gases from the Roasters are routed to the Acid Plant to convert $SO_2$ gas into product sulfuric acid ($H_2SO_4$). The gas stream is cooled and cleaned using a Dynawave scrubber, scrubber cooler, wet electrostatic precipitators, and condenser coolers prior to entering the Acid Plant. The Drying Tower removes moisture from process gas before pulling through the Main Gas Blower and into the Sulfur Furnace which provides supplemental $SO_2$ into the process gas stream. The gas then enters the Waste Heat Boiler and Preheater for appropriate temperature adjustment before entering the converter. The gas stream passes through the converter, consisting of four converter beds, which convert the $SO_2$ in the gas to sulfur trioxide ($SO_3$). The converted gas then flows through absorption tower circuits where the $SO_3$ is converted to 93% sulfuric acid. Any residual sulfur dioxide remaining in the gas stream, that has not been converted, is exhausted from the Acid Plant through ST20 into the atmosphere.

Primary components of the Acid Plant are identified in Table 2.1 below.

Table 2.1 Primary Acid Plant Components and Process Description

| Component | Process Description |
|---|---|
| Drying Tower | Removes moisture from process gas and controls final acid concentration |
| Main Gas Blowers | Pulls $SO_2$ process gas through Drying Tower and into Heat Exchanger/Converter system |
| Sulfur Furnace | Provides supplemental $SO_2$ into gas stream for proper conversion of process gas |
| Waste Heat Boiler | Provides temperature control for proper $SO_2$ conversion |
| Preheater | Process gas temperature control for $SO_2$ conversion |
| Converter | Conversion of $SO_2$ to $SO_3$ |
| External Heat Exchangers | Process gas temperature control for $SO_2$ conversion |
| $SO_3$ Cooler | Cools $SO_3$ prior to H2SO4 conversion |
| Absorption Towers | Conversion of $SO_3$ to $H_2SO_4$ |

# 3. Preventative Maintenance Schedule *[567 IAC 24.2(2)(a)]*

## 3.1 Persons Responsible for Inspecting, Maintaining, and Repairing Acid Plant Equipment

To ensure the Acid Plant operates and performs as designed, the following CMC Departments are responsible for inspecting, maintaining, and repairing Acid Plant equipment as specified below:

- Operations is responsible for operating the Acid Plant, performing identified inspections, and notifying appropriate parties during upset conditions or malfunctions.
- Maintenance (Mechanics, Engineers, Instrumentation Technicians, Reliability Centered Maintenance [RCM] Technicians and Contractors) is responsible for assisting with troubleshooting and/or making appropriate repairs during upset conditions or malfunctions.
- Technical Service is responsible for managing converter catalyst sampling and providing Acid Plant process support.

Responsibilities for specific tasks are identified in Table 3-2.

## 3.2 Preventative Maintenance

Acid Plant preventative maintenance frequencies, tasks, and responsibilities are identified in Table 3-2 below.

Table 3-2. CMC – Acid Plant – Preventive Maintenance

| Equipment | Frequency | Task Performed | Responsible Department |
|---|---|---|---|
| Acid Plant Ductwork | Annual | Inspect and repair as required | Maintenance |
| | Annual | Reliability Centered Maintenance Thickness Testing | Maintenance |
| Drying Tower Candles | Annual | Replace as required | Maintenance |
| [1]Converter - A Bed Catalyst | Every 1 – 2 years | Screen and replace mechanically degraded catalyst | Technical Services and Maintenance |
| [1]Converter – B-Bed Catalyst | Every 1 – 3 years | Screen and replace mechanically degraded catalyst | Technical Services and Maintenance |
| [1]Converter – C-Bed Catalyst | Every 2 – 4 years | Screen and replace mechanically degraded catalyst | Technical Services and Maintenance |
| [1]Converter – D-Bed Catalyst | Every 4 – 6 years | Screen and replace mechanically degraded catalyst | Technical Services and Maintenance |
| [2]Converter Beds (A – D) Catalyst | Annual | Obtain catalyst sample from each bed and analyze catalyst activity | Technical Services |

[1] Catalyst in the converter beds is screened per Preventative Maintenance schedule based on manufacturer recommendations & Acid Plant production. Any mechanically degraded catalyst removed during the screening process is replaced with new.
[2] Catalyst from all four beds (A – D) is sampled and analyzed for catalyst activity during Annual Turnaround. Based on the activity report, a replacement schedule is developed. If activity is less than 60% for a particular converter bed, the catalyst will be replaced during the next Turn-Around event.[See Note 1 in "IDNR Comments and Discussion with Climax – Draft Maintenance Plan."]

| Equipment | Frequency | Task Performed | Responsible Department |
|---|---|---|---|
| Converter Internal Structure Inspection | Annual | Inspect and repair as required | Maintenance |
| Heat Exchanger Inspections | Annual | Inspect and repair as required | Maintenance |
| Spare Main Gas Blower - Inlet Butterfly Valve | Weekly | Actuate inlet butterfly valve | Operations |
| Main Gas Blowers | Annual | Inspect and repair as required | Maintenance |
| | Weekly | External Mechanical Inspection | Maintenance |
| | Monthly | RCM Vibration Check | Maintenance |
| Acid Plant Emergency Blower | Annual | Inspect and repair as required | Maintenance |
| | Quarterly | Blade Check | Maintenance |
| | Monthly | RCM Vibration Checks, Mechanical Lube Route, | Maintenance |
| Rotating Process Equipment | Monthly | Lube oil checks | Maintenance |
| Absorption Tower Inspections (Drying Tower, Absorption Tower #1, Absorption Tower #2) | Annual | Inspect, clean, and repair as required; Acid distribution check | Maintenance and Operations |
| Waste Heat Boiler Inspections | Annual | Inspect and repair as required | Maintenance |
| Sulfur Furnace and Sulfur Tank Inspections | Annual | Inspect, clean, and repair as required | Maintenance |
| Acid Strength Controller | Monthly | Checked/Calibrated as needed | Maintenance |
| | 3x/Shift | Manual strength check | Operations |
| Main Stack | Weekly | Flush and drain | Operations |
| | Annual | Clean | Operations |
| Acid Coolers | Annual | Internal Inspection, clean, and Eddy current check | Maintenance |
| Cooling Tower | Annual | Clean and inspect | Maintenance |
| Acid Plant Ductwork | Quarterly | Ductwork inspections utilizing UAV flights. Based on review of quarterly UAV images, CMC will establish a plan for repair for any identified compromised insulation. | Maintenance |

Table 3-3. CMC – Acid Plant – Daily Operational Inspections

| Inspection Item | Task Performed |
|---|---|
| General Acid Plant Operational Inspection | Workplace Examinations (Visual Inspections) |

### 3.3. Critical Equipment Spare Parts List

Table 3-4. CMC – Critical Equipment Spare Parts List

Table 3-4 lists the critical spare parts which will be maintained in inventory for quick replacement to ensure continuity of operation of the Acid Plant.

| Description | Identification |
|---|---|
| Acid Plant $SO_3$ Cooler Fan | 112433007W |
| Acid Plant MCC Unit 1 | 112499024D |
| Acid Plant MCC Unit 2 | 112499025D |
| Acid Plant MCC Unit 3 | 112499026D |
| Acid Plant MCC Unit 4 | 112499027D |
| Main Gas Blower MCC | 112499003D |
| Main Gas Blower – North | 112433002W |
| Main Gas Blower – South | 112433001W |
| Emergency Gas Blower | 112451006W |
| West Sulfur Feed Pump | 112461031W |
| East Sulfur Feed Pump | 112461030W |
| Acid Plant Combustion Air Forge Blower | 112433003W |

Spare parts are purchased and stored by the field service warehouse personnel based on historic repair trends and the expectation of a part failure based on manufacturer recommended service life and historic trends. The spare parts inventory is maintained through a computerized system based on availability of spare parts, cost of spare parts, and time to delivery of the spare parts. Parts in need of repair are repaired either on-site or sent to a repair facility. If the part is worn beyond repair, a new part is ordered.

# 4. Operating Variables Monitored to Detect Malfunctions or Failures *[567 IAC 24.2(2)(b)]*

CMC Operations monitors certain variables continuously throughout the day to detect leading indicators of inefficient Acid Plant operation or malfunctions so that it can take corrective action for purposes of ensuring the Acid Plant is running optimally and in compliance with permitted emission limits.

The timing for catalyst replacement in each bed depends upon the catalyst activity. CMC conducts an annual catalyst activity analysis in which catalyst from each bed of the converter is sampled and sent to a third party for analysis. Based upon the catalyst activity report, CMC develops a replacement schedule for each of the beds to maintain a catalyst activity of 60%.

The following sections identify the variables monitored (along with a description why the variable is monitored), the normal operating range of these variables, and a description of the monitoring methods and surveillance procedures.

## 4.1 Variables Monitored

### *4.1.1 $SO_2$ – Concentration and Pounds per Hour*

The $SO_2$ concentration (ppm) and pounds of $SO_2$ per hour are two operating parameters selected as representative and reliable indicators of Acid Plant and converter operating performance. Elevated concentrations and pounds per hour could be indicative of poor $SO_2$ conversion in the Acid Plant converter. $SO_2$ concentrations above levels indicated in Table 4.2 below indicate a need for further investigation and troubleshooting to ensure the Acid Plant is operating efficiently while maintaining compliance.

### *4.1.2 $SO_2$ – Pounds per Ton of Sulfuric Acid Produced*

While natural variation of $SO_2$ concentration and pounds per hour is expected, another parameter indicative of catalyst and converter health is pounds of $SO_2$ per ton of Sulfuric Acid produced. Measurements outside of normal ranges in Table 4.2 below indicate a need for further investigation and troubleshooting to ensure the Acid Plant is operating efficiently.

### *4.1.3 Absorption Tower #2 – Inlet Acid Temperature and Acid Strength*

Absorption Tower #2 inlet acid temperature and acid strength are also monitored as a performance indicator of overall Acid Plant performance. Measurements outside of normal ranges in Table 4.2 below indicate a need for further investigation and troubleshooting to ensure Acid Plant is operating efficiently.

### *4.1.4 Acid Plant Ductwork – Visible Emissions*

Acid Plant ductwork is visually inspected daily for evidence of visual emissions which would indicate compromised ductwork. Variables outside of normal ranges in Table 4.2 below would result in further investigation and troubleshooting to ensure Acid Plant is operating efficiently while maintaining compliance.

## 4.2 Normal Operating Ranges

The normal operating range for each of the variables monitored is identified in Table 4.2 below.

Table 4.2 Normal Operating Ranges

| Parameter | Normal Operating Range | Averaging Times |
|---|---|---|
| Sulfur Dioxide ($SO_2$) | 50 - 250ppm | 1-Second Average |
| | 10 – 75 Pounds of $SO_2$ per Hour | 1-Hour Average |
| | 1 – 3 Pounds of $SO_2$ per Ton of $H_2SO_4$ Produced | 24-Hour Average |
| Absorption Tower #2 Inlet Acid Temperature | 165°F -195°F | 1-Hour Average |
| Absorption Tower #2 Acid Strength | 98.2% - 98.7% | 1-Hour Average |
| Visible Emissions | None | Instantaneous |

## 4.3 Monitoring Methods and Surveillance Procedures

The Absorption Tower #2 acid inlet temperature and strength are measured by a thermocouple and strength controller, respectively. Sulfur dioxide concentration is measured by a Continuous Emission Monitoring System (CEMS). Sulfur dioxide pounds per hour is calculated utilizing concentration data and process gas flow data. Sulfur dioxide pounds per ton of Sulfuric Acid produced is calculated from data obtained from CEMS unit as well as an acid production flow meter and totalizer. Sulfur dioxide and Absorption Tower parameters are averaged for the specified time-block listed in Table 4.2 such that there are 24 1-hour average periods each day and one 24-hour period constituting a calendar day.

Data from these pieces of equipment is transferred to a distributive control system (DCS) which processes and manages the data. The DCS includes; Control Processors, a data storage system, and a control panel. The transmitter collects data, amplifies the signal, and transmits it to the DCS I/O system. The DCS is a specialized computer system designed to run algorithms to automatically control or adjust processes that affect operating parameters through a controller based on signals received from the transmitter. The DCS also transmits these signals to the data storage system for recording purposes. Operators can view the data in a numeric or a graphical manner in real time mode. The operators can also manually adjust processes as warranted by the observed data.

## 5. Contingency Plan [567 IAC 24.2(2)(c)]

If an upset, malfunction, or other potential problem with the Acid Plant is identified (via DCS alarm or otherwise) or parameters outside of ranges identified in Table 4.2 occur, operators shall initiate the steps as outlined below. Section 5.1 identifies initial steps personnel may take in response for each parameter. However, because there are numerous reasons a parameter may be out of range, a more extensive investigation may be required. The general steps of these investigations are outlined in Section 5.2.

### 5.1. Action Levels and Response

#### 5.1.1 *$SO_2$ – Concentration and Pounds per Hour*

If the $SO_2$ concentration or pounds per hour are not within the Normal Operating Range listed in Table 4.2, CMC will verify that the CEMS is properly calibrated by reviewing the daily calibration information. If the calibration is not verified, then recalibration/troubleshooting procedures will be implemented to ensure the CEMS is operating properly. If the CEMS has been determined to be properly calibrated, the next step in the process is to observe the Converter Bed inlet temperatures (for Beds A, B & D) to look for any changes from the previous reading. The Bed temperatures can be adjusted by adjusting steam and flow settings, as required. If these steps do not identify and remedy the issue, then additional progressive investigation/corrective actions as set forth below will be followed.

#### 5.1.2 *Absorption Tower #2 – Inlet Acid Temperature*

If the Acid temperature is not within the Normal Operating Range listed in Table 4.2, CMC will verify that the thermocouples are reading correctly by reviewing the temperature history to determine the consistency of the readings. If it is determined that a thermocouple is reading incorrectly, then it will be replaced. If it is determined that the thermocouple is reading correctly, CMC will verify that the bypass valves/actuators for the Acid Coolers are reacting properly based upon the signal received from the thermocouple. If any are found to not be functioning properly, then the Acid Cooler system will be placed in manual control until the valve/actuator can be replaced. If these steps do not identify and remedy the issue, then additional progressive investigation/corrective actions as set forth below will be followed.

#### 5.1.3 *Absorption Tower #2 – Acid Strength*

If the Acid strength is not within the Normal Operating Range listed in Table 4.2, CMC will verify the calibration of the Acid Strength Controller. If the Controller is out of calibration, then it will be recalibrated. If the calibration has been verified to be correct, CMC will verify that the Controller is sending the appropriate open/close signal to the Acid Flow Valve and that the valve is actuating appropriately. If the Controller is not working properly, the system will be placed into manual operation and the flow valve will be manually adjusted, based upon hourly acid strength results obtained by titration, while the Controller is being replaced. If the open/close signal is not being sent to the flow valve actuator, then Electronics and Instrumentation (E&I) personnel will troubleshoot the issue and repair as required. If the valve actuator is not working properly, then the valve will be replaced. If these steps do not identify and remedy the issue, then additional progressive investigation/corrective actions as set forth below will be followed.

#### 5.1.4 *Acid Plant Ductwork – Visible Emissions*

If visible emissions are observed, the first step in the Investigation/Corrective Action Process is to attempt to determine the exact location, size, and severity of the leak. Depending upon leak location, this may require installing scaffolding and removal of insulation. Not all leaks are identical in nature, therefore the extensiveness of the repairs required to fix the leaks differ as well. These repairs could be as simple as welding a patch over a small hole while the Roasters & Acid Plant are still in operation, to more extensive repairs requiring removal of feed from the Roasters and shutting down the Acid Plant.

### 5.2. General Procedures

#### 5.2.1. *Investigation*

Operators will immediately investigate the nature and extent of the potential problem. Some problems may be of an emergency nature and require immediate corrective action by operations or maintenance staff to minimize amount and/or duration of emissions, ensure employee and surrounding community safety, or prevent damage to critical equipment. Removing feed from the Roasters and shutting down the Acid Plant is a form of corrective action, but not the only corrective action. Other problems may be more minimal in nature and less critical to the performance of the Acid Plant and may allow for troubleshooting and problem diagnosis by the operator during continued operations. Appropriate next steps are based on the results of the operator's investigation.

#### 5.2.2. *Troubleshooting, Adjustments, and Problem Diagnosis*

If warranted by the operator's investigation, the operator should attempt to confirm or eliminate possible causes of the problem by troubleshooting. As part of this effort, the operator may try to concurrently resolve the problem by adjusting processes. While such adjustments may resolve the immediate problem, further diagnosis may be warranted to identify and address underlying causal factors. For such situations, or where the operator is unable to identify and address the suspected cause, problem diagnosis may require assistance from other departments (maintenance, electrical, etc.).

#### 5.2.3. *Diagnostic Inspection*

In the event the operator is unable to promptly identify and resolve the source of the problem, the operator shall contact appropriate personnel (e.g., maintenance staff) and request a diagnostic inspection. A work order shall be generated for the diagnostic inspection, including any recommended repairs, replacements, or other corrective action based on the results of the inspection.

### 5.2.4. *Corrective Action and Preventive Measures*

Based on the diagnostic inspection and associated recommendations, appropriate corrective action and/or preventive measures shall be identified and implemented to include any or all the following activities:

1. Conduct repair or perform operational adjustments while operating
2. Remove feed from the Roasters
3. Shut down the Acid Plant

The timing of such action (e.g., immediate, during preventive maintenance intervals, or scheduled plant outages) shall be determined considering personnel safety, environmental impacts, risk of potential damage to equipment, the performance of the Acid Plant, and the ability to remain in compliance with applicable emission limitations or standards. Any corrective action or preventive measure taken shall be documented and maintained in the FMMI work order system.