Malfunction Abatement Plans (MAP)

Kraft Mill

Utilities

Starch Unloading

KRAFT MILL

Malfunction Abatement Plan

Verso Corporation

Verso Escanaba LLC
Escanaba, Michigan

Updated March 2020

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1. INTRODUCTION

The purpose of this Malfunction Abatement Plan (MAP) is to prevent, detect, and correct malfunctions or equipment failures resulting in emissions exceeding any applicable emission limit in accordance with Rule 336.1911. The original MAP was approved by the Michigan Department of Environment, Great Lakes, and Energy (EGLE) in the 1990's, see file 8.17.1 for further details. The MAP identifies how Verso Escanaba LLC (VE) will minimize pollutant emissions during periods of startup, shutdown, and malfunction. This document provides a framework for preventing pollutant emissions through good operating practices while also identifying quick corrective actions when required. In many cases the required corrective action will depend on the type of incident that has occurred. For this reason corrective actions are not necessarily intended to be implemented in the order they are listed. This document will be updated periodically to incorporate any corrective actions that are not included in the plan at this time. Appendix A contains a list of critical spare parts that are maintained in inventory at this facility.

It should be noted that several rules have been implemented to address these same issues since the time the original MAP was prepared. Specifically, 40 CFR 63 Subpart S (MACT I) and Subpart MM (MACT II) address startup, shutdown, and malfunction (SSM) procedures for the low volume high concentration (LVHC) non condensable gas (NCG) system, the high volume low concentration (HVLC) system, the pulping condensate collection and treatment system, the bleach plant, the recovery furnace, the smelt dissolving tank, and the lime kiln. Please refer to the MACT I and MACT II SSM Plans for specific details around these systems. In addition, 40 CFR 64 Continuous Assurance Monitoring (CAM), addresses how pollution control equipment is continuously monitored to minimize air emissions on several sources. Please see the CAM Plan for more details.

2. WOODYARD

2.1 Introduction

Debarking and chipping occurs in the woodyard. After debarked wood is processed in the chippers it is pneumatically transferred to surge bins. Two cyclones are used to control particulate emission from these surge bins.

2.2 Pollutant Emission Control

Two surge bin cyclones (#1 and #2 Chipper Cyclones) are used to control particulate emissions in the woodyard.

2.3 Preventive Maintenance

1. The cyclones are visually inspected weekly by operations to ensure proper operation and pollution control, repairs are made as necessary.

2. The cyclones are inspected regularly by maintenance and repairs are made as necessary. See the Title V Inspection and Maintenance (I&M) Plan for more details.

2.4 Monitored Operating Variables

The cyclones are visually inspected weekly to ensure proper operation and pollution control.

2.5 Corrective Actions for Startup, Shutdown or Malfunction Abatement

1. Cyclone pluggage

    - Stop processing chips through plugged cyclone and, if necessary, place the alternate wood process line in operation
    - Clean and, if necessary, repair cyclone

2. Hole in cyclone

    - Stop processing chips through damaged cyclone and, if necessary, place the alternate wood process line in operation
    - Repair cyclone

3. CHIP THICKNESS SCREENING

3.1 Introduction

All chips in the screening room pass over one of four thickness screens. Each of these four chip thickness screens has its own cyclone and fan. These cyclones are an integral part of an air density separator (ADS) system that is designed to protect chip slicers from receiving any metal objects that could damage the slicer knives. Chips that are light enough are blown to one of four ADS cyclones where they fall out and go to a slicer. Air leaves the cyclone and exits out the top of the chip thickness building. Cyclone air flow is controlled by the vacuum on the suction side of the fan.

Two reclaim cyclones are used to control particulate emissions during the transfer of purchased chips from storage to chip thickness screening. Air from pneumatic blowers controls air flow through the cyclones.

3.2 Pollutant Emission Control

Six cyclones (#1 and #2 Chip Reclaim Cyclones and #1A, #2A, #1B, & 2B Air Density Separator Cyclones) are used in chip thickness screening to control particulate emissions.

3.3 Preventive Maintenance

1. The cyclones are visually inspected weekly by operations to ensure proper operation and pollution control, repairs are made as necessary.

2. The cyclones are inspected regularly by maintenance and repairs are made as necessary. See the Title V I&M Plan for more details.

3.4 Monitored Operating Variables

1. The vacuum on each of the ADS cyclones is monitored periodically by the day supervisor.

2. An alarm in the control room alerts the screen room operator whenever an air density separator fan kicks out.

3. The cyclones are visually inspected weekly to ensure proper operation and pollution control.

3.5 Corrective Actions for Startup, Shutdown or Malfunction Abatement

1. Air density fan trip

   - The flow of chips is automatically diverted to one or more operating separator lines
   - Repair or replace fan as necessary

2. ADS cyclone pluggage

   - Divert chip flow to operating separator line(s)
   - Clean and, if necessary, repair cyclone

3. Reclaim cyclone pluggage

   - Stop processing chips through plugged cyclone and, if necessary, use the alternate wood processing line
   - Clean and, if necessary, repair cyclone

4. Hole in reclaim cyclone

   - Stop processing chips through damaged cyclone and, if necessary, place the alternate wood process line in operation
   - Repair cyclone

4. LVHC NCG COLLECTION SYSTEM

4.1 Introduction

Low Volume High Concentration (LVHC) noncondensible gases (NCGs) are collected in three separate gas collection and conveyance systems; the Digester NCG System; the Evaporator NCG System; and the Stripper Off-Gas (SOG) System. Vent gases from the digester blow heat recovery system, the turpentine recovery system, and the stripper column feed tank are collected in the Digester NCG collection system. Vent gases from the multiple-effect evaporator aftercooler and hotwell are collected in the Evaporator NCG collection system. Stripper off-gases from the treatment of pulping condensates with low-pressure steam are collected in a SOG collection system. Each of these gas collection systems routes HAPs and malodorous gases to either the Thermal Oxidizer (or the Lime Kiln as a back-up) to be burned.

VE has a MACT I SSM Plan to address LVHC collection and treatment. The SSM Plan ensures good air pollution control practices are followed to minimize emissions; details how to correct process control malfunctions as soon as possible; and details how excess emissions events are recorded. Please refer to the MACT I SSM Plan for details regarding the LVHC system.

4.2 Pollutant Emission Control

LVHC gases are incinerated in the Thermal Oxidizer or the Lime Kiln as a back-up. Please refer to the MACT I SSM Plan for details regarding the LVHC system.

4.3 Preventive Maintenance

1. Monthly and annual inspections are conducted on the LVHC collection system in accordance with MACT I. Please see the MACT I SSM Plan for details.

2. The LVHC system is inspected regularly and repairs are made as necessary. See the Title V I&M Plan for details.

4.4 Monitored Operating Variables

Please see the MACT I SSM Plan for details.

4.5 Corrective Actions for Startup, Shutdown and Malfunction Abatement

Please see the MACT I SSM Plan for details.

5. HVLC NCG COLLECTION SYSTEM

5.1 Introduction

High Volume Low Concentration (HVLC) NCGs are collected from several MACT regulated sources, including the primary knotters and knot drainer, the four-stage brownstock washing system, and the brownstock washer filtrate tanks. The HVLC gases collected from the knotting and washing systems are regulated by 40 CFR 63 Subpart S (MACT I). The Escanaba Mill also collects HVLC gases from the digester air evacuation system and various black liquor and salt cake storage tanks not regulated by MACT I; vent gases from these non-regulated equipment items are collected for odor reduction purposes. The brown stock washer vent gas collection system routes HAPs and malodorous gases from the collected HVLC sources to the No. 10 Recovery Furnace to be burned.

VE has a MACT I SSM Plan to address HVLC collection and treatment. The SSM Plan ensures good air pollution control practices are followed to minimize emissions; details how to correct process control malfunctions as soon as possible; and details how excess emissions events are recorded. Please refer to the MACT I SSM Plan for details regarding the HVLC system.

5.2 Pollutant Emission Control

HVLC gases are destroyed in the No. 10 Recovery Furnace. Please refer to the MACT I SSM Plan for details regarding the HVLC system.

5.3 Preventive Maintenance

1. Monthly and annual inspections are conducted on the HVLC collection system in accordance with MACT I. Please see the MACT I SSM Plan for details.

2. The HVLC system is inspected regularly and repairs are made as necessary. See the Title V I&M Plan for details.

5.4 Monitored Operating Variables

Please see the MACT I SSM Plan for details.

5.5 Corrective Actions for Startup, Shutdown and Malfunction Abatement

Please see the MACT I SSM Plan for details.

6. BLEACH PLANT

6.1 Introduction

Bleach plant gases are collected from the five-stage bleaching system as required by MACT I. The bleach plant gas collection system routes chlorinated hazardous air pollutants (HAPs) to a two-stage scrubbing system where the scrubbing medium removes chlorinated HAPs from the bleach plant vent gases.

VE has a MACT I SSM Plan to address chlorinated HAP collection and treatment. The SSM Plan ensures good air pollution control practices are followed to minimize emissions; details how to correct process control malfunctions as soon as possible; and details how excess emissions events are recorded. Please refer to the MACT I SSM Plan for details regarding the bleach plant system.

6.2 Pollutant Emission Control

Chlorinated HAPs from the bleaching system are treated by a two-stage scrubbing system. Please refer to the MACT I SSM Plan for details regarding the bleach plant system.

6.3 Preventive Maintenance

1. Monthly inspections are conducted on the bleach plant collection system in accordance with MACT I. Please see the MACT I SSM Plan for details.

2. The bleach plant system is inspected regularly and repairs are made as necessary. See the Title V I&M Plan for details.

6.4 Monitored Operating Variables

Please see the MACT I SSM Plan for details.

6.5 Corrective Actions for Startup, Shutdown and Malfunction Abatement

Please see the MACT I SSM Plan for details.

7. PULPING CONDENSATES

7.1 Introduction

Foul pulping condensates are collected from several equipment systems and are regulated under MACT I provisions. These include:

- Blow heat accumulator overflow
- Turpentine decanter underflow

The Escanaba Mill also collects other foul pulping condensates not necessary to demonstrate compliance with MACT I provisions. These include:

- Evaporator hotwell condensates
- Evaporator foul condensates
- LVHC system condensates

Collected pulping condensate streams from the evaporator hotwell, evaporator foul condensate tank, and the NCG and SOG condensate seal tanks are pumped individually to the stripper column feed tank. Turpentine decanter underflow and accumulator overflow condensates drain by gravity to the column feed tank. From the column feed tank, foul pulping condensates are pumped to the steam stripper column for treatment.
Foul condensates from the column feed tank are transferred by the stripper feed pumps through strainers and condensate pre-heaters to the steam stripper column. Stripper column feed is heated by indirect contact with stripped condensate. Stripper off-gases are collected and vented to the Thermal Oxidizer or the Lime Kiln as a back-up to be burned. Stripped condensate is pumped to the brown stock washer showers for additional collection and treatment in the brown stock washer vent gas collection system.

VE has a MACT I SSM Plan to address pulping condensate collection and treatment. The SSM Plan ensures good air pollution control practices are followed to minimize emissions; details how to correct process control malfunctions as soon as possible; and details how excess emissions events are recorded. Please refer to the MACT I SSM Plan for details regarding the pulping condensate system.

7.2 Pollutant Emission Control

Pulping condensates are pretreated in the steam stripper column. The stripped condensates are then sent to the brownstock washers for additional treatment. Please refer to the MACT I SSM Plan for details regarding the pulping condensate system.

7.3 Preventive Maintenance

1. Monthly and annual inspections are conducted on the pulping condensate collection system in accordance with MACT I. Please see the MACT I SSM Plan for details.

2. The pulping condensate system is inspected regularly and repairs are made as necessary. See the Title V I&M Plan for details.

7.4 Monitored Operating Variables

Please see the MACT I SSM Plan for details.

7.5 Corrective Actions for Startup, Shutdown and Malfunction Abatement

Please see the MACT I SSM Plan for details.

8. LIME SLAKER

8.1 Introduction

The purpose of the lime slaker, also known as the recausticizing system is to hydrate quicklime and to initiate the causticizing reaction that regenerates sodium hydroxide for pulp cooking. To control particulate emissions that arise from the addition of quicklime a wet scrubber is used. Please note that the lime slaker is subject to the continuous assurance monitoring (CAM) requirements of 40 CFR 64 and VE has a CAM Plan for the lime slaker to address these requirements. Please see the CAM Plan for more details.

8.2 Pollutant Emission Control

Particulate emissions from the lime slaker are controlled through the use of a wet scrubber. Green liquor from the smelt dissolving tank is the normal scrubbing medium.

8.3 Preventive Maintenance

1. Inspections are performed on the lime slaker system routinely by operations. This includes cleaning out the build-up that accumulates in the scrubber and vent piping and checking the temperature of the nozzles that feed the scrubber to ensure they are not plugged. Any abnormalities, problems or concerns are reported to the supervisory personnel and corrective actions are taken as necessary.

2. The lime slaker and scrubber system is inspected regularly my maintenance and repairs are made as necessary. See the Title V I&M Plan for details.

8.4 Monitored Operating Variables

1. The lime kiln operator is responsible for monitoring the following variables to ensure proper operation of the slaker scrubber.

   - green liquor pressure to scrubber
   - green liquor flow to the scrubber
   - vacuum on the suction of the slaker scrubber exhaust fan

2. The lime kiln operator receives an alarm and is responsible for taking corrective actions when the lime slaker is running and the scrubber flow drops below 150 gpm. See the CAM Plan for more details.

8.5 Corrective Actions for Startup, Shutdown and Malfunction Abatement

1. Slaker scrubber fan stops

   - Try to restart fan
   - Reset starter and try to restart
   - Repair fan/motor

2. Fan running but no vacuum on fan suction

   - Check belts and change if necessary
   - Unplug pressure transmitter tap

3. Low or no green liquor flow to scrubber

   - Shut down the slaker if no flow is present
   - Stroke automatic valve and repair if necessary
   - Check rotometers to each stage and adjust if necessary
   - Valve out flow to scrubber and unplug lines

4. Low green liquor pressure to the slaker

   - Stroke automatic valve and repair if necessary
   - Unplug pressure tap

9. LIME KILN

9.1 Introduction

VE operates a rotary lime kiln to recover quicklime from lime mud. The system begins with the lime mud pre-coat filter system, which feeds lime mud to the rotary kiln, and ends with the reburned lime silo where product lime is conveyed by bucket elevator from the product end of the lime kiln. The lime kiln is subject to the requirements of 40 CFR 63 Subpart MM (MACT II). Exhaust gases from the lime kiln are treated in a venturi scrubber with alkaline scrubbing medium to remove particulate matter (PM) and PM-hazardous air pollutants (HAPs) from the kiln exhaust gases. Combustion control is used to control total reduced sulfur (TRS) emissions.

Malfunction of the wet venturi scrubber, monitoring systems, or any of the components of the lime kiln could result in periods of uncontrolled HAP emissions. The SSM Plan describes mill procedures for controlling HAP emissions during startup and shutdown events and plans for the abatement of uncontrolled emissions caused by malfunctions of process equipment, air pollution control equipment, and monitoring equipment. Please refer to the MACT II SSM Plan for details regarding the lime kiln system.

9.2 Pollutant Emission Control

In the process of drying and burning lime mud in the kiln, lime dust becomes entrained in the exhaust gases which exit at the feed end of the unit. To control these particulate emissions a scrubber system consisting of a lime dust ash hopper, venturi scrubber and a cyclonic separator or mist eliminator is used. An induced draft fan, located between the dust hopper and the venturi scrubber, is used to pull gases through the kiln and push them through the venturi scrubber, mist eliminator and, ultimately, out the lime kiln stack. The area of the venturi scrubber throat may be adjusted to optimize particulate collection efficiency.

Efficient combustion is the primary means used to control the small amounts of TRS gases which form in the lime kiln. A TRS continuous emission monitoring system (CEMS) is used as an indicator of TRS emissions. This monitor is used to assess the effectiveness of any corrective actions that may be necessary to reduce TRS during an upset condition.

Please refer to the MACT II SSM Plan for more details regarding the lime kiln system.

9.3 Preventive Maintenance

1. Inspections are performed on the lime kiln system routinely by operations. Any abnormalities, problems or concerns are reported to the supervisory personnel and corrective actions are taken as necessary. See the MACT II SSM Plan for more details.

2. The lime kiln and scrubber system is inspected regularly by maintenance and repairs are made as necessary. See the Title V I&M Plan for details.

9.4 Monitored Operating Variables

9.4.1 Venturi Scrubber

1. The lime kiln operator periodically monitors the following variables through the panel board or Foxboro system.

   - Flow to scrubber
   - Scrubber differential pressure
   - Scrubber throat damper position
   - Mill water flow to the sump
   - Bleed flow from the sump to the mud washer
   - Scrubber sump solids
   - Scrubber sump level

2. The following alarms are monitored by the lime kiln operator. Please see the MACT II SSM Plan for more details.

   - Low scrubber flow
   - Low scrubber differential pressure

9.4.2 Lime Kiln

1. The lime kiln operator monitors the following variables through the panel board or Foxboro system to minimize TRS emissions.

   - Lime kiln flue gas percent oxygen
   - Vibration of inboard and outboard bearings on ID fan
   - Flame scanner readings
   - Gas flow and valve positions
   - Air flow to lime kiln
   - NCGs to lime kiln or incinerator
   - Lime kiln TRS
   - Temperature profile

2. The following alarms are monitored by the lime kiln operator.

   - Low NCG flow to lime kiln
   - Kiln not rotating

- Bearing cooling water pump failure (low flow switch)
- Low lime kiln percent oxygen
- Low fuel gas pressure
- High TRS

9.5 Corrective Actions for Startup, Shutdown and Malfunction Abatement

9.5.1 Venturi Scrubber

1. Scrubber circulation pump failure

    - Switch to spare pump
    - Repair or replace failed pump

2. Scrubber sump level transmitter failure which causes the sump to empty

    - Open the mill water valve to sump
    - Ensure that mill water flow maintains sump level
    - Clean bubble tube
    - Repair transmitter

3. Scrubber sump level transmitter failure which causes the sump to overflow

    - Clean bubble tube

4. Mist eliminator pluggage

    - Maintain higher differential pressure by adjusting scrubber throat damper

5. Low or no scrubber water flow to venturi scrubber

    - Visually check level in scrubber sump and add make-up water if necessary
    - Switch to spare pump
    - Check injectors to scrubber throat and, if not hot, blow out with air
    - If spare pump does not help, take fire out of kiln and shut down the ID fan
    - Put lime kiln on auxiliary engine
    - Inspect automatic valve to verify it is operating properly
    - Calibrate flowmeter

9.5.2 Lime Kiln

1. Induced draft fan failure

- Put all NCGs into incinerator
- Put lime kiln on auxiliary engine
- Continue to operate scrubber while fan maintenance is being performed
- Take lime mud off of lime filters
- Repair fan/motor

2. High vibration on the induced draft fan

- Put all NCGs into incinerator
- Put lime kiln on auxiliary engine
- Continue to operate the scrubber while fan maintenance is being performed
- Take lime mud off of lime filters
- Sand blast induced draft fan
- If vibration is still apparent, check fan bearings

3. Noncondensible booster fan failure

- Put all NCGs into incinerator
- Open dilution air valve as far as possible
- Repair fan/motor

4. Dilution air blower failure

- Put all NCGs into incinerator
- Shut down mud filters
- Take fire out of kiln
- Put lime kiln on auxiliary engine
- Repair fan/motor

5. Lime kiln drive failure

- Put all NCGs into incinerator
- Shut down mud filters
- Take fire out of kiln
- Put lime kiln on auxiliary engine
- Repair motor or coupling
- If a repair is necessary on the drive chain, the auxiliary engine must be down as well.

6. High scrubber throat differential pressure

    - Open scrubber throat damper
    - Check pressure transmitter lines for pluggage

7. One flame scanner failure

    - Clean or replace flame scanner (NCGs may remain in lime kiln)

9.6 TRS Reduction Action Plan

When the average TRS reading, corrected to 10% O_2, exceeds 10 ppm (dry volume) for any one hour period the following actions are taken, as necessary, to reduce TRS emissions. Any actions taken are consistent with safe operating practices.

- If NCGs are being burned, switch the NCGs to the incinerator if this unit is operating normally
- If flue gas O_2 readings are low, reduce natural gas flow or open scrubber throat damper
- If flue gas O_2 is high and/or the lime mud is cold, increase the natural gas feed rate to increase the combustion temperature and/or close the scrubber throat damper
- Reduce the area of the venturi scrubber throat (to increase flue gas residence time)

10. SODA ASH UNLOADING

10.1 Introduction

Soda ash is used as a makeup chemical for the sulfur dioxide (SO_2) scrubber on the thermal oxidizer odor control system. Particulate emissions from the dry material handling are controlled with a baghouse system.

10.2 Pollutant Emission Control

A pulse jet baghouse is used to control particulate emissions during soda ash unloading. An air filter provides secondary treatment for gases exhausting from the pulsed jet baghouse. In this manner efficient particulate control is achieved.

10.3 Preventive Maintenance

1. Inspections are performed on the soda ash unloading system routinely by operations. Any abnormalities, problems or concerns are reported to the supervisory personnel and corrective actions are taken as necessary.

2. The soda ash unloading system is inspected regularly by maintenance and repairs are made as necessary. See the Title V I&M Plan for details.

10.4 Monitored Operating Variables

1. The equipment tender monitors differential pressure for the baghouse and filter. Low differential pressure indicates a rip or tear in a bag(s), while high differential pressure indicates pluggage of bag(s), the soda ash transfer line, or the filter.

2. The bleach plant operator responds to the following alarms:

    - Chain failure on rotary feeder
    - High differential pressure across vacuum filter
    - High vacuum on the vacuum blower
    - High pressure on the pressure blower
    - High level in the soda ash receiver
    - Soda ash unloading pump has stopped

10.5 Corrective Actions for Startup, Shutdown or Malfunction Abatement

1. High pressure

   - Check operation of rotary feeder and repair if necessary
   - Verify vacuum breaker valve has opened to minimize soda ash loading to the soda ash receiver
   - Unplug soda ash line from receiver to top of soda ash tank

2. Loss of vacuum

   - Stop processing soda ash
   - Check belts on vacuum blower
   - Replace filter (check vacuum receiver bags to make sure all are intact)

3. High vacuum

   - Check filter for pluggage
   - Inspect vacuum receiver to verify all bags in place; replace cartridge and/or bag if they have been crushed or fallen off

4. High level in soda ash receiver

   - Stop processing soda ash
   - Verify vacuum breaker valve is working
   - Check belts on pressure blower
   - Have maintenance inspect rotary feeder

11. THERMAL OXIDIZER (ODOR CONTROL) SYSTEM

11.1 Introduction

The purpose of the thermal oxidizer is to control odor and to recover sulfur for re-use in kraft pulping. The thermal oxidizer incinerates LVHC noncondensible gases (NCGs) from the evaporators, steam stripper, and the digesters and is regulated under New Source Performance Standards (NSPS) 40 CFR 60 Subpart BB, 40 CFR 63 Subpart S (MACT I), and 40 CFR 64 CAM. The odor control system consists of a thermal oxidizer, also known as the incinerator at VE, and a sulfur dioxide (SO_2) scrubber. Total reduced sulfur (TRS) and SO_2 emissions are limited at the discharge of the SO_2 scrubber. The lime kiln serves as a back-up incineration device for the thermal oxidizer. Please see the LVHC portion of the MACT I SSM Plan and the CAM Plan for more details.

11.2 Pollutant Emission Control

The kraft process generates by-product NCGs which contain significant concentrations of odorous TRS compounds. The thermal oxidizer is designed to control odor emissions by oxidizing these reduced sulfur compounds to SO_2. Three sources of NCGs are combusted in the incinerator: NCGs from the digester system, the evaporator hotwell system, and the steam stripper.

SO_2 formed at the incinerator is scrubbed in an SO_2 scrubber to recover sulfur for reuse in the kraft process. The SO_2 scrubber is a two stage packed tower which typically uses sodium carbonate (Na_2CO_3), or soda ash, as the scrubbing medium. Sodium hydroxide can also used as a scrubbing medium. The SO_2 reacts to form carbon dioxide (CO_2) which exits the scrubber with the other gases, and sodium sulfite (Na_2SO_3) which is retained in the liquid scrubbing medium.

11.3 Preventive Maintenance

11.3.1 LVHC NCG Collection Systems

See section 4.0 LVHC NCG Collection System.

11.3.2 Thermal Oxidizer

1. Temperature is monitored continuously and inspections are performed on the thermal oxidizer routinely by operations. Any abnormalities, problems or concerns are reported to the supervisory personnel and corrective actions are taken as necessary. See the MACT I SSM Plan for more details.

2. The thermal oxidizer is inspected regularly by maintenance and repairs are made as necessary. See the Title V I&M Plan for details.

11.3.3 Sulfur Dioxide Scrubber

1. Flow, pH, and differential pressure are monitored continuously and inspections are performed on the SO_2 scrubber routinely by operations. Any abnormalities, problems or concerns are reported to the supervisory personnel and corrective actions are taken as necessary. See the MACT I SSM Plan and the CAM Plan for more details.

2. The SO_2 scrubber is inspected regularly by maintenance and repairs are made as necessary. See the Title V I&M Plan for details.

11.4 Monitored Operating Variables

11.4.1 NCG Collection Systems

See section 4.0 LVHC NCG Collection System.

11.4.2 Thermal Oxidizer

1. The following variables are monitored by the lime kiln operator through the Foxboro system.

    - Incinerator temperature (4 locations)
    - Percent oxygen in flue gas
    - Gas flow to the incinerator
    - Steam ejector vacuum for the stripper and hotwell gases to the incinerator or lime kiln
    - Location of all three gas sources (incinerator or kiln)

2. The following alarms are monitored by the lime kiln operator. Please see the LVHC section of the MACT I SSM Plan for more details.

    - System shutdown
    - NCG burner low pressure
    - Flame failure
    - Low/high/high high incinerator temperature
    - Low primary air flow to natural gas burner
    - Power supply faults #1 & #2
    - SO2 scrubber ID fan tripped
    - PLC failure
    - Low primary air pressure

11.4.3 Sulfur Dioxide Scrubber

1. The lime kiln operator monitors the following variables through the Foxboro system.

    - pH of recirculation scrubbing medium for the 1st stage and 2nd stage
    - Soda ash flow (alarms at low flow)
    - Bleed flow
    - Scrubber differential pressure
    - Tank levels for 1st and 2nd stages
    - Bleed flow density
    - SO2 scrubber ID fan speed
    - Scrubber circulation flow

2. The following alarms are monitored by the lime kiln operator. Please see the CAM Plan for more details.

    - Low differential pressure
    - Low Flow
    - Low pH

11.5 Corrective Actions for Startup, Shutdown and Malfunction Abatement

11.5.1 NCG Collection Systems

- See section 4.0 LVHC NCG Collection System.

11.5.2 Thermal Oxidizer

Below are corrective actions taken by VE for certain scenarios, however, please see the LVHC section of the MACT I SSM Plan for more details.

1. Incinerator kickout or flame out

    - Put all NCGs into lime kiln
    - Investigate problem with incinerator
    - Take whatever corrective actions are appropriate before putting NCGs back in incinerator

2. Primary air fan failure (incinerator still running)

    - Check belts on fan
    - Repair fan/motor

3. Secondary air fan failure (incinerator still running)

    - Check belts on fan
    - Repair fan/motor

11.5.3 Sulfur Dioxide Scrubber

Below are corrective actions taken by VE for certain scenarios, however, please see the LVHC section of the MACT I SSM Plan and the CAM Plan for more details.

1. Scrubber induced draft fan failure

    - Put all NCGs into lime kiln
    - Investigate problem with induced draft fan
    - Take whatever corrective actions are appropriate before putting NCGs back in incinerator

2. Scrubber recirculation pump failure

    - Valve in and start spare pump
    - Investigate problem with failed pump
    - Repair or replace failed pump

3. Scale buildup in the SO2 scrubber

    - Verify water softener operation
    - Determine if it is necessary to shutdown and clean scrubber packing
    - If cleaning is necessary, put all NCGs into lime kiln before shutting down scrubber for maintenance

4. Quench chamber pump failure

    - Switch to spare pump
    - Repair pump/motor

5. Bleed flow high density

    - Take a sample from first stage and check density with a hydrometer
    - Increase bleed flow in MANUAL to reduce density in first stage
    - Calibrate density meter

12. REFINER MECHANICAL PULPING

12.1 Introduction

The Refiner Mechanical Pulp (RMP) mill mechanically refines wood chips into pulp. Chips from storage piles are blown into a Chip Silo and then processed in a disc scalper before being pneumatically transferred to a Chip Surge Bin. From the Chip Surge Bin, the chips are washed, steamed and mechanically pulped in primary and secondary refiners. Following refining, the pulp is cured, screened, and washed. Typically filler, caustic, and bleaching agent are added to the pulp before entering a storage chest. The pulp is thickened and additional bleaching agent may be added. The chip silo cyclone and the chip surge bin cyclone are used to control particulate emissions.

12.2 Pollutant Emission Control

Particulate emissions from the pneumatic transfer of wood chips to the chip storage silo and the chip surge bin are controlled using cyclones.

12.3 Preventive Maintenance

1. The cyclones are visually inspected weekly by operations to ensure proper operation and pollution control, repairs are made as necessary.

2. The cyclones are inspected regularly by maintenance and repairs are made as necessary. See the Title V Inspection and Maintenance (I&M) Plan for more details.

12.4 Monitored Operating Variables

The cyclones are visually inspected weekly to ensure proper operation and pollution control.

12.5 Corrective Actions for Startup, Shutdown or Malfunction Abatement

1. Cyclone pluggage

   - Stop processing wood chips
   - Clean and, if necessary, repair cyclone

2. Hole in cyclone

   - Stop processing chips through damaged cyclone
   - Repair cyclone

Plan Revision Record

Revision Date	Description of Change	Reviewer
7/28/16	Added section for Lime Silo Storage Bins (incomplete as of 7/28/16), added Verso headings, added this revision table	P. LaFleur

APPENDIX A

Critical Spare Parts List

Bleach Plant

1. #1 sump pump, bearing bracket
   (Equip # 25-4-0310-20, Stores # 00215164)
2. #1 sump pump motor
   (Equip # 25-4-3315-80)
3. #2 sump pump, bearing bracket
   (Equip # 25-4-3330-20, Stores # 00215164)
4. #2 sump pump motor
   (Equip # 25-4-3335-80)

Thermal Oxidizer Odor Control System

1. jet condenser pump, bearing bracket
   (Equip # 33-4-0612-20)
2. jet condenser pump motor
   (Equip # 33-4-0616080)
3. rupture discs

UTILITIES

Malfunction Abatement Plan

Updated March 2020

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1. INTRODUCTION

The purpose of this Malfunction Abatement Plan (MAP) is to prevent, detect, and correct malfunctions or equipment failures resulting in emissions exceeding any applicable emission limit in accordance with Rule 336.1911. The original MAP was approved by the Michigan Department of Environment, Great Lakes, and Energy (EGLE) in the 1990's, see file 8.17.1 for further details. The MAP identifies how Verso Escanaba LLC (VE) will minimize pollutant emissions during periods of startup, shutdown, and malfunction. This document provides a framework for preventing pollutant emissions through good operating practices while also identifying quick corrective actions when required. In many cases the required corrective action will depend on the type of incident that has occurred. For this reason corrective actions are not necessarily intended to be implemented in the order they are listed. This document will be updated periodically to incorporate any corrective actions that are not included in the plan at this time. Appendix A contains a list of critical spare parts that are maintained in inventory at this facility.

It should be noted that several rules have been implemented to address these same issues since the time the original MAP was prepared. Specifically, 40 CFR 63 Subpart S (MACT I) and Subpart MM (MACT II) address startup, shutdown, and malfunction (SSM) procedures for the low volume high concentration (LVHC) non condensable gas (NCG) system, the high volume low concentration (HVLC) system, the pulping condensate collection and treatment system, the bleach plant, the recovery furnace, the smelt dissolving tank, and the lime kiln. Please refer to the MACT I and MACT II SSM Plans for specific details around these systems. In addition, 40 CFR 64 Continuous Assurance Monitoring (CAM), addresses how pollution control equipment is continuously monitored to minimize air emissions on several sources. Please see the CAM Plan for more details.

2. SALTCAKE UNLOADING

2.1 Introduction

Saltcake can be added to the salt cake mix tank in the chemical recovery area to maintain liquor sulfidity as required, although this is rarely necessary. Particulate emissions from saltcake unloading are controlled with a baghouse.

2.2 Pollutant Emission Control

A baghouse is used to control particulate emissions during saltcake unloading, thereby, providing efficient particulate control.

2.3 Preventive Maintenance

1. If the saltcake unloading system has not been used for more than one year, an inspection is performed by the first equipment tender prior to using the system. Bag replacement and repairs are made as necessary.

2. The saltcake unloading system is inspected by the utilities maintenance department as needed. Bag replacement and repairs are made as necessary.

2.4 Monitored Operating Variables

Operations monitors differential pressure for the baghouse. Low differential pressure indicates a rip or tear in a bag(s), while high differential pressure indicates pluggage of a bag(s) or the saltcake transfer line.

2.5 Corrective Actions for Startup, Shutdown or Malfunction Abatement

Baghouse malfunction

- Stop transferring saltcake
- Repair the baghouse system

3. NO. 10 RECOVERY FURNACE

3.1 Introduction

The Chemical Recovery Furnace System is used to regenerate chemicals used in wood pulping. The No. 10 Recovery Furnace is rated for 565,000 pounds of steam per hour (approximately 950 million BTU per hour heat input), and produces steam for mill processes and steam turbine-generator sets for producing electricity. The No. 10 Recovery Furnace burns black liquor, natural gas, No. 6 fuel oil, and is permitted to burn used oil. Smelt from the recovery furnace is used to produce green liquor, a solution of sodium sulfide and sodium carbonate salts, when it is dissolved in water or weak wash in the Smelt Dissolving Tank. Also, the No. 10 Recovery Furnace receives gases from enclosures and closed-vent systems and is used to incinerate HVLC gases.

A wet bottom electrostatic precipitator (ESP) is used to control particulate emissions from the No. 10 recovery furnace. Efficient combustion control is the primary means of controlling TRS emissions. An opacity COMS and a TRS CEMS are used as performance indicators. The recovery furnace is subject to the requirements of New Source Performance Standards (NSPS) 40 CFR 60 Subpart BB, 40 CFR 63 Subpart S (MACT I), and 40 CFR 63 Subpart MM (MACT II).

Malfunction of the recovery furnace, the ESP, monitoring systems, or any of the components of the HVLC collection system could result in periods of uncontrolled hazardous air pollutant (HAP) emissions. VE has a MACT I SSM Plan and MACT II SSM Plan to address these situations. The SSM Plans describe mill procedures for controlling HAP emissions during startup and shutdown events and plans for the abatement of uncontrolled emissions caused by malfunctions of process equipment, air pollution control equipment, and monitoring equipment. Please refer to the MACT I and MACT II SSM Plans for details regarding the recovery furnace system.

3.2 Pollutant Emission Control

The electrostatic precipitator is used to control particulate emissions from the No. 10 recovery furnace. The ESP is divided into identical east and west cells which operate independently. This allows one side of the precipitator to be shut down for emergency maintenance while the other side is still operating. Each cell utilizes six transformer-rectifier or T-R sets which power the three collection fields. The T-R sets can be controlled by control units located in an air conditioned MCC (Motor Control Center) room. The T-R sets can also be controlled directly by the recovery furnace operator who monitors and adjusts key variables such as voltage and current.

Most of the total reduced sulfur (TRS) released in the furnace firebox is oxidized to SO_2 and subsequently scrubbed from the flue gas by gas phase reactions. A small fraction of the TRS from the furnace is released to the atmosphere. These TRS emissions are controlled through optimized furnace combustion and are monitored with a continuous emission monitoring system (CEMS). Please refer to the MACT I and MACT II SSM Plans for more details regarding the recovery furnace system.

3.3 Preventative Maintenance

Below are corrective actions taken by VE for certain scenarios, however, please see the HVLC section of the MACT I SSM Plan, the Recovery Furnace MACT II SSM Plan, and the Title V I&M Plan for more details.

The following maintenance is performed on the electrostatic precipitator.

1. The first equipment tender inspects the following items every shift during normal operation. Any abnormalities, problems or concerns will be investigated and further actions taken as necessary. Significant events are recorded on the operator's log sheet and, if necessary, reported to supervisory personnel.

    - Spot check noises made by rappers for uniformity of tapping noises and duration of cycle
    - Inspect T-R sets for leaking coolant
    - Rapper pressure should be greater than 90 psi and steady
    - All drag conveyors shafts should be turning
    - The makedown agitator should be running
    - Circulation pumps near agitator should be running
    - Trip currents on all T-R control sets should be in normal range
    - Air lines that feed compressed air to drive rappers should be properly connected
    - All bolts on top end of rappers should be securely fastened
    - Filters for the shell heater fan should be clean; change filters as necessary
    - Fans for shell heaters and penthouse heaters should be running and belts and motors functioning properly
    - The gauge on shell heater fan should read between the low and high preset values
    - Air conditioning should be on in the T-R control room

2. The first equipment tender will perform the following duties when it is necessary:

    - The air filters for the shell heater fan will be changed approximately once per week.

3. A visual inspection of the ESP is conducted weekly by operations. Any abnormalities are documented, reported to supervisory personnel, and corrective actions are taken.

4. Routine preventive maintenance is scheduled on the recovery furnace and the ESP and repairs are made as necessary. See the Title V I&M Plan for details.

3.4 Monitored Operating Variables

3.4.1 Particulate Control

An alarm appears on the control console when opacity exceeds 15%. The No. 10 recovery furnace operator monitors the following variables to help ensure compliance with the 20% 6-minute opacity limit. Please see the MACT II SSM Plan for more details.

- Opacity
- Voltage and current on T-R control sets
- Flue gas temperature at the precipitator inlet
- Flue gas flow through precipitator (sum of combustion air flows)
- Percent motor load current on drag conveyor

3.4.2 TRS Combustion Control

The following variables are monitored by the No. 10 operator to ensure compliance with TRS limits. Normally TRS, black liquor flow rate and opacity are recorded on log sheets on an hourly basis. An alarm is triggered when TRS concentrations exceed 3 ppm on a 1 hour average. See section 3.6 for more details.

- TRS
- black liquor flow rate
- black liquor solids
- black liquor temperature
- stack oxygen
- opacity
- CO
- primary air flow rate
- secondary air flow rate
- tertiary air flow rate
- primary air temperature
- secondary air temperature

3.5 Corrective Actions for Startup, Shutdown and Malfunction Abatement

Below are corrective actions taken by VE to control particulate emissions during startup, shutdown, or malfunction of the electrostatic precipitator for certain scenarios, however, please see the MACT II SSM Plan for more details.

1. During startup ensure that the precipitator is operating, consistent with safe operating practice, before firing black liquor in the furnace.

2. During shutdown ensure that the precipitator is operating until the fires are out, the boiler is cooled and the fans are at minimum flow.

3. If opacity approaches the opacity standard (20% on a 6 minute average) making an exceedance possible, the No. 10 recovery furnace operator takes the following actions, as necessary, to reduce opacity.

   - Check rapper pressure to make sure it is greater than 90 psi and steady
   - Ensure all T-R sets are operating
   - Adjust T-R sets by increasing wire voltages until sparking is detected or until the current limit is reached
   - Check liquor guns for holes in barrels and replace if necessary
   - Lower primary air flow
   - Lower liquor temperature to build up smelt bed
   - Lower oxygen supplied to furnace
   - Reduce liquor burning rate
   - Check rappers to ensure they are running

4. If the No. 10 recovery furnace operator fails to control opacity using the above procedures or if a significant reduction in black liquor burning rate is required for opacity control, the potential problems listed below are investigated.

   - Grounding of electrodes
   - Ribbon mixer failure
   - Drag conveyor failure
   - Buss support insulator failure
   - Rapper and rapper controller failure
   - T-R set failure
   - T-R controller failure

   If entry into one side of the ESP is required repairs are accomplished as follows:

   - Reduce liquor burning rate to less than 1.86 mmlbs/day and put 5 oil guns in the furnace
   - Set the liquor flow to 100 gpm
   - Isolate affected side of the precipitator
   - Shut down heaters on affected side and open access doors to facilitate cooling
   - Perform necessary maintenance

3.6 TRS Reduction Action Plan

1. When TRS exceeds 3 ppm (dry volume) corrected to 8% 02 based on a one hour average the recovery furnace operator takes the following actions, as necessary.

    - Call kraft mill foreman to determine if black liquor sulfidity is within target range
    - Check and, if necessary, clean furnace air ports
    - Check automatic air port rodders
    - Inspect liquor guns
    - Increase secondary air
    - If necessary, increase primary air (watch opacity)
    - Adjust liquor temperature
    - Adjust liquor gun angle
    - Increase liquor solids
    - Add caustic to precipitator makedown tank
    - Check primary air temperature

2. When TRS exceeds 5 ppm (dry volume) corrected to 8% 02 based on a one hour average the recovery furnace operator takes the following actions, as necessary.

    - Increase excess 02
    - Decrease liquor production rate
    - If on auxiliary fuel, adjust secondary air damper to maintain both bright flame and high secondary windbox pressure
    - Check calibration of TRS/0_2 CEMS

3. When the 02 corrected TRS exceeds 5 ppm (dry volume) for more than six consecutive hours or 10 ppm (dry volume) for more than one hour the recovery furnace operator takes the following actions.

    - Call the recovery superintendent (weekdays) or the person on call (nights or weekends).
    - If person on call is not available, call recovery superintendent
    - If recovery superintendent is not available, call the utilities manager
    - Call or page person on call for the Environmental Department
    - If necessary, shut the recovery furnace system down

4. SMELT DISSOLVING TANK

4.1 Introduction

Smelt from the recovery furnace is used to produce green liquor, a solution of sodium sulfide and sodium carbonate salts, when it is dissolved in water or weak wash in the Smelt Dissolving Tank. A wet scrubber is used to control particulate and TRS emissions from the smelt dissolving tank. The recovery furnace is subject to the requirements of New Source Performance Standards (NSPS) 40 CFR 60 Subpart BB and 40 CFR 63 Subpart MM (MACT II).

Malfunction of the smelt dissolving tank or the scrubber could result in periods of uncontrolled HAP emissions. VE has a MACT II SSM Plan which describes mill procedures for controlling HAP emissions during startup and shutdown events and plans for the abatement of uncontrolled emissions caused by malfunctions of process equipment, air pollution control equipment, and monitoring equipment. Please refer to the MACT II SSM Plan details regarding the smelt dissolving tank system.

4.2 Pollutant Emission Control

The purpose of the smelt tank is to dissolve smelt from the recovery furnace to form green liquor. The exhaust from the smelt tank is treated in a wet scrubber designed to control particulate and TRS emissions. Weak wash is the normal scrubbing media. Flow rate and fan status in the scrubber is continuously monitored to ensure compliance. Please refer to the MACT II SSM Plan for more details regarding the smelt dissolving tank system.

4.3 Preventive Maintenance

1. Scrubber flow rate and fan status are monitored continuously and inspections are performed on the smelt dissolving tank system routinely by operations. Any abnormalities, problems or concerns are reported to the supervisory personnel and corrective actions are taken as necessary. See the MACT II SSM Plan for more details.

2. The smelt dissolving tank scrubber is inspected regularly by maintenance and repairs are made as necessary. See the Title V I&M Plan for details.

4.4 Monitored Operating Variables

The No. 10 recovery furnace operator monitors the following variables on the smelt dissolving tank system through the Foxboro system to ensure compliance. Please see the MACT II SSM Plan.

- Scrubber differential pressure
- Smelt dissolving tank differential pressure
- Scrubber flow rate
- Scrubber fan status

4.5 Corrective Actions for Startup, Shutdown and Malfunction Abatement

Below are corrective actions taken by VE to control particulate and TRS emissions during startup, shutdown, or malfunction of the smelt dissolving tank system for certain scenarios, however, please see the MACT II SSM Plan for more details.

Fumes coming out of dissolving tank hoods

- Bypass scrubber
- Check for broken belts on fan
- Open valve on side of unit to check for high level of weak wash in scrubber (fan will rumble when this happens)
- If necessary, rod out the interior drain using the installed port on the back side of the unit (4^{th} floor)
- Check for plugged ductwork to fan (fan will run quietly and dissolving tank pressure will be positive) and, if necessary, clean with hot condensate
- If necessary, shut recovery furnace system down
- If necessary, bring in an outside contractor to assist in cleanup

5. NO. 8 BOILER

5.1 Introduction

The No. 8 Boiler is a Combustion Engineering boiler rated for 450,000 pounds of steam per hour (approximately 594 million BTU per hour heat input) that provides steam for mill processes and steam turbine-generator sets for producing electricity. A Flue Gas Recirculation system was installed on the No. 8 Boiler in 2003 to ensure compliance with the NOx emission limitations specified in Rule 336.1801. The No. 8 Boiler burns natural gas and fuel oil. Standard operating procedures are followed to minimize the potential impact of fuel oil burning.

5.2 Pollutant Emission Control

A NO_x CEMS is installed and continuously monitored to ensure compliance with the emission limits on No. 8 Boiler. In addition, standard operating procedures have been developed to minimize the potential emissions from fuel oil burning. These procedures constitute good operating practice for this unit.

5.3 Preventive Maintenance

Operations cleans the oil guns (including the tips) and replaces the gaskets before oil is burned.

5.4 Monitored Operating Variables

1. The NOx CEMS monitors and records data continuously.

2. The No. 8 boiler operator monitors the following variables:

    - Oil temperature
    - Air flow
    - CO concentration
    - Steam flow
    - Fuel usage (natural gas and/or fuel oil)

5.5 Corrective Actions for Startup, Shutdown and Malfunction Abatement

1. Startup of oil burning

    - Raise oil temperature (210 F)
    - Clean oil guns
    - Reduce gas firing to a minimum
    - Operate at reduced oil firing rate until stable combustion conditions exist and all oil guns are in the boiler
    - Check stack for visible emissions

2. High CO or smoke

- Check furnace conditions and adjust as necessary
- Check oil temperature (210 F) and raise as necessary
- Inspect the boiler and clean any oil guns that are not burning properly
- Ensure proper air flow

6. WOOD RESIDUE SURGE BIN

6.1 Introduction

Wood residue is pneumatically transferred to the No. 9 boiler. Prior to entering the surge bin and being metered onto the boiler grate with rotary screws, the wood residue is treated in a wood residue surge bin cyclone to control particulate emissions.

6.2 Pollutant Emission Control

The wood residue surge bin cyclone is visually inspected weekly to ensure proper control of air emissions is achieved. Corrective actions are taken when necessary.

6.3 Preventive Maintenance

1. The wood residue surge bin is visually inspected weekly by operations for proper operation and repairs are made as necessary.

2. The wood residue surge bin is inspected regularly by maintenance and repairs are made as necessary. See the Title V I&M Plan for more details.

6.4 Monitored Operating Variables

Operations performs weekly visual inspections on the cyclone.

6.5 Corrective Actions for Startup, Shutdown or Malfunction Abatement

1. Cyclone pluggage

    - Stop bark burning and begin firing gas
    - Clean and, if necessary, repair the cyclone

2. Hole in cyclone

    - Stop bark burning and begin firing gas
    - Clean and, if necessary, repair the cyclone

7. NO. 9 BOILER

7.1 Introduction

The No. 9 Boiler is a Babcock & Wilcox boiler rated for 250,000 pounds of steam per hour (approximately 360 million BTU per hour heat input) that provides steam for mill processes and steam turbine-generator sets for producing electricity. No. 9 Boiler burns primarily wood residue, but may also burn natural gas and paper cores. No. 9 Boiler uses two wet scrubbers to control particulate emissions and opacity from bark burning and is subject to 40 CFR 64 CAM. Please see the CAM Plan for more details.

7.2 Pollutant Emission Control

Flue gases from the No. 9 boiler are pulled through the firebox by an induced draft fan. On the discharge side of the fan the gases are split into two streams, each of which is treated with a wet scrubber. Water is used as the scrubbing media to remove particulates from the flue gases. Each scrubber uses a high capacity "bull" nozzle followed by a series of inlet nozzles to control entrained particulate matter.

Two sources of back up water are available in the event of an emergency. The main secondary water source is activated automatically if high flue gas temperature or low recirculation water is detected. If this main backup system does not function properly, a spare pump is available for supplying water to the scrubbers.

7.3 Preventative Maintenance

1. Operations performs the following every shift. Any problems or abnormalities are investigated, corrected, and, if necessary, reported to a supervisor. Significant abnormalities are recorded on the operator's log sheet.

   - Ensure primary water supply pump is running
   - Check primary water supply pump for leaks
   - Check the supply pump for the main backup water source and, if it is operating, investigate the reason why (normally not running)
   - Recirculation pumps should be running
   - Check recirculation pumps for leaks
   - Overflow pots at bottom of scrubber should have adequate flow to ensure proper operation
   - Water line to bull nozzles should feel cool to touch
   - Adequate pressure on wall nozzles should be indicated by the local pressure gauges

2. Operations performs a weekly visual inspection of the scrubber to ensure it is operating properly. Repairs are made as necessary.

3. The wood residue surge bin is inspected regularly by maintenance and repairs are made as necessary. See the Title V I&M Plan for more details.

7.4 Monitored Operating Variables

Scrubber flow rate and differential pressure are monitored continuously and alarms are triggered when set parameters are exceeded. In addition, the operator monitors the following variables on the No. 9 Boiler system to ensure compliance. Please see the CAM Plan for more details.

- Scrubber pump on
- Scrubber high-low level
- Primary water supply pump failure
- Backup water availability
- Back-up water on
- Back-up water failure
- Stack temperature
- Spare recirculation pump on

7.5 Corrective Actions for Startup, Shutdown and Malfunction Abatement

1. Startup or upset during startup

   - Startup on natural gas
   - Ensure the scrubber is operating properly before burning any bark
   - If an upset occurs, stop bark burning and burn only gas until the problem can be identified and corrected

2. Shutdown or upset during shutdown

   - Ensure scrubber is operating properly until bark burning stops
   - If an upset occurs pull bark fuel immediately

3. Plugged scrubber

   - Stop bark burning and begin firing gas
   - Open atmospheric damper and close scrubber damper to bypass scrubber
   - Take scrubbers off-line and perform necessary maintenance

4. Plugged or sheared nozzles

   - Stop bark burning and begin firing gas
   - Open atmospheric damper and close scrubber damper to bypass the scrubber
   - Take scrubbers off-line and repair nozzle(s)

5. Water recirculation pump failure

    - Start spare pump
    - Repair failed pump

6. Failure of primary water supply pump

    - Ensure that backup water is being supplied to scrubber
    - Start up spare pump if necessary
    - Repair primary water supply pump

8. NO. 11 BOILER

8.1 Introduction

The No. 11 Boiler is an ABB Combustion Engineering combination fuel boiler rated for 750,000 pounds of steam per hour (approximately 1040 million BTU per hour heat input) that provides steam for mill processes and steam turbine-generator sets for producing electricity. The No. 11 Boiler burns natural gas and pulverized coal from four tangentially located windboxes. The boiler also burns wood residue, paper mill sludge and tire-derived fuel (TDF) from a traveling grate located at the bottom of the unit. An electrostatic precipitator is used to treat flue gases from the No. 11 boiler to control particulate emissions. NOx emissions are controlled through proper combustion. An opacity COMS and a NOx CEMS are used as performance indicators. No. 11 Boiler is subject to 40 CFR 64 CAM. Please see the CAM Plan for more details.

8.2 Pollutant Emission Control

Particulate and opacity emissions are controlled with the ESP. The precipitator on the No. 11 boiler is divided into identical east and west cells. Each cell has three fields. Each field utilizes a TR set which is regulated by controls located in an air conditioned motor control center or MCC room.

An induced draft (ID) fan is used to pull the flue gases through the boiler. Downstream of this fan the flue gases split into two separate streams before entering the precipitator. These two streams are recombined after they exit the precipitator and are exhausted through a common stack.

Combustion control is used to control NOx emissions.

8.3 Preventative Maintenance

8.3.1 Electrostatic Precipitator

1. Operations inspects the following items every shift. Any abnormalities, problems or concerns are investigated and further actions are taken as necessary. Significant events are recorded on the operator's log sheet and, if necessary, reported to supervisory personnel.

    - All lights on the control panels should indicate that the T-R sets are on
    - Currents and voltages on meters in MCC room should be similar to previous readings and significant fluctuations should be reported
    - Walk past rapper drives and listen for sound of hammers hitting frame (listen for uniformity in sound and duration of rapper cycles)
    - Inspect T-R sets for leaking coolant
    - Shafts on screw conveyors should be rotating smoothly
    - Drag conveyors should be working properly

- Check level of ash in hoppers by inserting a rod
- Remove caps on ports at bottom of hoppers (ash should escape ports in a sudden discharge when system is functioning properly)
- Filters for heater/blower fan are inspected and changed as necessary
- Fans for heater/blower units should be running and belts and motors functioning properly
- Check silo level indicator
- Air conditioning should be on in T-R control room

2. Operations performs a weekly visual inspection of the ESP to ensure it is operating properly. Repairs are made as necessary.

3. During large outages, which typically occur annually, all the internal parts of the precipitator are thoroughly inspected by supervisory personnel and an outside service specialist. Maintenance is performed as needed. Procedures performed during such outages include those listed below. Key findings from each large outage are documented in a report by the outside service specialist and maintained on file for at least 2 years. Please see the Title V I&M Plan for more details.

   - Remove fly ash buildup in all parts of precipitator
   - Inspect and clean or replace bushings
   - Inspect and clean or replace insulators
   - Inspect and clean T-R control sets
   - Replace faulty elements and controls on heater/blower units
   - Replace all filters and fans belts on blower/heater units
   - Clean and inspect rapper drive control cabinets
   - Repair rappers if operating poorly
   - Adjust rapping frequencies for optimum performance
   - Replace gear oil for DE and collection plate rapper drives
   - Repair leaks in precipitator shell
   - Adjust spacing between discharge electrode wires and collection plates
   - Relocate collection plate spacer frames
   - Inspect ductwork
   - Inspect and repair all conveyors
   - Clean and lubricate access door components

8.4 Monitored Operating Variables

8.4.1 Electrostatic Precipitator

1. Opacity is monitored continuously and alarms are triggered to help ensure compliance with the 20% 6-minute opacity limit.

2. The No. 11 boiler operator monitors alarms that allow detection of the following problems:

    - T-R failure
    - Rapper failure
    - Ash hopper high level alarm
    - Heater/blower failure
    - Conveyor failure
    - Rotary screw failure

8.4.2 NOx Combustion Control

The No. 11 operator uses a NOx CEMS to continuously monitor NOx emissions from No. 11 Boiler.

8.4.3 Fugitive Dust Control

Fugitive dust control for fuel handling is monitored as described in the Fugitive Dust Control Plan.

8.5 Corrective Actions for Startup, Shutdown and Malfunction Abatement

8.5.1 Electrostatic Precipitator

The following corrective actions are taken to control particulate emissions during a startup, shutdown, or malfunction of the electrostatic precipitator:

1. During startup ensure that the precipitator is operating properly before firing coal, woodwaste, sludge, or TDF in the boiler.

2. During shutdown ensure that the precipitator is operating until coal, woodwaste, sludge, and TDF burning has stopped.

3. When opacity exceeds 10% on a 6 minute average, the No. 11 boiler operator takes the following actions, as necessary, to reduce opacity. These are usually implemented in the order presented below:

    - Ensure all T-R sets are operating
    - Adjust T-R sets by increasing DE wire voltages until sparking is detected or until the current limit is reached
    - Lower over fire air flow
    - Lower oxygen supplied to furnace
    - Reduce coal burning rate
    - Reduce woodwaste burning rate

4. If the No. 11 boiler operator fails to control opacity using the above procedures or if a significant reduction in coal or woodwaste burning rate is required for opacity control, the potential problems listed below are investigated:

   - Grounding of electrodes
   - Drag conveyor failure
   - Screw conveyor failure
   - Buss support insulator failure
   - Rapper failure (ensure all rappers are turning in correct sequence)
   - T-R set failure
   - T-R controller failure

   The last 3 problems listed above can usually be corrected on-line. The first 4 require entry into one side of the precipitator. Under these circumstances repairs are accomplished as follows.

   - Reduce coal burning rate until 6-minute opacity is below 20% and, if necessary, reduce woodwaste burning also
   - Supply natural gas to furnace to maintain heat input to boiler
   - Isolate affected side of precipitator
   - Shut down heaters on affected side and open access doors to facilitate cooling
   - Perform necessary maintenance

   In the event that high opacity (> 20%, 6-minute average) persists, only natural gas will be used as a fuel. Alternatively, the boiler will be shut down to repair the precipitator.

8.5.2 NOx Combustion Control

The following actions are taken as necessary.

1. The second assistant operator opens the NOx dampers (fourth floor).

2. The No. 11 boiler operator increases the windbox to furnace differential pressure.

8.5.3 Fugitive Dust Control

Preventive measures and corrective actions are described in the Fugitive Dust Control Plan.

9. COAL SILOS

9.1 Introduction

There are three coal silos for No. 11 Boiler. When the coal silos are filled with coal, fugitive dust emissions can occur. To control these emissions a baghouse has been installed on each silo. When a coal silo is being filled the appropriate baghouse is operational.

9.2 Pollutant Emission Control

Bag filters are used to control fugitive coal dust emissions from each of three coal silos for the No. 11 boiler. Operations performs visible inspections of the coal silo systems weekly to ensure they are operating correctly. Repairs are made as necessary.

9.3 Preventive Maintenance

1. Operations visually inspects the outlet pipe from the coal silos during daylight hours on a weekly basis to ensure there are no emissions. Repairs are made if visual emissions are observed.

2. The utilities maintenance department inspects the coal silo baghouses regularly and repairs are made as necessary. See the Title V I&M Plan for details.

9.4 Monitored Operating Variables

The second assistant operator periodically inspects each filter during filling of the coal silo and inspects the system weekly. If visible emissions are observed, repairs are made as necessary.

9.5 Corrective Actions for Startup, Shutdown or Malfunction Abatement

Baghouse filter malfunction

- Stop using the filter and, if necessary, load a silo which has an operable filter
- Repair the filter system

10. ASH SILOS

10.1 Introduction

There are two ash silos for No. 11 Boiler. The No. 1 ash silo collects ash from the multiclone system and the No. 2 ash silo collects fly ash from the ESP. A filter is used to control fugitive dust emissions from the No. 1 ash silo and a baghouse is used to control fugitive dust emissions from No. 2 ash silo.

10.2 Pollutant Emission Control

A filter is used to control fugitive dust emissions from the No. 1 ash silo and a baghouse is used to control fugitive dust emissions from the No. 2 ash silo. Operations performs visible inspections of the ash silo systems weekly to ensure they are operating correctly. Repairs are made as necessary.

10.3 Preventive Maintenance

1. Operations visually inspects the ash silos during daylight hours on a weekly basis to ensure there are no emissions. Repairs are made if visual emissions are observed.

2. The utilities maintenance department inspects the ash silo baghouse regularly and repairs are made as necessary. See the Title V I&M Plan for details.

10.4 Monitored Operating Variables

1. Operations visually inspects the ash silos during daylight hours on a weekly basis to ensure there are no emissions. Repairs are made if visual emissions are observed.

2. The ash handlers periodically inspect the dust filter during filling of the No. 1 ash silo. Repairs are made as necessary

3. The ash handlers ensure no ash is coming out of the conveyors or silo.

10.5 Corrective Actions for Startup, Shutdown or Malfunction Abatement

1. Filter malfunction

    - Repair filter system

2. Lack of negative draft

    - Ensure suction line is open to induced draft fan to maintain a negative draft

11. NO. 11 ASH UNLOADING

11.1 Introduction

Ash from the No. 1 and No. 2 ash silos are transferred into dump trucks for disposal in the on-site landfill via pugmills. Particulate emissions from No. 11 boiler ash unloading are controlled by wetting the ash prior to loading it into the dump trucks.

11.2 Pollutant Emission Control

Fugitive particulate emissions can be created when ash from the boiler economizer and electrostatic precipitator is unloaded from the ash silos into dump trucks for disposal. The ash is sprayed with water prior to unloading to minimize these particulate emissions.

11.3 Preventive Maintenance

1. The ash handlers inspect the ash mixers and rotary feeders once each day.

2. The utilities maintenance department performs regular inspections of the ash unloading system and repairs are made as needed. See the Title V I&M Plan for details.

10.3 Monitored Operating Variables

The ash handlers perform a visual inspection each time a truck is filled with ash to ensure adequate dust control.

10.4 Corrective Actions for Startup, Shutdown or Malfunction Abatement

Excessive dusting during truck loading

- Check mixer water pressure and increase as necessary
- Check rotary feeder speed and slow as necessary
- If dusting persists stop truck loading and clean mixer paddles
- If dusting still persists stop truck loading and initiate corrective maintenance
- Stop unloading operations until effective corrective action has been taken

APPENDIX A

CRITICAL SPARE PARTS

No. 9 Boiler

Ready spare circulation pump
2 ready backup scrubber water supply pumps
Gas backup for boiler in the event of a scrubber failure
Scrubber Nozzles

No. 10 Recovery Furnace

Description	Old Stores # or Location	New Store #
T-R sets	1lth floor No. 10 furnace	
T-R controls wire	EPIC-38083522	00195597
wire rappers	16602657	00184894 yellow
plate rappers	16602600	0184893 red
precipitator wires	6th floor No. 10 furnace	

Smelt Dissolving Tank

Description	Old Stores # or Location	New Store #
fan rotor, shaft, & pulleys	4th floor No. 10 furnace	
fan bearings	11250551	00002635
fan belts	14841107	00003607

No. 11 Boiler Precipitator

Description	Old Stores # or Location	New Store #
T-R sets	6th floor of precipitator	
T-R controls	EPIC-38083522	00195597
wire rappers	See Attached Sheet	
plate rappers	See Attached Sheet	

Ash Silo

Description	Old Stores # or Location	New Store #
filter bags	16140530	00184617
loading controls		
timer	29500157	00191057
solenoid	93709980	00229441

No. 11 Wire Rappers

Old	New	Description
16600581	00184866	support insulator
16600568	00184865	insulator gasket
16600371	00184853	stand off bracket
16606450	00184897	shaft insulator
16600615	00184868	motor shaft gasket
79560202	00219186	gear reducer, rapper shaft drive
16601060	00184886	spacer, hammer link
16602517	00184892	hammer assembly
16600428	00184858	bushing, hammer
16600430	00184859	bushing, rapper shaft support
39200524	00199540	drive motor

No. 11 Plate Rappers

Old	New	Description
16606251	00184896	packing ring, rapper shaft
09202688	00182181	bearing, rapper shaft
23020200	00187303	gear Coupling, rapper drive
16606554	00184899	spacer, hammer link
16602505	00184891	hammer assembly
16600417	00184857	bushing, hammer
16600265	00184850	bearing, rapper shaft
79560155	00219185	gear reducer, rapper shaft drive
39200465		drive motor

STARCH UNLOADING

Malfunction Abatement Plan

Updated June 2020

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1. INTRODUCTION

The purpose of this document is to identify how Verso Escanaba LLC (VE) will minimize pollutant emissions from starch unloading activities during periods of startup, shutdown, and malfunction. This document provides a framework for preventing pollutant emissions through good operating practices while also identifying quick corrective actions when required. In many cases the required corrective action will depend on the type of incident that has occurred. For this reason corrective actions are not necessarily intended to be implemented in the order they are listed. This document will be updated periodically to incorporate any corrective actions that are not included in the plan at this time. Appendix A contains a list of critical spare parts that are maintained in inventory at this facility.

2. El STARCH UNLOADING

2.1 Introduction

Starch is used in coating, and is also added to the wet end of the E1 paper machine. The E1 system has four baghouses: the No. 1 starch silo baghouse; the No. 2 starch silo baghouse; the No. 1 and No. 2 starch day bins baghouse; and the No. 1 and No. 2 starch wet out tanks baghouse. The two starch silos each have their own baghouse while the two day bins and the two wet out tanks share common baghouses. A truck or railcar can be unloaded directly into the day bins if required; otherwise the starch is normally unloaded into the silos. Particulate emissions from starch unloading are controlled with these four baghouse systems.

2.2 Pollutant Emission Control

Particulate emissions are controlled with the baghouses. The baghouses are inspected regularly to ensure proper collection of particulate emissions.

2.3 Preventive Maintenance

The following preventive maintenance is performed:

1. A visible emissions checklist is completed during daylight hours weekly by operations. Any abnormalities are recorded and corrective actions are taken as needed.

2. Routine inspections are performed by maintenance and corrective actions are taken as needed. See the Title V I&M Plan for details.

2.4 Monitored Operating Variables

The operator responds to the following alarms:

- Chain failure on rotary feeder
- High/Low differential pressure across the vacuum filter

2.5 Corrective Actions for Startup, Shutdown or Malfunction Abatement

1. High differential pressure

   - Cut back on exhaust fan damper
   - Check the rotary valve and repair if necessary
   - Clean any dust from plenum chamber, inside, and outside of bags
   - Clean discharge system and check for capacity in silo
   - Unplug starch line from receiver to silo
   - Check for a defective timer and replace if necessary

2. Loss of compressed air

   - Tighten lose fittings
   - Clean debris from diaphragm valve and solenoid plunger
   - Check for electrical short
   - Check for frozen air line

3. Airflow volume too low

   - Check to see that the fan rotation is in the right direction
   - Ensure fan belts are not slipping
   - Repair any leaks in piping, rotary valve, and collector flanges
   - Clean any dust from plenum chamber and outside of bags

4. Starch dust puffing

   - Inspect bag connections and re-tighten bag clamps
   - Inspect for worn or damaged bags and change as necessary
   - Clean plenum before installing new bag set

5. Timer does not operate

   - Check wiring on timer
   - Check for a short circuit
   - Replace blown fuses
   - Replace defective timer or run the baghouse continuously

3. E3 STARCH UNLOADING

3.1 Introduction

Starch is used in coating, and is also added to the wet end of the E3 paper machine. The E3 system has three baghouses: the No. 1 starch (Pearl) silo baghouse; the No. 2 starch (Pearl) silo baghouse; and the No. 3 starch (Cato) silo baghouse. Each of the starch silos has its own baghouse. Particulate emissions from starch unloading are controlled with these three baghouse systems.

3.2 Pollutant Emission Control

Particulate emissions are controlled with the baghouses. The baghouses are inspected regularly to ensure proper collection of particulate emissions.

3.3 Preventive Maintenance

The following preventive maintenance is performed:

1. A visible emissions checklist is completed during daylight hours weekly by operations. Any abnormalities are recorded and corrective actions are taken as needed.

2. Routine inspections are performed by maintenance and corrective actions are taken as needed. See the Title V I&M Plan for details.

3.4 Monitored Operating Variables

1. The equipment tender monitors unit differential pressure on the baghouses. Low differential pressure indicates a rip or tear in the bags. High differential pressure indicates plugged bags and/or a plug in the starch transfer line.

2. The operator responds to the following alarm:

    - High/Low differential pressure across the vacuum filter

3.5 Corrective Actions for Startup, Shutdown or Malfunction Abatement

1. High differential pressure

   - Cut back on exhaust fan damper
   - Clean any dust from plenum chamber, inside, and outside of bags
   - Clean discharge system and check for capacity in silo
   - Unplug starch line from receiver to silo

2. Loss of compressed air

   - Tighten lose fittings
   - Clean debris from diaphragm valve and solenoid plunger
   - Check for electrical short
   - Check for frozen air line

3. Airflow volume too low

   - Check to see that the fan rotation is in the right direction
   - Ensure fan belts are not slipping
   - Repair any leaks in piping, rotary valve, and collector flanges
   - Clean any dust from plenum chamber and outside of bags

4. Starch dust puffing

   - Inspect bag connections and re-tighten bag clamps
   - Inspect for worn or damaged bags and change as necessary
   - Clean plenum before installing new bag set

5. Timer does not operate

   - Check wiring on timer
   - Check for a short circuit
   - Replace blown fuses
   - Replace defective timer or run the baghouse continuously

4. E4 STARCH UNLOADING

4.1 Introduction

Starch is used in coating, and is also added to the wet end of the E4 paper machine. The E4 system has two baghouses: the No. 1 starch (Pearl) silo baghouse; and the No. 2 starch (Pearl) silo baghouse. Each of the starch silos has its own baghouse. Particulate emissions from starch unloading are controlled with these two baghouse systems.

4.2 Pollutant Emission Control

Particulate emissions are controlled with the baghouses. The baghouses are inspected regularly to ensure proper collection of particulate emissions.

4.3 Preventive Maintenance

The following preventive maintenance is performed:

1. A visible emissions checklist is completed during daylight hours weekly by operations. Any abnormalities are recorded and corrective actions are taken as needed.

2. Routine inspections are performed by maintenance and corrective actions are taken as needed. See the Title V I&M Plan for details.

4.4 Monitored Operating Variables

1. Operations monitors puffing from all of the equipment during periods of unloading. Corrective actions are taken as needed.

2. A visible emissions checklist is completed during daylight hours weekly by operations. Any abnormalities are recorded and corrective actions are taken as needed.

4.5 Corrective Actions for Startup, Shutdown or Malfunction Abatement

1. Loss of compressed air

   - Tighten lose fittings
   - Clean debris from diaphragm valve and solenoid plunger
   - Check for electrical short
   - Check for frozen air line

2. Airflow volume too low

   - Check to see that the fan rotation is in the right direction
   - Ensure fan belts are not slipping
   - Repair any leaks in piping, rotary valve, and collector flanges
   - Clean any dust from plenum chamber and outside of bags

3. Starch dust puffing

   - Inspect bag connections and re-tighten bag clamps
   - Inspect for worn or damaged bags and change as necessary
   - Clean plenum before installing new bag set

4. Timer does not operate

   - Check wiring on timer
   - Check for a short circuit
   - Replace blown fuses
   - Replace defective timer or run the baghouse continuously

APPENDIX A

CRITICAL SPARE PARTS

All Baghouses	Item #
Magnehelic pressure gauge	00079837
Hose #64104 for clamps	00567138
Filter bag 6"x72'.' dacron	00567117
Filter cage 5 ½" galvanized steel	00567130
Air filter for pressure gauge	00567146
1" diaphragm valve	00567181
Sealing gasket	00567182
Timer board	00191080
Solenoid valve	00567180