

MALFUNCTION ABATEMENT PLAN
Sulfur Removal System

For:

Harland's Sanitary Landfill, Inc.
Manistee County Landfill

Manistee, Michigan

By:



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Amended August 2010

1.0 INTRODUCTION

Harland's Sanitary Landfill, Inc. the owner and operator of the Manistee County Landfill (MCL) is a municipal solid waste landfill operating in Manistee, Michigan. The facility has installed and operates a sulfur removal system in conjunction with a landfill gas collection and control system.

Pursuant to Section IV.1 of Permit to Install No. 357-08A, issued October 2, 2009, the Michigan Department of Environmental Quality – Air Quality Division, requested that MCL prepare a Malfunction Abatement Plan for the sulfur removal system in accordance with R 336.1205, R 336.1225, R 336.1901, R336.1910, R 336.2803, R 336.2804, 40 CFR 52.21(c) and (d). This document was developed in response to that request.

2.0 RESPONSIBLE PARTIES

The following personnel will be responsible for the identified tasks

Personnel	Responsibilities	Phone Number
Landfill Manager	Sulfur System Operations	231-425-8975
Environmental Engineer	Notify MDEQ of Malfunction	616-431-6173

3.0 NORMAL OPERATION OF CONTROL EQUIPMENT

The sulfur removal system is located adjacent to the existing open stick flare (utility flare) which combusts landfill gas collected from MSL. Landfill gas is directed from the existing gas collection system blower that is used to actively extract gas from the landfill to the sulfur removal system. The sulfur removal system is equipped with scrubbers, a solution contactor and filtration system that is designed to achieve a minimum 400-ppm sulfur concentration in the exit gas prior to combustion in the flare.

4.0 INSPECTION/MAINTENANCE AND SCHEDULE

The following table provides a general maintenance and inspection schedule for the sulfur removal system. A more detailed schedule and routine monitoring and maintenance requirements are listed in Book 1, Section 9 and 11 of the NATCO Paques Operations and Maintenance Manual.

For purposes of this section, the term “daily” shall mean normal business hours (this excludes holidays and weekends unless facility is open during those periods).

Unit	Equipment Type	Inspection/Maintenance Action	Inspection/Maintenance Frequency
Scrubber Skid			
Inlet Scrubber Pump	Pump	Verify pump operations as specified in the NATCO Paques Operations Manual and inspect for leaks	Inspect daily. Initiate repairs within 24 hours of detection of malfunction.
		Pump overhaul or replacement	Initiate repairs within 24 hours of detection of malfunction.
Outlet Scrubber Pump	Pump	Verify pump operations as specified in the NATCO Paques Operations Manual and inspect for leaks	Inspect daily. Initiate repairs within 24 hours of detection of malfunction.
		Pump overhaul or replacement	Initiate repairs within 24 hours of detection of malfunction.
Inlet Gas Scrubber	Vessel	Verify Vessel operations as specified in the NATCO Paques Operations Manual.	Inspect daily. Initiate repairs within 24 hours of detection of malfunction.
		Inspect for cracks, leaks, etc.	Conduct inspections monthly. Initiate repairs within 1 week of detection of malfunction.
Outlet Gas Scrubber	Vessel	Verify Vessel operations as specified in the NATCO Paques Operations Manual.	Inspect daily. Initiate repairs within 24 hours of detection of malfunction.
		Inspect for cracks, leaks, etc.	Conduct inspections monthly. Initiate repairs within 1 week of detection of malfunction.
Scrubber Skid	Instruments	Inspect valves, gauges, site glasses for proper operation.	Inspect Daily. Initiate repairs within 24 hours of detection of malfunction.

Unit	Equipment Type	Inspection/Maintenance Action	Inspection/Maintenance Frequency
Scrubber Skid	Instruments	Inspect for corrosion as specified in the NATCO Paques Operations Manual.	Inspect monthly. Initiate repairs within 1 week of detection of malfunction.
Pump Skid			
Solution Cooler	Exchanger	Verify Exchanger operations as specified in the NATCO Paques Operations Manual. .	Inspect monthly. Initiate repairs within 1 week of detection of malfunction.
Solution Bottoms Pump (2)	Pump	Verify pump operations as specified in the NATCO Paques Operations Manual and inspect for leaks	Inspect daily. Initiate repairs within 24 hours of detection of malfunction.
		Lubricate pump	Monthly or as needed
		Pump overhaul or replacement	Initiate repairs within 24 hours of detection of malfunction.
Solution Circulation Pump (2)	Pump	Verify pump operations as specified in the NATCO Paques Operations Manual and inspect for leaks	Inspect daily. Initiate repairs within 24 hours of detection of malfunction.
		Lubricate pump	Monthly or as needed
		Pump overhaul or replacement	Initiate repairs within 24 hours of detection of malfunction.
Pump Skid	Instruments	Inspect valves, gauges, site glasses for proper operation.	Inspect Daily. Initiate repairs within 24 hours of detection of malfunction.
		Inspect for corrosion as specified in the NATCO Paques Operations Manual.	Inspect monthly. Initiate repairs within 1 week of detection of malfunction.
Blower Skid			
Bioreactor Vessel	Vessel	Verify Vessel operations as specified in the NATCO Paques Operations Manual.	Inspect daily. Initiate repairs within 24 hours of detection of malfunction.

Unit	Equipment Type	Inspection/Maintenance Action	Inspection/Maintenance Frequency
		Inspect for cracks, leaks, etc.	Conduct inspections monthly. Initiate repairs within 1 week of detection of malfunction.
Bioreactor Air Blower (3)	Blower	Verify blower operations as specified in the NATCO Paques Operations Manual.	Inspect blower monthly. Initiate repairs within 1 week of detection of malfunction.
		Lubricate blower	Monthly or as needed.
		Blower overhaul or replacement	Initiate repairs within 24 hours of detection of malfunction.
Bioreactor Air Cooler	Exchanger	Verify Exchanger operations as specified in the NATCO Paques Operations Manual.	Inspect monthly. Initiate repairs within 1 week of detection of malfunction.
Blower Skid	Instruments	Inspect valves, gauges, site glasses for proper operation.	Inspect Daily. Initiate repairs within 24 hours of detection of malfunction.
		Inspect for corrosion as specified in the NATCO Paques Operations Manual.	Inspect monthly. Initiate repairs within 1 week of detection of malfunction.
OFF-Skid Equipment			
Sulfur Decanting Centrifuge	Centrifuge	Verify Centrifuge operations as specified in the NATCO Paques Operations Manual.	Inspect Daily. Initiate repairs within 24 hours of detection of malfunction.
Sulfur Slurry Pump (2)	Pump	Verify pump operations as specified in the NATCO Paques Operations Manual and inspect for leaks	Inspect daily. Initiate repairs within 24 hours of detection of malfunction.
		Lubricate pump	Monthly or as needed
		Pump overhaul or replacement	Initiate repairs within 24 hours of detection of malfunction.

Unit	Equipment Type	Inspection/Maintenance Action	Inspection/Maintenance Frequency
Caustic Dosing Pump	Pump	Verify pump operations as specified in the NATCO Paques Operations Manual and inspect for leaks	Inspect daily. Initiate repairs within 24 hours of detection of malfunction.
		Lubricate pump	Monthly or as needed
		Pump overhaul or replacement	Initiate repairs within 24 hours of detection of malfunction.
Nutrient Dosing Pump	Pump	Verify pump operations as specified in the NATCO Paques Operations Manual and inspect for leaks	Inspect daily. Initiate repairs within 24 hours of detection of malfunction.
		Lubricate pump	Monthly or as needed
		Pump overhaul or replacement	Initiate repairs within 24 hours of detection of malfunction.
Solution Pump Tank	Pump	Verify pump operations as specified in the NATCO Paques Operations Manual and inspect for leaks	Inspect daily. Initiate repairs within 24 hours of detection of malfunction.
		Lubricate pump	Monthly or as needed
		Pump overhaul or replacement	Initiate repairs within 24 hours of detection of malfunction.
Sulfur Settler	Tank	Verify Vessel operations as specified in the NATCO Paques Operations Manual.	Inspect daily. Initiate repairs within 24 hours of detection of malfunction.
		Inspect for cracks, leaks, etc.	Conduct inspections monthly. Initiate repairs within 1 week of detection of malfunction.
Nutrient Tank	Tank	Verify Vessel operations as specified in the NATCO Paques Operations Manual.	Inspect daily. Initiate repairs within 24 hours of detection of malfunction.

Unit	Equipment Type	Inspection/Maintenance Action	Inspection/Maintenance Frequency
		Inspect for cracks, leaks, etc.	Conduct inspections monthly. Initiate repairs within 1 week of detection of malfunction.
Paques Solution Contactor Vessel	Vessel	Verify Vessel operations as specified in the NATCO Paques Operations Manual.	Inspect daily. Initiate repairs within 24 hours of detection of malfunction.
		Inspect for cracks, leaks, etc.	Conduct inspections monthly. Initiate repairs within 1 week of detection of malfunction.
Bioreactor (2)	Vessel	Verify Vessel operations as specified in the NATCO Paques Operations Manual.	Inspect daily. Initiate repairs within 24 hours of detection of malfunction.
		Inspect for cracks, leaks, etc.	Conduct inspections monthly. Initiate repairs within 1 week of detection of malfunction.
Filtrate Tank	Tank	Verify Vessel operations as specified in the NATCO Paques Operations Manual.	Inspect daily. Initiate repairs within 24 hours of detection of malfunction.
		Inspect for cracks, leaks, etc.	Conduct inspections monthly. Initiate repairs within 1 week of detection of malfunction.
Filtrate Pump (2)	Pump	Verify pump operations as specified in the NATCO Paques Operations Manual and inspect for leaks	Inspect daily. Initiate repairs within 24 hours of detection of malfunction.
		Lubricate pump	Monthly or as needed
		Pump overhaul or replacement	Initiate repairs within 24 hours of detection of malfunction.
Inline Gas Heater	Heater	Verify heater operations as specified in the NATCO Paques Operations Manual.	Conduct inspections monthly. Initiate repairs within 1 week of detection of malfunction.

Unit	Equipment Type	Inspection/Maintenance Action	Inspection/Maintenance Frequency
Control Panel	Electrical	Check panel integrity for leaks, etc. as specified in the NATCO Paques Operations Manual. Operations to be confirmed during equipment maintenance implementing lock-out/tag-out procedures.	Inspect monthly. Initiate repairs/ overhaul or replacement within 24 hours of detection of malfunction.
Air Compressor	Compressor	Verify compressor operations as specified in the NATCO Paques Operations Manual.	Daily. Initiate repairs/ overhaul or replacement within 24 hours of detection of malfunction.
		Lubricate compressor	Monthly or as needed.
		Inspect for leaks	Daily. Initiate repairs within 24 hours of detection of malfunction.

The facility typically keeps the following types of spare parts on site, as per the manufacturer recommendation, in order to facilitate quick repairs to the sulfur removal system:

- Valves
- Piping
- Temperature and pressure gauges

Recommended spare parts are listed in Book 6 of the NATCO Paques Operations and Maintenance Manual.

5.0 CORRECTIVE ACTION TO BE TAKEN IN THE EVENT OF MALFUNCTIONS

In the event a malfunction is detected, one or more of the following steps will be taken. A detailed schedule and routine monitoring and maintenance requirements are listed in Book 1, Section 10.

Possible Malfunction	Corrective Action (including personnel to be notified)	Approximate Timeline for Corrective Actions
Loss of electrical power	Determine the cause of the power loss. If possible restore electrical service (notify electrician if needed). Restart sulfur removal system as soon as possible after power is restored.	Initiate immediately upon discovery. However, it may take anywhere from a few minutes to a few days to resolve, depending on the reason for the power loss to restore power (i.e. ice storm, Act of God, etc.).
Sulfur removal system shutdown	Investigate cause and restart sulfur removal system (notify site manager or operations manager or electrician if duration is expected to exceed 48 hours)	Initiate immediately upon discovery. However, this may take anywhere from a few minutes to a few days to resolve, depending on the reason of the shutdown. The timeline for correcting other shutdowns will depend strictly upon the cause of the shutdown.
Tanks	Notify the site manager and operations manager if duration is expected to exceed 48 hours. Ensure vessel components are working correctly and are in good condition; inspect for cracks, leaks, etc. and repair/replace if necessary.	Initiate corrective action within 24 hours if leaks or cracks are major. However if the leaks are small and can be contained, then initiate corrective action within one week. This corrective action may take a few hours to a day to resolve, depending on requirement for repair and/or parts availability.
Air Compressor	Notify the site manager and operations manager if duration is expected to exceed 48 hours. Ensure compressor components are working correctly and are in good condition; inspect for damages leaks, etc. and repair/replace if necessary.	If the air compressor is non-functioning or is preventing the system from operating, initiate corrective action within 24 hours of discovery, otherwise initiate within one week of discovery. This corrective action may take a few hours to a day to resolve, depending on requirement for repair and/or parts availability.

Possible Malfunction	Corrective Action (including personnel to be notified)	Approximate Timeline for Corrective Actions
Low H ₂ S Removal	Notify the site manager and operations manager if duration is expected to exceed 48 hours. Follow instructions in the NATCO Paques Operations Manual: check gas composition; verify that the nutrient pump working properly; check condition/orientation of the redox probes and calibrate if necessary; verify set points by determining how far apart the redox probes are reading.	Initiate within 72 hours of discovery. This corrective action may take a few hours to a day to resolve, depending on requirement for repair and/or parts availability.
pH Alarm	Notify the site manager and operations manager if duration is expected to exceed 48 hours. Follow instructions in the NATCO Paques Operations Manual: check caustic storage tank levels and ensure that the transmitter is reading correctly; verify that the set points on the PLC are accurate; verify that the caustic pump is working properly and is set to the correct flow rate; check pH levels and adjust accordingly; verify the pH meter is working properly and calibrate if needed.	Initiate within 24 hours of discovery. If not contributing to a condition that exceeds a permit limit, initiate within one week of discovery. This corrective action may take a few hours to a day to resolve, depending on requirement for repair and/or parts availability.

Possible Malfunction	Corrective Action (including personnel to be notified)	Approximate Timeline for Corrective Actions
Low Redox Alarm	Notify the site manager and operations manager if duration is expected to exceed 48 hours. Follow instructions in the NATCO Paques Operations Manual: ensure redox meter is working correctly; check blower belts and operation; check for closed valves.	Initiate within one week of discovery. This corrective action may take a few hours to a day to resolve, depending on requirement for repair and/or parts availability.
High Conductivity	Notify the site manager and operations manager if duration is expected to exceed 48 hours. Follow instructions in the NATCO Paques Operations Manual: clean and calibrate electrode; verify water pump is working correctly.	Initiate within one week of discovery. This corrective action may take a few hours to a day to resolve, depending on requirement for repair and/or parts availability.
Low Solids Concentration	Notify the site manager and operations manager if duration is expected to exceed 48 hours. Follow instructions in the NATCO Paques Operations Manual: verify all process variables are within proper limits.	Initiate within one week of discovery. This corrective action may take a few hours to a day to resolve, depending on requirement for repair and/or parts availability.
High Temperature	Notify the site manager and operations manager if duration is expected to exceed 48 hours. Follow instructions in the NATCO Paques Operations Manual: ensure that the inlet gas heater and temperature transmitters are working correctly.	Initiate within 24 hours of discovery. However, this corrective action may take a few hours to a day to resolve, depending on requirement for repair and/or parts availability.

Possible Malfunction	Corrective Action (including personnel to be notified)	Approximate Timeline for Corrective Actions
High Liquid Level	Notify the site manager and operations manager if duration is expected to exceed 48 hours. Follow instructions in the NATCO Paques Operations Manual: check bleed valve and repair if needed; verify tank level transmitter is working correctly; ensure that the flow to each pump seal flush is correct.	If the system is not operating, initiate corrective action within 24 hours of discovery, otherwise initiate within one week of discovery. However, this corrective action may take a few hours to a day to resolve, depending on requirement for repair and/or parts availability.
System Low Liquid Level	Notify the site manager and operations manager if duration is expected to exceed 48 hours. Follow instructions in the NATCO Paques Operations Manual: verify that the water feed pump and filtrate tank bleed valve is working correctly; check for leaks and repair if necessary; ensure that the pumps are working correctly, repair/replace if needed.	If the system is not operating, initiate corrective action within 24 hours of discovery, otherwise initiate within one week of discovery. This corrective action may take a few hours to a day to resolve, depending on requirement for repair and/or parts availability.
No flow pump alarm	Notify the site manager and operations manager if duration is expected to exceed 48 hours. Follow instructions in the NATCO Paques Operations Manual: clean lines and investigate the cause of the low flow; verify that the pump is working properly and that the pump seals are in good condition; ensure all seal flushes are working properly; confirm set points are correct.	Initiate within 24 hours of discovery. This corrective action may take a few hours to a day to resolve, depending on requirement for repair and/or parts availability.

Possible Malfunction	Corrective Action (including personnel to be notified)	Approximate Timeline for Corrective Actions
Foaming	Notify the site manager and operations manager if duration is expected to exceed 48 hours. Follow instructions in the NATCO Paques Operations Manual: determine if flow foam sprayers need to be increased or decreased; ensure spray nozzles are operating properly, if not then clean; determine if any variables have been changed, which could have contributed to the problem; determine if any process variables are not within acceptable limits.	Initiate within 72 hours of discovery. However, this corrective action may take a few hours to a day to resolve, depending on requirement for repair and/or parts availability.

6.0 PLAN REVIEW FREQUENCY

The Malfunction Abatement Plan will be reviewed annually or more frequently if needed and will be amended if it is determined additional measures are needed. If amendments are made, they will be provided to the MDNRE for review and approval.