

## **MALFUNCTION ABATEMENT AND PREVENTATIVE MAINTENANCE PLAN**

This Malfunction Abatement Plan is written to address the operational parameters, preventive maintenance, and malfunction response for the dust collection systems at the Martin Marietta Magnesia Specialties, LLC plant located at 1800 Eastlake Road, Manistee, Michigan.

Martin Marietta currently uses electrostatic precipitators, baghouses, bin vents, an HCl fume scrubber and cyclones for dust collection.

### **I. OPERATIONAL PARAMETERS**

#### **a. Electrostatic Precipitators**

The electrostatic precipitators are used to capture product (MgO) from the exit gases of one rotary kiln, 3 multihearth furnaces, and 2 shaft kilns.

There are a total of four E.S.P.s on site. The E.S.P. on #1 Plant and #2 Plant at Periclase are equipped with continuous opacity monitoring systems (COMS). The #3 Plant at Periclase and #3 Rotary Kiln stacks are observed each shift by a non-certified observer for opacity.

The controls for the E.S.P. are normally set in automatic and a controller adjusts voltage and current to obtain the most efficient operation of the E.S.P. The controller will make significant changes in the voltage and current depending on moisture content, production rate, and temperature of the exhaust gases.

#### **b. Baghouses and Bin Vents**

The baghouses and bin vents are used to control dust generated from conveying systems and bins.

The baghouses and bin vents are inspected each shift they are operating. The differential pressure is recorded and retained for a period of five years. Operating differential pressure ranges for each system are listed in Appendix A of this document.

Once each day, the exhaust stacks of operating baghouses are observed by a non-certified observer. The observer looks for emissions. If emissions are observed, the employee shall log:

1. Color of emissions;
2. Whether the emissions are representative of normal emissions;
3. If the emissions are not representative of normal operations, the cause of the abnormal emission;
4. The total duration of any abnormal emissions incident;
5. Any corrective action taken to eliminate the abnormal visible emission.

A record of these observations shall be kept on file for a period of five years.

c. Cyclones

The cyclones in the plant are used to remove product from air streams. The cyclones are inspected each shift to insure proper operation. The operator checks the differential pressure and records the readings. Normal operating range for the cyclones is listed in Appendix A of this document.

A record of these observations shall be kept on file for a period of five years.

d. HCl Fume Scrubber

A packed tower fume scrubber is used to remove HCl fumes emanating from the HCl tank. The operator checks the differential pressure and water flow rate through the scrubber and records the readings. Normal operating range for the scrubber is listed in Appendix A of this document.

## II. PREVENTIVE MAINTENANCE

It is the responsibility of the Plant Manager to ensure all preventive maintenance schedules are adhered to and the work is completed in a satisfactory manner.

### **Electrostatic Precipitators (ESP)**

To insure the long-term reliability of the E.S.P.s, maintenance must be performed to control corrosion and prevent unscheduled downtime due to electrical failure. The following maintenance schedule will apply to all existing and future ESP's located at Martin Marietta's Manistee plant:

Frequency:  
Annual

Procedure:

Internal Inspection

1. Check for excessive dust deposits on wires and plates. Remove as necessary.
2. Check interior for corrosion. Repair as necessary.
3. Check plates and wires for warping and alignment. Adjust or repair as necessary.
4. Remove or replace broken or brittle wires.

Penthouse Area Inspection

1. Check for corrosion. Repair as necessary.
2. Check and clean high-tension insulators as necessary.

Transformer Rectifier Inspection

1. Check liquid level. Add oil as needed.
2. Check and clean insulators and terminals as necessary.
3. Check for oil leakage. Repair leak and refill as needed.

Control Inspection

1. Check control cabinet relays. Repair or replace as necessary.
2. Check instrument controls. Adjust Controls to manufacturer's recommended optimum operating control levels.

Rapper System

1. Check for operation and free movement. Adjust or replace items that cause sticking or erratic movement.

Document all maintenance performed. Records must be kept on file for a period of five years.

**Bin Vents**

The following maintenance schedule applies to bin vents located at the Manistee Plant:

Frequency:

Annual

Procedure:

Internal Inspection

1. Check for dust buildups at inlet and around bags or cartridges. Clean as necessary.
2. Inspect bags or cartridges for excessive buildup, tears, or leakage. Clean or replace as necessary.
3. Inspect for corrosion. Repair as necessary.

External Inspection

1. Check for material buildup on unit. Clean as necessary.
2. Check for corrosion. Repair as necessary.

Document all maintenance performed. Records must be kept on file for a period of five years.

**Baghouse Collectors**

The following maintenance schedule applies to the baghouses located at the Manistee plant:

Frequency:

Annual

Procedure:

Internal Inspection

1. Check for dust abrasion. Repair as necessary.
2. Check for buildups in suction piping and clean air plenum. Clean as necessary.

External Inspection

1. Check shell for leaks or brittleness. Repair as necessary.
2. Check ducts for abrasion, leakage and plugging. Clean or repair as necessary.
3. Check for proper operation of blowbacks. Repair as necessary.
4. Check condition of blower and blower motor.
5. Check operation of discharge valves and air lock valves. Repair or replace if needed.
6. Check inlet damper for proper setting and operation. Repair as necessary.

7. Observation of baghouse operation. Check air pressure to bag filter to maintain 85-100 psig or level recommended by the manufacturer. Check static pressure on inlet and outlet sides of baghouse. Check mechanical shakers and vibrators for operation. Check timers for cleaning frequencies both air pulse and shaker style baghouses.
8. Check hopper for plugging. Clean as necessary.
9. Check areas where ducts pick up dust from vacuum. Clean ducts as necessary.

Document all maintenance performed. Records must be kept on file for a period of five years.

### **Cyclone Collectors**

The following maintenance schedule applies to all cyclones located in the Manistee plant.

#### Frequency

Annual

#### Procedure

1. Check inlet and effluent ducts for leaks. Check cyclone and ducts for wear due to dust abrasion. Repair as necessary.
2. Observation of dust hopper. Check hopper valves and transfer systems for proper operation.

Major replacement parts, which should be inventoried, are summarized below:

#### Equipment

ESP

Gasket material for sealing flanges  
Sealing material for penthouse area  
Gears and bearings for collection transfer equipment  
Electrical wire

Baghouse

Fabric filter bags or cartridges  
Retainers  
Miscellaneous hardware for shaker mechanisms

Magnehelic gauges  
Damper and hopper valves  
Sealants for duct work  
Gaskets for porthole seals

Cyclone

Sealant for duct repairs

Document all maintenance performed. Records must be kept on file for a period of five years.

### **HCL Fume Scrubber**

The following maintenance schedule applies to the HCL fume scrubber located at the Manistee plant.

#### Frequency

Annual

#### Procedure

##### Internal Inspection

1. Check spray nozzle for wear or obstructions, repair as necessary.
2. Check packing for wear or buildup, repair as necessary.

##### External Inspection

1. Inspect entire scrubber system for leaks.
2. Inspect exhaust fan for proper operation.
3. Inspect recycle pump for proper operation.
4. Observe flow meters, pressure gauges, and pH probes for normal function.
5. Check sump overflow line. Clean or replace as necessary.
6. Check sump fresh water fill line and solenoid valve. Replace as necessary.
7. Observe stack during the unloading process to ensure unit is working properly.

Document all maintenance performed. Records must be kept on file for a period of five years.

### **III. MALFUNCTION RESPONSE**

#### **a. E.S.P.s**

##### **#3 Rotary Kiln**

If an electrical dead short occurs in a section of this E.S.P., the section must be shutdown. The E.S.P. must have at least 3 of the 4 fields operating to continue operating the kiln. The stack opacity cannot exceed a six-minute average of 20 percent.

If three or more fields are operating and the six-minute average opacity exceeds 20 percent, the following corrective action takes place:

1. Inspect rapper operation for proper operation, repair as necessary
2. Inspect hopper and screws at discharge of E.S.P., repair as necessary
3. Inspect electrical controls, repair as necessary

If the opacity cannot be controlled below a six-minute average of 20 percent with corrective action, the kiln must be shutdown and the E.S.P. inspected.

All malfunctions must be documented with corrective action. These records must be kept on file for a period of five years. Deviations from permit limits must be reported to the Manager of Engineering Services for prompt reporting to the MDEQ.

##### **#1 Plant (Periclase) E.S.P.**

The opacity on the exhaust stack of #1 E.S.P. is monitored by a COMS. If the 6-minute average for opacity exceeds 20%, the following corrective action takes place:

1. Reduce herreshoff draft.
2. Reduce shaft kiln draft.
3. Add heat to the top hearths of the herreshoff to increase E.S.P. temperature.
4. Add heat to the top of the shaft kiln to increase E.S.P. temperature.
5. If the opacity cannot be controlled below a six-minute average of 20 percent with corrective action, the kiln must be shutdown and the E.S.P. inspected.

All malfunctions must be documented with corrective action. These records must be kept on file for a period of five years. Deviations from

permit limits must be reported to the Manager of Engineering Services for prompt reporting to the MDEQ.

### **#2 Plant (Periclase) E.S.P.**

The opacity on the exhaust stack of #2 E.S.P. is monitored by a COMS. If the 6-minute average for opacity exceeds 20%, the following corrective action takes place:

1. Reduce herreshoff draft.
2. Reduce shaft kiln draft.
3. Add heat to the top hearths of the herreshoff to increase E.S.P. temperature.
4. Add heat to the top of the shaft kiln to increase E.S.P. temperature.
5. If the opacity cannot be controlled below a six-minute average of 20 percent with corrective action, the kiln must be shutdown and the E.S.P. inspected.

All malfunctions must be documented with corrective action. These records must be kept on file for a period of five years. Deviations from permit limits must be reported to the Manager of Engineering Services for prompt reporting to the MDEQ.

### **#3 Plant (Periclase) E.S.P.**

If the operator observes or is informed of excess emissions from the #3 E.S.P., the following corrective action will take place:

1. Reduce herreshoff draft.
2. Reduce shaft kiln draft.
3. Add heat to the top hearths of the herreshoff to increase E.S.P. temperature.
4. Add heat to the top of the shaft kiln to increase E.S.P. temperature.
5. If the opacity cannot be controlled below a six-minute average of 20 percent with corrective action, the kiln must be shutdown and the E.S.P. inspected.

All malfunctions must be documented with corrective action. These records must be kept on file for a period of five years. Deviations from permit limits must be reported to the Manager of Engineering Services for prompt reporting to the MDEQ.

### **Dust Collectors**



If the operator observes excess emissions from the exhaust stack of a dust collector, the emission unit must be shutdown and the dust collector must be repaired before restarting emission unit.

If the operator observes excess emissions from an emissions unit, the operator will check the following items:

1. Check to see if dust collector is operating.
2. Check differential pressure (ensure gauge is operating properly).
  - a. Excess pressure indicates blinded filter bags. Shutdown and replace bags.
  - b. Low differential pressure indicates fan problems or a hole in the ductwork. Shutdown and repair.
3. Inspect ductwork, clean as necessary.

If the cause of the excessive emissions cannot be found and corrected, shut down equipment and contact supervisor.

All malfunctions must be documented with corrective action. These records must be kept on file for a period of five years. Deviations from permit limits must be reported to the Manager of Engineering Services for prompt reporting to the MDEQ.

### Bin Vents

If the operator observes excess emissions from the bin vent or the bin, shut down and contact supervisor.

All malfunctions must be documented with corrective action. These records must be kept on file for a period of five years. Deviations from permit limits must be reported to the Manager of Engineering Services for prompt reporting to the MDEQ.

### Cyclones

If the operator should find high differential pressure:

1. Ensure gauge is operating properly.
2. Check for pluggage in the cyclone and ductwork.
3. Inspect air lock for proper operation. If the cause of the high differential pressure cannot be found, shutdown and contact supervisor.

If the operator should find low differential pressure:

1. Ensure gauge is operating properly.
2. Ensure fan is operating properly.
3. Inspect for holes in system.

4. Inspect air lock for proper operation.

If the source of the problem cannot be found and corrected, shut equipment down and contact supervisor.

All malfunctions must be documented with corrective action. These records must be kept on file for a period of five years. Deviations from permit limits must be reported to the Manager of Engineering Services for prompt reporting to the MDEQ.

### **HCl Fume Scrubber**

If the operator should find high differential pressure:

1. Ensure gauge is operating properly.
2. Check for pluggage of the nozzle in the packed column.
3. Inspect system for air leaks. If the cause of the high differential pressure cannot be found, shutdown and contact supervisor.

If the operator should find low differential pressure:

1. Ensure gauge is operating properly.
2. Ensure fan is operating properly.
3. Inspect for holes in system.
4. Inspect air leaks.

If the source of the problem cannot be found and corrected, shut equipment down and contact supervisor.

All malfunctions must be documented with corrective action. These records must be kept on file for a period of five years. Deviations from permit limits must be reported to the Manager of Engineering Services for prompt reporting to the MDEQ.

Appendix A

<b>Permitted Dust Collector DP Operating Ranges</b>				
<b>Emission Unit NAME</b>	<b>DESCRIPTION</b>	<b>EQUIP. NO.</b>	<b>Differential Pressure Range</b>	<b>ACFM</b>
EUUPPERLIME	NORTH & SOUTH SILOS - UPPER SYSTEM D C	25-1050	1-10	6000
EUMIDDLELIME	NORTH & SOUTH SILOS - LOWER SYSTEM D C	25-1051	1-10	6000
EUC-LIME	"C"-LIME DUST COLLECTOR	25-0873	2-8	2000
EUB-LIME	"B"-LIME DUST COLLECTOR	25133855	0-15	2046
EUBOTTOMLIME	NEW BOTTOM LIME DC FOR INCOMING SYSTEM	25777777	0-15	5500
EUHCLTANK	HYDROCHLORIC ACID FUME SCRUBBER	99-5290	-4-+3	300
EU2HERRLB-BIN	#2 HERR LIGHTBURN BIN AND TRANSFER EQ DE	25-XXXX	1-11	2300
EURK3-S-FUEL	#3 ROTARY KILN COAL/COKE CYCLONE	25-1024	2-8	7200
EURK3-S-FUEL	#3 ROTARY KILN COAL/COKE DUST COLLECTOR	25-1026	2-8	7200
EUROLLER-MILL	ROLLER MILL DUST COLLECTOR	25-1059	1-7	2970
EU2-BAGGER	#2 BAGGER DUST COLLECTOR	25-0664	1-10	13500
EU3PH-ADD-DC	#3 P.H. N,S, & M ADDITIVE DUST COLLECTOR	25-0781	0.5-10	350
EU3PH-ADD-DC	#3 P.H. N,S, & M ADDITIVE DUST COLLECTOR	25-0782	0.5-10	350
EU3PH-ADD-DC	#3 P.H. N,S, & M ADDITIVE DUST COLLECTOR	25-0783	0.5-10	865
EU98-PUL-DC	98 PULVERIZED DUST COLLECTOR	25-0746	1-6	1500
EUPER-PRIM-DC	PERICLASE PRIMARY DUST COLLECTOR	25-0745	1-11	25800
EUMIDLAND-SYS	INCOMING 92 DUST COLLECTOR	25-0827	4-12	7200
EUGYRADISC	GYRADISC DUST COLLECTOR	25-0892	1-9	8000
EUP-LOADOUT	PERICLASE LOADOUT DUST COLLECTOR	25123822	1-11	1200
EU88-SCRNR	88 PRIMARY SCREEN DUST COLLECTOR	25-0890	1-11	4500
EU88-PRIMARY	88 PRIMARY DUST COLLECTOR	25-0709	1-13	6300
EUDAY-BIN-DC	DAY BIN DUST COLLECTOR	25-0708	1-10	2900
EUNO3BAGGER	No. 3 BAGGER	25-0706	2-13	6000
EU88SECONDARY	88 SECONDARY DUST COLLECTOR	25-0707	2-12	9100
EUANIMAG	ANIMAG LOADOUT BELT DUST COLLECTOR	25-0832	2-8	700
EUANIMAG	ANIMAG LOADOUT DUST COLLECTOR	25-0929	1-8	1500
EUN2SMILL	#2 SOUTH RAYMOND MILL DUST COLLECTOR	25-0887	2-13	5600

EUADDITIVE-DC	ADDITIVE DUST COLLECTOR	25-0881	1-6	2000
EUHB-BINS	HARD BURN COLLECTOR	25-0880	1-8	18000
EULB-BINS	LIGHT BURN BAGHOUSE	25-0879	1-8	3000
EUNSMILLS	SOUTH RAYMOND MILL DUST COLLECTOR	25-0769	1-10	5600
EUNSMILLS	NORTH RAYMOND MILL COLLECTOR	25-0770	1-10	5600
EUN2SMILLTRANS	NO. 2 SOUTH MILL TRANSFER DUST COLLECTOR	25-1020	1-10	4100
EURM-UNLOADING	RAIL CAR UNLOADING D.C.	25-0768	0.5-10	14000
EU6TRAKLOADOUT	88-#6 TRACK LOADOUT BAGHOUSE D.C.	25-0774	4-8	900
EUCCHANGE-LS	#2 LOAD OUT BAGHOUSE	25-0828	1-8	2500
EUCCHANGE-LS	#3 & 4 SPOUT #6 TRACK DUST COLLECTOR	25-0894	1-8	2800
EUCCHANGE-LS	CHANGE BIN DUST COLLECTOR	25-0768	0.5-12	14000
EU3RKPRIMSCREEN	IMPACTOR DUST COLLECTOR	25-0834	2-9	1570
EUSK-FINES-BIN	SHAFT KILN FINES BIN DUST COLLECTOR	25-1011	1-8	2800
EU1+2LB-DC	#1 LIGHT BURN DUST COLLECTOR	25-1067	2-6	4500
EU1+2LB-DC	#2 LIGHT BURN DUST COLLECTOR	25-1068	2-6	3300
EUP-ADD-BINS	LIME #3 ADDITIVE BIN DUST COLLECTOR	25-1073	2-6	1300
EUP-ADD-BINS	SILICA #3 ADDITIVE BIN DUST COLLECTOR	25-1074	1-6	1300
EUP-ADD-BINS	#1 LIME #2 LIME DUST COLLECTOR	25-1078	1-6	1300
EUP-ADD-BINS	SILICA #2 ADDITIVE BIN DUST COLLECTOR	25-1079	1-6	1300
EUP-STOR-SILO	PERICLASE STORAGE SILO DUST COLLECTOR	25-0895	2-6	2000
EUSK-BINS-TRANS	PERICLASE #1 DUST COLLECTOR	25-1031	2-8	5300
EUSK-BINS-TRANS	PERICLASE #2 DUST COLLECTOR	25-1032	1-8	5300
EUSK-BINS-TRANS	PERICLASE #3 DUST COLLECTOR	25-1033	1-8	5300
EUSK-TRAN-DC	SHAFT KILN TRANSFER DUST COLLECTOR	25-0824	1-6	3600
EU2DUSTEX	#2 DUSTEX DUST COLLECTOR	25-0799	3-12	10000
EU3DUSTEX	#3 DUSTEX DUST COLLECTOR	25-0808	1-8	6300
EUSHAFTKILN2	#2 SHAFT KILN CYCLONE	25-0791	2-8	22500
EUSHAFTKILN3	#3 SHAFT KILN CYCLONE	25-0810	1-8	22500
EUDRYMAGDRYER	FABRIC FILTER	25-1111	1-12	30000
EUDRYMAGMILL	FABRIC FILTER	25-2222	1-12	7500

- MAB updated on 9/28/18. Preventative Maintenance description for HCl Fume Scrubber was added to Section II.
- MAB reviewed on 4/4/19. No changes or updates were deemed necessary.