Malfunction Abatement Plan
EUBOILER10

Hemlock Semiconductor Operations, LLC
Hemlock, Michigan

Project No. 180200
November 7, 2019

Fishbeck, Thompson, Carr & Huber, Inc.
engineers | scientists | architects | constructors

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List of Abbreviations/Acronyms

DCS	Distributed Control System
DAHS	Data Acquisition and Handling System
EGLE	Michigan Department of Environment, Great Lakes, and Energy
EU	emission unit
lb/hr	pound(s) per hour
lb/MMBtu	pound(s) per million British thermal units
MAP	Malfunction Abatement Plan
MMBtu/hr	million British thermal units per hour
HSC	Hemlock Semiconductor Operations, LLC
NO_X	oxides of nitrogen
O_2	oxygen
PEMS	Parametric Emission Monitoring System
PMP	Preventative Maintenance Program
PTI	Air Use Permit to Install
ROP	Renewable Operating Permit

1.0 Introduction

This MAP has been prepared to comply with HSC's PTI No. 185-18 and Rule 911. The purpose of this Plan is to define actions that will be taken by HSC in the event of a malfunction or equipment breakdown which could result in an exceedance of emission limitations, and to maintain a PMP.

Rule 911 states:

> *(1) Upon request of the department, a person responsible for the operation of a source of an air contaminant shall prepare a malfunction abatement plan to prevent, detect, and correct malfunctions or equipment failures resulting in emissions exceeding any applicable emission limitation.*
>
> *(2) A malfunction abatement plan required by subrule (1) of this rule shall be in writing and shall, at a minimum, specify all of the following:*
>
> *(a) A complete PMP, including identification of the supervisory personnel responsible for overseeing the inspection, maintenance, and repair of air cleaning devices, a description of the items or conditions that shall be inspected, the frequency of the inspections or repairs, and an identification of the major replacement parts that shall be maintained in inventory for quick replacement.*
>
> *(b) An identification of the source and air cleaning device operating variables that shall be monitored to detect a malfunction or failure, the normal operating range of these variables, and a description of the method of monitoring or surveillance procedures.*
>
> *(c) A description of the corrective procedures or operational changes that shall be taken in the event of a malfunction or failure to achieve compliance with the applicable emission limits.*
>
> *(3) A malfunction abatement plan required by subrule (1) of this rule shall be submitted to the department and shall be subject to review and approval by the department. If, in the opinion of the commission, the plan does not adequately carry out the objectives as set forth in subrules (1) and (2) of this rule, then the department may disapprove the plan, state its reasons for disapproval, and order the preparation of an amended plan within the time period specified in the order. If, within the time period specified in the order, an amended plan is submitted which, in the opinion of the department, fails to meet the objective, then the department, on its own initiative, may amend the plan to cause it to meet the objective.*
>
> *(4) Within 180 days after the department approves a malfunction abatement plan, a person responsible for the preparation of a malfunction abatement plan shall implement the malfunction abatement plan required by subrule (1) of this rule.*

2.0 Defining Malfunctions

Rule 113(a) defines a malfunction as:

> ***Malfunction*** *means any sudden, infrequent and not reasonably preventable failure of a source, process, process equipment, or air pollution control equipment to operate in a normal or usual manner. Failures that are caused in part by poor maintenance or careless operation are not malfunctions.* [emphasis added]

A true malfunction must have a reasonable potential to cause an exceedance in emissions. This MAP will address the natural gas fired, 152 MMBtu/hr boiler (EUBOILER10).

3.0 Air Pollutant Emission Control Technology

EUBOILER10 is equipped with a low NO_X burner and flue gas recirculation for the control of NO_X emissions. The EUBOILER10 stack is equipped with a Parametric Emission Monitoring System (PEMS). The PEMS and its' dedicated data acquisition system was supplied by CMC Solutions.

Plant personnel utilize the PEMS data to determine continuous compliance with permit emission limitations. The variables being monitored by the EUBOILER10 PEMS are NO_X and O_2. The normal operating range of these variables will be at or below the permitted limitations.

3.1 Determination of an Excess Emission

Plant personnel will use a Predictive Emissions Monitoring System which utilizes all available unit-operating parameters and establishes relationships between any quality assured input with significant correlation to the emission rate. The SmartCEMS® statistical hybrid engine will determine the NO_X and O_2 rate for each monitored boiler with excellent accuracy in real-time based on previously collected and quality assured emission data. In the event of an exceedance of emissions or other limitation, plant personnel will determine whether the cause of exceedance is due to an equipment breakdown or malfunction as defined in Section 2.0.

If the exceedance is due to an equipment breakdown or malfunction of the PEMS, plant personnel will determine if the repair is to be performed by the PEMS equipment manufacturer. Equipment repairs to be performed by the PEMS equipment manufacturer will be completed expeditiously. In the event that equipment is sent back to the PEMS manufacturer for repair, HSC has spare NO_X and O_2 analyzers which can be used until the equipment has been repaired and returned by the PEMS equipment manufacturer. Equipment which has undergone major repair is subject to a Relative Accuracy Test Audit as determined by the EGLE District Supervisor.

If a malfunction occurs to the EUBOILER10 burner system which causes, or may cause, excess emissions during boiler operation, the portion of the burner system causing the possible excess emission will be evaluated as soon as practicable in accordance with safe operating procedures to determine the proper procedure to correct the problem. An exceedance of an emission limit which is established on an hourly basis (lb/hr) or a concentration basis (lb/MMBtu) is determined by calculating the status of compliance for every 1-hour period. A **1-hour period** is defined as *any 60 minute period, commencing on the hour*.

The Distributed Control System and Data Acquisition and Handling System (DCS and DAHS, respectively) assimilate stack exhaust parameters gathered by the PEMS, input fuel rates, and heat input rates. The resulting information is provided to plant personnel directly from the computer or on printed logs. The DCS is also programmed with alarms to alert the board operator to variations in excess of the pre-established set points. Such alarms can only be cleared through acknowledgment by the Board Operator. These alarms provide plant personnel with advance warning of a potential emission exceedance. The alarms that have been established in the DCS are summarized in Table 1.

Upon recognition of an excess emission or exceedance resulting from any reason other than boiler tuning, an equipment breakdown/malfunction, or a startup and/or shutdown of the boiler, plant personnel shall follow the following steps to document the event:

1. Evaluate the situation and ensure the safety of plant personnel and the facility. Take all reasonable steps to minimize levels of emissions that exceeded emission limitations or other restriction.
2. Make written notations of the occurrence in the facility logs. Notations should clearly denote the duration of the occurrence and the cause, if known.
3. If excess emissions have lasted for longer than 2 hours, contact the Environmental Manager or other plant personnel delegated to receive such notification.
4. The Environmental Manager, or designee, must notify EGLE within 2 working days.

5. Within 10 calendar days from the date the excess emissions have been corrected, a follow up letter with certification describing the details of the occurrence shall be submitted to the EGLE District Supervisor. The written report shall be submitted by the Environmental Manager or other plant personnel delegated to submit such documentation.
6. All original documentation and copies of emissions and operator logs which are relative in providing the facility with a burden of proof of the occurrence shall be maintained onsite for a minimum of 5 years.

4.0 Source Description

EUBOILER10 is equipped with a low NO_X burner and flue gas recirculation for the control of NO_X emissions. The emissions of NO_X from EUBOILER10 are monitored continuously at the exhaust stack by the PEMS. Plant personnel utilize the PEMS to determine continuous compliance with permit emission limitations. The facility will typically operate at or below these limitations.

The operating variables that shall be monitored by HSC – to detect a malfunction or failure of EUBOILER10 resulting in an excess emission – will be the PEMS data for fuel input and NO_X. The normal operating range of these variables will be at or below the permitted limitations.

5.0 Responsible Personnel

Table 2 provides a list of responsible personnel at HSC. HSC also has a technician on staff who is trained in general maintenance and calibration of the PEMS. Extraordinary malfunctions or repairs will be handled by an independent PEMS representative.

In the event that a PEMS becomes inoperative due to a malfunction, or for maintenance, plant personnel shall follow these steps:

1. Note the time of the malfunction or maintenance of the PEMS in the Operators Log as well as on the Emissions Log. Notes should clearly denote the duration of the malfunction, cause, and repairs made or a description of the required maintenance.
2. Any instance of PEMS downtime is reported by Deviation Reports, which are submitted quarterly.

5.1 Personnel Training

HSC personnel are trained in the operation and maintenance of equipment to prevent and respond to emission exceedances and/or breakdowns or malfunctions that result in exceedances of applicable permit conditions or air pollution laws, rules, and regulations. Employees participate in training upon hire and annually thereafter. A sample of an Annual Training Form is provided in Appendix 1. Completed forms are maintained onsite in the Administrative Office.

6.0 PMP, Operational Variables, and Corrective Procedures

A written program for maintaining and inspecting the ongoing integrity of process equipment and PEMS ensures that equipment receives appropriate, regularly scheduled maintenance. Regular inspections document and identify each equipment inspection and test.

6.1 Items Inspected and Operational Variables

Inspections are performed in accordance with written procedures developed by and for HSC. Inspections are performed at various intervals and are described in Table 3.

6.2 Preventative Maintenance Schedule

Written procedures are included with each PMP, which are to be followed when repair, maintenance, or service is being performed. These procedures include maintenance to be performed on equipment such as PEMS, dry low NO_X burners, etc. HSC uses an electronic PMP to track regular preventive maintenance tasks A typical list of preventive maintenance tasks is provided in Table 3.

6.3 Corrective Action

HSC, to the extent reasonably possible, will operate in a manner consistent with good air pollution control practices with regard to minimizing emissions during periods of exceedances resulting from abnormal operations, startups/shutdowns, breakdowns and malfunctions.

All reasonable corrective actions shall be taken to reduce the number of excess emissions during such occurrences. The safety of the facility and plant personnel must be ensured at all times. Upon investigation into the cause of an excess emission and implementation of reasonable corrective actions, notify the Environmental Manager or other plant personnel delegated to receive such notification and perform any further procedures deemed necessary to correct the situation.

Operators are trained to observe burner system operating parameters to detect a potential malfunction before it happens. Nonetheless, not all malfunctions can be detected prior to an actual malfunction occurring. Therefore, it is imperative to have a PMP to minimize potential malfunction events from occurring, maximize continuous compliance with air pollutant emission limits, and ensure boiler reliability and availability.

If a malfunction occurs to the EUBOILER10 burner system which causes, or may cause, excess emissions during boiler operation, the portion of the burner system causing the possible excess emission will be evaluated as soon as practicable in accordance with safe operating procedures to determine the proper procedure to correct the problem or to determine that the malfunction will not cause excess emissions.

EUBOILER10 may continue to operate consistent with good air pollution control practices to minimize emissions in compliance with the emission limits in the permit until the boiler can be repaired.

If a malfunction occurs, the Environmental Manager, or designated representative, will determine whether the malfunctioning equipment can continue to operate consistent with the requirements of the ROP. If not, appropriate plant personnel will follow the procedure outlined below:

- Define and correct the problem.
- Determine if the equipment can continue to operate within compliance of the limitations specified in the ROP. If not, action will be taken to correct the problem in accordance with safe operating procedures.
- Notify the appropriate staff of any problems that occur and/or if there are any questions regarding compliance or action(s) that should be taken to correct the problem.
- If the problem is one that calls for immediate corrective action, contact any one of the individuals listed in Table 2.

6.4 Preventative Maintenance Records

The following records will be maintained:

- Inspection records will include the date, findings, and corrective actions taken or repairs made, if appropriate.
- All significant unscheduled maintenance activities performed on EUBOILER10. Records will include the date, findings, and corrective actions taken or repairs made, if necessary.

7.0 Replacement Parts Inventory

HSC maintains an inventory of replacement parts for major equipment, control equipment, and the PEMS. A list of replacement parts inventory for the PEMS is included in the PEMS Monitoring Plan.

Tables

Table 1 - Audible Alarms
Malfunction Abatement Plan
Hemlock Semiconductor Operations, LLC
Hemlock, Michigan

Tag #	Tag Description	P&ID	Alarm Value	Eng Units	Alarm Type	Priority of Alarm	Hysteresis (%)	Filter Time (sec)	State Based (Y/N)	Alarm Cause	Consequences	Severity	Time-To-Respond	Operator Actions
AI407563	S407 Boiler Blowdown Conductivity	HW1-62228	1500	microSIE	H	3	200	10						
AI407563	S407 Boiler Blowdown Conductivity	HW1-62228	1999	microSIE	HH	3	200	10						
AI407563	S407 Boiler Blowdown Conductivity	HW1-62228	50	microSIE	L	3	200	10						
AI407563	S407 Boiler Blowdown Conductivity	HW1-62228	50	microSIE	LL	3	200	10						
PI407560	S407 Boiler Feedwater Pressure	HW1-62228	265	PSIG	H	3	1.50	0						
PI407560	S407 Boiler Feedwater Pressure	HW1-62228	270	PSIG	HH	2	1.50	0						
PI407560	S407 Boiler Feedwater Pressure	HW1-62228	225	PSIG	L	3	1.50	0						
PI407560	S407 Boiler Feedwater Pressure	HW1-62228	220	PSIG	LL	2	1.50	0						
PI407715	S407 Deaerator Steam Pressure	HW1-62236	73	PSIG	H	3	0.50	0						
PI407715	S407 Deaerator Steam Pressure	HW1-62236	75	PSIG	HH	2	0.50	0						
PI407715	S407 Deaerator Steam Pressure	HW1-62236	4	PSIG	L	3	0.50	0						
PI407715	S407 Deaerator Steam Pressure	HW1-62236	3	PSIG	LL	2	0.50	0						
PI407718	S407 Boiler Steam Pressure	HW1-62236	132	PSIG	H	3	1	0						
PI407718	S407 Boiler Steam Pressure	HW1-62236	135	PSIG	HH	3	1	0						
PI407718	S407 Boiler Steam Pressure	HW1-62236	110	PSIG	L	3	1	0						
PI407718	S407 Boiler Steam Pressure	HW1-62236	110	PSIG	LL	3	1	0						
FI407562	S407 Boiler Feedwater Flow	HW1-62228	75	MLB/HR	H	3	0.47	600						
FI407562	S407 Boiler Feedwater Flow	HW1-62228	75	MLB/HR	HH	2	0.47	600						
LI407568	S407 Boiler Steam Drum Level	HW1-62228	60	%	H	3	0.50	0						
LI407568	S407 Boiler Steam Drum Level	HW1-62228	45	%	L	3	0.50	0						
TI407561	S407 Boiler Feedwater Temperature	HW1-62228	115	DEG C	H	3	0.75	0						
TI407561	S407 Boiler Feedwater Temperature	HW1-62228	118	DEG C	HH	2	0.75	0						
TI407561	S407 Boiler Feedwater Temperature	HW1-62228	80	DEG C	L	3	0.75	0						
TI407561	S407 Boiler Feedwater Temperature	HW1-62228	70	DEG C	LL	2	0.75	0						
TI407564	S407 Boiler Economizer Vent Gas Temp	HW1-62228	180	DEG C	H	3	2.75	0						
TI407564	S407 Boiler Economizer Vent Gas Temp	HW1-62228	205	DEG C	HH	2	2.75	0						
TI407565	S407 Boiler Economizer Temperature	HW1-62228	315	DEG C	H	3	2.40	0						
TI407565	S407 Boiler Economizer Temperature	HW1-62228	370	DEG C	HH	2	2.40	0						
TI407567	S407 Boiler Economizer Water Temperature	HW1-62228	150	DEG C	H	3	1	0						
TI407567	S407 Boiler Economizer Water Temperature	HW1-62228	160	DEG C	HH	2	1	0						
AI407592	S407 RO System Inlet pH	HW1-62229	12	pH	H	3	0.07	0						
AI407592	S407 RO System Inlet pH	HW1-62229	14	pH	HH	3	0.07	0						
AI407592	S407 RO System Inlet pH	HW1-62229	4	pH	L	3	0.07	0						
AI407592	S407 RO System Inlet pH	HW1-62229	4	pH	LL	3	0.07	0						
AI407593	S407 RO System Inlet ORP	HW1-62229	550	mVOLT	H	3	5	300						
AI407593	S407 RO System Inlet ORP	HW1-62229	600	mVOLT	HH	3	5	300						
AI407728	S407 RO System Permeate pH	HW1-62230	14	pH	H	3	0.50	5						
AI407728	S407 RO System Permeate pH	HW1-62230	0	pH	L	3	0.50	5						
FI407599	S407 RO System Concentrate Flow	HW1-62229	110	GPM	H	3	0.75	18000						
FI407599	S407 RO System Concentrate Flow	HW1-62229	120	GPM	HH	3	0.75	18000						
FI407599	S407 RO System Concentrate Flow	HW1-62229	0	GPM	L	3	0.75	18000						
FI407599	S407 RO System Concentrate Flow	HW1-62229	0	GPM	LL	3	0.75	18000						
FI407607	S407 RO System Permeate Flow	HW1-62229	220	GPM	H	3	2	0						
FI407607	S407 RO System Permeate Flow	HW1-62229	240	GPM	HH	3	2	0						
LI407725	S407 Permeate Storage Tank Level	HW1-62230	95	%	H	3	5	0						
LI407725	S407 Permeate Storage Tank Level	HW1-62230	95	%	HH	3	5	0						
LI407725	S407 Permeate Storage Tank Level	HW1-62230	30	%	L	3	5	0						
LI407725	S407 Permeate Storage Tank Level	HW1-62230	20	%	LL	3	5	0						
PI407598	S407 RO System Primary Pressure	HW1-62229	350	PSI	H	3	2.50	40000						
PI407598	S407 RO System Primary Pressure	HW1-62229	400	PSI	HH	3	2.50	40000						
PI407598	S407 RO System Primary Pressure	HW1-62229	0	PSI	L	3	2.50	40000						
PI407598	S407 RO System Primary Pressure	HW1-62229	0	PSI	LL	3	2.50	40000						
TI407608	S407 RO System Temperature	HW1-62229	115	DEG F	H	3	5	0						
TI407608	S407 RO System Temperature	HW1-62229	122	DEG F	HH	3	5	0						
TI407608	S407 RO System Temperature	HW1-62229	36	DEG F	L	3	5	0						
TI407608	S407 RO System Temperature	HW1-62229	32	DEG F	LL	3	5	0						
FI407512	S407 Condensate Flow to Deaerator 1	HW1-62225	270	MLB/HR	H	3	1.82	0						

Table 1 - Audible Alarms
Malfunction Abatement Plan
Hemlock Semiconductor Operations, LLC
Hemlock, Michigan

Tag #	Tag Description	P&ID	Alarm Value	Eng Units	Alarm Type	Priority of Alarm	Hysteresis (%)	Filter Time (sec)	State Based (Y/N)	Alarm Cause	Consequences	Severity	Time-To-Respond	Operator Actions
FI407512	S407 Condensate Flow to Deaerator 1	HW1-62225	290	MLB/HR	HH	2	1.82	0						
FI407512	S407 Condensate Flow to Deaerator 1	HW1-62225	25	MLB/HR	L	3	1.82	0						
FI407512	S407 Condensate Flow to Deaerator 1	HW1-62225	5	MLB/HR	LL	2	1.82	0						
FI407514	S407 Condensate Flow to Deaerator 2	HW1-62225	330	MLB/HR	H	3	1.82	0						
FI407514	S407 Condensate Flow to Deaerator 2	HW1-62225	335	MLB/HR	HH	2	1.82	0						
FI407514	S407 Condensate Flow to Deaerator 2	HW1-62225	25	MLB/HR	L	3	1.82	0						
FI407514	S407 Condensate Flow to Deaerator 2	HW1-62225	5	MLB/HR	LL	2	1.82	0						
FI407520	S407 Condensate Return Flow	HW1-62225	520	MLB/HR	H	3	3.65	0						
FI407520	S407 Condensate Return Flow	HW1-62225	540	MLB/HR	HH	3	3.65	0						
LY407500	S407 Condensate Return Tank 1 Sel Lvl	HW1-62225	90	%	H	3	0.50	0						
LY407500	S407 Condensate Return Tank 1 Sel Lvl	HW1-62225	95	%	HH	2	0.50	0						
LY407500	S407 Condensate Return Tank 1 Sel Lvl	HW1-62225	60	%	L	3	0.50	0						
LY407500	S407 Condensate Return Tank 1 Sel Lvl	HW1-62225	50	%	LL	2	0.50	0						
LY407515	S407 Condensate Return Tank 2 Sel Lvl	HW1-62225	90	%	H	3	0.50	0						
LY407515	S407 Condensate Return Tank 2 Sel Lvl	HW1-62225	95	%	HH	2	0.50	0						
LY407515	S407 Condensate Return Tank 2 Sel Lvl	HW1-62225	60	%	L	3	0.50	0						
LY407515	S407 Condensate Return Tank 2 Sel Lvl	HW1-62225	50	%	LL	2	0.50	0						
PI407511	S407 Condensate Pumps Outlet Pressure	HW1-62225	48	PSIG	H	3	0.25	0						
PI407511	S407 Condensate Pumps Outlet Pressure	HW1-62225	50	PSIG	HH	2	0.25	0						
PI407511	S407 Condensate Pumps Outlet Pressure	HW1-62225	24	PSIG	L	3	0.25	0						
PI407511	S407 Condensate Pumps Outlet Pressure	HW1-62225	15	PSIG	LL	2	0.25	0						
TI407502	S407 Condensate Return Tank 1 Temp	HW1-62225	105	DEG C	H	3	0.75	0						
TI407502	S407 Condensate Return Tank 1 Temp	HW1-62225	110	DEG C	HH	2	0.75	0						
TI407502	S407 Condensate Return Tank 1 Temp	HW1-62225	75	DEG C	L	3	0.75	0						
TI407502	S407 Condensate Return Tank 1 Temp	HW1-62225	70	DEG C	LL	2	0.75	0						
TI407517	S407 Condensate Return Tank 2 Temp	HW1-62225	105	DEG C	H	3	2	0						
TI407517	S407 Condensate Return Tank 2 Temp	HW1-62225	110	DEG C	HH	2	2	0						
TI407517	S407 Condensate Return Tank 2 Temp	HW1-62225	75	DEG C	L	3	2	0						
TI407517	S407 Condensate Return Tank 2 Temp	HW1-62225	75	DEG C	LL	2	2	0						
FI407549	S407 Boiler Feedwater Pumps Disch Flow	HW1-62227	519	MLB/HR	H	3	3.27	0						
FI407549	S407 Boiler Feedwater Pumps Disch Flow	HW1-62227	539	MLB/HR	HH	2	3.27	0						
FI407549	S407 Boiler Feedwater Pumps Disch Flow	HW1-62227	25	MLB/HR	L	3	3.27	0						
FI407549	S407 Boiler Feedwater Pumps Disch Flow	HW1-62227	5	MLB/HR	LL	2	3.27	0						
PI407542	S407 Boiler Feedwater Pumps Disch Press	HW1-62227	220	PSIG	L	3	1.50	0						
PI407542	S407 Boiler Feedwater Pumps Disch Press	HW1-62227	200	PSIG	LL	3	1.50	0						
TI407540	S407 Boiler FW Pmps Temp frm Deaerator 1	HW1-62227	113	DEG C	H	3	0.75	0						
TI407540	S407 Boiler FW Pmps Temp frm Deaerator 1	HW1-62227	117	DEG C	HH	2	0.75	0						
TI407540	S407 Boiler FW Pmps Temp frm Deaerator 1	HW1-62227	104	DEG C	L	3	0.75	0						
TI407540	S407 Boiler FW Pmps Temp frm Deaerator 1	HW1-62227	99	DEG C	LL	2	0.75	0						
TI407551	S407 Boiler FW Pmps Temp frm Deaerator 2	HW1-62227	113	DEG C	H	3	0.75	0						
TI407551	S407 Boiler FW Pmps Temp frm Deaerator 2	HW1-62227	117	DEG C	HH	2	0.75	0						
TI407551	S407 Boiler FW Pmps Temp frm Deaerator 2	HW1-62227	104	DEG C	L	3	0.75	0						
TI407551	S407 Boiler FW Pmps Temp frm Deaerator 2	HW1-62227	99	DEG C	LL	2	0.75	0						
LT407671	S407 Flash Tank Raw Level	HW1-62237	80	%	H	3	6	20						
LT407671	S407 Flash Tank Raw Level	HW1-62237	95	%	HH	3	6	20						
PI407692	S407 Boiler Fuel Gas Supply Pressure	HW1-62238	90	PSIG	H	3	0.50	0						
PI407692	S407 Boiler Fuel Gas Supply Pressure	HW1-62238	95	PSIG	HH	2	0.50	0						
PI407692	S407 Boiler Fuel Gas Supply Pressure	HW1-62238	13	PSIG	L	3	0.50	0						
PI407692	S407 Boiler Fuel Gas Supply Pressure	HW1-62238	12	PSIG	LL	2	0.50	0						
TI407663	S407 Blowdown Cooler Discharge Temp	HW1-62234	40	DEG C	H	3	0.30	0						
LY407530	S407 Deaerator 1 Selected Level	HW1-62226	90	%	H	3	7	30						
LY407530	S407 Deaerator 1 Selected Level	HW1-62226	91	%	HH	2	7	30						
LY407530	S407 Deaerator 1 Selected Level	HW1-62226	65	%	L	3	7	30						
LY407530	S407 Deaerator 1 Selected Level	HW1-62226	60	%	LL	2	7	30						
PI407525	S407 Deaerator 1 Pressure	HW1-62226	7	PSIG	H	3	0.08	0						
PI407525	S407 Deaerator 1 Pressure	HW1-62226	10	PSIG	HH	2	0.08	0						
PI407525	S407 Deaerator 1 Pressure	HW1-62226	4	PSIG	L	3	0.08	0						

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Hemlock Semiconductor Operations, LLC
Hemlock, Michigan

Tag #	Tag Description	P&ID	Alarm Value	Eng Units	Alarm Type	Priority of Alarm	Hysteresis (%)	Filter Time (sec)	State Based (Y/N)	Alarm Cause	Consequences	Severity	Time-To-Respond	Operator Actions
PI407525	S407 Deaerator 1 Pressure	HW1-62226	3	PSIG	LL	2	0.08	0						
TI407527	S407 Deaerator 1 Liquid Temperature	HW1-62226	113	DEG C	H	3	0.75	0						
TI407527	S407 Deaerator 1 Liquid Temperature	HW1-62226	117	DEG C	HH	2	0.75	0						
TI407527	S407 Deaerator 1 Liquid Temperature	HW1-62226	104	DEG C	L	3	0.75	0						
TI407527	S407 Deaerator 1 Liquid Temperature	HW1-62226	99	DEG C	LL	2	0.75	0						
LY407705	S407 Deaerator 2 Selected Level	HW1-62240	86	%	H	3	3	30						
LY407705	S407 Deaerator 2 Selected Level	HW1-62240	90	%	HH	2	3	30						
LY407705	S407 Deaerator 2 Selected Level	HW1-62240	65	%	L	3	3	30						
LY407705	S407 Deaerator 2 Selected Level	HW1-62240	60	%	LL	2	3	30						
PI407700	S407 Deaerator 2 Pressure	HW1-62240	7	PSIG	H	3	0.08	0						
PI407700	S407 Deaerator 2 Pressure	HW1-62240	10	PSIG	HH	2	0.08	0						
PI407700	S407 Deaerator 2 Pressure	HW1-62240	4	PSIG	L	3	0.08	0						
PI407700	S407 Deaerator 2 Pressure	HW1-62240	3	PSIG	LL	2	0.08	0						
TI407702	S407 Deaerator 2 Liquid Temperature	HW1-62240	113	DEG C	H	3	0.75	0						
TI407702	S407 Deaerator 2 Liquid Temperature	HW1-62240	117	DEG C	HH	2	0.75	0						
TI407702	S407 Deaerator 2 Liquid Temperature	HW1-62240	104	DEG C	L	3	0.75	0						
TI407702	S407 Deaerator 2 Liquid Temperature	HW1-62240	99	DEG C	LL	2	0.75	0						
HS407503-Motor	S407 Condensate Pump P4-42924	HW1-62225	18	Amps	Amps	3								
HS407505-Motor	S407 Condensate Pump P3-42924	HW1-62225	18	Amps	Amps	3								
HS407507-Motor	S407 Condensate Pump P2-42924	HW1-62225	18	Amps	Amps	3								
HS407509-Motor	S407 Condensate Pump P1-42924	HW1-62225	18	Amps	Amps	3								
HS407518-Motor	S407 Condensate Pump P5-42924	HW1-62225	18	Amps	Amps	3								
HS407541-Motor	S407 Boiler Feedwater Pump P1-42926	HW1-62227	90	Amps	Amps	3								
HS407543-Motor	S407 Boiler Feedwater Pump P2-42926	HW1-62227	90	Amps	Amps	3								
HS407545-Motor	S407 Boiler Feedwater Pump P3-42926	HW1-62227	90	Amps	Amps	3								
HS407547-Motor	S407 Boiler Feedwater Pump P4-42926	HW1-62227	90	Amps	Amps	3								
HS407550-Motor	S407 Boiler Feedwater Pump P5-42926	HW1-62227	90	Amps	Amps	3								
HS407640-Motor	S407 Amine Fd Pmp P1-42831 to Deaerator1	HW1-62232	10	Amps	Amps	3								
HS407641-Motor	S407 Amine Fd Pmp P2-42831 to Deaerator2	HW1-62232	10	Amps	Amps	3								
HS407642-Motor	S407 Backup Amine Fd Pmp P3-42831	HW1-62232	10	Amps	Amps	3								
HS407643-Motor	S407 O2 Scvngr Fd Pmp P1-42835 Deaeratr1	HW1-62232	10	Amps	Amps	3								
HS407644-Motor	S407 O2 Scvngr Fd Pmp P2-42835 Deaeratr2	HW1-62232	10	Amps	Amps	3								
HS407645-Motor	S407 Backup O2 Scvngr Fd Pmp P3-42835	HW1-62232	10	Amps	Amps	3								
HS407650-Motor	S407 Phosp Fd Pmp P1-42821 to Deaerator1	HW1-62233	10	Amps	Amps	3								
HS407651-Motor	S407 Phosp Fd Pmp P2-42821 to Deaerator2	HW1-62233	10	Amps	Amps	3								
HS407652-Motor	S407 Backup Phosphate Fd Pmp P3-42821	HW1-62233	10	Amps	Amps	3								

Note: Alarms may be updated as needed following operation. Table will be updated as needed

Table No. 2 – Responsible Personnel

Malfunction Abatement Plan

Hemlock Semiconductor Operations, LLC

Hemlock, Michigan

PLANT CONTACTS:

Name	Title	Office Number
Andrew L. Ault	HSC VP Manufacturing	989.301.5761
Gerard E. Manley	HSC EHS&S Manager	989.301.6247
Annette Lucas	HSC EHS&S Engineering Specialist	989.301.5639
Todd Graham, PMP	HSC Project Manager	989.301.5746

Contact key personnel if an air exceedence is detected, or if any other type of air episode occurs.

AGENCY CONTACTS:

REQUIRED NOTIFICATIONS: Notify agency within two working days of excess emission.

Michigan EGLE, Bay City District Supervisor 989.894.6200

Table 3 - Preventative Maintenance Inspection Table and Frequency

Malfunction Abatement Plan

Hemlock Semiconductor Operations, LLC

Hemlock, Michigan

Maintenance Plan Description	Inspection Frequency
PLANT 4 & EAST VES INSP SMP-010	10 years
ANNUAL INTERNAL/CSD-1 TESTING	Annual
BOILER #9 KNIFEGATE BLOWDOWN VALVE	Quarterly
WEEKLY TEST STEAM BOILER	Weekly
LUBE FAN MOTOR	Semi-Annual
PLANT 4 & EAST VES INSP SMP-010	10 years
PLANT 4 & EAST VES INSP SMP-010	5 years
PM02 HVAC/AHU UNIT	Annual
CHANGE AIR FILTERS	Quarterly
GREASE BLOWER MOTOR BEARINGS	Annual

Appendix

Hemlock Semiconductor Operations, LLC
Malfunction Abatement Plan
Training Record

Trainer's Name: _____

Date of Training: _____

Employee Name (Print)	**Employee Signature**	**Job Classification**