

## **Dow Silicones Corporation Preventative Maintenance and Malfunction Abatement Plan FGSITESCRUBBERS – Back up control equipment**

In 2008, Dow Silicones Corporation (hereinafter “Dow”) received a PTI to add a thermal oxidizer as control for numerous on-site processes. The PTI also allowed Dow to install backup scrubbers for use when the thermal oxidizer is non-operational. Dow currently operates the thermal oxidizer and backup scrubbers under Renewable Operating Permit (ROP) Number MI-ROP-A4043-2008. Pursuant to R 336.1911 and the requirements of table FGFACILITY in the ROP, Dow is required to generate and maintain a Malfunction Abatement Plan (MAP) for the THROX (FGTHROX) and Site Scrubbers (FGSITESCRUBBERS). This document covers FGSITESCRUBBERS. A separate plan was submitted to the DEQ for FGTHROX.

Dow installed a thermal oxidizer that controls various process vents with a minimum destruction efficiency of 98%. When the thermal oxidizer goes down for maintenance or an emergency, the vents are automatically switched over to the site scrubber system. This scrubber system consists of two separate spray towers which can operate individually or together in parallel. The two parallel scrubber systems are 36” in diameter and 36’ tall and are constructed of FRP. The top section of the scrubber contains 12 spray nozzles 1’ apart which are fed with fresh city water. The bottom section contains 6 baffle trays about 1’ apart and it’s fed recycled water from an in-ground containment tank. The liquid effluent flows out the bottom of the scrubber to the in-ground containment tank which overflows to the Wastewater Sewer. A pump is used to circulate the water from the containment tanks to the baffled section of the scrubber. The total water flow to the scrubber will be a minimum of 100 gpm when venting to the scrubber occurs and 40 gpm when the scrubber is on stand-by. Depending on the vent load and composition, the spray tower section has a minimum flow setting of 50 gpm, and the baffle system has a minimum flow setting of 50 gpm. When vents are directed to one of the FGSITESCRUBBERS, the scrubber will obtain the 100 gpm minimum flow rate within 15 minutes of taking vents. Process vents enter the scrubber near the bottom and flow upward against the down flowing water. At the top of the scrubber is a 4’6” x 9’ expanded head to slow down the gas velocity to reduce entrainment. The vents exit the top of the scrubber through a 10” carbon steel pipe which reduces down to 6” to increase velocity and improve dispersion. Normally, only one scrubber is operational while the other unit is being cleaned, on stand-by or shutdown. Both the fresh city water and the recycle feeds are monitored using inline flow meters that are on a preventative maintenance schedule to assure proper operation.

FGSITESCRUBBERS have a design removal efficiency of 99.4% for HCl and chlorosilanes. Methanol, Ethanol and IPA have a removal efficiency of 98%.

FGSITEBLOWER in the ROP covers the site vent consolidation and blower system that collects vapor streams from numerous emission units and vents throughout the facility and routes them to either the THROX (FGTHROX) or the site-scrubber system (FGSITESCRUBBERS). This system is comprised of blowers located at both the buildings/plants and THROX. Upon malfunction of FGSITEBLOWER, emissions from the individual buildings/plants are automatically routed to FGSITESCRUBBERS as described in condition no. VI.1 of table FGSITEBLOWER in the ROP. In some cases, if FGSITEBLOWER malfunctions and THROX diverts emissions to FGSITESCRUBBERS, buildings/plants may be able to divert emissions to locally owned air pollution control equipment prior to discharging to FGSITESCRUBBERS or the atmosphere.

Pursuant to R 336.1911(2)(a), a MAP shall specify a complete preventative maintenance program, 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. Tables 1, 3 and 4 below address this requirement.

Pursuant to R 336.1911(2)(b), a MAP shall specify 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. Tables 1 and 2 below address this requirement.

Pursuant to R 336.1911(2)(c), a MAP shall specify 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. Tables 1 and 2 below address this requirement.

**Table 1 – Control system summary**

Control System No.	Control System Description	Description of Vapor Sources
1	Two identical water spray towers	Consolidated process vents which are taken from a wide variety of process units

**Table 4 – Maintenance Spare Parts Summary**

Control System No.	Spare Parts
1	Scrubber spray nozzles, CW pump parts, Sump pump parts
2	Scrubber spray nozzles, CW pump parts, Sump pump parts

**Table 3 – Preventative Maintenance Summary**

Control System No.	Device Description	Equipment No. or Name	Preventative Maintenance Task	Frequency	Responsible Supervisory Personnel
1	East Site Scrubber	23709	Calibrate Flow meters FE/FT-24095 FE/FT-24096	Annually	The Site Scrubber / Throx supervisor
2	West Site Scrubber	23710	Calibrate Flow meters FE/FT-24105 FE/FT-24106	Annually	The Site Scrubber / Throx supervisor
3	East & West Scrubber	23709 & 23710	High pressure wash/clean scrubber	Bi-Weekly, or on a less frequent/more frequent schedule as determined by the building.	The Site Scrubber / Throx supervisor
4	East & West Scrubber	23709 & 23710	Calibrate pressure transmitters on spray nozzle header (East PT-24110, West PT-24111)	Annually	The Site Scrubber / Throx supervisor

**Table 4 – Maintenance Spare Parts Summary**

Control System No.	Spare Parts
1	Scrubber spray nozzles, CW pump parts, Sump pump parts
2	Scrubber spray nozzles, CW pump parts, Sump pump parts

# **Dow Silicones Corporation Preventative Maintenance and Malfunction Abatement Plan FGTHROX – Primary Control Equipment**

In 2008, Dow Silicones Corporation (hereinafter “Dow”) received a PTI to add a thermal oxidizer as control for numerous on-site processes. This PTI also allowed Dow to install backup scrubbers for use when the thermal oxidizer is non-operational. Dow currently operates the thermal oxidizer and backup scrubbers under Renewable Operating Permit (ROP) Number MI-ROP-A4043-2008. Pursuant to R 336.1911 and the requirements of table FGFACILITY in the ROP, Dow is required to generate and maintain a Malfunction Abatement Plan (MAP) for the THROX (FGTHROX) and Site Scrubbers (FGSITESCRUBBERS). This document covers the THROX. A separate plan was submitted to the DEQ for the Site Scrubbers.

The thermal oxidizer controls various process vents with a minimum VOC destruction efficiency of 98%. The PTI allows chemical processes, which vent emissions to FGTHROX or FGSITESCRUBBERS, to either bypass or operate their local building control devices outside of the ranges specified in their individual emission unit and flexible group tables when FGTHROX or FGSCRUBBERS is operating properly. During FGTHROX shutdown, most of the vents are automatically switched over to one of the two scrubbers that make-up the FGSITESCRUBBERS system. If both FGTHROX and FGSITESCRUBBERS are down, processes will vent to their local building control prior to discharging to atmosphere or shutdown. Detail regarding individual vent scenarios can be obtained from the ROP and PTIs.

Pursuant to R 336.1911(2)(a), a MAP shall specify a complete preventative maintenance program, 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. Tables 1, 3 and 4 below address this requirement.

Pursuant to R 336.1911(2)(b), a MAP shall specify 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. Tables 1 and 2 below address this requirement.

Pursuant to R 336.1911(2)(c), a MAP shall specify 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. Tables 1 and 2 below address this requirement.

During all times when FGTHROX is operating or if FGTHROX goes down (except during annual maintenance shutdown events), FGSITESCRUBBERS will operate in accordance with its MAP which was submitted to the DEQ for review and approval.

If FGTHROX goes down, all affected buildings will be notified. All building control equipment will operate within the parameter limits (e.g. pressure, temperature, flow) allowed by the ROP within 1 hour after FGTHROX goes down.

If the FGSITESCRUBBERS goes down, a site-wide announcement will be made.

There are currently three gas chromatographs (GCs) associated with THROX located on the wet and dry vents and the 2703/601 vent. The 2703/601 vent line does not vent to the site scrubber. In the event THROX is non-operational, buildings associated with the 2703/601 vent line will exhaust to their local building control prior to discharging to atmosphere or shutdown.



**Table 1 – Control system summary**

Control System No.	Control System Description	Description of Vapor Sources
1	Thermal Oxidizer	Consolidated process vents which are taken from a wide variety of process units
2	HCL Absorber	Consolidated process vents which are taken from a wide variety of process units
3	Ionizing Wet Scrubbers	Consolidated process vents which are taken from a wide variety of process units

**Table 2 – Pollution Control System Operating Variables**

Control System No.	Control Equipment	Operating Variable	Monitoring Method	Frequency	Permitted Operating Range	Corrective Procedure or Operational Change in the Event of a Malfunction	Responsible Supervisor
1,2&3	Vent Collection System	Silicon Atom	Gas Chromatograph	Continuously – every 60 minutes	See permit for conditions that define the proper operation of Throx and IWS #1 and #2.	See note 1 below.	The Site Scrubber / Throx supervisor
1	Thermal Oxidizer Chamber	Temperature	Thermocouple	Continuously – every 15 minutes	See permit for conditions that define the proper operation of Throx and IWS #1 and #2.	If the temperature drops below the permitted temperature for longer than 15 minutes, vents will be routed to some other back-up control or shutdown.	The Site Scrubber / Throx supervisor
2	HCL Absorber	pH	pH Probe	Continuously – every 15 minutes	Greater than 5 pH	If the pH drops below 5 for longer than 24 hours, vents will be routed to some other back-up control or shutdown.	The Site Scrubber / Throx supervisor
3	Ionizing Wet Scrubbers 1 & 2	Voltage	Voltage meters	Continuously – every 30 minutes	See permit for conditions that define proper operation of Throx.	If voltage of either two wet ionizing scrubbers drops below the permitted voltage for a period of 30	The Site Scrubber / Throx supervisor

					and IWS #1 and #2.	continuous minutes, vents will be routed to some other back-up control or shutdown.	
3	Ionizing Wet Scrubbers 1 & 2	Water Flow	Flow meters	Continuously – every 15 minutes	See permit for conditions that define the proper operation of Throx and IWS #1 and #2.	If water flow to the ionizing wet scrubbers is lost (i.e., drops below the permit limit), vents will be routed to some other back-up control or shutdown.	The Site Scrubber / Throx supervisor

Note 1: There are two alarms on the three GC systems (i.e., wet & dry vent GCs & the 2703/601 vent line GC). The first alarm is for total composition that alarms low and high set points. This alarm checks that the constituents making up the feed stream when added equal approximately 100% or 1,000,000 parts per million by volume. The second alarm makes sure that the GC is continuously updating by looking for periods when constituent compositions do not change. If either of these alarms indicate an issue, then troubleshooting of the GC system will be initiated.

As required by the PTI, the GC systems (i.e., wet & dry vent GCs and the 2703/601 vent line GC) will be operated in a satisfactory manner. A satisfactory manner is defined as 90% uptime. Normal verification, calibration, troubleshooting and preventive maintenance do not count as downtime.

**Table 3 – Preventative Maintenance Summary**

Control System No.	Device Description	Equipment No. or Name	Preventative Maintenance Task	Frequency	Responsible Supervisory Personnel
1	Thermal Oxidizer Chamber	24422	Calibrate thermocouples TT29150A, TT29150B	Annually	The Site Scrubber / Throx supervisor
1	Thermal Oxidizer Chamber	24422	Verification/Calibration – wet & dry vent GCs & 2703/601 vent GC	Monthly	“ “ “
1	Thermal Oxidizer Chamber	24422	Routine maintenance – wet & dry vent GCs & 2703/601 vent GC	Weekly	“ “ “
1	Thermal Oxidizer Chamber	24422	Preventive maintenance – wet & dry vent GCs & 2703/601 vent GC	Semi-annually	“ “ “
2	HCL Absorber	24425	Calibrate pH probes AT29247 & AT29248	Annually	The Site Scrubber / Throx supervisor
3	Ionizing Wet Scrubbers 1 & 2	24427 & 24428	Annual Visual Inspection	Annually	The Site Scrubber / Throx supervisor
3	Ionizing Wet Scrubbers 1 & 2	24427 & 24428	Visual Inspection of both IWS units to confirm there is water flow which will demonstrate that flow meters are functioning properly.	Annually	The Site Scrubber / Throx supervisor

**Table 4 – Maintenance Spare Parts Summary**

Control System No.	Spare Parts
1	1 set of GC columns, GC rotameter, GC gold seals, GC liner O-rigs, GC chemtraps, GC Hoke stone filters, GC large Parker filter, GC 6 port valve, GC vacuum pump rebuild kit, GC vacuum pump, GC septums
2	Caustic pump rebuild kit
3	Electrode Wires