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Installation, Operations and Maintenance Manual

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Patents

The design of the RPM-12 Point of Use Scrubber and its appurtenances are Protected by U.S. Patents.

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Section 1.0 Operating Concept

The ABATECH Model RPM-12 is a co-current/counter-current wet scrubber. The inlet side of the unit is co-current where contaminant gas concentration is highest. The outlet side is counter-current where contaminant gas concentration is lowest.

The patented rotary element inside the polypropylene scrubber housing performs several functions. It provides sufficient pumping to compensate for pressure drop through the unit. Pressure drop/rise is zero at about 10 CFM. The balanced, precision rotary element surfaces move through the contaminant gas stream at a peripheral speed of 5,500 feet/minute creating high turbulence and intimate mixing between water and contaminant gases. The unique geometry and flow patterns provide sufficient liquid coalescence so that no entrainment eliminator is necessary. The rotary element replaces the traditional “packing” used in other types of wet scrubbers. This feature permits an overall unit size that is a fraction of the size of traditional “packed bed” wet scrubbers. Measuring 28” L x 24” W x 24” H and weighing 160lbs, the RPM-12 will fit into confined spaces. Units can be stacked, or nested. The stainless steel secondary enclosure makes the RPM-12 suitable for outdoor installation.

Scrubbing water passes through the flow switch, the seal housing, and is introduced into the scrubber through six (6) spray nozzles – three (3) on the inlet side and three (3) on the outlet side. The water drains from the bottom of the unit. The turbulence inside the scrubber prevents solids accumulation in the unit. Optimal efficiency is obtained at 2.5 GPM. Scrubbing water is used once, so water recirculation and pH treatment are not necessary. To protect the unit from damage, the flow switch will turn the motor off if the water supply falls below 1.5 GPM, but this does not require the process to be shut down. Maintenance can wait until the process run is completed.

The patented RPM-12 inlet is designed to greatly reduce cleaning requirements. The inlet pipe is fabricated from 2” Hastalloy™. It is electrically heated to 260°F. Heating the inlet forces the water vapor-contaminant gas interface back toward the scrubber. This delays the point that contaminant gases begin to form solids. Two Hastalloy™ probes mounted on the rotary element hub extend into the inlet pipe. The probes are designed to wipe the inlet free of solids as they form in the interface region.

The ABATECH Model RPM-12 will efficiently abate all water soluble/wet-able effluents from semiconductor process gases at flows up to 40 CFM.

Section 2.0 Site & Utility Requirements

Piping

Use Teflon flexible connectors (IMPORTANT) on the inlet and exhaust lines to prevent pipe loading. Failure to do so will misalign the rotary element, possibly damaging the scrubber. The process pipe should come in above the scrubber inlet, so that when connected the inlet will be self-draining. The outlet should also be self-draining. A liquid loop seal (P-trap) must be installed to comprehend the negative pressure of the central exhaust system. The water drain must be vented downstream of the P-trap. In outdoor installations freeze protection should be installed on water lines.

Water

Water pressure of 40 PSIG is sufficient to maintain the optimal water flow of 2.5 GPM. Industrial wastewater is satisfactory if pH is neutral. A water pressure regulator is necessary to control water flow to the scrubber.

Electricity

110 VAC, 10 Amps. The RPM-12 motor will draw 6 amps to start and operate on 2.5 amps. The RPM-12 heaters will draw 2.5 amps to start and operate on 1.5 amps. Total operating load is 4 amps.

Purge

A nitrogen purge is necessary prior to inlet inspection.

Alarms

The user may wish to add alarms to remotely monitor inlet backpressure, inlet temperature, and the scrubber motor.

Section 3.0 Operation

Start Up

1. Open the water supply valve and check for leaks.
2. Insure that the wastewater drain is open.
3. Turn the scrubber power switch to “ON”. The scrubber motor will not start until water flow has reached 1.5 GPM. A green light indicates that the scrubber is operating.
4. Press the “RESET” switch to reset the inlet heater warning light.
5. The unit should operate quietly and vibration free.

Operational Checks

1. Check to see that water flow is set to 2.5 GPM. Water flows below this rate cause solids break-through in the scrubber exhaust line.
2. The unit should operate quietly and vibration free. The bearings and shaft should be warm to the touch. If not, see the troubleshooting section.
3. The inlet should reach operating temperature (260° F) within 15 minutes. High startup purge rates delay the heating process.

Process Connection

1. Check to see that all valves are open between the scrubber and the central exhaust.
2. If the process tool exhaust feed to the scrubber contains flammables, the scrubber should be purged with inert gas prior to introducing process chemicals. A 1 CFM purge for 10 minutes is sufficient to prevent any combustion reaction.
3. Be certain that the inlet heaters have reached operating temperature prior to introducing process chemicals to the scrubber.

Shutdown

1. Turn off or by-pass process tool exhaust feed to scrubber.
2. Purge scrubber for 10 minutes.
3. Turn off purge gas.
4. Close valve between scrubber and central exhaust.
5. Turn off scrubber power.
6. Turn off water.
7. Disconnect power before control box is opened.

Safety

1. The stainless steel enclosure contains rotating machinery. Care should be exercised if the access door is opened while the unit is operating.
2. The control box contains 115 VAC circuits. Power should be disconnected before removing the control box access panel.
3. The scrubber should be purged and the exhaust valve closed before inlet inspection.

Section 4.0 Preventative Maintenance

Daily Checks

1. Check green operating light. Check that water flow is set at 2.5 GPM. Inability to maintain 2.5 GPM may indicate that the water filter cleaning is necessary. Water filter cleaning intervals vary with water quality. The scrubber motor interlocks at 1.5 GPM to protect the seal.
2. Check that inlet temperature is controlling at 260° F.
3. Check for vibration or noise. Rattling in the inlet area may indicate that inlet cleaning is necessary. Inlet cleaning intervals will vary by process.
4. Inspect process feed lines for evidence of pipe leakage.

Quarterly Checks

1. Arrange for scrubber bypass, and follow the shutdown procedure.
2. Inspect bearings for lubricant leakage. The bearings are sealed and should seldom require lubrication.
3. Inspect timing belt for cracking or fraying. The timing belt should deflect 1/8" to 3/16" inch under proper tension.
4. Clean inline water filter (See Picture 1), and clean the scrubber inlet. (See Picture 5).

Section 5.0 Troubleshooting

Problem- Scrubber fills with water

Possible Cause

- Closed drain vent.

Solution

- Open drain valve, purge inlet (prevents corrosion).

Possible Cause

- Unvented drain line.

Solution

- Vent drain line, purge inlet

Problem- Unable to maintain 2.5 GPM water flow

Possible Cause

- Water supply pressure..

Solution

- Adjust pressure regulator.

Possible Cause

- Plugged water filter.

Solution

- Clean water filter (See Picture 1).

Possible Cause

- Plugged spray nozzles.

Solution

- Loosen Swedgelock™ fittings, remove pipe nipple and spray nozzle and clean if needed (See Picture 2).



(Picture 1)



(Picture 2)

(Note: The scrubber interlocks at 1.5 GPM to protect the seal.)

Problem- Squealing noise around shaft

Possible Cause

- Bearing/timing pulley set screw is loose.

Solution

- Tighten setscrew. Use Blue Locktite™ if necessary.

Problem- Excessive vibration

Possible Cause

- Belt misaligned.

Solution

- Using a straight edge, insure that timing pulleys are aligned. Belt should be in the middle of the pulleys. Insure motor base is square with the mounting plate.

Possible Cause

- Inlet probes hitting, process solids buildup.

Solution

- Clean inlet (See Picture 5), insure inlet temperature is operating at 260° F.

Possible Cause

- Shaft misaligned through the seal housing.

Solution

- Insure inlet and or outlet pipe loading is not twisting the wheel housing.
- Loosen four bolts on wheel housing angle supports (See Picture 3) and adjust wheel housing until shaft is centered in the seal housing (See Picture 4) and in the inlet (See Picture 5).



(Picture 3)



(Picture 4)



(Picture 5)