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Operation and Maintenance Manual for NIXTOX and Econosorb-V Vapor Phase Units

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1.0 GENERAL

Standard adsorbent is *virgin* granular or pelletized vapor phase coal based activated carbon and is normally installed prior to shipment. These units are designed to operate in the upflow mode. If the inlet organic contaminant concentrations exceed 500 ppm and the air flow is less than 50ft/min, significant heat of adsorption may be generated. Prewetting the adsorbent with water is recommended in these cases, in order to minimize the chance of ignition.

In all cases of a combustible source of air or gases, a suitable **bi-directional detonation flame arrestor** should be installed between the source and the adsorber. TIGG premounts arrestors as ordered; otherwise, carefully observe instructions included with your own arrestor.

If media other than carbon is to be used, contact a TIGG representative for any procedural changes.

2.0 SAFETY CONCERNS

WARNING: Wet drained activated carbon preferentially removes oxygen from air. In closed or partially closed containers, the oxygen concentration can reach dangerously low levels. Therefore, OSHA procedures related to entering low-oxygen spaces should be followed by workers who must enter a vessel containing wet carbon.

Activated carbon can react with oxidizing/easily oxidized substances such as ozone, concentrated oxygen, halogens, ketones etc. to liberate heat in addition to that which is normal for physical adsorption. Regular activated carbon is not recommended with these materials, **especially in intermittent use application.**

If it is used in these applications contact a TIGG representative to discuss the necessary precautions to prevent temperature excursions. **In this application, TIGG SAFE carbon should be used.**

3.0 UNLOADING & STARTUP PROCEDURES

3.1 Receiving

When a unit is delivered to the site, it should be checked thoroughly to ensure all required items have been received and the equipment is free of any shipping damage **prior to signing the bill of lading.**

3.2 Rigging

All equipment will arrive at the job site via truck. The adsorbers will usually be filled with carbon prior to shipment. The unit should be carefully removed from the

truck in a horizontal position by either a forklift or an overhead crane. If a crane is used it is advisable to use a properly sized spreader beam and lifting cables.

Following are weights of the NIXTOX units.

UNIT	Empty Wt.	Filled Wt.
Econosorb V	-	218
N50	-	150
N100	-	260
N150	-	390
N250	-	530
N20 XP	-	60
N50 XP	-	130
N100 XP	-	230
N400 XP	-	440
N750 PDB	850	1500
N1200 PDB	1200	2200
N1800 PDB	1425	2925
N2500 PDB	2860	4860
N4000 PDB	2735	5935
N5000 PDB	3115	7515
EVP-1000	550	1550
EVP-2000	600	2600
EV-1000	765	1765
EV-2000	1340	3340
EV-3000	1700	4700
EV-5000	3700	8700
RADIAL UNITS		
N-500	160	360
N-1000	220	620
N-1500	240	540
N-3000	600	2200

Once the adsorber has been removed from the truck, it should be placed on a stable, level surface and oriented to complement the piping and blower arrangement. After the adsorber has been correctly positioned, the piping or hose connections can be made.

The following units will have either male NPT fittings or FNPT couplings:
Econosorb V, N50-N250 & N20 XP-N100 XP, EVP-1000-2000

All of the PDB, Radial Flow and EV-1000-5000 units have duct connections.

The N400 XP unit has flanged connections.

The polyethylene units, with the exception of the N20 XP, have a stainless steel electrical grounding rod installed in order to prevent static electricity buildup. Connect to a ground.

3.3 Startup

3.3.1 Breakthrough Detector

Most of the units can be supplied with a "Breakthrough Detector". It will be shrink wrapped and located on the fork tubes. It should be installed on the ¾" connection on the top of the adsorber. Remove the tape covering the diffusion ports on each end.

Breakthrough detectors for the radial units use a special fitting supplied on the unit side or, for Accumulator Cabinets, to a side fitting on the cabinet which is connected by tubing to the adsorber fitting.

The colored granules will change from violet to a brown color when organics(s) reach the ports – signaling that about 70% of the carbon bed is exhausted for that compound. A sliding shield, to prevent light from prematurely changing the indicator color, is moved to view the granules.

3.3.2 Prewetting - (if required, see Sec. 1.0)

For upflow models, plug the bottom side gas inlet port and fill with water; let stand for 30 minutes and drain off excess water through the bottom condensate drain or the gas inlet.

The water remaining in the carbon acts as a heat sink to reduce the temperature rise. The water will reduce the saturation adsorption capacity, somewhat. In streams containing halogenated organics, the reduction can be significant and the breakthrough will be earlier than expected with a dry bed.

NOTE: The adsorbent may require rewetting, or the incoming gas may be humidified as an option, if the gas to be treated is low in humidity.

3.3.3 Initiating air/gas flow

When all the piping/duct connections have been made, the Breakthrough Detector has been installed (if provided), and any prewetting (if required) has been completed and the blower/fan has been commissioned, the unit is ready to accept the flow of gas/air.

A momentary emission of adsorbent fines created during shipment may be noted at high flows. If the possibility of a small quantity of dust is objectionable, a cloth bag tied to a fitting may initially filter outlet air, or the unit could be purged at another location prior to installation.

4.0 MISCELLANEOUS

4.1 Condensate Drains

All NIXTOX and ECONOSORB V units have drains thereby eliminating the need for siphons or disconnecting air sources for draining. The upflow units may be drained full time via a customer applied liquid trap with sufficient head to exceed the airflow back pressure and thus avoid leakage of untreated air.

Bottom edge drains on the radial units may remain open, since air reaching them already has been treated. Accumulator cabinets also have drains, which can be connected to radial unit drains, as desired.

4.2 Accumulator Cabinets for Radial Units

Accumulator cabinets, supplied by TIGG, are recommended for unsheltered installations and where the treated air must be analyzed. Also they are ideal if the air is to be recycled, require further treatment or must be directed to a stack.

With the radial unit placed inside the cabinet, the internal flex hose (supplied) is connected to the adsorber inlet, and the air source is connected to the external duct connected to the flex hose.

4.3 Care Package (except for Econosorb V)

A package including a 2" rain cap, 2" close nipple, 2-2" Reike bungs, sticky wicket and installation instructions are generally shrink-wrapped to the bottom sides of the N50 - N250 units. For installation in unsheltered areas, install the rain cap on N50 – N150 drums with the top depression. The N250 is supplied with a 4" rain shield. Use the pipe nipple (N50 – N150) to eliminate overflow into the unit, and install the sticky wicket on the N50 – N250's to prevent water from entering the adsorber.

4.4 Accessory Fans and Motors

Fans are available and can usually be premounted with the adsorber onto a skid.

5.0 REFILLING ADSORBERS WITH CARBON

Depending on the type of unit the following steps should be taken:

- Remove the unit cover or handhole/manway.
- Pour or vacuum the spent adsorbent out and discard in an approved manner.
- Pour fresh adsorbent directly into upflow units. Level the top of the bed.
- Radial units should be filled slowly and evenly in the annular space between the distributor and side until the bed is within one-two inches of the top, avoid pouring adsorbent inside the distributor column.
- Level the top of the bed.
- Replace the top or close the adsorber fittings and return to operation.

Note: N50, N100 and N250 may have been specially ordered in closed head versions, and are not normally refilled.

CAUTION: Depending on the application, spent adsorbent may be capable of evolving toxic or combustible levels of vapor which may require special handling procedures.

6.0 TROUBLESHOOTING

This section is intended to identify some of the more common problems which may be encountered during the operation of a vapor phase carbon system. The following discussion is not intended to be all-inclusive since situations and circumstances will vary with each individual system by virtue of design, operating philosophy etc. Therefore, this section should only be considered as a guideline for troubleshooting. If the problem is not solved, please call a TIGG representative.

6.1 General

The problems which arise generally fall under the following categories:

- High pressure drop
- Poor adsorption and inefficient carbon usage

6.2 High Pressure Drop Adsorbers w/Plenum

High pressure drop can usually be caused by:

- Excessive moisture accumulation in the plenum and/or
- Blinding of the plenum by particulates

6.2.1 Excessive Moisture Accumulation

If excessive moisture is present in the process vapors, liquid may accumulate within the bottom portion of the unit. Excessive moisture accumulation may restrict or completely block portions of the inlet duct connection and the open space beneath the carbon support.

Either restriction or blockage will increase inlet velocities and pressure drop through the unit. This condition may be

avoided by periodically draining the inlet lines and drains on the unit.

6.2.2 Blinding the Plenum

The plenum is constructed of black porous polyethylene support medium (N250 N400 XP, EV-1000 – 5000) or stainless steel (N750 PDB-N5000 PDB) attached to angle bracing every 18 inches. The porous polyethylene looks like pelleted carbon bonded together. The porous polyethylene and stainless steel plate not only supports the carbon, it also provides uniform distribution of the vapor.

If the influent vapor contains an excessive amount of particulates, the particulates may build up on the underside of the porous plate, causing a restriction of the open area, channeling and an increase in the pressure drop. If excessive blinding occurs within the unit, an upstream filter may have to be installed to remove the particulates prior to the adsorption unit.

6.2.3 Poor Adsorption and Inefficient Carbon Usage

Poor adsorption, and/or inefficient carbon usage, may be caused by the following:

- Channeling – Level the bed
- Carbon saturation – Change the carbon
- Premature increase in the effluent concentration – check the influent concentration
- Change in types of contaminants in the influent – Compare influent analyses with original
- Presence of non-adsorbable organics in effluent – Compare influent analyses with original

For reorders, replacement adsorbents or further technical information please contact TIGG Corporation, 1-800-925-0011