APPENDIX D
OPERATIONS AND MAINTENANCE MANUAL

OPERATING & MAINTENANCE INSTRUCTIONS

for

Miramar Hope Bay Ltd.

"FLOW AND PLUG"
(OIL ABSORPTION EQUIPMENT)

Model No: FII-AP-C-180-TM-Cx2
Maximum Pressure: 10 PSI
Product: Oil Absorption Equipment

MANUAL NO. C5121

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TLI-CHO LOGISTICS

"FLOW AND PLUG"
(OIL ABSORPTION EQUIPMENT)

GENERAL DESCRIPTION

The FII "Flow and Plug" Oil Absorption System is the simplest, most efficient and versatile method for removing oil and grease in waste water streams to a level below 15 PPM as regulated by the Ministry of the Environment. (Not Recommended for chemical Oil Emulsions).

The FII "Flow and Plug" Oil Absorption Equipment consists of four basic systems: (1) the Coalescer, (2) the Particulate Filter, (3) the Oil Absorbing Media, and (4) the activated carbon media.

(1) The Coalescer

The basic concepts used in our Coalescing Systems are gravity and coalescence. First the contaminated solution is taken into and through the coalescer with a pump. Because oil and water do not mix (unless chemically emulsified), the larger droplets float to the top and are skimmed off. The smaller droplets are collected on the olephilic ("oil-loving") media to coalesce into larger units. These larger particles float to the surface and are skimmed off into a holding vessel. The "oil-free" water passes under a weir (wall) and out of the coalescer. Marlin units have achieved efficiencies of 90%-95% of the free oil removed.

(2) The Particulate Filter

The Particulate Filter is a pre-filter to effectively remove any dirt and dust particles which would prematurely plug the oil absorbing media. It is a bag filter system consisting of the pressure vessel, the micron rated disposable filter bag and restrainer basket (to support the filter bag).

The disposable filter bag is a triple layered bag having a filter rating of approximately 1 micron. It will hold from 1-2 pounds of dry solids before becoming plugged.

Rapid access to the filter bag ensures a quick and easy clean-up of the vessel, since filtered out contaminants are trapped within the bag. "Spaghetti" is added into the clean filter bag to enhance the dirt holding capacity by up to 5 times.

(3) The Oil Absorbing Media

The Oil Absorbing TM Media is contained in removable disposable drums. The drums are specially coated with epoxy making them both chemical and abrasive resistant. This TM media absorbs oil and grease through a partitioning phenomena. The unique characteristics of the media results in a slight swelling of the bed as it removes the hydrocarbon from the contaminated liquid. At a maximum pressure of 8 PSI stoppage of the pumping action through the system is required as media is saturated and needs to be replaced thus eliminating the flow of unfiltered liquid to the environment.

(4) Activated Carbon

GC 12 X 40 is a virgin activated carbon derived form bituminous coal. Granular in form, it is ideal for many liquid phase applications including the removal of organics from water streams. Its superior adsorptive capacity and surface area make it particularly attractive for use in waste water while its size makes it appealing where low pressure drop is needed.

The net result is oil/grease readings will be well below 15 ppm enabling the water to be sewerable.

WARNING

THIS FILTRATION SYSTEM IS DESIGNED WITH DISPOSABLE FII FILTER PRODUCTS OF THE TYPE AND MODEL SPECIFIED IN THE OPERATION INSTRUCTION MANUAL AND DRAWINGS. SAFE OPERATION AND PERFORMANCE IS GUARANTEED WITH THE SPECIFIED FII FILTERS. WE WILL NOT GUARANTEE THE PERFORMANCE AND FUNCTION OF THE SYSTEM WITH OTHER MAKES, MODELS OR TYPES. ANY ACCIDENTS OR DAMAGES CAUSED BY USING INCORRECT, NON-SPECIFIED FILTER AND MEDIA ARE THE FULL RESPONSIBILITY OF THE OPERATOR OR USER.

INSTALLATIONS

Remove the unit from the shipping crate, being careful not to damage any of the projecting connections.

CAUTION:

DO NOT ATTACH SLINGS TO ANY NOZZLES WELDED TO THE UNIT. BE SURE TO PLACE SLINGS ON THE FRAME OF THE UNIT.

IMPORTANT:

BE SURE TO CORRECTLY IDENTIFY THE INLET AND OUTLET CONNECTIONS OF THE UNIT TO AVOID PIPING THE UNIT BACKWARDS. THE FILTER WILL NOT PERFORM IF THE CONNECTIONS ARE REVERSED. INLET CONNECTION LEADS TO AIR DIAPHRAGM PUMP.

Proceed with the required piping. Tighten all bolts evenly and securely. Check to make sure that the bag filter has been installed in the filter vessel before tightening the end cover bolts.

Drain piping should be led well away from the unit. The water drain lines can be connected into a common drain system.

A container is required to be placed under the elbow of the tubular skimmer to catch free oil coalesced from the oil water separator. A threaded reducer is included with the elbow. **DO NOT GLUE UNTIL TUBULAR SKIMMER IS SET.**

After all connections have been made and all bolting tightened securely, the unit is ready to be placed in operation.

NOTE:

The FII "Flow and Plug" Treatment System should be level to 1/8" per foot to be conducive to proper operation.

OPERATION
(Refer to drawing 1, Pictorial 1-6)

The filter system requires a minimum amount of attention after the initial installation. Differential pressure readings should be made and recorded on initial start-up.

OPERATION CONDITIONS

(1) Pump (23) on skid mounted system, **this pump must be properly grounded**. Read fire or explosion hazard in Apendix 1 Manufacturers Literature.
(2) Pump Air Supply permits pumping of fluid until filter bag (2) or oil absorbing drum (3) become plugged.
(3) When the differential pressure across the bag filter vessel reaches 15 PSI shown on pressure gauge (8A) the pump needs to be stopped and filter bag changed.
(4) When the differential pressure across the oil absorbing drum (2) reaches 8 PSI as shown by the gauge (8B) the pump should be shut off. The absorbing drum is saturated and needs to be replaced.

Set Up of Coalescer (1)

This procedure is to be followed for the installation of the unit or the restart after cleaning of the unit.

Begin by filling the unit with clean water. Make sure it is high enough to slightly exceed the bottom portion of the separator weir. This procedure prevents the premature posts break out of oil on the clean water side of the weir.

Rotate the slot of the oil outlet tube (20) to a straight up position.

Continue to fill the coalescer with the oil/water mixture that is to be separated, until the solution begins to exit the coalescer.

Adjust the slot in the tubular rotating oil weir (20) to within 1/16 of an inch of the oil/water mix surface. When tubular skimmer is at desired level tighten set screw (22). This is a one time adjustment, tubular skimmer does not need to be adjusted again. Glue elbow and provided reducer to oil discharge pipe and connect appropriate hose to collect free oil into a waste oil container.

To make adjustments to the coalescer, set the rotating oil pipe slot 1/16" above the level of the solution on the side of the coalescing filter. Various periods will elapse before there is enough oil accumulated to begin flowing oil out of the oil pipe. Allow 3/8" to 3/4" of oil on the surface during operation. To prevent the aqueous solution from migrating with the oil an occasional check can be made on the post weir side for an oil break out. If this occurs check to see if the pump is exceeding the designed capacity of the coalescer by checking the flow meter. If meter is showing flows higher or lower than 19 LPM adjust with flow control valve (11 A).

Refer to Drawing **1**

To place the unit in operation, the following procedures must be observed

1) Attach air hose to pump (23). Connect hose to suction side of pump from processing tank. Use clean water first for start up.
2) Connect drain hose on final carbon absorbing drum (4B).
3) Close all drain valves (10, 15, 16, 19) and sample effluent valve (18).
4) Open flow control valves (11, 11 A) slightly.
5) Pump will start up as air is applied to pump.

   NOTE: ½ pump designed to pump into coalescer. ½ pump designed to pump out of coalescer.

6) Check flow meter (13) and if flow is greater than 19 LPM immediately adjust with flow control valves.

   NOTE: If flow is greater than 19 LPM treated water quality will be come worse due to speed of flow through system. If excessive flow and or pressure (greater than 15 psi) is allowed than damage and leakage to drums will occur!

7) Allow water to fill system which will purge all air trapped in filters.
8) Allow water to flow approximately 15 minutes after system filled to ensure all trapped air is removed from filters, as well as TM-fines and carbon fines are removed.
9) To make adjustments to the coalescer, set the rotating oil pipe slot (20) 1/16" above the level of the solution on the side of the coalescing filter. Various periods will elapse before there is enough oil accumulated to begin flowing oil out of the oil pipe. Tighten set screw (22) then glue elbow and reducer to oil discharge pipe. Allow 3/8" to 3/4" of oil on the surface during operation. To prevent the aqueous solution from migrating with the oil. An occasional check can be made on the post weir side for an oil break out. If this occurs check to see if the pump is exceeding the designed capacity of the coalescer of 19 LPM. If meter is showing flows higher or lower than 19 LPM adjust with flow control valve (11A).
10) Observe the pressure gauge readings (8) and record pressures over bag filter and TM drum for future reference.
11) Samples of incoming water may be taken from sampling drain valve and samples of discharge water after filtration may be taken from sampling drain valves (15, 16, 19).
12) The system is now ready to treat your waste water transfer suction hose.

NOTE:

UNIT SHOULD ONLY BE DRAINED WHEN CHANGING FILTER ELEMENTS OR WHEN NO LONGER IN SERVICE. THE OIL ABSORBING MEDIA MUST BE IMMERSED IN WATER TO ELIMINATE AIR POCKETS WHICH WOULD EFFECT ITS OIL ABSORBING CAPABILITIES.

INSTRUCTIONS FOR CHANGING FILTER BAGS

THE MOST IMPORTANT STEP IN CHANGING FILTER BAGS IS TO MAKE SURE THAT THE PRESSURE IN THE FILTER VESSEL IS RELIEVED PRIOR TO OPENING THE UNIT. THIS IS ACCOMPLISHED BY OPENING THE DRAIN VALVE AT THE DISCHARGE OF THE FILTER.

To change filter bags

1) Pressure gauge (8A) on top of bag filter at 15 psi or greater filter bag is plugged and change is required.

2) Shut the system off (turn pump (23) off).

2A) Shut off valves before and after filter.

3) Open the bag filter drain valve (10). The product drained from the filter may contain oil and should be piped or collected accordingly. This will also relieve any internal pressure.

4) Wait five minutes to allow water in bag filter to drain. Check pressure gauge to make sure no pressure is in system.

5) Loosen bar knobs on the lid so that they are free and eye bolt assembly can be swung away from it.

7) Remove "Spaghetti" from bag filter. Remove and discard saturated filter bag.

8) Insert the clean filter bag into the restrainer basket (already installed) and form the bag to the contours of the basket by pressing against the restrainer basket.

9) Insert new "Spaghetti". Take small handfuls and push firmly to bottom of bag. Repeat until the filter bag is filled.

10) Check positioning of the "O" ring which should be properly seated in the filter. The ring of the filter bag must be seated in the edge provided by the restrainer basket.

11) Replace bag hold down device.

12) Close cover carefully. (Do not drop.) Tighten bar knobs evenly and securely. (Slight downward force is necessary to compress bag hold down device.)

13) Close drain valve (10). Partially open the flow control valve (11).

14) Reopen the main flow control valve slightly (11A).

15) Unit is ready to operate. On restart ensure flow meter (13) is reading at or under 19 LPM. If not adjust flow control valves (11, 11A) accordingly.

16) Record in the Logbook the **Time** and **Date** and **Cubic Meters** processed for the bag filter change.

INSTRUCTIONS FOR CHANGING OIL ABSORBING DRUM

THE MOST IMPORTANT STEP IN CHANGING THE OIL ABSORBING DRUM IS TO MAKE SURE THAT THE PRESSURE IN THE SYSTEM IS RELIEVED PRIOR TO REMOVING THE DRUM. THIS CAN BE ACCOMPLISHED BY OPENING THE DRAIN VALVE AT THE BOTTOM OF BAG FILTER.

1) Check pressure gauge (8B) to confirm oil absorbing drum (3) is plugged and requires change-out. (8 psi maximum)

NOTE: At 10 psi pressure relief valve will open to prevent over pressurizing of drum

2) Shut the pump off. Close the flow control valve (11A) prior to inlet on coalescer.

3) Open drain valve (10) at the bottom of the bag filter to relieve internal pressure and open sample valve (15) between TM-100 drum and carbon drum (4A) to remove any water which may remain in the drum. Wait 10 minutes to allow any drain-water to escape.

4) Undo union (9A) on inlet and (9B) on the outlet of the drum.

5) Release the drum hold down devices by unscrewing eye nut.

Note: The saturated weight of drums and media is approximately 500 lbs. The drums need to be handled with proper equipment to remove them from the skid.

6) Remove spent drum.

7) Replace with new drum.

8) Remove threaded inlet/outlet connections from spent drum. Remove 2 inch coupling with cap seal from new drum. Replace threaded outlet connection to bottom discharge on the new drum securing tightly against the O-ring for a good seal. Replace 2 inch coupling with the cap seal onto the spent drum and tighten securely against the O-ring for a good seal. The spent drum is now completely sealed for disposal.

9) The new drum having the newly placed inlet lid and outlet connection is ready for hook-up.

10) Replace and retighten unions (9A) on inlet of drum and (9B) on outlet of drum.

11) Close drain valve (10) and sample valve (15) open flow control valve (11).

12) Restart pump. On restart ensure that the flow is at or under 19 LPM. If not adjust flow control valve accordingly.

13) Record in the Logbook the **Time, Date** and **Cubic Meters** processed for the TM-100 change.

INSTRUCTIONS FOR CHANGING ACTIVATED CARBON DRUMS

THE MOST IMPORTANT STEP IN CHANGING THE ACTIVATED CARBON DRUM IS TO MAKE SURE THAT THE PRESSURE IN THE SYSTEM IS RELIEVED PRIOR TO REMOVING THE DRUM. THIS CAN BE ACCOMPLISHED BY OPENING THE SAMPLE VALVE AT THE INLET TO THE ACTIVATED CARBON DRUM.

1. Check water sample from sample valve (16 and 18) and discharge. If water quality is same then carbon drum (4A) is saturated and needs to be replaced.

2. Shut the pump off. Close the flow control valve (11) prior to inlet connection on TM drum.

3. Open sample valve (15) at the bottom of the TM-100 drum to relieve internal pressure and to remove any water which may remain in the drums. Wait 15 minutes to allow any drain-water to escape.

4. Undo union (9C) on inlet and (9D) on the outlet of the first activated carbon drum.

5. Release the drum hold down device by undoing the eye bolt.

NOTE: The saturated weight of drums and media is approximately 250 lbs. The drums need to be handled with proper equipment to remove them from the skid.

6. Undo union (9E) on the inlet and (9F) on the outlet of the second carbon drum.

7. Remove discharge hose.

8. Remove the first activated carbon drum (4A).

9. Replace with the second activated carbon drum (4B) (i.e. put the second drum in the first carbon drum position).

10. Replace the second activated carbon drum with a new activated carbon drum.

11. Exchange drum lids between the spent drums and the new carbon drum that is now in position two. The inlet connections are now in position on the new drum and the spent drum is now ready to be sealed for safe transportation. Tighten drum hold down lids securely.

12. The new drum having the newly placed inlet lid and outlet connections is ready for hook-up.

13. Replace outlet piping and union (9F) on the second carbon drum retighten the union (9F). Transfer the piping between carbon drums one and two. Replace and tighten the union (9E) on the inlet of the second carbon drum.

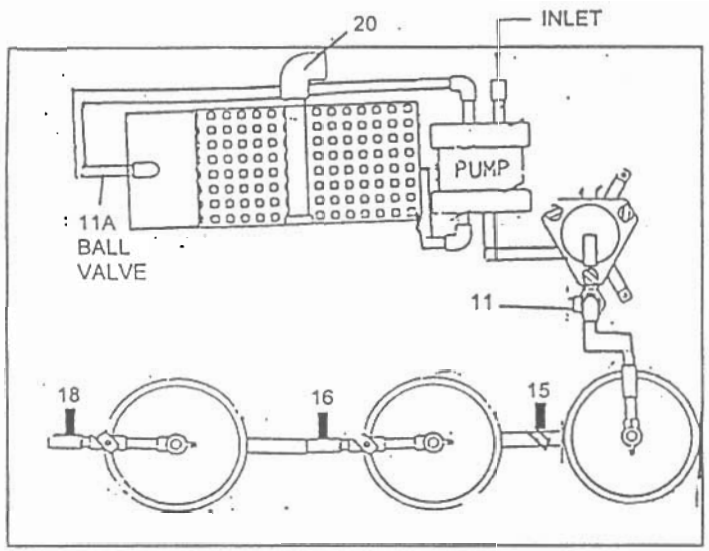
14. Replace and retighten union (9C) on inlet of drum and (9D) on outlet of the first carbon drum.

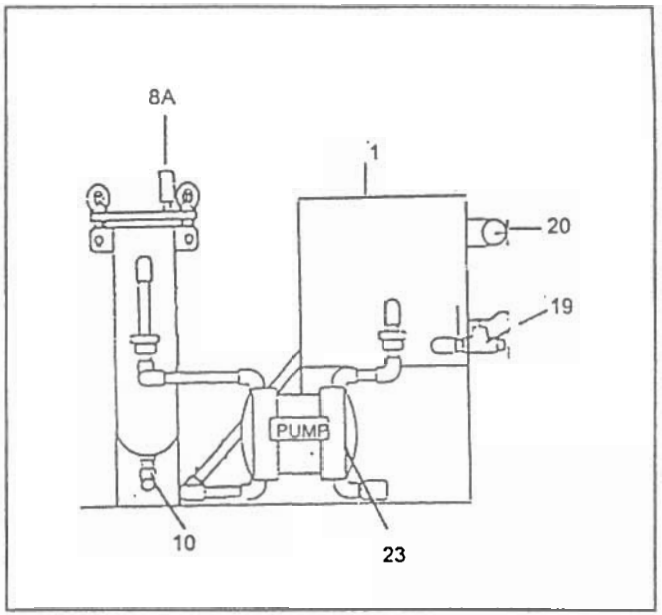
15. Close sample valve (16) and open flow control valve (11).

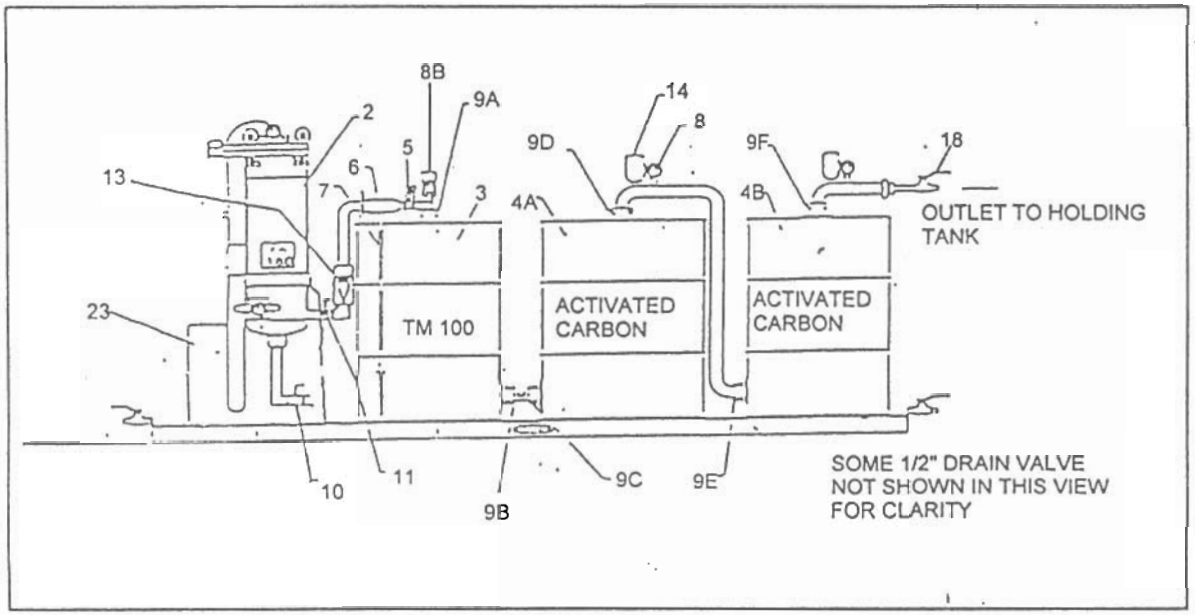
16. On restart ensure that the flow is at or under 19 LPM. If not adjust flow control valve accordingly.

17. Record in the Logbook the **Time, Date** and **Cubic Meters** processed for the Activated carbon Changes.

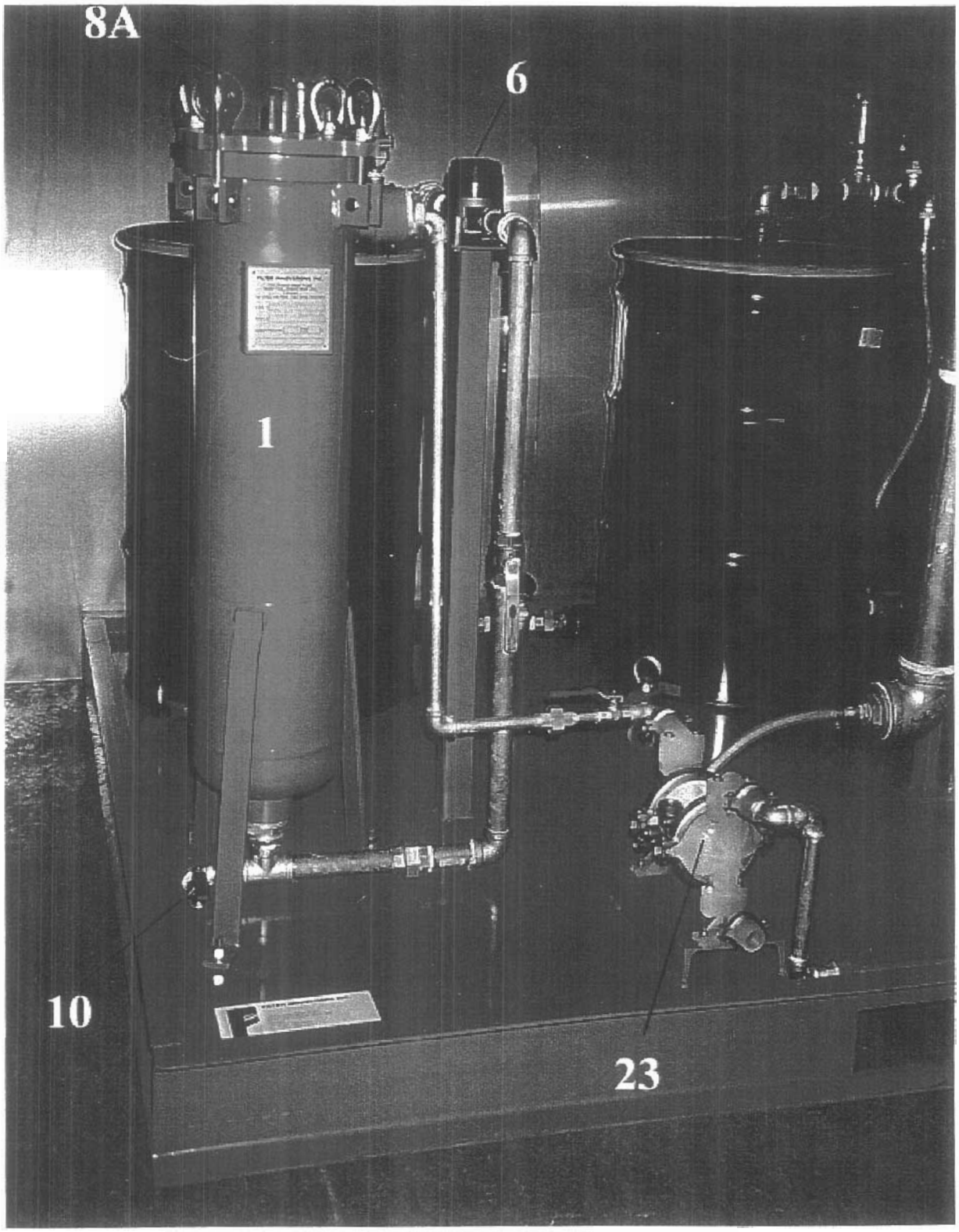
Drawing 1





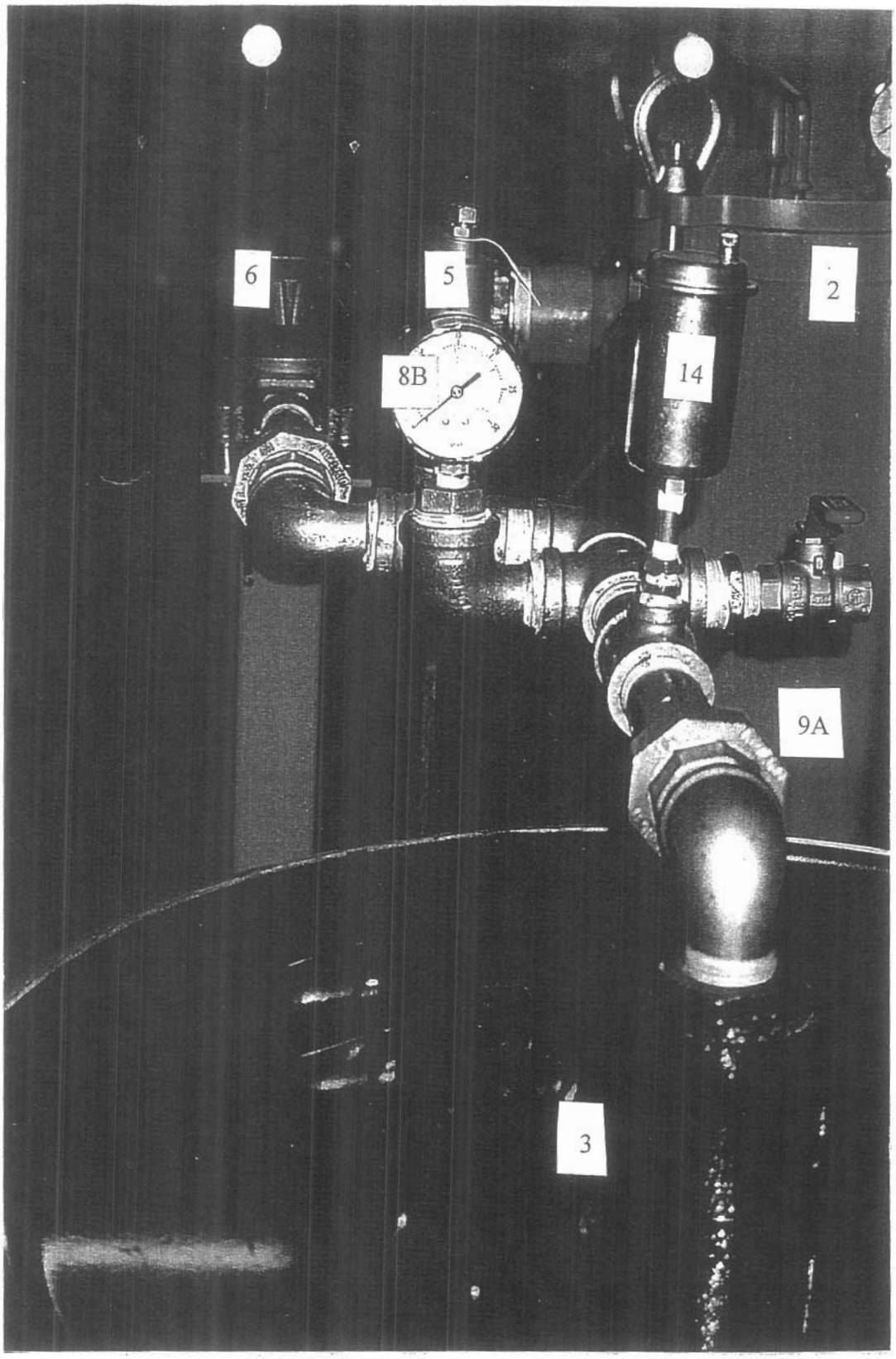


20	1	Oil Concentrate Discharge Pipe
19	1	Drain Valve
18	1	Sample Valve (Effluent)
17	1	Sample Valve
16	1	Drain Valve
15	1	Drain Valve
14	3	Air Eliminator
13	1	Flow Meter
11A	1	Main Flow Control Valve
11	1	Flow Control Valva
10	1	Bag Filter Drain
9F	1	Outlet Act. Carbon # 2
9E	1	Inlet Act. Carbon # 2
9D	1	Outlet Act. Carbon # 1
9C	1	Union Inlet Act. Carbon # 1
9B	1	Union Outlet – TM-100
9A	1	Union inlet – TM-100
8B	1	TM Pressure Gauge
8A	1	Bag Filter Pressure Gauge
8		Pressure Gauges
7	1	Equipment Standard
6	1	Water Meter
5	1	Pressure Relief Valve
4B	1	2nd Drum of Act. Carbon
4A	1	1st Drum of Act. Carbon
23	1	Pump
3	3	TM-100
2	2	Pre Filter
1	1	Coalescer
Item	Qty	Description



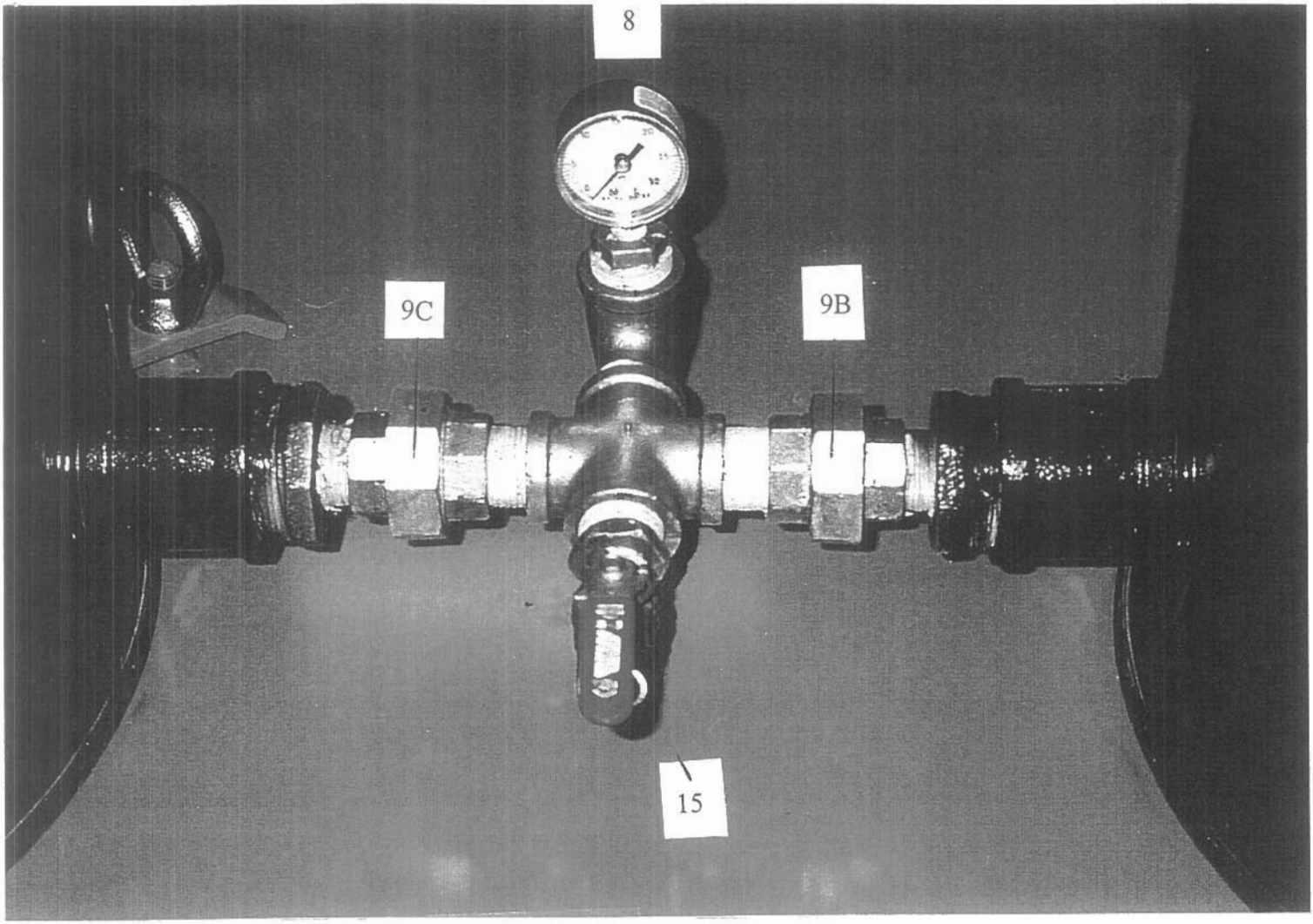
Pictorial #4 – Bag Filter Layout

2	Bag Filter
6	Water Meter
8A	Pressure Gauge
10	Bag Filter Drain
23	Pump



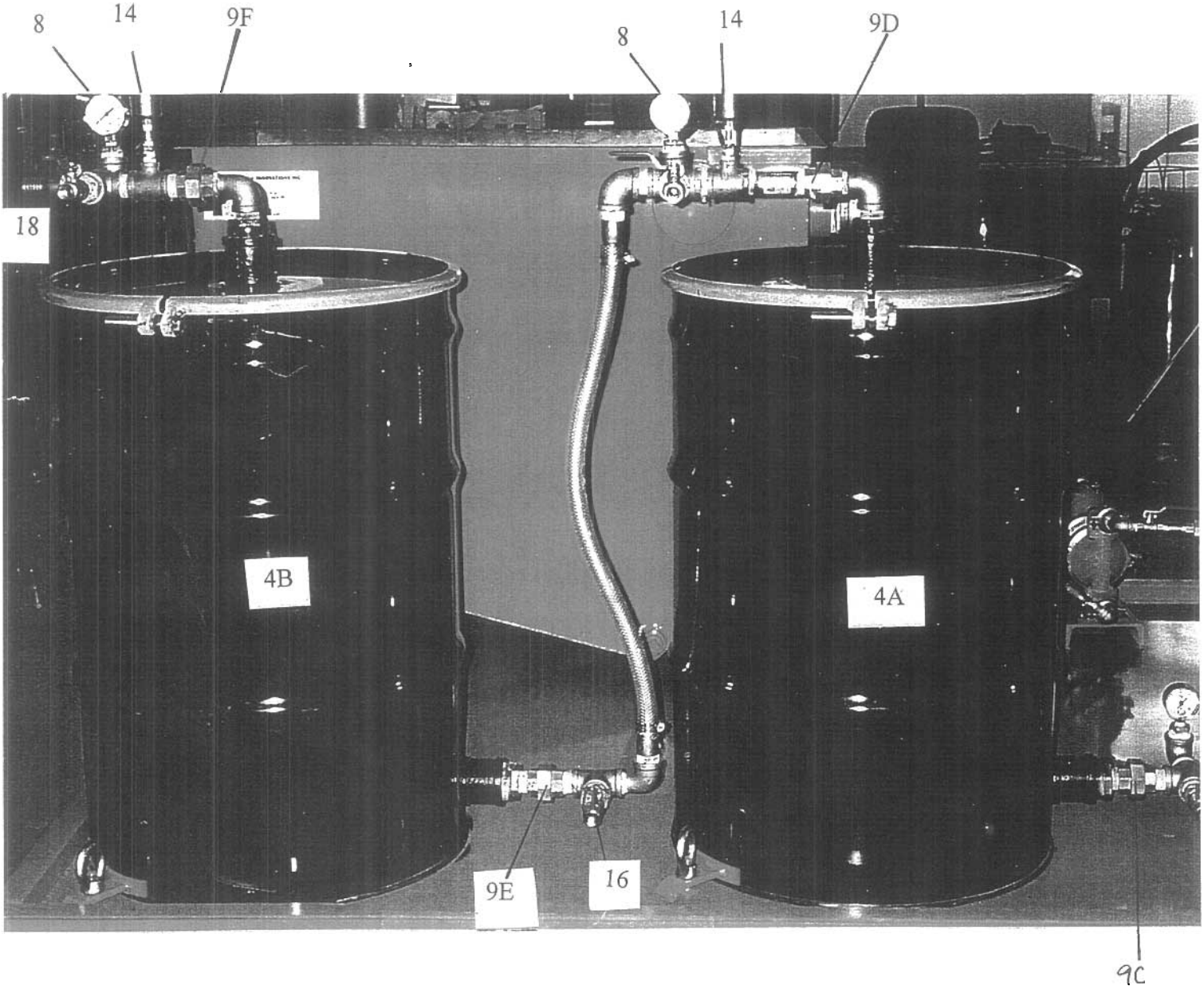
Pictorial #5 – Inlet Piping to TM-drum

2	Bag Filter
3	TM-Drum
5	Pressure Relief Valve
6	Water Meter
8B	Pressure Gauge
9A	Union
14	Air Eliminator



Pictorial #6 – Interconnecting Piping TM-Activated Carbon

8	Pressure Gauge
9B	Union
9C	Union
15	Drain/Sample Valve



Pictorial #7 – Interconnecting Piping Carbon-Carbon

4A	1st Carbon Drum
4B	2nd Carbon Drum
8	Pressure Gauge
9C	Union
9D	Outlet Piping 1st Drum
9E	Inlet Piping 2nd Drum
9F	Outlet Piping 2nd Drum
14	Air Eliminator
16	Drain Valve
18	Effluent/Discharge Sample Valve

FILTER INNOVATIONS INC.

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Highlights Of TM-products

Economical
TM-MEDIA has a greater capacity for the absorption of higher molecular weight hydrocarbons (up to 60% of its weight), which means longer bed life (6 to 10 times longer than carbon).

Fewer pounds required in typical bed means:

1.Lower media costs
2.Reduced bed height
3.Lower equipment costs
4.Minimization of amount of waste to dispose of

Longer Bedlife means less Manpower required for bed changes.

Dependable
TM-MEDIA can accommodate increases in contaminant concentration levels caused by plant upsets. TM-MEDIA is thermally stable up to 300 degrees celsius.

Easy To Use
Versatile - can be used in columns in both the downflow and upflow mode no bed conditioning required to increase absorption capabilities. No carcinogenic dust problems associated when filing vessels.

Disposal
Filter Innovations has eliminated your disposal problem by arranging a cradle to grave life cycle this includes the acquisition of the media, the utilization of the product and the final disposition of the spent media. The final portion of this cycle is achievable because of the high BTU value of the spent media. As a result, it may be incinerated as a fuel in fuel blending programs, which are supplying cement kiln operations.

The spent media could also be disposed of at a landfill. The material is non-hazardous because it will not leach any hazardous constituents when subjected to the TCLP (Toxicity Characteristic Leaching Procedure) test for determining if a waste meets the criteria for a hazardous waste classification.

In summary, we feel that the excellent absorption capabilities of the TM-products to remove large molecular weight organic can effectively minimize the amount of contaminants discharged, as well as meet or exceed the new discharge limits set by government agencies.

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Potential Applications

The TM-Media may be used in the following applications in the stand alone mode, such as in the treatment of steam condensate; in the pretreatment mode, for protection of other treatment processes such as activated carbon, reverse osmosis and desalination; and in the post-treatment mode, for polishing effluent from DAF units, API oily water separators, coalescers, ultrafiltration units, air strippers, and System AC units.

Process Or Waste	Contaminants Removed
Wood Treating	Pentacholophenol
Boiler Feed Water	Humic Acids
Metalcasting	Dye Penetrants
Natural Gas Compressors	Condensate
Industrial Stormwater	Oil And Grease
Drinking Water Treatment	Trihalomethanes (Formed On Cholrination)
Gas Sweetening	High Molecular Weight Hydrocarbons
Manufacturing Degreasing	Solvents Oil, Grease
General Parts Cleaning	Non-Ionic Surfactants
Electroplating	Heavy Metals
Paint Stripping	Various Solvents
Groundwater	PCB's, Oil, Grease, Gasoline And Diesel Contamination

"CLEANING THE WORLD WITH ACTIVATED CARBON"

GC Corp.
GENERAL CARBON CORP.

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GC 12x40

GRANULAR ACTIVATED CARBON

GC 12x40 is a virgin activated carbon which is granular in form. Made from the finest grades of bituminous coal, it is ideal for many liquid phase applications including the removal of organics from water streams and the purification of potable water.

Specifications

Mesh Size - 12x40, %:	90 (min)
Less than No. 12, %:	5 (max)
Greater than No. 40, %:	5 (max)
Iodine No., mg/g:	1000 (min)
Surface Area, m^2/g:	1000 (min)
Hardness, %:	90 (min)
Abrasion No.:	80 (min)
Moisture, % (as packaged):	3.0 (max)
Typical Density, lbs./cu.ft.:	27-30
g/cc:	0.43-0.48

*Standard packaging is in 55 lb. vinyl bags. Other packaging is available upon request.

Caution!

Wet activated carbon removes oxygen from air causing a severe hazard to workers inside carbon vessels. Confined space/low oxygen procedures should be put in place before any entry is made. Such procedures should comply with all applicable local, state and federal guidelines.