APPENDIX 8

Grease Trap Waste Technical Information, Sampling Plan and SDSs

Dissolved Air Flotation (DAF)

Trade Waste Guideline

Reviewed 1/03/2013

INTRODUCTION

Grease arrestors are the simplest devices for the removal of grease and oil (G&O), and fine suspended solids (SS) from trade wastewater. Their simple operating principle using adequate retention time and differences in specific gravity to separate and retain contaminants, produces wastewater quality under ideal conditions that is acceptable for small trade waste discharges.

However, their effectiveness drops greatly in many everyday circumstances despite regular maintenance pump-outs. For example;

- Sustained periods of high inflow rate reduce the retention time and the arrestor's ability to separate contaminants or reduce temperature.
- Short periods of excessive flow can flush some of the retained contaminants from the arrestor to sewer.
- Poor aeration of wastewater promotes anaerobic decay of retained contaminants, leading to foul odours and acidic (low pH) discharge to sewer.
- Arrestors cannot retain significant amounts of SS or G&O before some of this carries over to sewer.
- G&O that is emulsified by strong detergents or alkaline/caustic cleaning agents cannot be separated.

Trade waste activities where grease arrestors have proven to be an inadequate pre-treatment option include:

- Industrial activities such as food manufacturing
- Discharges with high G&O or SS concentrations
- Food courts and other large food service activities
- Activities with periodic caustic discharges or other factors that inhibit simple gravity separation

Pre-treatment of trade wastewater by a system based on the Dissolved Air Flotation (DAF) principle is a commonly used best practice option, where grease arrestors or other simple passive pre-treatment devices are inadequate.

At its heart, micro fine bubbles of air generated in the DAF vessel combine with insoluble contaminants in the wastewater, lifting them to the surface. Mechanical scrapers remove the floating sludge layer and the purified wastewater discharges to sewer. This achieves superior results at higher flow and contaminant loadings than can be achieved by conventional gravity separation technologies.

The DAF unit is only one element of a multi-component wastewater treatment system that controls and pre-conditions wastewater for optimum DAF operation. Selection and sizing of individual components from the range of possible alternatives requires technical expertise from a supplier or consultant to arrive at a DAF treatment package that delivers a reliable, cost-effective solution to each customer's specific wastewater treatment needs.

This guideline is not professional technical advice. Our intent is to provide trade waste generators with some insights into the specific areas of system design and set down a number of aspects that we have found to be essential for effective operation.

WHEN DO I NEED A DAF SYSTEM?

Retail activity

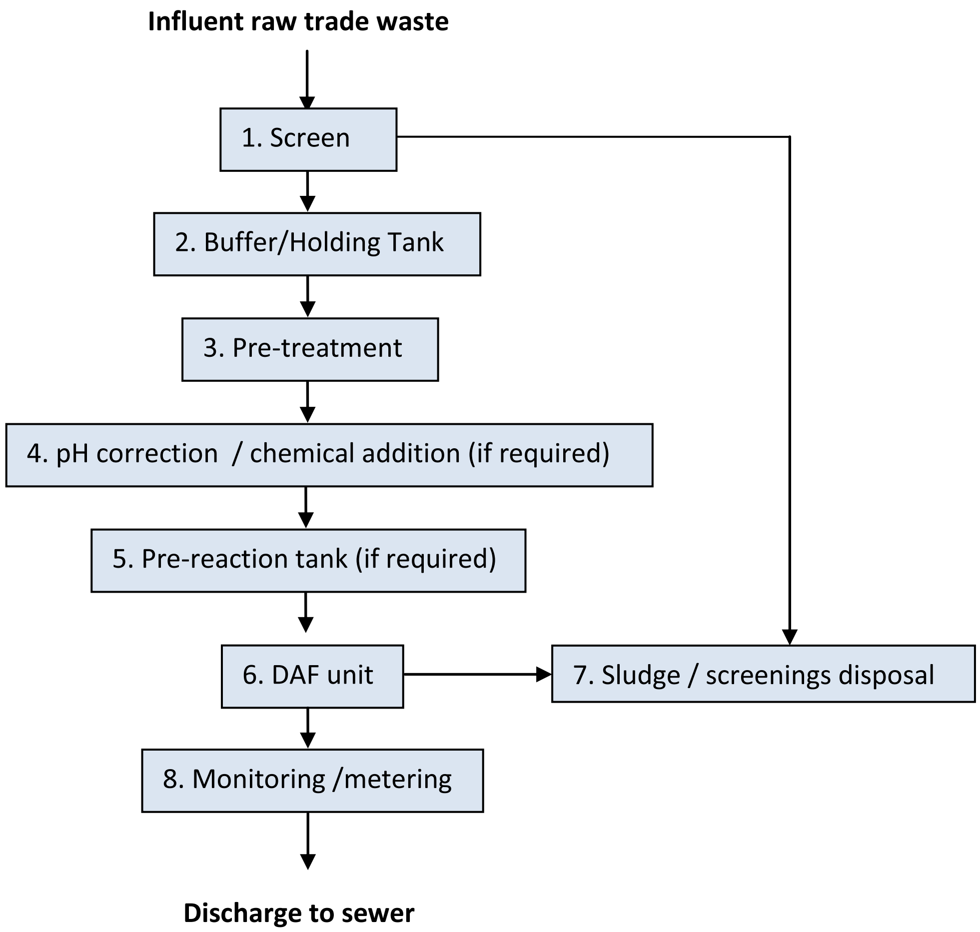
- For a new site with multiple trade waste activities (e.g. shopping centre, food court, large food service area) where the combined calculated grease arrestor capacity requirement for all activities exceeds 12000 litres (using the indicative sizing methods and rules given in the Trade Waste Commercial Food Preparation and Service Guideline).
    - For development projects use 2400 litres for each unleased retail food tenancy with a trade waste connection, when calculating pre-treatment capacity.
    - Do not include tenancies where trade waste discharge risers are provided for future contingency, but are currently sealed below finished floor level. However, appropriate design consideration should be given for future hook-up/development.
- For an existing site with multiple trade waste activities if the scale, scope or number of activities has changed from the original, or it becomes evident that changes will occur, to the extent that the new combined calculated capacity exceeds 12,000L, and it is reasonably viable to group sufficient individual discharges to make DAF or similar pre-treatment practical.
- For an existing site with multiple trade waste activities if sewer chokes or other negative impacts on the downstream sewer are attributed to a site's discharge and compliance with acceptable discharge quality cannot be achieved by optimising the existing pre-treatment devices and DAF or similar pre-treatment is a practical solution.

Industrial activity

DAF units are widely used for treating industrial trade wastes high in solids, grease and insoluble BOD. Most industrial processes (including food manufacturing) cannot maintain adequate trade waste discharge quality through a conventional grease arrestor or settling pit. This can be simply explained by the higher loads, higher flows and higher temperatures that result in poor separation in the arrestor/pit.

- For existing sites where chokes or other negative impacts on the downstream sewer are caused by a site's discharge, and DAF or similar pre-treatment is a practical solution.
- For existing sites where SA Water has determined that discharge quality significantly exceeds one or more acceptance limits, and DAF or similar pre-treatment is a practical solution.
- For proposed new trade waste discharges, if DAF is proven in comparable situations to be a suitable, best practice trade waste treatment option.

A TYPICAL DAF SYSTEM



1. Screening

Adequate screening to remove gross solids from trade waste influent, buffering and treatment steps is crucial as it:

- Prevents solids blocking/damaging wastewater feed pumps, DAF recycle pumps and sludge pumps.
- Limits odours produced by anaerobic degradation of settled sludge that build up in the DAF unit and buffer tank. Reducing the build-up minimises the need for complete vessel clean out.
- Minimises sludge formation over the aeration bars in the DAF unit, which could otherwise upset micro-bubble formation.
- Reduces coagulant/flocculant consumption (if used at a later stage) by first removing as many solids as possible by simpler means.

A variety of screening mechanisms is available. Careful matching of the design and hole/mesh size with typical particle size and other wastewater characteristics is necessary. Rotating drum/sieve and bow shaped wedge-wire screens are commonly used.

In retail food preparation/service areas, silt trap baskets are useful for preventing localised drain blockages, but are not an acceptable mechanism for screening before a DAF. A centralised screening mechanism with maximum **1mm hole/mesh size** for processing all wastewater destined for DAF treatment is necessary.

2. **Buffering / holding tank**

Ensuring the influent is as consistent as possible over a production period or daily DAF operating cycle is crucial for optimum DAF performance. Collecting screened wastewater in a buffering/holding tank for a sufficiently long period before further treatment moderates short-term variations in quality. The key parameters to be moderated are;

Temperature

Elevated temperature or hot 'slugs' of material can emulsify G&O resulting in a higher percentage of carryover through the DAF unit, hinder the supply of dissolved air and promote undesirable biological breakdown of material in the DAF unit. Temperature in the DAF vessel should be maintained **below 40 degrees C**.

pH

pH inconsistencies can result in potential damage to treatment equipment, odours and non-compliance with the trade waste discharge limit of **pH 6-10** at all times. Buffering of pH by mixing acidic and alkaline discharges might eliminate the need for chemical pH correction, or reduce alkali/acid dosing costs and their undesirable Total Dissolved Solids (TDS) impact.

Solids

The recycle volume and air settings are set manually, to arrive at the desired air to solids ratio in the DAF vessel. Similarly, the dose rate of flocculant (floc) or coagulant (coag) is set to efficiently treat a certain concentration of contaminants. The DAF unit cannot automatically vary the settings to accommodate wide fluctuations in wastewater quality. Solids carryover to sewer is likely if higher than expected concentrations of solids enter the unit. Buffering moderates variations in wastewater solids concentrations and is a better alternative to adjusting the ongoing DAF settings, for effectively coping with short-term high contaminant concentration events.

Careful investigation of wastewater quality and flow variations is needed to arrive at an effective buffering/holding tank capacity. The minimum capacity varies significantly between individual applications, particularly industrial sites. However, a typical minimum buffering tank capacity of **4 hours** at design peak influent flow rate is required for centralised retail applications.

Other Buffering Considerations

Appropriate mixing of tank contents ensures that solids and fats do not separate out, and tank contents remain aerated to minimise odours from biodegradation of waste before treatment.

Extra contingency capacity in buffer tank storage is advisable for emergencies (e.g. DAF unit maintenance shutdown, sewer unavailability). It also allows for increasing the normal operating levels, if required to achieve the desired buffering of wastewater. However, holding wastewater for excessive periods due to overly generous buffering capacity or delays in processing wastewater can lead to degradation of influent, odours and lower wastewater pH.

During low flow periods, the buffering volume should be adjusted accordingly. During prolonged shutdown periods, it is advisable to process the buffer tank contents through the DAF unit and have the sludge from the buffer tank and DAF cell hauled off site.

Pre-reaction and pre-treatment tank volumes can be included as volume toward the minimum buffering requirement.

3. **Pre-treatment**

Aside from screening, further pre-treatment is not generally required for retail food service applications.

In some industrial situations, it may be advantageous to install various forms of pre-treatment before DAF - to minimise DAF operating costs, maintain consistent loadings to the DAF unit, or target removal of contaminants not primarily suited to air flotation. For example:

- An oil water separator can be used to remove free oil (and solids at low levels) for minimal cost before DAF treatment.
- A clarifier/settling tank can minimise solids loading to the DAF unit, by gravitational separation. This is especially useful for capturing grit and other rapidly settling solids that would cause settled sludge deposits in the DAF unit.

4. **pH correction / chemical addition**

pH correction systems must be installed on all DAF units, unless sufficient evidence verifies that this is not necessary.

In retail applications with adequate buffering, alkali dosing is usually necessary (to increase pH). This is primarily due to the natural tendency for highly biodegradable wastewater to decay before all on-site treatment steps are completed. Poor treatment system design and operation can compound on this tendency. Acid dosing to lower pH will not generally be required.

pH control of DAF treatment systems is essential for;

- Ensuring pH complies with discharge limits.
- Ensuring pH is within the ideal range for floc/coag effectiveness.
- Minimising grease/oil emulsions.

Where the removal of targeted contaminants with DAF alone is poor, a flocculant and/or coagulant may be required. They assist in the separation of solids/fats from the water, and can greatly increase the removal efficiency of the DAF unit, or allow it to effectively cope with heavier contaminant loads than originally envisaged. A wide variety of chemicals are available, requiring specialist selection to arrive at the best balance between cost and effectiveness at each site.

Chemical addition is generally not required in retail applications provided influent is consistent, low in temperature and emulsified grease/oil.

Provision should be made at the outset on all DAF installations, for possible future inclusion of chemical addition (e.g. bunding, space for a pre-reaction chamber, flow meter & PLC compatibility).

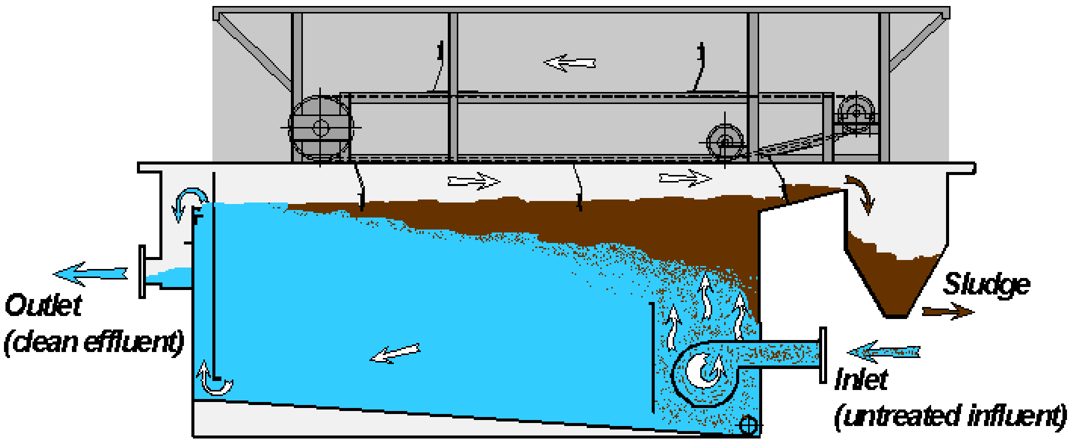
5. Pre-reaction tank

Pre-reaction tanks (well-mixed vessel on the influent side of the DAF unit) are not generally required for retail operations, but are common in treatment of industrial trade waste. Pre-reaction tanks assist in mixing chemicals for pH correction, floc/coag addition. A pre-reaction tank provides adequate retention time to ensure optimum contact with chemicals before aeration. This is vital when using clay or bentonite-based floc/coag additives that require increased reaction times to achieve the most effective separation. The use of pre-reaction tanks can minimise chemical costs and unwanted increases in final TDS concentrations.

Although an adequately sized buffer tank is preferable, a pre-reaction tank provides additional buffering before DAF treatment in circumstances where buffer tank sizing may be restricted.

6. DAF unit

Figure 1: Typical example showing process flows



Influent enters a well-mixed zone where micro-bubbles from air previously dissolved into the water attach to the solid/grease particles, raising them to surface. Chain-driven blades scrape off the floating sludge for de-watering and disposal. The treated wastewater exiting the outlet has a greatly reduced solids/grease loading. Those rapidly settling solids that cannot be floated will settle in the DAF vessel and must be removed periodically before they build up to an unacceptable level.

Although the counter-current rectangular DAF shown in Figure 1 is not the only type available to achieve SA Water's discharge quality standards, its design has greater flexibility than others for accommodating changes in source flow, loading, etc.

DAF units with 'hopper' or conical bottom sections on the main DAF vessel are advisable when there is likely to be significant loadings of grit, clays, silt and any other solids likely to sink rather than float in the DAF vessel. This design simplifies removal of settled sludge.

Plumbing into and out of the DAF unit should prevent any syphoning, or any significant changes to DAF operating water level. Otherwise, higher level surges could cause water carryover in the scraped sludge, and floating solids removal would not occur with a drop in level below the scraper blade and sludge 'beach' positions.

It is vital to maintain flow and consistent contaminant levels into the DAF unit, within its practical operating limits.

All feed pumps must be of the non-emulsifying type (e.g. diaphragm or progressive cavity "Mono").

Relief of dissolved air into the DAF unit should be through an appropriate self flushing valve with broad seat clearance. Manual valves (i.e. ball valves) must not be used in an attempt to maintain constant dissolved air feed to the DAF unit, as they are likely to partially block and result in turbulent large air bubbles. This decreases the performance and reliability of the DAF unit.

7. Sludge/screenings disposal

DAF units, screening and pre-treatment mechanisms are likely to produce a significant quantity of sludge for off-site disposal. The quantity can be predicted with reasonable accuracy if the untreated wastewater quality and quantity is known. These calculations will determine final sludge tank sizing.

A de-watering device is a practical necessity for almost all DAF systems, to reduce the quantity of solids to be hauled off site.

Appropriate organic floc/coag additives are desirable, due to increased scope of disposal options, such as composting instead of landfill.

8. Monitoring/metering requirements

Process control
pH correction probes used to ensure compliant discharge and optimum DAF performance must be placed upstream of main DAF unit in a location exposed to representative wastewater flows. Suggested locations include; pre-reaction tank or a well-mixed buffer tank. pH control probes should NOT be located in main DAF vessel, unless careful consideration has been given to their ability to accurately maintain compliant discharge at all times. Probes should be of suitable quality and design appropriate for the particular wastewater type.

Final effluent monitoring
Effluent flow meters are required on all DAF installations. Refer to the Trade Waste Discharge Flow Meters Guideline for details.

Electronic monitoring of final discharge quality
Monitoring of final pH, TDS, etc may also be required. Electronic probes must be in a location exposed to representative final treated trade waste discharge. Recommended locations are;

- a flooded section of pipe work immediately downstream of the DAF unit,
- the effluent weir overflow (if flows are uninterrupted), or
- in the main DAF cell against the effluent weir near its overflow.

Data collection and alarms
These may also be required. Refer to the Trade Waste Electronic Monitoring and Data Collection Guideline for details.

VENTING AND ODOUR CONTROL

Wastewater containing food or other biodegradable substances is often prone to odours generated by natural microbiological activity. With good management, they can be minimised and controlled. Some of the DAF system elements where odours can occur are;

- ***The DAF cell*** The main body of the DAF cell on conventional DAF units is not enclosed or covered. The aeration process can drive odours into the surrounding area. For installations within buildings or other enclosures, an extraction fan located directly above the main DAF cell and/or adequate venting should be installed (i.e. 'whirly bird' or some form of forced extraction device).
- ***Sludge handling*** The sludge tank/holding vessel often has significant volumes of concentrated organic effluent which is the source for the majority of odour issues surrounding DAF treatment systems. This tank should be
  - adequately enclosed (i.e. cannot vent to atmosphere), or
  - where sludge is routinely pumped and odour is minimal, connected to an adequate (air forced) venting system.
- ***Screenings*** A full volume screen often removes a large quantity of organic solids into a bin/container. This should be regularly emptied and cleaned to prevent significant odour generation.

Other odour/venting considerations should include:

- Use materials appropriate for the design application, which can withstand lower pH and higher Hydrogen Sulphide (H_2S) levels. Copper or low grade stainless pipe/tank lining materials can rapidly corrode.
- Buffer tank levels and consequent holding time of effluent should be constantly optimised to minimise odour levels. High temperatures (i.e. during summer periods) and significant changes in volume (i.e. progressive addition or deletion of trade waste activities) should promote these alterations.
- Adequate pH correction system will minimise H_2S and odour generation.

Regular house-keeping in general treatment area can greatly reduce odours.

MAINTENANCE

Maintenance of all elements in the DAF system should be conducted in accordance with the manufacturer's recommendations, or more frequently where actual experience shows it to be necessary. The following recommendations are a guide;

- The DAF unit should be periodically drained and cleaned to prevent sludge build-up and poor micro bubble formation.
- pH probes should be calibrated monthly and cleaned weekly as a minimum.
- Screens should be periodically kept clean to prevent carry-over of large solids or sharps into the DAF unit.

An inventory of critical spare parts, prior arrangements for rapidly obtaining specialised assistance in the event of an equipment failure and other contingency measures to minimise down-time are necessary.

The odour management experts...

FiltaCarb
CARBON VAPOUR FILTRATION

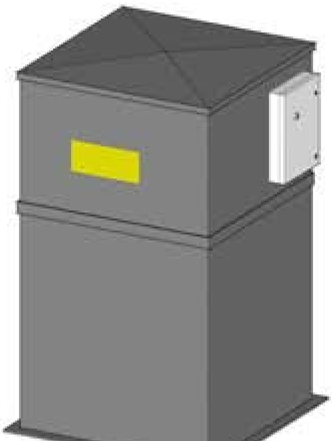
FiltaCarb Vent Cube

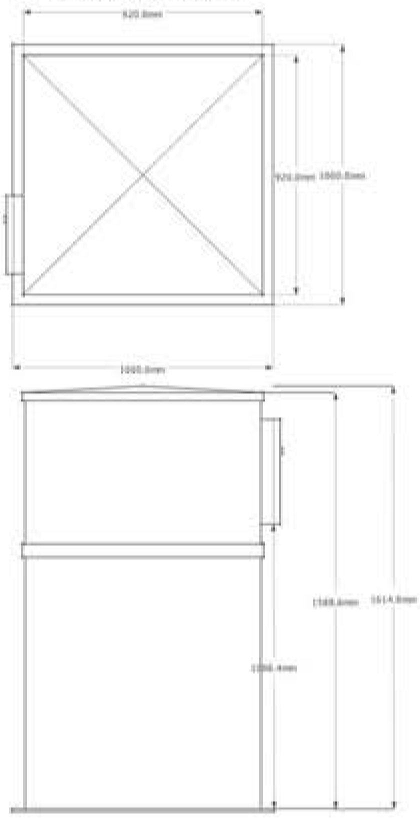
FiltaCarb Vent Cube was developed to provide a simple and secure solution for fugitive odours from pump stations.
The system can be mounted directly above a penetration into the wet well or mounted locally and ducted to the system.
It comes complete with extraction fan and contol panel which has a Variable Speed Drive (VSD) with local on/off control with the option to connect to SCADA control system.
Vent Cube is constructed from High Density Polyethylene (HDPE) that has high durability, UV and corrosion resistance.

Suitable for small wastewater treatment plants, pumps stations, rising mains and manholes. The system is also suitable for other industrial emission treatment applications where specific activated carbon is used to treat the target emissions.

Unlike passive filtration and vents the forced extration provides a garanteed rate of extraction that is critical in municipal wastewater to reduce the corrosion caused by H2S.

Model: **FCC150F**
Capacity (Max): 150LPS - 540m3/hr
Dimensions (mm): 900 x 900 x 1700H
Media Mass (kg): 225
Media Volume (ltrs): 410
Media Type: Activated Carbon is impregnated with a base or metal salt so as to increase its selectivity regarding acid gases such as H2S and mercaptans
Contact Time (seconds): 75LPS = 5.4
100LPS = 4.1
150LPS = 2.7
Power Requirements: 240VAC 10A
Inlet Duct Size: 75LPS = 100mm
100LPS = 150mm
150LPS = 150mm
Duct Connection options:
1. Penetration from the filter plenum directly into wet well
2. Side enrty from wet well into the plenum





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AUSTRALIA PTY LTD

FiltaCarb FCC150F GAC Vent Filter Specifications

Function	Description	Measurement
FILTER TYPE	FiltaCarb FCC150F GAC Vent Filter	
REQUIREMENTS	Maximum Flow	150 LPS
		540 m^3/h
FUNCTIONAL DESCRIPTION	The system is a single-stage treatment system using carbon adsorption technology. Hazardous gases are extracted from the source using an extraction/blower fan that then vents the untreated gases through the filter media. The untreated gases accumulate in the lower plenum of the filter before being evenly diffused through the media of the filter bed where contaminates are physically adsorbed. A specific activated carbon media is used to treat the target gases to achieve >99% removal of source gases.	
ABSORPTIVE MEDIA	EcoSorb® CX is an activated carbon that is specifically manufactured from a sustainable raw material for the removal of gaseous pollutants. The product has a high activation level resulting in the development of excellent adsorption characteristics. EcoSorb® CX is ideally suited to the removal of low molecular weight compounds present in low to medium concentrations.	
	SPECIFICATIONS	
	Media Volume	0.580 m^3
	Media Mass	319.0 kg
	Empty Bed Residence Time (EBRT)	3.87 sec
	Pressure Drop	111.3 Pa
	CTC adsorption (min.)	60%
	Total ash content (max.)	4%
	Moisture content (max. as packed)	5%
	Hardness (min.)	97%
	Particle size tolerance (max.)	5%
	TYPICAL PROPERTIES	
	Surface Area	1050m^2/g
	Butane adsorption (base)	23%
	Apparent Density (tapped)	440-500 kg/m^3
	Filling Density (loose packed)	375-425 kg/m^3
FILTER VESSEL	FiltaCarb FCC150F Activated Carbon Filter is designed to reduce logistic and installation costs. The system is preloaded with media and is factory tested prior to installation. The filter vessel, fan and control panel are mounted on a galvanised skid arrangement	
	DIMENSIONS	
	Length, Width, Height (mm) – L = 900, W = 900, H = 1400	
	Height (Filter Vessel) – 1400 mm	
	Overall Footprint including Skid – 81 m2	
	CONSTRUCTION	
	Filter vessels are constructed from P300 High Density Polyethylene (HDPE) material, which is made from UV-impregnated resins that are resistant and UV stabilized throughout the material. They have a high chemical-resistance to provide significant design life expectation and are suitable for all climatic conditions. Construction follows DVS technical codes on plastic jointing DVS 2202 / 2210. Jointing construction is butt-welded and extrusion welded. The vessel is constructed on a galvanised skid arrangement for ease of transport, lifting and installation.	
	MATERIAL SPECIFICATION	
	Specific Gravity	0.95 g/m^2
	Max Continuous Operating Temp.	80°C
	Max Short Term Operating Temp	100 °C
	Tensile Strength	22 MPa
	Hardness	63 Rockwell M
	Co-efficient of thermal expansion	150-230 m/(m.k) x 10≈6
	Dielectric Strength	45 KV/mm
	Surface Sensitivity	>10^{14} OHMS
	Relative Abrasion Loss by Sand Slurry	500
	PENETRATIONS	
	All duct and pipe penetrations - HDPE	
	Screw inspection hatches - HDPE	
	Irrigation pipe – Schedule 80 uPVC	
	VESSEL AND LID CONNECTION	
	Lid and control chamber are sealed using Neoprene rubber then bolted to the vessel.	
DUCT AND PIPE SIZE	Minimum Duct @ 8 m/s – 154	
	Minimum Duct @ 10 m/s – 138	
	Waste Line – 100mm	
CONTROL PANEL (OPTIONAL)	Electrical Control Panel is mounted to the control skid for local control. It has a manual ON/OFF/AUTO switch operation. Indicator lights show operational status.	
	Control Panel – Powder Coated Steel IP65 Rated	
	Power Requirements – 440VAC 15A	
	Variable Speed Control – Schneider Direct 1.5kw	

	2 x Circuit Breakers
	1 x Local Relay
	1 x Client Relay (remote operation)
	ON/OFF/REMOTE Switch
	Switch Indicator Light
	Hour run meter
	Isolation switch
	E-Stop
	Ammeter
	Ventilation fan
	Optional – PLC Duty/Standby Fan Operation
FAN	Fan/s are mounted on the control skid and can operate in positive or negative pressure. The standard fan provided is corrosion and spark-proof.
	Fan Type – Seat 20
	Specified Flow – 150LPS
	Maximum Flow – 325 LPS @ 111.3 Pa
	Specified Pressure Drop – 111.3 Pa
	Inlet Size – 160 mm
	Outlet Size – 160 mm
	Fan Support – Stainless Steel
	Fan Mount – Vibration Mounts to Galvanised Steel Strut
	Motor Brand - TECO
	Motor Size – 0.25 kw
	Power – 415VAC
	Rating – IP66
	Protection – Ex ‘n’
	Cable – Shielded Cable to Control Panel
	Duct Connection – Flexible Coupling with Stainless Steel Clamps
OVERALL WEIGHT	565.0 kg
INSTALLATION REQUIREMENTS	Concrete Slab Engineered to System Loading (Layout and Dimensions Provided)
	Wastewater Line with 300mm Water Seal Fitted
	Power - 240VAC 10A with Individual Circuit Protection
OPTIONAL ITEMS	Duct Noise Attenuator