Pan America Environmental, Inc.

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ENGINEERING SPECIFICATION

VH Series DAF Dissolved Air Flotation

Engineering Specification

MODEL RANGE	GET A QUOTE	SPEAK TO AN ENGINEER
DAF5 through DAF600	technical@panamenv.com	262.716.0105

PRODUCT PAGE

https://www.panamenv.com/dissolved-air-flotation-daf/dissolved-air-flotation/

EQUIPMENT DESIGN & CONSTRUCTION

Performance

The Pan America Environmental DAF Series systems are designed to remove petroleum products, fats, oils & greases (FOG), suspended solids and many other contaminants. Clarification rates as high as 98% can be achieved using our DAF systems.

A percentage of the clean effluent is recycled and super-saturated with air, mixed with the wastewater influent and injected into the DAF separation chamber. The dissolved air comes out of solution, producing millions of microscopic bubbles. These bubbles attach to solids and float them to the surface where they are skimmed and removed from the tank.

SECTION 1.0 EQUIPMENT

The DAF Dissolved Air Flotation system will be designed and fabricated per the following specifications. The tank shall be a rectangular design with features as described.

1.01 Float/Separation Chamber

The separation chamber provides a velocity decreasing horizontal separation surface area that minimizes turbulence and maximizes flow and solids throughput. The mixed wastewater enters this chamber where separation and flotation occur.

The Separation chamber includes the float storage chamber, float baffle, water baffle with adjustable water weir, settleable sludge hopper, surface float skimmer, clean water effluent chamber and the skim ramp.

1.02 Float Storage Chamber

As the surface float skimmer continuously skims float from the water surface it conveys float up the skim ramp and deposits it in the float storage chamber which is provided to allow temporary float storage. The chamber has sloped sides to allow solids to slide to the bottom sludge outlets.

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1.03 Effluent Chamber

The waste flow and float run into the float baffle at the effluent end of the tank. The float is contained while the water is directed under the baffle and over the adjustable 304 stainless steel weir plate. The clean water accumulates in this chamber and is discharged.

1.04 Sludge Hopper

A sludge V-hopper is located under the separation chamber to provide temporary storage of any settleable solids. A sludge auger is provided to convey sludge to the sludge outlet (auger provided as standard feature with DAF60 and larger).

1.05 Sludge Auger System (STANDARD FEATURE ON DAF-60 & LARGER)

The solids hopper is provided with a rotating, screw type sludge auger. The auger consists of stainless steel shafts with coated steel screw auger driven by a slow speed gear motor drive assembly. The auger extends the full length of the solids hopper and conveys solids to the sludge outlet.

1.06 Surface Float Skimmer

A mechanical surface drag skimmer assembly is provided to sweep the floating solids (float) from the effluent end of the separation chamber toward the influent end. The skimmer consists of:

- 304 stainless steel skimmer flights and Buna-N wiper blades.
- Acetal plastic flight chain and sprockets.
- Acetal chain sprockets with 304 SS hubs.
- Chain guards on both sides of tank extending the full length of skimmer system.
- Variable speed drive, sprocket shafts, bearings and chain adjustment bearing frames.

The flights will be bolted to the two roller chains spanning the width of the tank and will be designed to wipe the tank sides and float ramp. UHMWPE flight wear bars are provided to reduce tank and flight wear.

1.07 Air Saturation System Model RSP

The DAF is provided with a recycle air saturation system that is designed to direct a portion of the water from the effluent end of the tank, super-saturate the water with air and then mix this solution with incoming wastewater facilitating intimate mixing of both flows. Recycle saturation pump and schedule 80 PVC piping are mounted on DAF tank with a bypass line to the effluent chamber.

Recycle Saturation Pump

The recycle system consists of the following features:

- High head, coated cast iron centrifugal, 100 psi recycle pump mounted to the DAF tank to provide air saturated water under pressure to the air/wastewater mixing inlet.
- TEFC motor, close coupled.
- Inlet mixing chamber
- Valving: suction control, discharge control & air flow measuring and metering
- Pressure gauge
- Vacuum gauge
- NEMA 4 control in MCP is provided

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The recycle pump draws ambient air into the pump and super-saturates the water with this air under high pressure. No external air source is required. Pump on/off operation is based on an on/off switch in the control panel. Once adjusted the recycle system can be turned on and off at will without losing settings and saturation process is virtually instantaneous upon startup.

1.07 Air Saturation System Model RSS

The DAF is provided with a recycle air saturation system that is designed to direct a portion of the water from the effluent end of the tank, super-saturate the water with air and then mix this solution with incoming wastewater facilitating intimate mixing of both flows. Recycle saturation pump and schedule 80 PVC piping are mounted on DAF tank and/or on the recycle system skid with a bypass line to the effluent chamber.

Recycle Saturation Vessel System

The recycle system consists of the following features:

Recycle Pump:	High head 304 stainless steel centrifugal 90 psi pump, mounted to the DAF or saturation vessel skid to provide air saturated water under pressure to the recycle system.
Saturation vessel:	Coated carbon steel or 304 SS construction.

- Air preparation and control assembly consisting of: check valve, solenoid valve, air flow meter with needle valve, bypass valve, regulator/filter, pressure relief valve and vent valve.
- Once adjusted the recycle system can be turned on and off at will without losing settings and saturation process is virtually instantaneous upon restart.
- Auto-Q™ automatic equalization level control assembly with switch sight glass, pressure gauge and isolation valves.
- Auto-Q™ automatic EQ electrical control logic.
- Inlet mixing chamber.
- Valving: suction isolation, bypass and discharge control.
- Pump discharge pressure gauge.
- Recycle pump discharge flowmeter (optional)
- NEMA 4 control in MCP is provided.
- System requires compressed air.

1.08 Influent Mixing Chamber

The saturated flow mixes with the wastewater flow at the DAF influent via a mixing chamber. Chamber to be constructed of same material as DAF tank.

1.09 Field Technician

A Field Technician can be provided ask for a quote, per Diem is $1250.00 + expenses.

Applications

- Remove FOG wastewater
- Oil removal DAF
- TSS removal flotation
- BOD COD reduction
- Petroleum products removal

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- Industrial wastewater treatment
- Oily wastewater treatment
- Solids separation flotation
- Chemical pretreatment DAF
- Sludge dewatering DAF

DAF Type

- Pan America Environmental DAF
- DAF dissolved air flotation system
- Compact DAF for industrial wastewater
- DAF V-bottom with auger
- Affordable small DAF system
- DAF for FOG and TSS removal
- Dissolved air flotation for oily water
- Pan America DAF series
- Compact dissolved air flotation Pan America
- DAF wastewater treatment equipment

SECTION 2.0 ChemClear SYSTEM

2.01 Chemical Treatment System Model CT-CpF

The two-stage, pretreatment system will provide wastestream coagulation, pH and flocculation on a continuous basis for gravity flow into the DAF inlet and consists of the following components:

- (2) Reaction tanks
- (2) Variable speed mixers
- (3) Chemical metering pumps
- (2) Makeup tanks with mixers
- NEMA 4 controls

Reaction Tanks

Coagulation/pH reaction chamber will include the following features:

Volume:	Coagulation/pH: 50 gallons Flocculation: 50 gallons
Construction:	Polyethylene, flat bottom, domed top, 8" access on top
Fittings:	1.5” NPT
Top:	Closed
Drain:	1” valved
Internal piping:	PVC

Flocculation reaction chamber will include the following features:

Volume:	Coagulation/pH: 50 gallons Flocculation: 50 gallons
Construction:	Polyethylene, flat bottom, domed top, 8" access on top
Fittings:	1.5” NPT
Top:	Closed
Drain:	1” valved
Internal piping:	PVC

Mixers

Each CT reaction tank will be provided with 0-425 RPM (or other rpm), adjustable fixed mount, variable speed mixer with 316 stainless steel impeller shaft and dual axial flow style impellers, inverter duty TEFC motor close coupled to the mixer gearbox.

Chemical Metering Pumps

Three (3) metering pumps are provided (1) coagulant, (1) NaOH caustic (1) flocculant. Each pump shall be an electronic, solenoid actuated diaphragm design. Each pump will be compatibility matched to the chemical being metered. All pumps will have frequency and stroke adjustment located on face of pump. Manufacturer to be Pulsafeeder. The flocculant pump is to be a polymer activation system, which will makeup a flocculation solution on demand and will require a fresh water connection.

Makeup Tanks

Two makeup tanks are provided for coagulant and flocculant solution preparation and storage. The coagulant makeup tank will be a 100 gallon, the flocculant makeup tank will be 50 gallons, will be polyethylene tank construction and will include a makeup mixer and on/off controls in the MCP.

pH Control

A pH controller with probe and quick remove probe assembly are provided to monitor coagulation tank pH level and control the caustic pump to maintain pH set point.

SECTION 3.0 PUMPING SYSTEMS

3.01 Influent Feed System — Model IFS-5-AO

Description: The Influent Feed System will provide the capability of transferring the wastestream from the below grade collection sump to the inlet of the OS Series separator. The system can be operated via manual or automatic mode.

Components:

- 1/2" air operated, double diaphragm pump with aluminum body/Buna-N diaphragms and check valves. Pump will be plumbed with a ball valve on inlet and outlet. Pump to be base mounted to a 304 SS base.
- Filter, regulator, metering valve and electric solenoid valve will be provided mounted to the pump base for filtering, regulation, fine meter control and on/off of air flow to pump. The assembly will include an air hose from assembly discharge to pump air inlet.
- Controls will be included in the MCP with HOA operation to control manual and automatic on/off of pump based on high/low levels in sump. Two float switches will be provided loose for installation in the collection sump (by others).

3.02 Sludge Pumpout System — Model SPS-15-AO

Description: The Sludge Pumpout System will provide the capability of transferring settled sludge from the DAF sludge hoppers. The system is designed per the following:

Components:

- One (1) 1.5" air operated, double diaphragm pump with aluminum body/Buna-N diaphragms and check valves. Pump will be plumbed with a ball valve on inlet and outlet. Pump will be mounted to the DAF tank and plumbed to sludge outlet(s) provided in the sludge hopper.
- Filter, regulator, metering valve and electric solenoid valves will be provided mounted to the pump base for filtering, regulation, fine meter control and on/off of air flow to pump. The assembly will include an air hose from assembly discharge to pump air inlet.
- Controls: An HOA allows manual and auto operation based on two adjustable timers are provided to control the pump on and off times.

3.03 Float Pumpout System — Model FPS-15-AO

Description: The Float Pumpout System will provide the capability of transferring skimmed sludge from the DAF float hopper. The system can be operated manually, automatically and is designed per the following:

Components:

- One (1) 1.5" air operated, double diaphragm pump with aluminum body/Buna-N diaphragms and check valves. Pump will be plumbed with a ball valve on inlet and outlet. Pump will be mounted to the DAF tank and plumbed to the float chamber outlet.
- Filter, regulator, metering valve and electric solenoid valves will be provided mounted to the pump base for filtering, regulation, fine meter control and on/off of air flow to pump. The assembly will include an air hose from assembly discharge to pump air inlet.
- Controls: An HOA allows manual and auto operation based on high and low level in the float chamber. Two level switches are mounted in the float chamber to control the automatic on/off.

3.04 Effluent Pumpout & Filtration System — Model EPS-5

Description: The Effluent Pumpout System will provide the capability of transferring the treated DAF effluent from the effluent chamber of the tank to down stream processes or discharge to drain. The system can be operated via manual or automatic mode.

Components:

- Centrifugal, multi-stage pump plumbed with ball valves on inlet and outlet. Pump construction: cast iron volute and impeller. Pump to be base mounted to a carbon steel, enamel coated base or to the tank. Pump will be plumbed, wired and tested prior to shipment. Pump performance will be 5 GPM @ 115' TDH. Piping is to be sch. 80 PVC. Motor to be TEFC.
- Control is included with HOA operation to control manual and automatic on/off of pump based on high/low levels in tank effluent chamber. Two float switches will be provided installed in the effluent tank. Controls are integrated into MCP.
- Effluent tank: 25 gallon, polyethylene, flat bottom, domed top, 2 pt level switch assembly for pump control. Tank is plumbed to DAF effluent via schedule 80 PVC pipe.
- Bag filter: Two (2) 7"D X 30" aluminum housing with isolation valve on inlet/outlets. Inlet/outlet pressure gauges provided. Drain valve at bottom of vessel. Filter is plumbed to the DAF effluent pump via schedule 80

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PVC pipe. A pressure differential sensor is provided for high pressure alarming. One (1) case of 25 filter bags is provided 25-micron size.

SECTION 4.0 SYSTEM CONTROLS

4.01 Master Control Panel (MCP)

The subsystems provided with this quotation will include controls that will be integrated into one, centralized Master Control Panel (MCP). The MCP will provide the following controls:

- DAF drag skimmer with adjustable timers
- RSS recycle controls
- Sludge auger controls
- UIT operator interface
- Power disconnect, transformer, circuit breakers are provided to accommodate a 3 phase input power.

MCP power required:	230 or 460V/3pH/60Hz.
Control power:	110V/1pH/60 Hz. & 24VDC
Enclosure:	NEMA 4, steel construction, ANSI 61 grey enamel coating.
Designed per:	UL508, NEC
Conduit:	EMT/Liquid tight
Wire:	THHN
Logic:	PLC
Control platform:	Intell-i-Touch (PAE controls/menuing user interface package)

PLC Based Design

The MCP will be provided as a PLC based logic design. The system provides the following at a minimum:

- Unitronics Unistream 7 PLC/UIT (User Interface Touchscreen) system or other as available.
- 7" UIT color touchscreen
- Unilogic software for PLC & UIT programming is provided.
- SD card, 32 gig minimum
- Flash drive, USB, 32 gig minimum
- Datalogging
- Ethernet ready

Alarms

The following alarms are provided:

None

Sensors & Feedback

As a typical option that is provided with each treatment system sensors provide the feedback necessary to automate processes and systems as well as provide accurate detail on the processes and operations of our treatment systems to facilitate process optimization.

Some of the sensors we offer for monitoring of:

Level	**Flow**	**Temperature**	**Pressure**
pH	**ORP**	**DO**	**Conductivity**
TDS	**TSS**	**Turbidity**	**O&G**
Metals	**Sludge**	**Chlorine**	

- Ion selectives for ammonium ions, nitrites, nitrates, magnesium, sodium, potassium, chloride, calcium, fluoride, metals and more.
- Motor sensors: Heat, moisture, mechanical seal leaks, more
- VFD feedback: Load imbalance, single phasing, draw per phase, more

Feedback Datalogging

Collecting sensor feedback data can be used to interpret, trend and analyze that information from one or multiple sensors to:

- Optimize and improve processes
- Create predictive results to improve proactive actions
- Avoid cyclical system upset
- Trend sensor degradation to predict point of diminishing performance and accuracy to maintain precision and give alerts for changeouts
- Trend and track and alert parts and consumables changeout or resupply
- Device monitoring for motors, VFDs, drive system alignment
- Monitor mission critical data and processes

Fieldbus Protocols

MODBUS	**EtherNetIP**	**CANopen, CAN Layer2**	**BACnet**

- Message Composer: Implement any RS232/485, TCP/IP, or CANbus 3rd -party protocol

Advanced Communications

MQTT	- SQL Client Connection to MS SQL Server, MySQL, PostgreSQL & Send Queries

SNMP Agent/Trap	**VNC Client, Remote Access via VNC**	**FTP Server/Client**	**Web Server**

e-mail & SMS messaging	- Modems: GPRS/GSM

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Intell-i-Features & Options (partial list)

Superior integration with hardware and facility controls	- Local UIT, remote cell phone, tablet & PC control
Simplified treatment process control	- Operator friendly screens
Sensor feedback access and control	- pH (& others) sensor Life Tracker™ logic
Data collection	- Data analysis for process optimization
Spare part & consumables reminders	- Continuous consumables monitoring
Email/SMS alerts for process and parts	- Operator PMI logs
Automation customization	- Internet capable
Local SSD NAS mass storage	- Virtual Intell-i-Touch design
On board IOM manuals	- On board How-To videos and item information drop down banners
Layers of information	- Dose formula calculations

Unicloud

- Unistream® cloud service available

CyberSecure Where Desired

The security of our systems is based on the provision of hardware and software to provide security by using such tactics as network communication port monitoring to check unexpected network connections, protocols or communications making a variety of detection easier and allows your controlling gateways to the system. Software such as anti-malware, layered firewalls and others can help in this process

Generating red flags for alerts and investigation is also a required function.

Hacks have to be expected and so steps need to be taken to limit data and hardware damage in the event a hack succeeds. Identification of vulnerabilities is also a key to protection with tiered protection and redundancy slows or can stop breaches.

Your facility & network infrastructure also needs to be reviewed by a professional in cybersecurity to compliment and support the controls effort and create multiple layers of difficulty for hacks.

Backup and recovery processes are also needed to assure business/controls continuity.

There is a lot to this subject matter and this paragraph cannot address a fraction of this issue. Let's discuss your needs and requirements.

SECTION 5.0 SLUDGE DEWATERING SYSTEM

5.01 Sludge dewatering system

A dewatering system is provided to collect the sludge and float from the DAF and pump these sludges through a dewatering filter press to reduce water content before disposal of the solids sludge. The filter press typically reduces sludges to 35% water content. The system components for the system are per the following details:

Filter Press

- 6 Ft3 volume expandable to 10 Ft3

- 630mm plates, polypropylene construction
- Painted steel framework
- Polypropylene filter clothes
- PVC head connections, 1.5" center feed, 1.5" top & bottom corner air inlets/outlets, 1.5" top & bottom wash/air filtrate outlets
- Inlet pressure gauge
- PVC air blow down manifold w/manual valves
- Self-dumping cake cart
- Manual plate shifting
- Manual hydraulic power unit closing device

Storage Tank

- 1000 gallon
- Tank and stand are polyethylene construction
- Cone bottom design
- Sludge discharge outlet in cone w/valve
- 64"D X 60"H

Filter Press Feed Pump

Description: The filter press sludge feed system will provide the capability of transferring settled sludge from the sludge tank hopper. The system can be operated via manual or automatic mode.

Components:

- 1.5" air operated, double diaphragm pump with aluminum body/Buna-N diaphragms and check valves. Pump will be plumbed with a PVC ball valve on inlet and outlet. Pump is to be mounted to an enamel coated base.
- Filter, regulator, metering valve and electric solenoid valve will be provided mounted to the pump base for filtering, regulation, fine meter control and on/off of air flow to pump. The assembly will include an air hose from assembly discharge to pump air inlet.

SECTION 6.0 SUBMITTAL PACKAGE

6.01 Submittal Approval Package

Upon receiving an order Pan America Environmental will engineer and produce a Submittal Approval Package, which allows you the customer to review and change or keep aspects of the system detailed in this quote. The submittal package provides the following at a minimum:

- General arrangement drawings, 2D, 3D, plan, end, sectional, detail and other views
- Hydraulic profile
- Electrical schematics
- Control panel physical layout
- Process/control narrative (where project size is applicable)
- Component datasheets
- Component cutsheets

Options

- P&ID

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- Structural, seismic, wind load, lifting lug review, anchorage and/or other PE review calculations
- Design sizing PE calculations and/or calculations of any other types
- Testing review and implementation during fabrication and assembly, i.e. NDT, NDE, radiographic, x-ray, ultrasonic, magnetic particle exam, others
- Piping testing per desired standards, i.e. ASME B31.1 power piping, ASME B31.3 process piping
- Rigging and lifting guide, drawings and/or procedures and methods
- WPS, ITP, PQR, PMI, others
- Document, QC report and/or other project document binder
- Mill certificates

Revisions & Meetings

The submittal package contains a limited amount of engineering and provides a maximum of Two (2) revisions of up to 10% maximum each. This quote does not include open ended, extensive or continuous revisions until approval is given. This submittal package does not include: Iterative R&D and review projects, design/redesign projects, pre-submittal before or after order placement to attain approval from the end user before order is placed, honored or executed by Buyer, engineers/consultants, contractors and/or other parties involved with this project. In addition, numerous and/or excessive meetings relative to the system design and complexity are not provided as PAE strives to have all valuable communications in writing so as to create a trackable/traceable project evolution.

Engineering Only

The quotation provides a limited amount of engineering and does not provide “Engineering Only”. The limited engineering is part of the system cost and is provided to give direction and final understanding as to what is being provided to you in the system design. The quoted and submitted system is a proprietary PAE product and PAE will not produce drawings for you to build, license, bid out or produce and/or market as your product for your or any other entities use.

SECTION 7.0 MATERIALS OF CONSTRUCTION

7.01 Steel Construction

Tank shell, baffles and internal structural members shall be constructed of A-36 carbon steel. Weld joints are to be double welded and dye penetrant tested.

7.02 Surface Preparation

Interior surfaces shall be prepared to an SSPC-SP10 near white metal blast. Exterior surfaces shall be prepared to an SSPC-SP6 commercial blast.

7.03 Coatings

Interior coating shall be coated with Ameron High Build Coal Tar Epoxy Amercoat 78HB (18-20 mils DFT). Exterior coating shall be coated with Ameron epoxy primer, Amerlock 2, (5-8 mils DFT). Final coat to be Ameron Amershield Aliphatic Polyurethane Enamel coat (5 mils DFT). Surface color to be Green RT-2203.

7.04 Internal Piping

Internal piping shall be ASTM A53 black steel.

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7.05 Fasteners

All wetted fasteners to be ANSI, 300 series stainless steel. All non-wetted fasteners to be zinc plated.

7.06 I.O.M. Manuals

Two copies of the Installation, Operation and Maintenance manuals will be provided.

7.07 Assembly

The DAF components will be installed on or in the DAF tank, plumbed, wired and functionally tested prior to shipping. The manufacturer of preference shall be: Pan America Environmental

7.08 Warranty

Pan America Environmental warrants its products to be free of defect in materials and workmanship for a period of one year from the date of shipment.

SECTION 8.0 FREIGHT AND SHIPPING PREPARATION

8.01 Freight Cost

The quoted freight cost is an actual or estimated cost. This cost is subject to change throughout the life of the quote and any resultant order.

8.02 Palletizing

All equipment prices include palletization where equipment size requires a pallet. Most DAF designs require flat bed shipment.

DAF with RSS Recycle Saturation System Saturation Vessel



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Specifying a VH Series DAF Dissolved Air Flotation for your project?

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