

Dissolved Air Flotation (DAF)



The ClearFox[®] DAF is a fully automated unit. The wastewater to be treated is fed from the customer's surge tanks or the ClearFox[®] buffer tanks of the DAF via a non-clogging cavity pump. The use of aerated buffers is recommended for certain applications.

Before the wastewater enters the reactor continuously, it first passes through a pH-controlled pipe system in which the pH value is adjusted if necessary. In a polymer mixing station, auxiliary materials are mixed to support the flocculation and flotation process. These polymers are automatically added to the incoming wastewater. With the help of a multiphase pump, the water flow is continuously saturated with air and then fed into the reactor via recirculation. The pressure relief causes the floating material to be lifted by fine air bubbles. These are collected in the upper part of the reactor, concentrated, and discharged through a conical opening by means of compressed air. The treated wastewater is discharged in the middle of the reactor and can be discharged as clean water or fed to the next treatment stage. The compressed sludge is discharged by gravity.

Depending on the consistency of the incoming water, high treatment efficiency is achieved. The ClearFox[®] DAFs have extremely low operating & maintenance costs. The operator has to take care of replenishing the consumables (chemicals) and disposing of the flotation sludge. The system should be checked daily for wastewater composition, chemical supply, and air pressure.

We do not use mechanical clearing equipment with moving chains (lubricant insert etc.) for sludge skimming.

The systems are robust, reliable and have been used in industrial applications for years. The daily time required to check this simple compact equipment is approx. 0.25 hours for trained personnel. All our technical parts are approved and certified.



Cleaning efficiency

The flotation process removes solids, fats, oils, and some biodegradable substances. In addition, the pH is adjusted to 7 and the temperature is not changed, making the wastewater quality suitable for biological treatment.

Typical parameters achieved for the food/oil industry in the inlet/outlet are given below in mg/l.

COD Inlet: 3000-7000 / Outlet: 1000-1500

BOD Inlet: 2000-3500 / Outlet: 700-1000

TSS Inlet: 500-1500 / Outlet: 5-50

Jar tests are recommended for the correct selection of chemicals and can be carried out in the PPU laboratories. A 5-litre sample is required for this.

Sludge

The solids, fats and oils removed from the wastewater are called flotation sludge. The amount produced depends on the concentration of the oils/solids and the precipitated/flocculated wastewater. The flotation sludge is collected and can then be disposed of or dewatered or used for agricultural purposes where permitted. At an average concentration, you can expect 40 - 60 litres of thickened flotation sludge per m³ of wastewater. This corresponds to an amount of about 4 - 6 percent by volume in relation to the wastewater supplied daily. The amount of sludge depends on the TSS, FOG as well as the flocculated/precipitated solids (oil, TOC, COD concentrations). Please refer to the data sheets for the ClearFox® sludge treatment options.

Advantages of the Clearfox® DAF:

- Up to 80% COD removal / up to 99% oil removal / up to 99% TSS removal
- Automatic sludge thickening / no mechanical scraper / corrosion-resistant material
- Developed according to the DWA design guidelines

Technical Data:

Max. flow rate of a DAF <i>Series/flow rate [m³/hr]</i>	DAF/1.0	DAF/2.0	DAF/3.0	DAF/5.0	DAF/7.5	DAF/10.0	DAF/15.0	DAF/18-20
Max. daily wastewater volume <i>[m³/d]</i>	20	40	60	100	150	200	300	400
Volume of the customer's storage tanks in m³	15	29	43	72	108	144	180	240
	This corresponds to approx. 60 % of the daily flow rate in m³/day and can be reduced if a steady inflow to the DAF is ensured, please ask the ClearFox® team for details.							
Twin-DAF	No	No	No	No	No	Yes	Yes	on request
	TWIN-DAF is a 2x parallel reactor system that gives double the flow rate (max. 18 m³/hr); ISO sea container transport. Contact the ClearFox® team for details.							
Power consumption Kilowatt/ampere, 400 Volt AC, 3- ,50 Hz	3/16 (240 Volt)	5/20	5/20	5/20	7/25	10/25	12/25	12/25
Sludge discharge with air transport from the DAF unit by:	manual	Compressed air, semi-automated	Compressed air, semi-automated	Compressed air, semi-automated	Compressed air, semi-automated	Compressed air, semi-automated	Compressed air, semi-automated	Compressed air, semi-automated
	If the discharged sludge cannot flow by gravity to the sludge dewatering system, it must be pumped, (optional hopper and eccentric screw pump) Please contact the ClearFox® team for details.							
Sludge storage/handling on site recommended [@4% TS flotote]	Litter bin	Bag drainage or without drainage	Without drainage, Dewatering container or Mini press	Without drainage, Dewatering container or Mini press	Unrollable drainage container or Mini press	Unrollable drainage container or Mini press	Unrollable drainage container or Mini press	Rollable drainage container or Press
Sludge removal support with scraper included	No	No	optional	optional	optional	optional	recommended	Yes, standard
Euro pallets / Transport	1,5	2	3	4	6	6	20 ft HC	20 ft HC
WF [cm]	85	100	125	150	175	200	220	240
WD [cm]	85	85	85	85	100	150	175	200
L [cm]	125	125	150	200	200	210	240	240
H [cm]	190	210	210	210	220	220	220	240

Equipment:

Note: The information provided by our standard suppliers and manufacturers is not binding. Changes due to seasonality and delivery times are possible.

Max. Flow rate of a DAF Series/Flow [m³/hr]		1,0	2,0	3,0	5,0	7,5	10,0	15,0	18-20
Max. Daily wastewater volume [m³/d]		20	40	60	100	150	200	300	400
Diameter of the DAF reactor [cm]	PPU	80	80-100	100	120	150	180	200	220
Height of the DAF reactor [cm]		150	180	180	180	200	200	220	220
Eccentric screw pump Flow rate [m³/hr]/ P [kW]/DN [mm]	Netsch	1,0/0,75/ 32	2,0/1,0/ 50	3,0/ 1,25/ 50	5,0/ 1,50/ 65	7,5/ 1,50/ 65	10,0/ 2,2/ 65	15,0/ 3,0/ 80	20,0/ 4,0/ 80
Multiphase pumps, total Flow rate [m³/hr]/ P [kW]/ DN [mm]	Edur	1,50/1,50/ 20	1,50/1,50/ 20	1,50/1,50/ 20	1,50/1,50/ 20	1,50/1,50/ 20	1,50/1,50/ 20	4,0/3,0/ 25	4,0/3,0/ 25
Polymer dosing pumps Flow rate [l/h]	Iwaki	10 – 20	10 – 20	10 – 20	30 – 50	30 – 50	50 – 75	-100	-150
Dosing pumps Flow rate [l/h] Total splitting/acid/alkali	Iwaki	4 – 8	4 – 8	4 – 8	10 – 20	10 – 20	10 – 20	15 – 25	15 – 25
Air compressor (containerised) P [kW]/flow rate [l/min]	Einhell	8 bar 1.50/165	8 bar 1.50/165	8 bar 1.50/165	8 bar 1.50/165	8 bar 1.50/165	8 bar 1.50/165	8 bar 1.50/165	8 bar 1.50/165
Polymer container Volume [l] Agitator P [kW]	Aricon Sewa	300 0.75	300 0.75	300 0.90	500 1.10	750 1.50	1000 2.20	1200 2,20	1500 3.0
Drain 2x inch female thread	ITG	32-50	50	50	50	50	50	50	50-80
Sludge discharge [mm]	PPU	110	110	110	160	160	160	200	200
Clearwater outlet [mm]		110	110	110	160	160	160	200	200
Mixing/saturation section PVC Mixing tank PE/agitator	PPU Aricon	PPU -	PPU -	PPU -	PPU -	PPU -	PPU	PPU Aricon 800 ltr	PPU Aricon 800 ltr

Control cabinet h x w [cm] PLC Mitsubishi optional Siemens SI 7	Rittal Mitsubishi	ClearFox® easy Mitsubishi	80x50 Mitsubishi	80x50 Mitsubishi	80x50 Mitsubishi	80x50 Mitsubishi	100x50 Mitsubishi	100x50 Mitsubishi/SI -7	100x50 Mitsubishi/SI -7
Level sensor buffer 4-20 mbar	Bamo	incl.	incl.	incl.	incl.	incl.	incl.	incl.	incl.
Air pressure/dry run Recycle	BD Sensor	incl.	incl.	incl.	incl.	incl.	incl.	incl.	incl.
Compressed air monitoring DAF	Festo	incl.	incl.	incl.	incl.	incl.	incl.	incl.	incl.
Dry run/thermal protection	Netsch	incl.	incl.	incl.	incl.	incl.	incl.	incl.	incl.
Chemical level	Elobau	incl.	incl.	incl.	incl.	incl.	incl.	incl.	incl.
pH value	Schott	incl.	incl.	incl.	incl.	incl.	incl.	incl.	incl.
pneum. sludge lifter DN [mm]	PPU	80	110	110	110	160	160	200	200
Scrapper [W/ rpm]	PPU	-	-	-	-	-	-	120/16	120/16
Special equipment possible 2-stage/ floor cleaning, etc.	PPU	No	No	No	yes	yes	yes	yes	yes

Note: Flow rates >40 m³/hr are handled with our Container Eco- DAF 40-60. Please request the data sheet.

Technical equipment / scope of delivery:

The ClearFox® DAF units, installed in a sea container, are designed for easy installation and commissioning. With the help of the commissioning instructions and the user manual, even unskilled customers can operate and run the system. The necessary installation and assembly material is also included in the scope of delivery.

The ClearFox® DAF unit, mounted on a rack, can be put into operation by connecting the P (feeding), F (flotation reactor), D (dosing and mixing) and control units.

Parts lists as well as wear and spare parts are included in the design documents 3-4 weeks after ordering and after the start of production. Please note that we design and plan the units for each application: e.g. dosing quantity, recycling rate, surface and oxygen load. Each technical unit can thus be dimensioned according to need in terms of performance, volume and flow rate, etc.

Typical customer requirements (basic data) Typical standard design parameters:

Sludge dry matter (flotate thickening)	≥ 4 < 6
Total surface load of the liquid phase	3 – 6 m ³ /hr (1-stage)
Surface loading of solids	5 – 20 kg/m ² *hr (1-stage)
Air/solid ratio	10 – 50 g air/kg solids
Average bubble size at 5–6 bar	30 – 60 micron
Saturation rate during operation	> 80 < 98 %
Recycling rate internal for D/H>1.5	≥ 25 < 40 % (1-stage)
Normal operating saturation pressure	≥ 3 < 6 bar (≥ 45 > 90 psi)
Air volume per fluid in multiphase operation	> 5 < 20 %
Sludge dry matter (flotate)	4 – 5 % TS
Concentration SS in clearwater	< 1 %
Carbon degradation (COD _{to} -COD _{off}) /COD _{in} x100	80 %
Removal of oils/dissolved substances	90 %

Note: The standard design parameters are closely related and influence each other.

They are valid when used without client details.

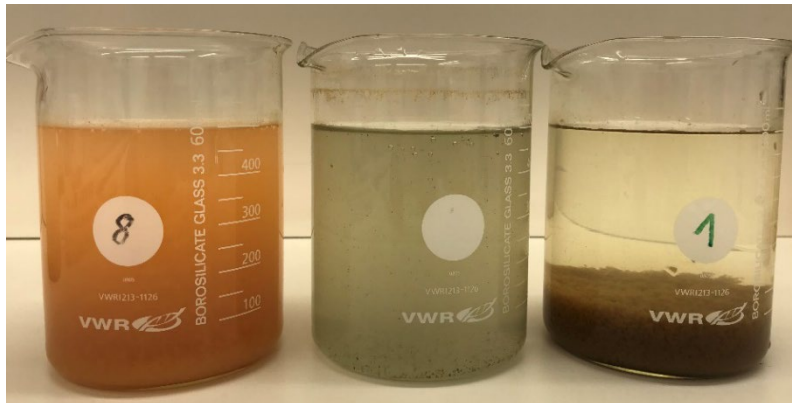
Basic data: The 2-stage DAFs are only possible after piloting a system or upgrading previous projects with the same wastewater characteristics.



Expected cleaning services:

Wastewater type	Raw sewage			Clearwater			Separation efficiency		
	Susp. solids [mg/l]	Etherl. fat [mg/l]	BOD ₅ [mg/l]	Susp. solids [mg/l]	Etherl. fat [mg/l]	BOD ₅ [mg/l]	Susp. solids [%]	Etherl. fat [%]	BOD ₅ [%]
Edible oil factory	230	460	2.900	20	25	94	91,3	94,6	96,8
Margarine factory	5.000	3.900	-	200	40	-	96,0	99,0	-
Cosmetics factory	15.000	5.405	25.400	1.800	485	5.880	88,0	91,0	76,0
Wool laundry	4.000	2.100	970	60	30	90	98,5	98,6	90,7
Slaughterhouse	700	892	1.900	10	32	39	98,6	96,4	97,6
Poultry processing	874	3.139	1.136	40	18	100	95,4	99,4	91,2
Rendering	5.353	4.614	-	780	775	-	95,4	83,2	-
Tannery	5.093	462	2.221	384	43	547	92,5	90,7	75,4
Soybean processing	1.656	-	3.000	42	-	800	97,5	-	73,4
Potato processing	2.600	-	2.760	60	-	260	97,7	-	90,6
Fibreboard factory	1.700	-	6.170	127	-	3.000	92,6	-	51,4

[Source: Fries ATV seminar 15/16.04.1996]



Geschäftsführer:
Dipl.Ing.(FH) Wolfgang U. Pöhl
Registergericht Bayreuth HRB 4726
USt.-IdNr.: DE259224458

PPU Umwelttechnik GmbH
Carl-Kolb-Str. 6,
95448 Bayreuth,
Germany
Tel. 0921 / 150 63 990,
Fax 0921 / 150 63 999,
E-Mail: info@clearfox.com
www.clearfox.com

Bankverbindung:
HypoVereinsbank Bayreuth
IBAN DE 8877 3200 7200 2542 4794
BIC: HYVEDEMM412