

Description

The ClearFox Container DAF plant is fully automated. Feedwater is supplied to the DAF module via non-clogging cavity pump from client's balancing tanks or ClearFox buffer tanks. Pre-aerated buffers are advisable for certain applications, also hard solids > 3 mm must be removed by any screening device upstream.

The wastewater firstly passes through a pH-controlled inline pipe system where the pH is automatically adjusted if necessary. Then it is divided hydraulically into 2 reactor cells. In a polymer-mixing module, conditions are created that support the flocculation and flotation process. These polymers are automatically added to the inflowing wastewater flocculators. By utilizing a multiphase pump, the flow of water is continuously saturated with air, then returned via a recirculation into the reactor. The pressure release causes an uplift of the floatable material (sludge) by fine air bubbles in a conical top of every reactorcell. Inside this compression zone the sludge is collected and thickened. By reducing the clearwater flowrate in certain intervalls the water level rises (airlift effect) inside the DAF. This causes an overflow of the sludge into a discharge pipe. The clean water is drawn off from several points in the center of the reactor and can be discharged as clean water or to the next treatment step. The thickened sludge is discharged by gravity to a sludge press or any other dewatering device. For special application the sludge discharge device is cleaned automatically by cleaning nozzles, feeded with pressurized clearwater.

Operation

Depending on the inflowing water consistency, a high treatment efficiency rate is achieved. The ClearFox DAF has extremely low O&M costs. The operator must ensure the consumables [chemicals] are replenished, and the disposal of the flotation sludge. The system should be checked daily for the wastewater composition, chemical storage volumes, and the air pressure can be adjusted. We do not use and mechanical clearing device with movable chains (lubricant use, etc.). The units are robust and used in the food industry for years. Due to the unique construction the consumption of chemicals is low. The daily time requirement for controlling this simple compact unit is approximately 0.25 hours by trained staff per day. All our technical parts are approved and certified.

Cleaning efficiency

The process removes solids, fat, oil and some biodegradable materials, pH is adjusted to 7, temperature is not changed, the effluent quality is suitable for biological treatment. Typical parameters achieved for food/oil industry in the INLET / OUTLET are detailed below in mg/l.

COD IN :3000-7000 / OUT :1000-1500

BOD IN: 2000-3500 / OUT :700-1000

TSS IN: 500-1500 / OUT :5-50

Jar Tests are advised for correct chemical selection and can be offered by PPU laboratory services. 5 ltr sample required.

Residues

In the flotation fats and oils are removed from the wastewater. The removed residues are called flotation sludge. The resulting amount depends on the concentration of oil/solids and the precipitated/flocculated wastewater. The flotation sludge must be collected and can then be disposed or, dewatered or used for agriculture. At an average concentration, you can expect 40-60 liters of thickened flotation sludge per m³ of wastewater. This corresponds to an amount of about 4 to 6 percent by volume in relation to the daily feed waste water. The amount of sludge depends on TSS +FOG, as well as on flocculated/precipitated solids (oil/ TOC/COD concentrations).

Please see datasheets for Clearfox sludge treatment options e.g. sludge presses

Construction and content of HC Containers

The Clearfox DAF consists out of 2 technical parts

- a) technical container (inside is preinstalled the suction line with feedpump, dosing pumps, injection points, static mixers, chemical storage, polymer preparation, multiphase systems, control unit, insulated walls, room aeration and/or air condition
- b) dissolved air cell container (including waterproof PE lining, conical reactor cells, discharge tubes for clearwater, settled solids, floated sludge, air release system

The system can be operated

- as one line (=1 technical container & 1 x DAF container)
- or
- as two line (=1 technical container & 2x DAF container parallel) with double flowrate

The containerized system is totally plug & play due to the preinstallations, including air compressor and a ventilation system for the odor exchange:

The 2 or 3 containers must be positioned onsite by crane, then the technical tubes between the containers are connected easily.

PPU gives support by layout drawings according to site requirements

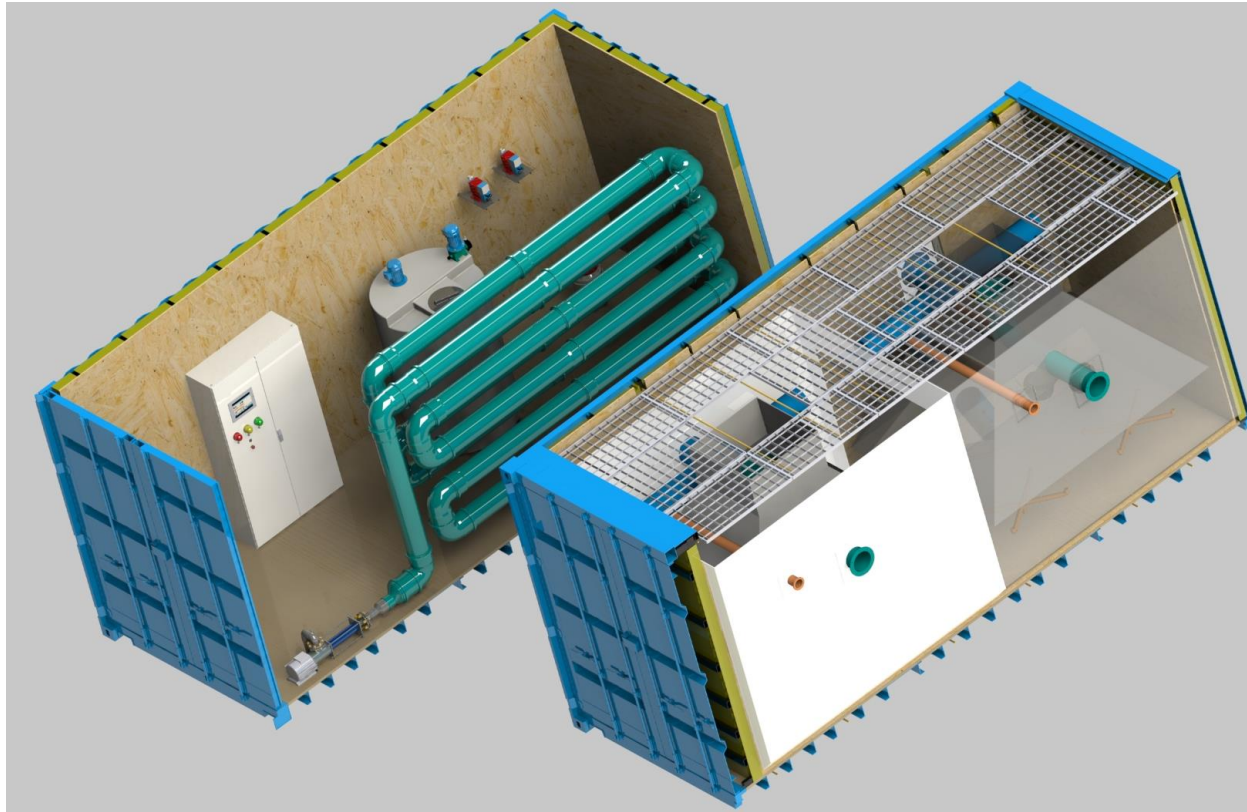
Data sheet: ClearFox® DAF

container series with airlift principle [Qd > 400 ≤ 1300 m³ /day]

Intelligent Dissolved air flotation in ISO- container with sludge thickening



Picture shows



control cabinet on technical container

Right container: Container open roof with DAF Cell, for 65 m³/hour (with a second Cell it gives 130 m³/hour)
Left container: Technical container

Data sheet: ClearFox® DAF

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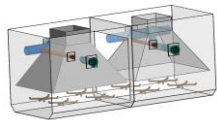


Reference / pictures



polymers, thicken

inlets DAF



adjustment switch
cabinet
dosing pump



control DAF unit



compressor unit incl. filter



polymer prepare station



saturation, mixing, aeration



cavity pumps



feeding / standard ISO container installation 10.0m³/h

(top left: polymers, down left: unit from DAF container, top middle: switch cabinet, down middle: devices in technical container, top right: dosing system, down right: sludge pumps)

The plant series is characterized by an extremely robust, space-saving design. The great success of the system technology is based, on a simple and cost effective operation. Systems are installed in many major European food producers, as well as in Eastern Europe in action.

Technical data for selection & site preparation:

Sizes/equipments

- ✓ 3 sizes available for different application, (high loaded, normal or less loaded DAF)
- ✓ each consisting out of 2 x 20 ft Container (40-65 m³/hour)
- ✓ each consisting out of 3 x 20 ft Container (80-130 m³/hour)
- ✓ container nr. 1 machine house, mixing devices, chemicals, precipitation, flocculation etc.
- ✓ container nr. 2 DAF Cell-1 (reactor) with sludge discharge, inlet, outlet
- ✓ container nr. 3 DAF Cell-2 (reactor) with sludge discharge, inlet, outlet (only with 80-130 m³/hour)

Data of one DAF Cell:

Max. flowrate of DAF design flow [m ³ /h]	DAF/42	DAF/52	DAF/65	DAF/84	DAF/104	DAF/130
3 sizes available for different application	extreme load/low NTU	normal load	less load	extreme load/low NTU	normal load	less load
nr. of container	2 X 20 ft Container	2 X 20 ft Container	2 X 20 ft Container	3 X 20 ft Container	3 X 20 ft Container	3 X 20 ft Container
Max. daily amount of wastewater [m ³ /d]	840	1.040	1.300	1.680	2.080	2.600
Recyclestream [%]	> 40	> 30	> 20	> 40	> 30	> 20
Power consumption Kilowatt/ Ampere, 400 Volt, 50Hz,	16/25	18/25	20/30	32/25	36/30	64/25
Sludge discharge with airlift out of DAF unit by:	sludge compression zone airlift principle, discharge by gravity DN 200 mm intervals free adjustable (DS of sludge)	sludge compression zone airlift principle, discharge by gravity DN 200 mm intervals free adjustable (DS of sludge)	sludge compression zone airlift principle, discharge by gravity DN 200 mm intervals free adjustable (DS of sludge)	sludge compression zone airlift principle, discharge by gravity DN 200 mm intervals free adjustable (DS of sludge)	sludge compression zone airlift principle, discharge by gravity DN 200 mm intervals free adjustable (DS of sludge)	sludge compression zone airlift principle, discharge by gravity DN 200 mm intervals free adjustable (DS of sludge)
Sludge storage/-treatment on site advised [@4-6% DS flotatate]	minipress	minipress	minipress	minipress	minipress	minipress
sludge removal support /with foam Jet	yes	yes	yes	yes	yes	yes

Technical specification (PPU standard Pre-supplier/manufacturer, Note: indication is without commitment, changes due to seasonality and deliverytime):

Max. flowrate of DAF design flow [m ³ /h]		DAF/42	DAF/52	DAF/65	DAF/84	DAF/104	DAF/130
Max. daily amount of wastewater [m ³ /d]		840	1.040	1.300	1.680	2.080	2.600
diameter of DAF reactor [cm] Polyethylen, welded	PPU	<h1>On request</h1>					
feed pump eccentric screw DN [mm] / P [kW] / flowrate [m ³ /h]	Netsch						
multiphase pumps totally DN [mm] / P [kW] / flowrate [m ³ /h]	Edur Calpeda						
dosing pumps polymer flowrate [ltr/h]	Iwaki ProMinent						
dosing pumps flowrate [ltr/h] splitting/caustic soda/totally	Iwaki						
air compressor (containerized) P [kW] / flowrate [ltr/min]	Einhell Scheppach						
tank polymer with stirrer (1 Cell) 4200 liter polymer preparation (2 Cells) 3000 liter stirrers	Aricon PPU Sewa						
drain 2x thread female [inch]	HTI						
sludge discharge d _{out} [mm]	PPU						
clear discharge d _{out} [mm]							
mixing line / saturation PVC mixing tank PE / static mixer	PPU Aricon						
controlcabinet HxW [cm] L35 Mitsubishi/Siemens SI 7	Rittal Mitsubishi						
level sensor buffer 4-20 mbar air pressure / Dryrun Recy air pressure monitoring DAF Dry run / thermo protection level indicator chemicals digi pH	BD Sensor Bamo Festo Netsch Elobau Schott						
pneumatic sludge lifter DN [mm]	PPU						
scraper device [Watt/rpm/min]	PPU						

Technical equipment /scope of delivery

The Clearfox DAF version installed in a sea container is designed for plug&play. With the startup guide and the operational manual, non skilled clients are able to operate the equipment. The technical equipment is complete for a simple installation onsite and also the installation and mounting materials are included.

The Clearfox DAF version installed on racks can be made ready for operation, by connecting the devices P,F,D & control unit, pipe connections, mounting materials are on demand or clients requirements.

Part lists as well as wear/spare are included in the design documents 3-4 weeks after ordering and after beginning of manufacturing.

Please note, that we design for every application: dosing quantity, recycling rate, surface load, oxygen load, so every technical device can be specified i.e power/volume/flow etc.

typical client requirement (basic data)	typical taken as standard design parameter (Clearfox airlift DAF)	typical efficiency rates expected
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dry matter of sludge (flotate)	%DS	dry matter in sludge (flotate thickening)	% => 4 < 6
concentration SS in clearwater	mg/l	total surface load liquid phase	[m ³ /h] = 3-6 (1 step)
C elimination (COD _{in} -COD _{out}) /COD _{in} x100	%	surface load solids	[kg/m ² h] = 5-20 (1 step)
same for heavy metals/oil/SS	%	air/solids ratio	[g air/kg solids *)]= 10-50
effluent concentration of any parameter	mg/l	average50-bubble size@5-6 bar	micron = 30-60
branch/production/	products	saturation rate during operation	% >80< 98
peak flow	m3/h	recycling rate internal for D/H>1.5	% =>25<40 (1 step)
		operational saturation pressure	bar = > 3 < 6
		air volume per liquid in multiphase operation	% > 5 < 20

note for standard design parameter: that they are in close correlation and influence each other, standard valid taken without any clients basic data

2- step DAF are only possible after piloting a system or upgrading former projects with same ww characteristics

clients service

how to startup-short version:

install feed suction line in buffer, connect sludge outlet pipe to sludge treatment, connect clearwater outlet, connect power supply in cc startup, operation and maintenance according to site conditions (photo documentation)

Abwasserart	Rohabwasser			Klarwasser			Abscheidegrad		
	susp. Stoffe [mg/L]	etherl. Fett [mg/L]	BSB ₅ [mg/L]	susp. Stoffe [mg/L]	etherl. Fett [mg/L]	BSB ₅ [mg/L]	susp. Stoffe [%]	etherl. Fett [%]	BSB ₅ [%]
Speiseölfabrik	230	460	2.900	20	25	94	91,3	94,6	96,8
Margarinefabrik	5.000	3.900	-	200	40	-	96,0	99,0	-
Kosmetikfabrik	15.000	5.405	25.400	1.800	485	5.880	88,0	91,0	76,0
Wollwäscherei	4.000	2.100	970	60	30	90	98,5	98,6	90,7
Schlachthof	700	892	1.900	10	32	39	98,6	96,4	97,6
Geflügelbearb.	874	3.139	1.136	40	18	100	95,4	99,4	91,2
Tierkörperbeseit.	5.353	4.614	-	780	775	-	95,4	83,2	-
Gerberei	5.093	462	2.221	384	43	547	92,5	90,7	75,4
Sojabonenverarb.	1.656	-	3.000	42	-	800	97,5	-	73,4
Kartoffelverarb.	2.600	-	2.760	60	-	260	97,7	-	90,6
Faserplattenfabrik	1.700	-	6.170	127	-	3.000	92,6	-	51,4

[Quelle: Fries (ATV-Seminar 15./ 16.04.1996