



Process flow description TPF system

The waste water enters the unit through the distribution pipe (1). The distribution pipe distributes the water evenly over the plate pack (2).

Part of the treated water is recycled to the feed with a special dissolution pump (3). The pump is capable of pressurising relatively large amounts of air together with water, while forcing the added air bubbles to dissolve. The pressurised and air saturated recycle flow is mixed with the waste water. The free air separator (4) removes large unwanted gas/air bubbles. Special designed bubble generator valves (5, 6) create a sharp pressure drop causing the dissolved gas to be released as very small micro bubbles.

The micro bubbles attach to the particles in the waste water and force them to float and form a floating layer (7) on the surface of the unit. Very small particles having lower up-flow velocity will be separated in the plate pack. The treated water is discharged through an outlet weir pipe (8) into the effluent (pump) compartment. The floating layer is removed by means of a pneumatic operated skimming device (9). The separated sludge is collected in an integrated sludge compartment (10).

Settled bottom sludge is intermittently removed by means of manually operated butterfly valves (11).

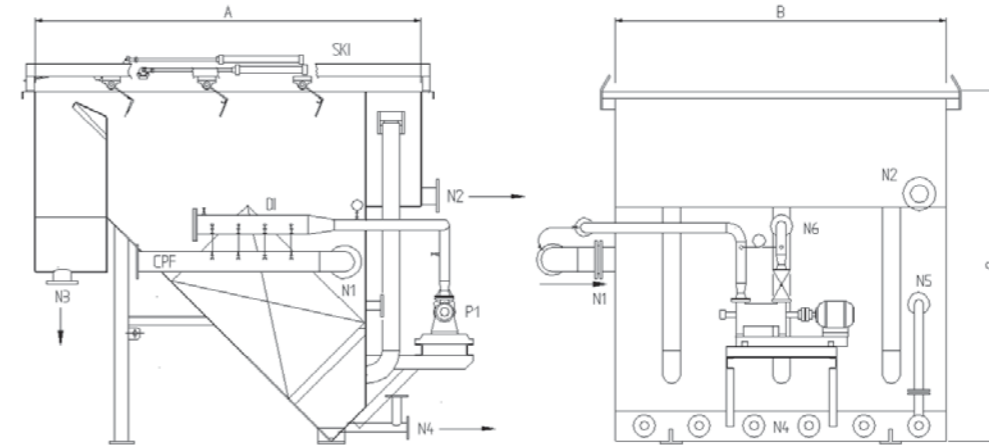
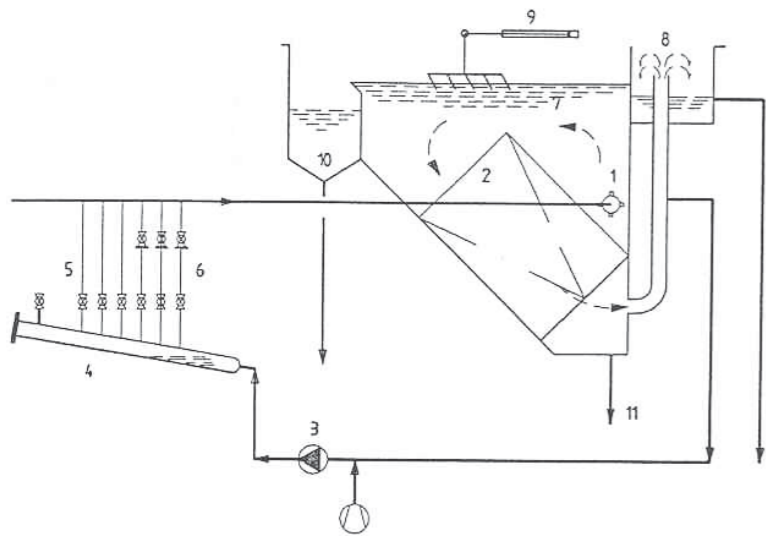
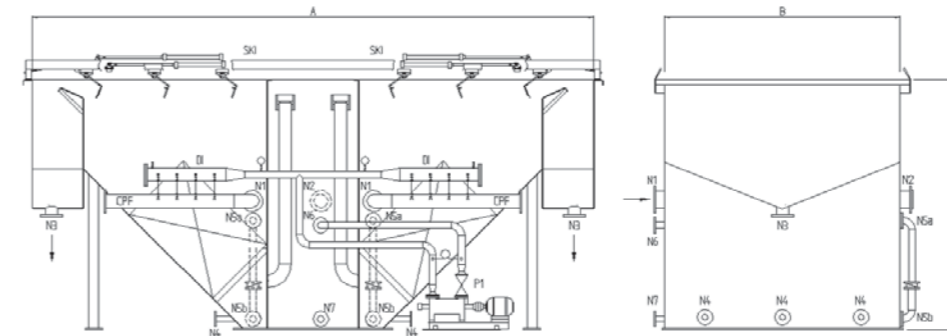


Fig. 2
Mini - 4 pack units



- N1 Inlet
- N2 Outlet
- N3 Flotation Sludge Outlet
- N4 Sludge
- N5 Fill/ drain/ bypass
- N6 Recirculation Water
- N7 Drain
- P1 Recirculation Water Pump
- SKI Skimmer
- DI Free Air Separator
- CPF Inlet Pipe

Fig. 3
6-8 Pack units

Type	Basin Dimensions (mm)			Nozzles 150#						Capacity	Weight nett	Weight operation	Air consumption	Power consumption
	A	B	C	N1	N2	N3	N4	N5	N6					
mini pack	2360	500	2000	4"	4"	4"	3"	2"	1"	5	2000	4500	37	1,0
1 pack	3512	1000	3200	6"	6"	6"	3"	2"	1 1/2"	30	2950	9750	50	3,0
2 pack	3512	2000	3200	8"	6"	6"	3"	3"	3"	60	3900	18200	80	4,0
3 pack	3516	3000	3200	8"	8"	6"	3"	3"	3"	90	4500	21250	83	5,5
4 pack	3516	4000	3200	10"	10"	8"	3"	3"	3"	120	7200	32800	91	11,0
6 pack	7032	3000	3200	12"	12"	8"	3"	3"	4"	180	12865	49465	166	11,0
8 pack	7032	4000	3200	14"	14"	10"	3"	3"	6"	240	14334	71264	175	18,5

Datasheet of TPF separator

TPF 4-pack for 120 m³/h oil water treatment of refinery



Optional pre-treatment

Chemical pre-treatment of the wastewater is required when emulsified oil or very small particles are present.

In some cases laboratory jar tests and investigation of type and quantity of chemicals, mixing intensity and reaction time is required in order to obtain a separable floc. These tests are carried out by Rossmark's process specialists who have broad experience with various kinds of waste water.

Coagulation - Flocculation methods

Coagulation-flocculation can be established in large tanks (CSTR or Continuously Stirred Tank Reactor) or in a coiled pipe flocculator (CPF). The choice for a specific mixing/reactor device is based on the characteristics and the treatment requirements of the raw water.

Coiled Pipe Flocculator in HDPE



The CSTR's are applied when long reaction times are required and available space is not limited.

The CPF is based on a concept of accelerated flocculation which results in a low distribution in size, shape and structure of the generated flocks. The flocculator acts as a plug flow reactor, and saves on addition of chemicals due to the very direct and intense

mixing. Reaction takes place as a combination of residence time and mixing energy. These values can be determined on laboratory scale, and thus the flocculator can be accurately designed to the requirements.

The flocculator can be executed in HDPE, PE and (stainless/coated) steel.

From single units to turnkey projects.

The TPF can be combined with several other Rossmark/Veolia separation systems to improve the quality of the effluent process water.

Upstream:

- Screens removal of coarse material
- TPI / CFI Plain gravity separators

Downstream:

- Biological SBR, Activated Sludge, MBR treatment
- ACF / RSF activated carbon filters / rapid sand filters
- Membrane Ultra filtration, RO filtration

The Rossmark scope of supply:

- turnkey deliveries
- design
- engineering
- fabrication
- site-erection, commissioning and start-up
- after sales service
- laboratory and field research

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Dissolved Air Flotation Coagulation-Flocculation (CPF, CSTR)

Dissolved Air Flotation (DAF) systems are used when gravity separation of oils or suspended solids does not meet the specifications. The Dissolved Air Flotation systems of Rossmark are called TPF (Tilted Plate Flotator). Unlike most DAF systems the TPF holds a Corrugated Plate Pack for enhanced separation and reduced space requirements.

Applications

- HPI industries:
 - Produced water (oil and gas fields)
 - Ballast water and tank farm waters
 - Refinery effluents
 - Petrochemical effluents
- CPI industries
- Textile industries
- Food and beverage industries:
- Edible oil refining
- Automotive, iron & steel industries
- Potable & process water pre-treatment

Advantages of the TPF system

- Standardized design enables quick delivery of unit and spares.
- Included plate pack gives enhanced performance and smaller footprint.
- No electrical internal parts (pneumatic scraper) improved safety in hazardous operations.
- Air dissolve system executed as special air mixing pump or with (conventional) pressurised vessel.
- Executed in coated carbon steel, stainless steel or concrete.
- Executed as Rossmark standard or stringent Oil industry standard.

Typical removal rates

- 30 - 99%* Oil/grease reduction
- 30 - 90%* COD reduction
- 50 - 95%* Suspended solids reduction
- 4 - 8%* Dry matter of floated sludge

* values originate from flocculation-flotation combinations.

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