

# CE 587

## Dissolved air flotation



2E

The illustration shows: supply unit (left) and trainer (right)

### Description

- **demonstration of dissolved air flotation**
- **flocculation to condition the raw water**
- **scraper to remove the float**

CE 587 demonstrates the clarification of raw water containing solids using the dissolved air flotation process.

First, a suspension (raw water) is prepared in a tank. From here the raw water flows into a flocculation tank divided into three chambers. By adding a coagulant in the first chamber the repulsive forces between the solid particles are cancelled out. The solid particles combine into flocs. To create larger flocs a flocculant is added in the second chamber. The coagulant causes a drop of the pH value. By adding caustic soda the pH value of the water can be increased again. In the following third chamber of the flocculation tank low flow velocities are present to prevent any turbulence. Turbulence would impede the formation of flocs.

From the flocculation tank the raw water enters the flotation tank. A part of the treated water is removed from the flotation tank and saturated with air under pressure. This water (recycle water) enters via a relief valve so that it suddenly expands to atmospheric pressure. This creates minute air bubbles which attach to the flocs. This makes the flocs rise to the surface of the water. Using a scraper the floating flocs (float) can be moved into a collection channel.

Flow rates, pressures and pH values are measured. The pH value can additionally be controlled. The pressure of the recycle water can be adjusted.

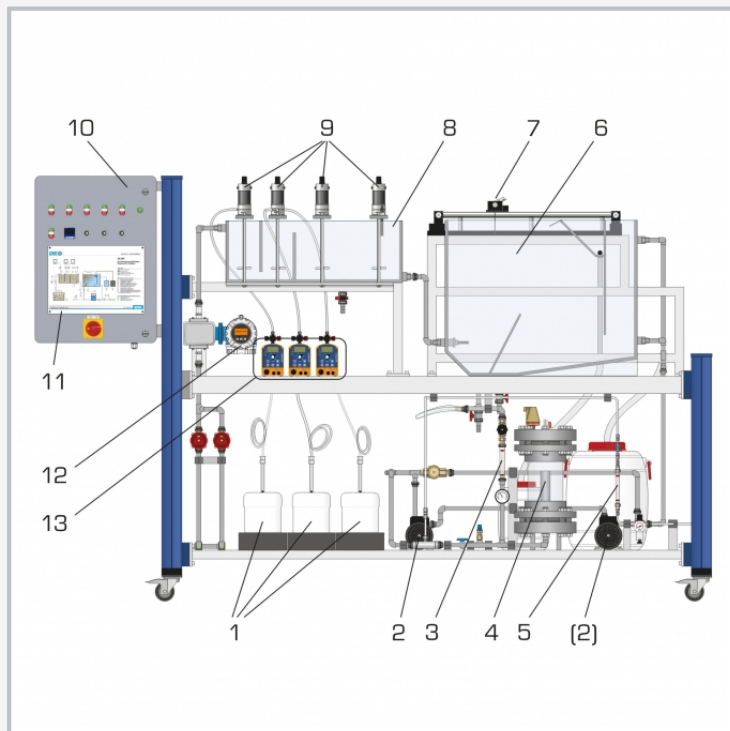
Trivalent metallic salts are usually well suited as coagulants. Common flocculants are organic polymers. Powdered activated carbon can be used to produce the raw water.

### Learning objectives/experiments

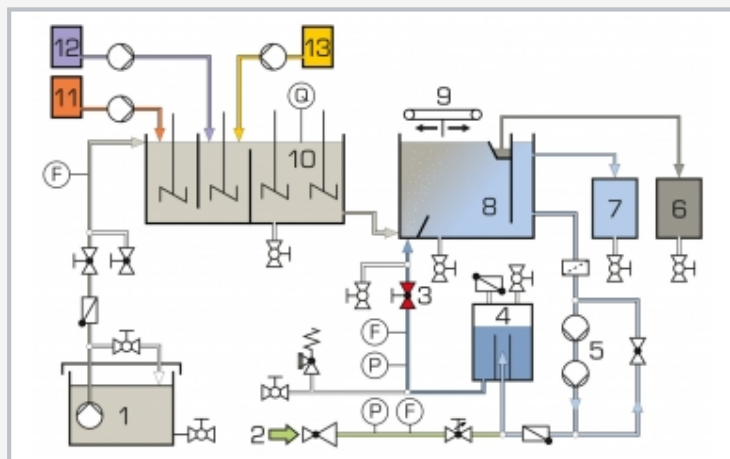
- functional principle of dissolved air flotation
- creation of a stable operating state
- effects of various parameters
  - ▶ coagulant concentration
  - ▶ flocculant concentration
- determination of the hydraulic loading rate (rising velocity)

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1 chemical tanks, 2 circulation pumps, 3 flow meter (recycle water), 4 pressure tank, 5 flow meter (air), 6 flotation tank, 7 scraper, 8 flocculation tank, 9 stirring machines, 10 switch cabinet, 11 process schematic, 12 electromagnetic flow rate sensor (raw water), 13 metering pumps



1 raw water, 2 compressed air, 3 relief valve, 4 pressure tank, 5 circulation pumps, 6 sludge (float), 7 treated water, 8 flotation tank, 9 scraper, 10 flocculation tank, 11 coagulant, 12 flocculant, 13 caustic soda; F flow rate, P pressure, Q pH value

### Specification

- [1] removal of solids from raw water using dissolved air flotation
- [2] conditioning of the raw water by flocculation
- [3] 3 Metering pumps for chemicals
- [4] flocculation tank with 3 chambers and 4 stirring machines
- [5] flotation tank with electrically driven scraper
- [6] pressure tank and 2 circulation pumps
- [7] relief valve
- [8] separate supply unit with tank and pump for raw water
- [9] electromagnetic flow rate sensor
- [10] measurement of flow rate, pressure and pH value
- [11] control of the pH value

### Technical data

#### Tanks

- flotation tank: 150L
- flocculation tank: 45L
- raw water: 300L
- treated water: 80L
- sludge (float): 15L

#### Raw water pump

- max. flow rate: 135L/min
- max. head: 7,0m

#### Circulation pumps

- max. flow rate: each 18L/min

- max. head: each 50m

#### Metering pumps

- max. flow rate: each 2,1L/h

#### Stirring machines

- max speed: each 600min<sup>-1</sup>

#### Measuring ranges

- flow rate: 0...550L/h (raw water)
- flow rate: 30...320L/h (recycle water)
- flow rate: 20...360L/h (air)
- pH value: 1...14
- pressure: 0...6bar (recycle water)

230V, 50Hz, 1 phase

230V, 60Hz, 1 phase; 120V, 60Hz, 1 phase

UL/CSA optional

LxWxH: 1560x790x1150mm (supply unit)

LxWxH: 3100x790x1950mm (trainer)

Total weight: approx. 550kg

### Required for operation

water connection, drain, compressed air, caustic soda, iron(III) sulfate, flocculant, powdered activated carbon (recommendation)

### Scope of delivery

- 1 supply unit
- 1 trainer
- 1 set of hoses
- 1 set of instructional material