HUBER TECHNOLOGY

HUBER
Dissolved Air Flotation HDF

Removal / recovery of solids, fat, oil and grease from wastewater or process water

- Exceptional separation performance
- Non-clogging saturation and pressure release system
- Lamella separator for high capacity on small footprint
- Made of stainless steel, pickled in an acid bath

The Quality Company – Worldwide

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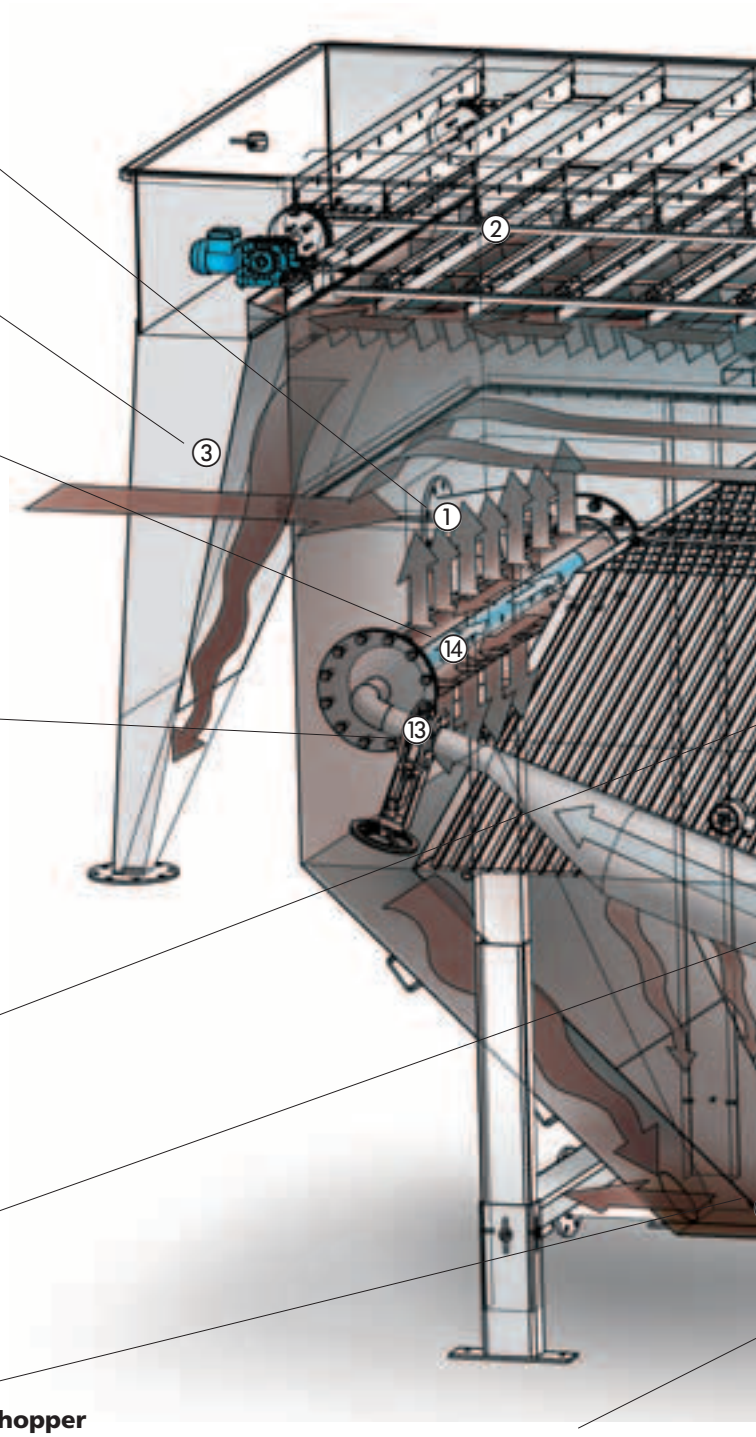

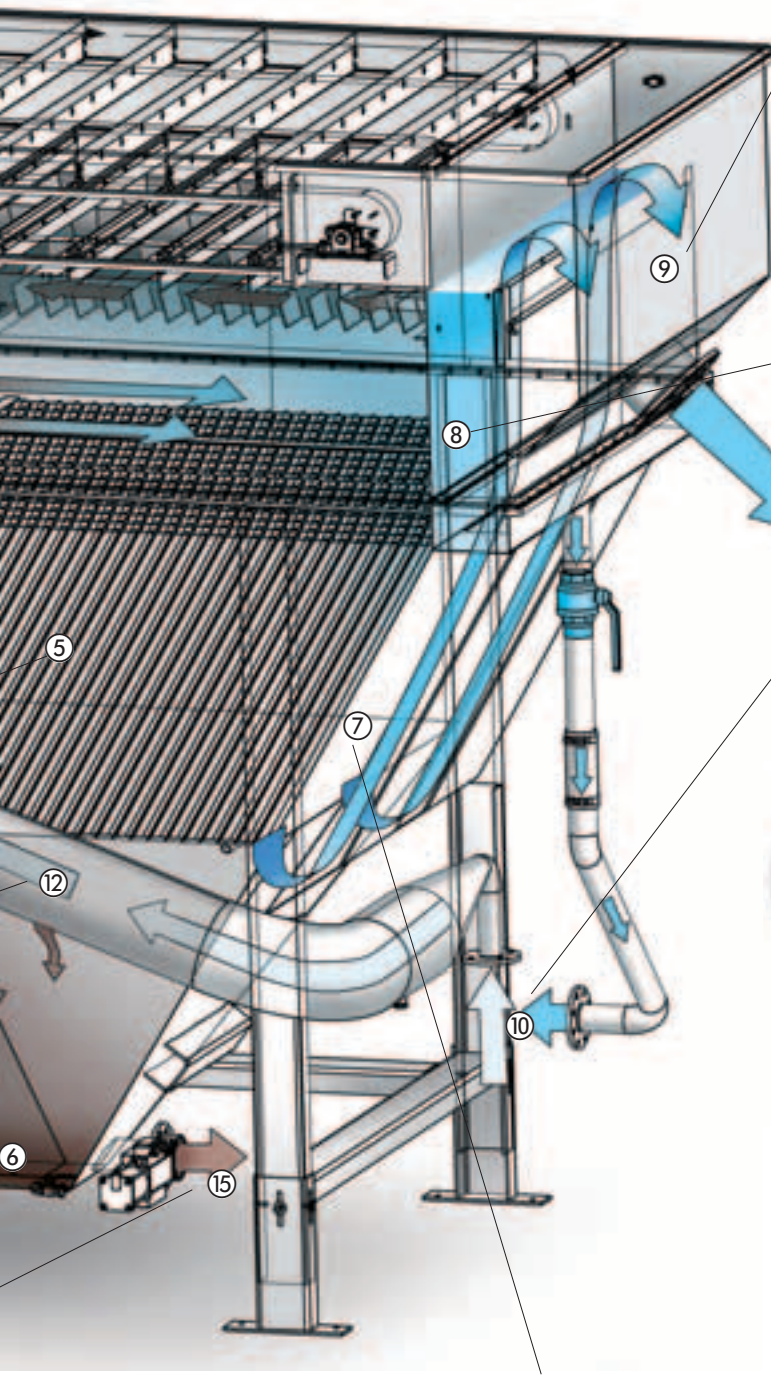

effluent weir

⑨

effluent box

for the supply of pressure water

⑧

centrifugal pump

pumping water and introducing air

⑩

air compressor

effluent channel

g

ew Press RoS 3

Applications

Process water is needed in many production processes as a solvent, for transportation of material, or for cleaning purposes. Water is recirculated and reused for economical and environmental reasons. Grease, oil, fat, floating and suspended solids, and dissolved components need to be separated to provide good and uniform water quality. Recovery of valuable product from the water may be another additional objective.

Where used process water is discharged as wastewater, pre-treatment is often required to prevent toxic or otherwise harmful substances from entering the sewer system. Industrial wastewater treatment can also be performed with the objective to reduce surcharges and fees.

Grease traps or gravity clarifiers are often incapable to achieve sufficient pre-treatment. Various types of flotation processes have been developed, whereof dissolved air flotation with pressure water recirculation has proven most effective.

HUBER Dissolved Air Flotation Units are used for a wide variety of industrial and municipal applications, such as:

- Slaughterhouses
- Meat processing and packing
- Fish processing
- Dairies
- Convenience food production
- Margarine production
- Oil and fat refineries
- Canneries
- Industrial kitchens and canteens
- Fast food providers
- Soap works
- Cosmetics industry
- Textile industry
- Chemical industry
- Petrochemical industry
- Iron and steel industry
- Metal processing
- Galvanizing, electroplating
- Land remediation
- Waste management
- Municipal wastewater treatment

Benefits

HUBER Engineers have developed a particularly effective and efficient DAF system that offers the following benefits:

- Generation of saturated pressure water with a single multi-stage pump; no need for air compressor or pressure tank
- Single, large, non-clogging and easily adjustable pressure release valve
- Coaxial tube feeder for thorough blending and mixing of influent and super-saturated water, and for even distribution of the influent over the entire width of the tank
- High capacity and efficiency on a small footprint due to lamella separator
- Full-automatic operation
- Low maintenance
- Made of stainless steel, pickled in an acid bath for perfect finishing and corrosion protection
- Experience from over a hundred installations

Features

Dissolved air flotation (DAF) is used for the separation of particles, fat, oil and grease from water. Micro-bubbles are generated and attached to the surface of such matter. Due to their increased buoyancy, the aggregates of solids and air bubbles float to the water surface where they form a scum (or flotate) layer that is skimmed off.

Mechanical and chemical pre-treatment

Large solids need to be removed from the influent to prevent clogging of the DAF unit, e.g. with a ROTAMAT® Wedge Wire Screen Ro 2 or a ROTAMAT® Micro Strainer Ro 9.

Precondition for an efficient DAF-process is that the micro-bubbles strongly attach to the solids. Air bubbles have a strong affinity to hydrophobic surfaces , such as oil and fat. In many cases, however, chemical pre-treatment of the influent is necessary to achieve good separation. Precipitation and/or destabilization of colloidal matter by zeta-potential reduction can be achieved by addition of coagulants, such as ferric chloride. In many cases pH-adjustment is required. Flocculation with polymer is often provided for the generation of large and strong flocs. Chemical pre-treatment, where provided, is done in a tubular reactor.

Generation of micro-bubbles and influent feeding

Influent to be treated is blended with so-called "milky water", an emulsion of millions of micro-bubbles per gallon of water, having a diameter of 20 to 40 microns. Such micro-bubbles are generated when the pressure of air-saturated water is suddenly released. This is the same effect as when a soda bottle is opened.

Up to 30 % of the effluent is recirculated for the generation of pressure water. A multi-stage centrifugal pump ⑩ generates a pressure of about 90 psi (0.6 MPa). A compressor ⑪ feeds compressed air to the pump rotor that generates small bubbles with a large surface for quick water saturation. Saturation of the water with air is completed in a tubular reactor ⑫. The saturated water flows through a single pressure release valve ⑬. By using a single large valve, we avoid the problems that are typical for systems employing a multitude of small valves: Clogging of the small valves, uneven distribution of the milky water, and the need for frequent cleaning and difficult re-adjustment of many valves.

The milky water flows into the inner tube of a coaxial tube feeder ⑭, while the influent to be treated enters the outer tube at the opposite end. The milky water flows through slots from the inner into the outer tube where it thoroughly blends with the influent so that all solids get in close contact with a sufficient number of micro-bubbles. The coaxial tube feeder thus ensures optimal mixing of super-saturated water and wastewater from the very beginning. The blended influent flows upward through slots ① of the outer tube into the tank of the dissolved air flotation unit.

Solid / liquid separation

A lamella separator ⑤ is submerged in the tank to achieve very effective solids/liquid separation on a small footprint. The effective clarifier area is the sum of the horizontal areas of all lamellae, and is about ten times the horizontal area of the lamella packet. While the water flows down through the gaps between the inclined lamella plates, buoying flocs rise a short distance and attach at the lower surface of the upper lamella and dense particles sink a short distance to the upper surface of the lower lamella. These lamellae have a special honey-comb surface to retain thin layers until they are grown into thick and compact layers that finally detach from the surface and slide quickly up or down along the lamella surface. Detached light aggregates slide up and rise to the water surface where they form a floating scum layer. Heavy sludge aggregates slide and sink down to the bottom of the tank.

The water, after it has passed down through the lamella separator, rises up again through a channel ⑦ to an effluent box ⑧. The water level in the tank and the immersion depth of the scraper is adjusted by the position of an effluent weir ⑨. Recirculated effluent drains from the effluent box into the pump ⑩.

Scum and sludge thickening and removal

A grate is installed just below the water surface. As the scum layer within the grate becomes thicker and thicker, it is compressed and partially lifted out of the water by its buoyancy. The scum is thus drained and thickened. A chain scraper ② travels over the grating and skims off the top of the scum. It drives the scum over a small ramp and drops it into a scum hopper ③. The scum flows into a container or sludge tank.

Sediment is gravity thickened in the conical sediment hopper ⑥. From time to time an automatic valve ⑮ is opened and the sediment flows into the sludge storage tank where it is blended with the scum. The removed sludge is usually dewatered in a ROTAMAT® Screw Press RoS 3.

Mobile units for on-site testing

Our mobile units permit on-site pilot testing and design of reliable systems. Our compact test units, including the equipment required for chemical pre-treatment of the influent, fit in a 20' container.

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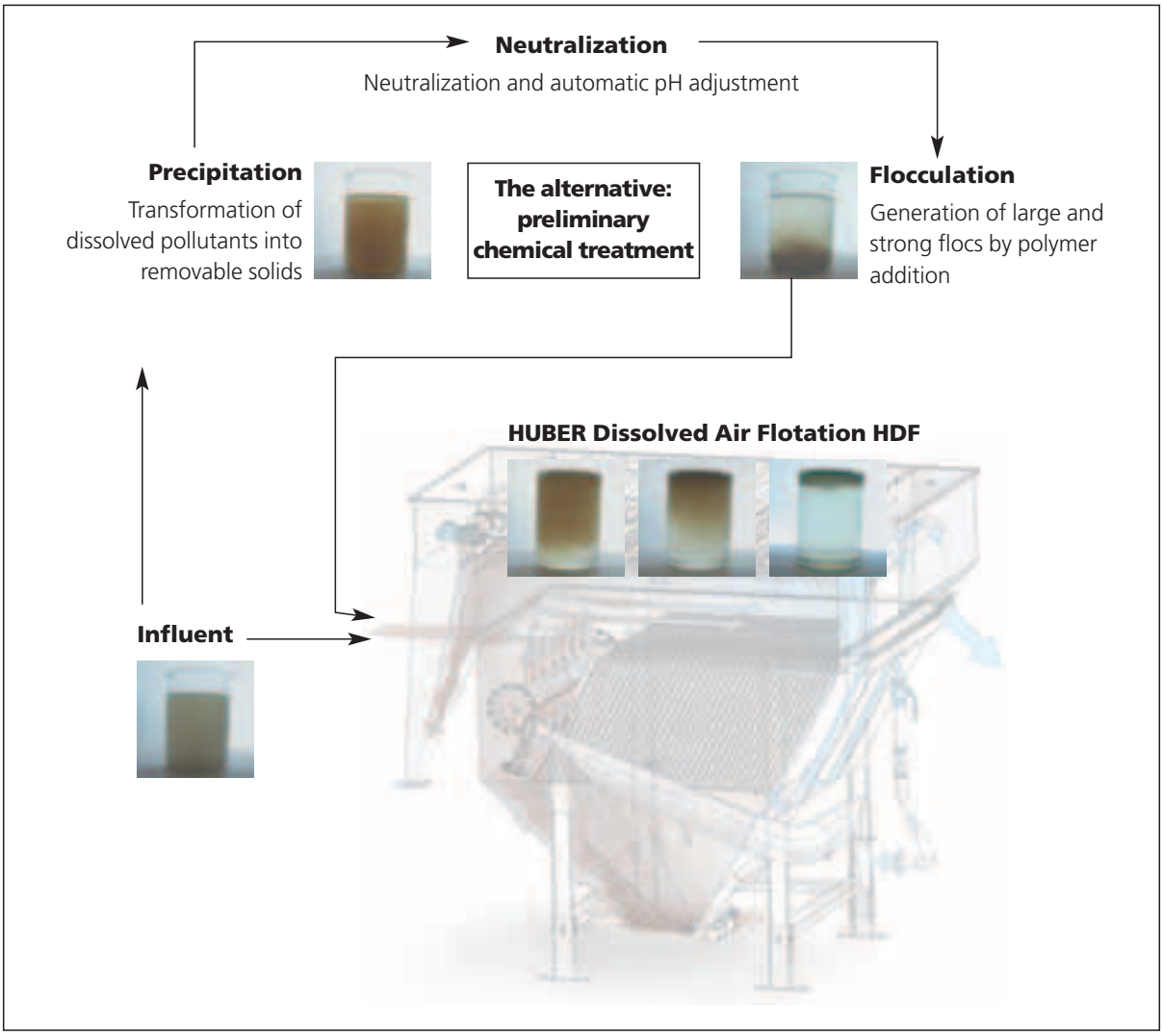
System Approach

We provide complete systems including:

- Mechanical pre-treatment, e.g. screening with a ROTAMAT® Micro Strainer Ro 9 or ROTAMAT® Wedge Wire Screen Ro 2; or screening and grit removal with a ROTAMAT® Complete Plant Ro 5
- Chemical pre-treatment by precipitation, neutralization and flocculation in a tube reactor to improve separation efficiencies, and even remove some dissolved pollutants
- Treatment of the removed scum and sediment: Sludge thickening with ROTAMAT® Sludge Thickener RoS 2; sludge dewatering with ROTAMAT® Screw Press RoS 3
- Additional biological wastewater treatment with HUBER membrane bioreactors including rotating HUBER VRM® membranes

Inproved separation efficiency through chemical pre-treatment



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Subject to technical alteration

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