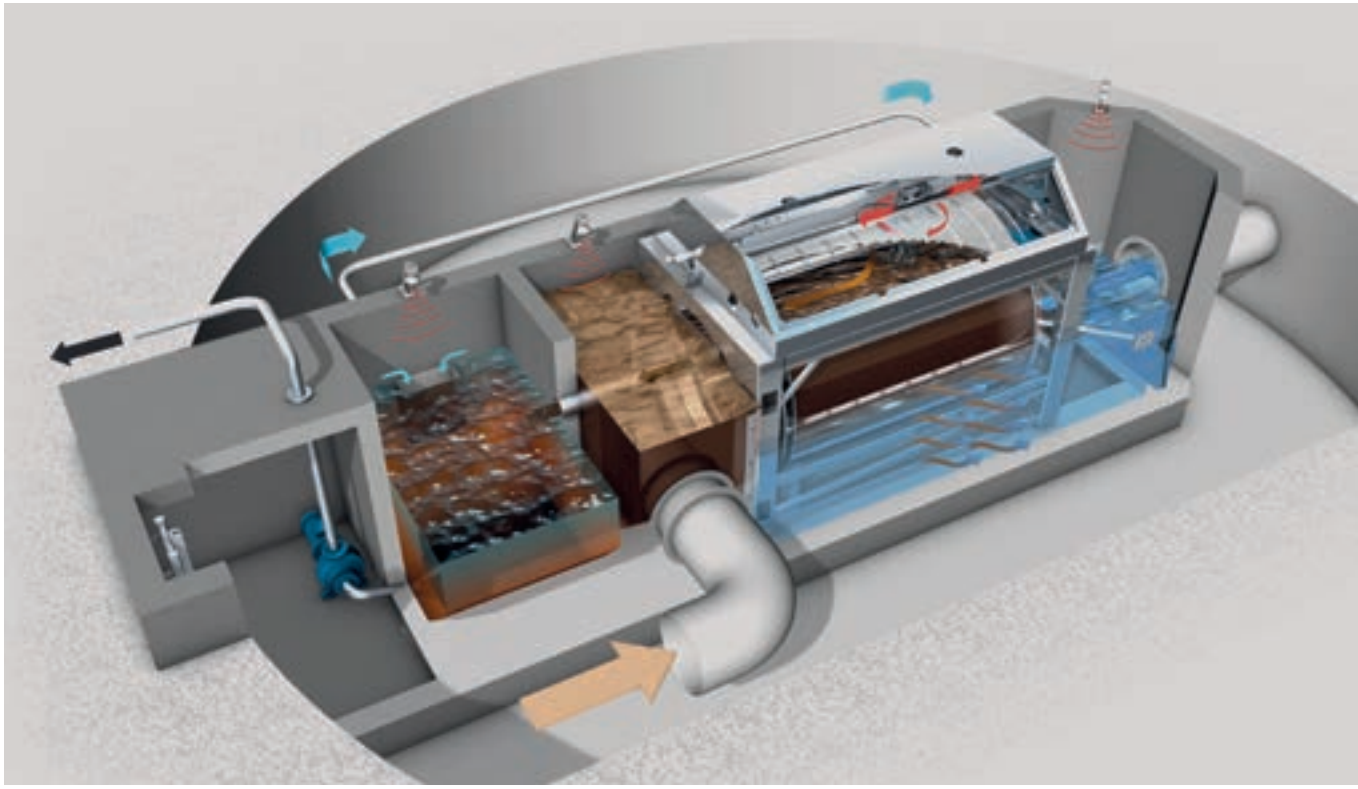
150 YEARS 1872-2022

HUBER TECHNOLOGY
WASTE WATER Solutions



HUBER
CarbonWin® System

System for any application of carbon removal from raw sewage

- Optimization of the energy balance of sewage treatment plants
- Process change from aerobic to anaerobic sludge stabilisation
- Makes primary clarifier unnecessary
- Very high SS and COD reduction rates with fine screening technology
- Small footprint

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The situation

Driven by continuously rising energy costs and technical innovations in the field of sludge digestion and digester gas utilisation, anaerobic sludge treatment is gaining in importance even for smaller sewage treatment plants designed for fewer than 50,000 PE. For an economical and energy-optimized process change from aerobic to anaerobic sludge stabilisation it is indispensable in most cases to have a primary clarifier. It is however expensive to build a primary settling tank, and it is a space-consuming solution.

Our solution – HUBER CarbonWin® system

The HUBER CarbonWin® system offers an interesting and economical possibility to do without a primary settling tank when changing from aerobic to anaerobic sludge stabilisation. To achieve the required carbon load reduction in the biological treatment stage, HUBER uses the fine screening system HUBER Drum Screen LIQUID.

Design and function

The first step of the HUBER CarbonWin® system consists in a mechanical treatment stage with e.g. a 6 mm bar screen and a grit and grease trap. The HUBER Drum Screen LIQUID is installed downstream of the grit trap instead of a primary settling tank and can easily be integrated into existing systems. The screen is installed in a channel or tank and the wastewater flows through the screen drum from inside to outside. Due to the horizontal position of the screen drum a very high maximum possible upstream level is possible and the available filter surface can be utilised optimally (see fig. 1). As the water level upstream of the machine rises, a carpet of screenings is developing on the filter mesh. Due to this layer of screenings leading to a deep bed filtration effect, even particles are retained that are much smaller than the nominal aperture size of the mesh. When the water level upstream of the drum screen reaches the maximum permissible water level, the screen basket is cleaned.

The fine screenings (primary sludge) are removed from the screen surface and accumulate in the internal trough from where they are conveyed by gravity to downstream systems for further treatment (see fig. 2).

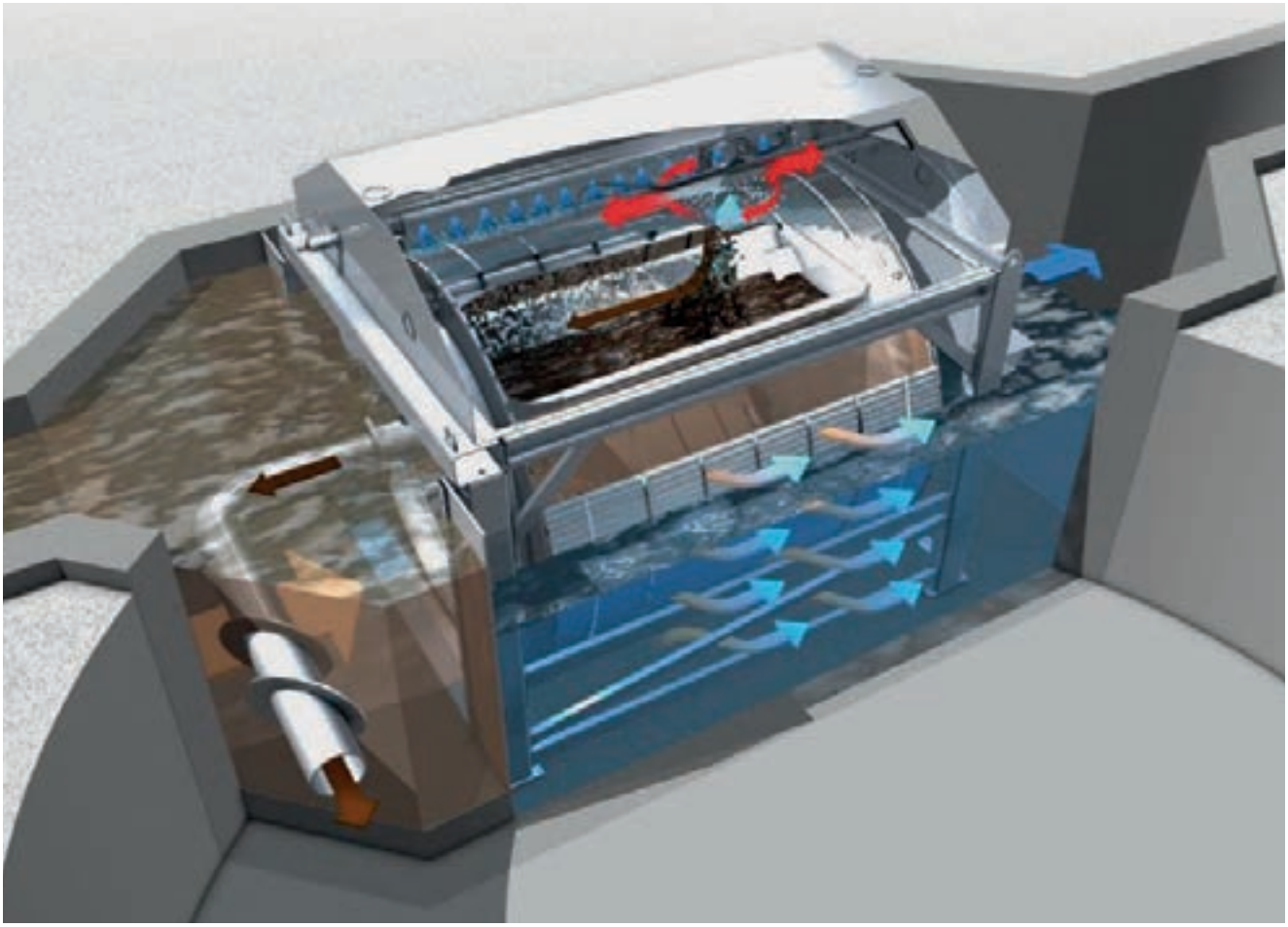

Fig. 1: HUBER Drum Screen LIQUID for maximum reductin of filterable solids and COD.

Process variants of the HUBER CarbonWin® system

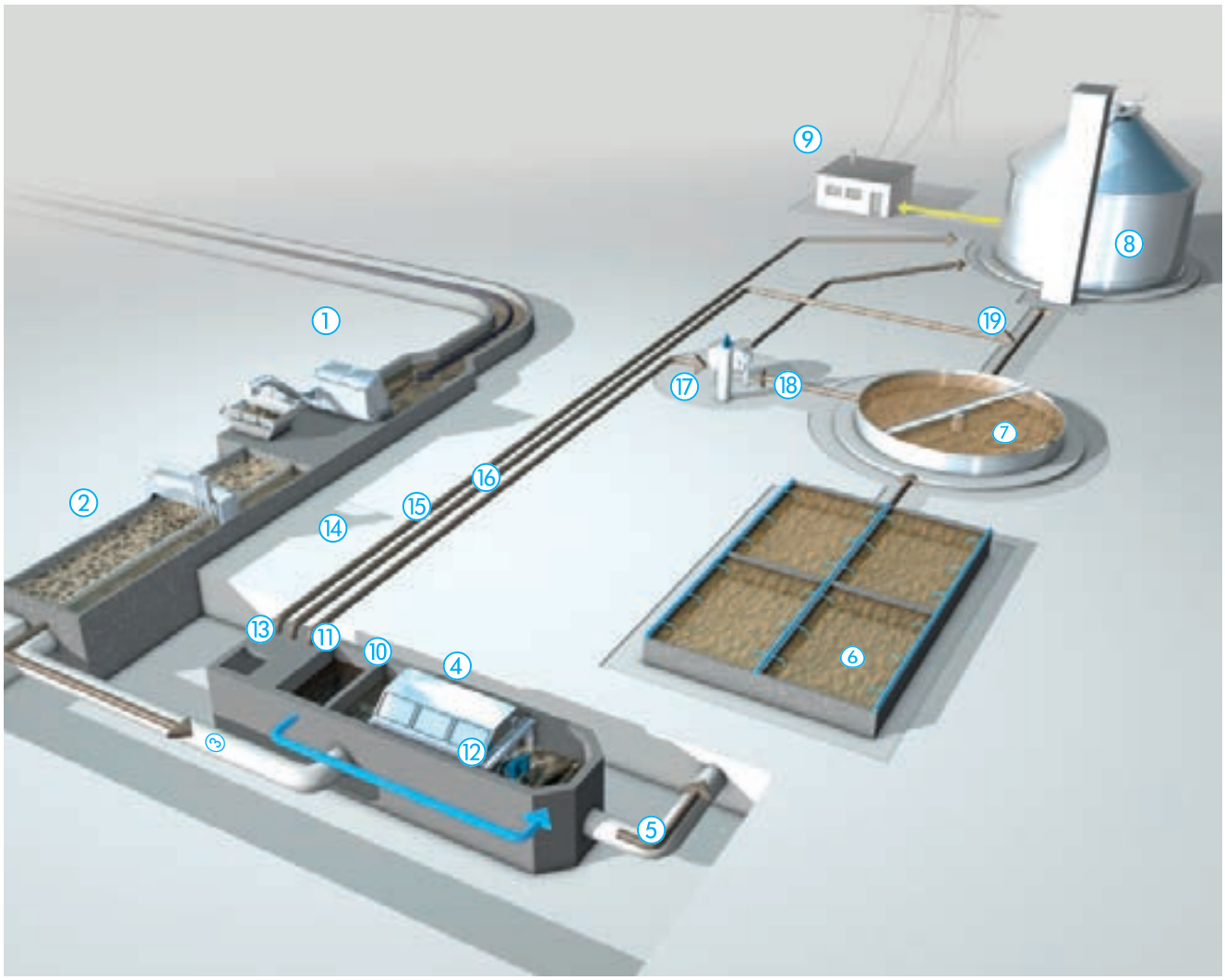

Fig. 2: The HUBER CarbonWin® system with different variants of primary sludge treatment.

① Mechanical pre-treatment
② Grit and grease trap
③ Feed line to HUBER Drum Screen LIQUID
④ HUBER Drum Screen LIQUID
⑤ Outlet of HUBER Drum Screen LIQUID and inlet to aeration tank
⑥ Aeration tank
⑦ Secondary clarifier
⑧ Digester
⑨ Block heat and power plant
⑩ Primary sludge outlet line of HUBER Drum Screen LIQUID
⑪ Continuous thickener
⑫ Clear water from continuous thickener
⑬ Pump cellar
⑭⑮⑯ Thickened primary sludge
⑰ Mechanical sludge thickening via HUBER Disc Thickener S-DISC
⑱ Surplus sludge
⑲ Statically thickened surplus sludge

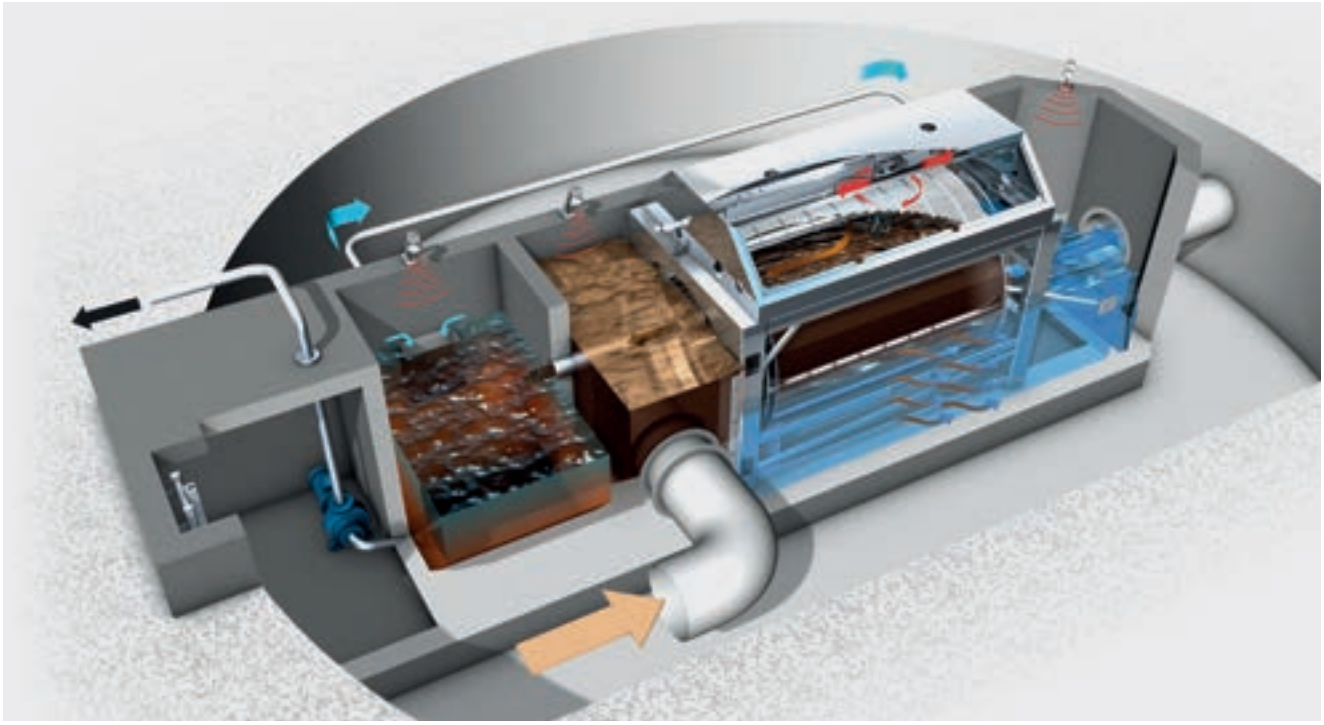

Fig. 3: HUBER Drum Screen LIQUID with continuous thickener for the separated primary sludge.

The HUBER CarbonWin® system offers different process variants for the treatment of the separated primary sludge (see fig. 2).

A very economical variant is to thicken the primary sludge separated by the HUBER Drum Screen LIQUID in a static continuous thickener (fig. 3). Depending on what quality of the primary sludge is required, the sludge can directly be pumped from the continuous thickener into the digester or after further mechanical thickening.

Another effective treatment of primary sludge is homogenisation of the primary sludge with the generated return sludge and further mechanical or static thickening.

River and sea outfall applications

The options shown can also be implemented especially in river-and-sea outfall applications. As these applications frequently do not have a downstream biological treatment stage and partly also do not generate biogas for power generation, the process can be extended with a HUBER sludge dewatering system. It is thus possible to purchase from one source the complete process consisting of a HUBER Complete Plant ROTAMAT® Ro5 with grit/grease trap, downstream HUBER Drum Screen LIQUID, HUBER Disc Thickener S-DISC for sludge thickening and HUBER Screw Press Q-PRESS® for sludge dewatering (see fig. 4).

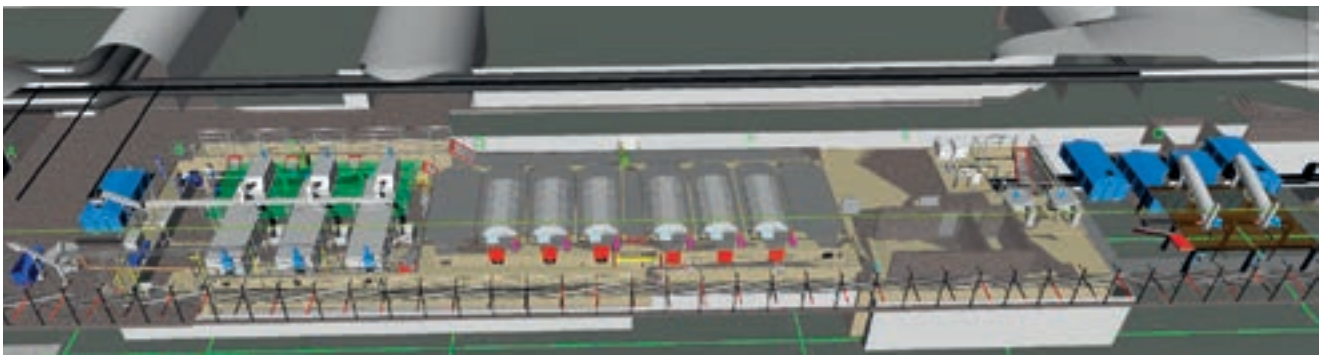

Fig. 4: River and sea outfall with 6 HUBER Drum Screen LIQUID units as replacement for a primary settling tank.

Reduction rates for filterable solids (AFS) and COD

The HUBER Drum Screen LIQUID with stainless steel mesh and apertures of 0.1-0.3 mm achieves an average reduction of filterable solids (AFS) in excess of 80% and a reduction of COD/BOD5 in excess of 40% without the addition of chemicals. This separation efficiency is equivalent to that of a preliminary settling tank with a residence time (according to DWA A-131) of more than two hours.

Table 1 and figure 5 show the sewage treatment plants and the results of full-scale tests carried out there (2015-2017) to determine filterable solids and COD reduction rates. The results could be confirmed under the research project E-Klär (BMBF FKZ 02WER1319F) „Increase gas yield through solids input“.

STP	PE	AFS inlet [mg/l]	AFS outlet [mg/l]	AFS reduction [%]	COD inlet [mg/l]	COD outlet [mg/l]	COD reduction [%]	COD part. [%]	COD diss. [%]	COD part. [mg/l]	COD part. / COD total
1	5000	319	101	69	652	347	46	80	20	522	0,8
2	40000	251	82	67	572	310	46	81	19	463	0,81
3	15000	160	42	74	330	183	45	75	25	248	0,75
4	28000	400	99	75	868	395	54	86	14	746	0,86
5	35000	350	105	70	600	210	65	X	X	X	X
6	15000	100	23	77	330	228	31	50	50	165	0,5
7	120000	317	99	69	700	483	31	75	25	525	0,75
8	8000	137	49	63	231	148	36	X	X	X	X
		254	75	71	535	288	44	75	26	X	0,75

Table 1: Results after three years full-scale operation with a HUBER Drum Screen LIQUID (5,000 – 120,000 PE).

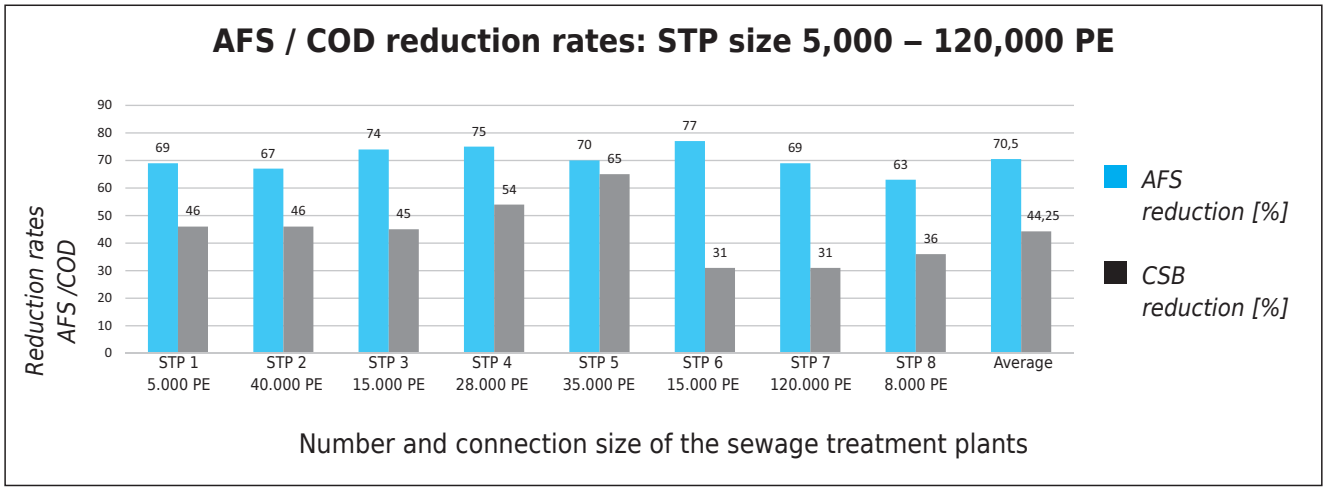

Fig. 5: Reduction rates for AFS and COD - results of research project E-Klär (BMBF FKZ 02WER1319F).

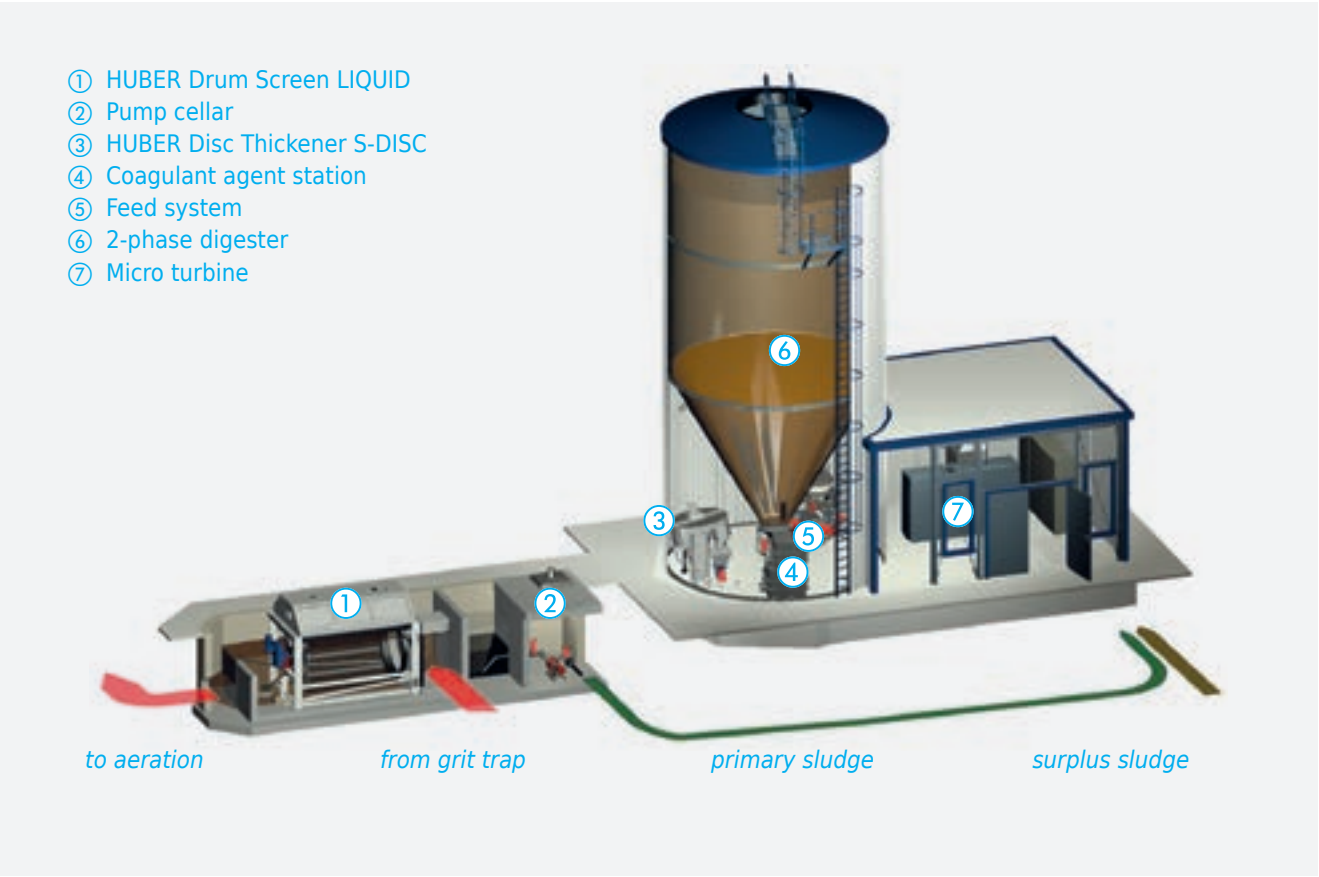

Fig. 6: Process change from aerobic to anaerobic sludge stabilisation with the HUBER CarbonWin® system.

Applications of the HUBER CarbonWin® system

- System change from aerobic to anaerobic sludge stabilisation even for smaller plants up to 15,000 PE
- River and sea outfall applications
- Load reduction in the biological treatment stage for further improved performance (suitable for any size of sewage treatment plant)

Advantages of the HUBER CarbonWin® system

- Requires only a tenth of the space needed for conventional primary settling tanks
- Minimised investment and operating costs
- Suitable to be integrated into existing plants
- Complete solution with adapted HUBER machines from one source

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