Multiphase Pumps for Gas Enrichment and Handling of Liquid-Gas Mixtures in Dissolved Air Flotation Units (DAF)

The EDUR multiphase pumps are unique products with outstanding features compared to conventional centrifugal pumps. The approach consists of using the pumps not only for transport of liquids but also for handling liquid-gas mixtures and as dynamic mixer with high sheering forces.

Multiphase pumps are suitable for various processes. Gassing liquids that also need to be handled reliably do occur in many applications.
Dissolved Air Flotation System (DAF)

A large market segment is the water and waste water treatment by means of dissolved air flotation (DAF) where the multiphase pumps provide the task of air saturation without the use of compressed air, without pressure tanks and without difficult control.

![Diagram of Flotation System with EDUR Multiphase Pump as per VDMA Specification 24430]

When operating EDUR multiphase pumps gases (e.g. carbon dioxide, methane, ozone etc.) are being added to the liquids (e.g. water, waste water, oil-water suspension etc.)

The gases do enter the liquid at the inlet of the pump. The gas bubbles do not implode abruptly, as would be the case with cavitation but are mixed and brought into solution as a result of the increased pressure.

Under such conditions ordinary centrifugal pumps either fail or do not allow reliable operation basically caused by the design of the impeller. At the centre of the impeller an insulating gas cushion is blocking the impeller inlet and interrupts the flow. The characteristic curve is no longer stable even at low gas content. Therefore the EDUR multiphase pumps are equipped with a special open impeller design.

Also the alternative use of a regenerative turbine pump does not cover the advantages of EDUR multiphase pumps. This pump type is limited in operating pressure and in airflow capacity. Gas bubbles smaller than 20 microns do not meet system requirements regarding to the rising speed. Large bubbles caused by free air are disturbing the flotate.

On the other side in case of too small bubbles effect to flotation process an extra excess air device and separation tank have to be installed which increase the investment costs.

Important also is the better tolerance of EDUR multiphase pumps to solids in the recycle flow which is unavoidable in the flotation process.
Energy-Efficiency

Power comparison* of EDUR multiphase pumps to side channel pump and regenerative turbine pump

Benefits and features of EDUR multiphase pumps at a glance

- Reliable gas enrichment due to special open impeller design without axial thrust.
- Successful transport of gas content up to 30% depending on selected pump model for high continuous steady substances removal efficiency.
- Up to 100% saturation by gas-charging of liquids for improving the yield of recyclable fractions.
- Micro bubble size between 30-50 microns for ideal cleaning result.
- Low wear due to tolerance to solids in the flow.
- Lower investment costs and high operational reliability by reduction of system components as normally used in conventional conceptions due to direct gas-charging into the suction pipe line. No compressors, pressure tanks, pumps, control system or valves are necessary.
- Reduced maintenance and service due to compact design.
- Significant energy savings following retrofitting of existing plants.
- 24 hours supply of spare parts from stock from the EDUR facility in Kiel/Germany.
- The high efficiency improves the energy balance and reduces operating costs.

* pressure (p) = 7 bar  temperature (t) = 20°C  density (ρ) = 1 kg/dm³  viscosity (ν) = 1 mm²/s
Some typical applications for EDUR multiphase pumps

- Dissolved air flotation with a pressure saturation system acc. to VDMA Specification 24430 Edition March 2010
- Aeration (Bioreactors)
- Ozonation
- Oil-water separation
- Elimination of lime in the paper industry
- Mineral processing (like copper extraction)
- And many others...

Advantages

- High Energy-Efficiency
- Technical Superiority
- Process Reliability
- Easy Installation
- Easy Maintenance
- Range of use
  - operating pressure up to 40 bar
  - temperature -40° C up to +140° C
  - viscosity up to 115 mm²/s