

INTENSE OXIDATION

REMOVAL OF XENOBIOTIC SUBSTANCES

The use of chemicals in coagulation and flocculation in solids-liquid separation generate much sludge, and are costly in operation. In some instances, these chemicals could even hinder the treatment process. Therefore, the water industry has been seeking for non-chemical treatment processes.

The NORLEX Intense Oxidation® system is one such non-chemical systems that uses air (or any gas) to perform solid-liquid separation, thereby reducing the total suspended solids (by more than 99%). This system can reduce the organic loading considerably in the waste stream. Some typical performances are COD > 80% and BOD > 50%. This helps in subsequent treatment of the waste stream where less chemicals/oxidants are needed. The Intense Oxidation® system can easily be coupled with UV, H₂O₂ and ultrasonic for Advanced Oxidation Process for the removal of trace recalcitrant organic pollutants from the waste stream.

One specific target area for the Intense Oxidation® system is the creation of nanobubble enhanced ozonated water, which can be used as an environmentally sound and chemical free biocide and disinfection agent.

Customer Benefits

- Decreased or no use of chemicals
- Less sludge formation and handling
- Low cost of ownership and high return on investment

Technology Features & Specifications

The production of fine bubbles of gas in the liquid medium greatly increases the surface area of the gas bubbles for enhanced mass transfer to the liquid medium. The presence of similar electrical charges on the extremely fine gas bubbles prevent it from coalescence and reduce its rising velocity in

the liquid medium. This in turn increases the residence time in the reactor.

As the surface area of the bubble is inversely proportional to the diameter, this increases the surface area of the gas in liquid emulsion, increasing the mass transfer co-efficient. The volumetric mass transfer co-efficient can increase 5 to 6 folds by this technique. As the bubble slowly rise in the liquid medium, the high surface area of the bubble transfers the gas to the surrounding liquid. The increased mass transfer of the gas to the liquid medium reduces the size/volume of the gas bubble increasing the pressure of the gas (Laplace pressure) within the gas bubble. The reducing size of the bubble increases the surface charge of the bubble increasing its Zeta potential ζ . As the bubble slowly rise and reduce in size due to mass transfer, the pressure inside the bubble increase to an extent that that it bursts. This bursting of micron size bubbles due to the increased pressure is reported to produce extreme heat, radicals and nano-bubbles.

The production of radicals' aid in oxidation and disinfection. The core of the Intense Oxidation® system is the Nanobubble Generator, which produces fine bubbles in the range of 60nm – 25 μ m.

Potential Applications

This technology is applicable in the following industries:

Water and waste water treatment for reuse and recovery. Gas liquid mixing applications. Cooling Tower water treatment. Oil water separation. Fresh produce washing (meat, fish, fruits and vegetable washing). In drip irrigation for aerating the soils. In aquaculture and fish farms for increased DO and organic removal, laundry for washing and water reuse. Membrane pretreatment and membrane fouling control. Ozone washing systems for food industry.