AquaCritox® SC
Hydrothermal oxidation of resilient and hard-to-treat COD in spent caustic
treatment. COD reduction up to 99.9% for sulphidic spent caustic can be achieved. Organic and sulphur-containing compounds are oxidised to form biodegradable organics, carbon dioxide, sulphate and water. Together with the remaining free sodium hydroxide in the spent caustic, carbon dioxide forms sodium carbonate.

The Technology – Tubular Reactor Design

Conventional wet oxidation and wet air oxidation processes employ bubble column vessel reactors. In contrast, the
centrepiece of the AquaCritox® SC technology is the tubular reactor. This design offers many benefits, including easily withstanding high pressures and temperatures, elimination of back-mixing, and therefore increased reaction kinetics, very short reaction times and improved safety.

Due to the novel multi-stage design of the AquaCritox® tubular reactor, the injection of both oxygen and quench water can be continuously optimised and monitored giving complete control of the oxidation reaction at every stage of the process. The oxygen supply is automatically adjusted to the oxygen demand of the feed by sophisticated process control, allowing the process oxidant consumption to be near stoichiometric.

The use of pure oxygen at elevated pressure offers dramatically higher oxygen transfer rates when compared with conventional processes using air as oxidant. Achieving higher temperatures in the reactor results in a rapid and efficient oxidation reaction and a short retention time in the reactor. As a result, small reactor volumes and therefore small plant footprints can be realised. The process produces almost no off gas. The innovative valveless pressure control system eliminates the use of control valves which are prone to erosion, malfunction and high maintenance demand.

The oxidation reaction is exothermic; to benefit from this effect, heat recovery from the reactor effluent is used to preheat the feed flow, optimising the energy demand of the system. For high COD effluents, the energy released during oxidation can be sufficient to allow operation without the need for continuous external heating.

The AquaCritox® SC system is supplied in factory-tested pre-assembled units, minimising on-site installation and commissioning periods. The system is fully automated, allowing safe and reliable operation with minimal intervention. Combining all benefits, the AquaCritox® SC technology addresses the shortcomings of conventional oxidation processes and represents the next generation of wet oxidation.

**Laboratory Testing and Demonstration Unit**

In our facilities in Cork, Ireland, we currently operate laboratory-scale AquaCritox® test units. Laboratory testing may be planned as a standalone ac-
Oxidation of resilient COD not amenable and harmful to biological treatment allows disposal of treated spent caustic to a conventional wastewater treatment plant or to the sewer.

The capability to work at high temperatures and pressures ensures a fast and far-reaching oxidation of COD. For sulphidic spent caustics, a COD reduction up to 99.9% can be achieved.

The tubular reactor design and the greatly improved oxygen transfer rate result in a small reactor volume, a reduced plant footprint and a thinner wall thickness.

Optimised usage of oxygen and oxygen supply enables operation at less than 120 % stochiometric oxygen demand with minimised off gas production.

Low maintenance due to innovative pressure relief system without control valves.

Preassembled skid design and factory-tested equipment ensures quick site installation and a short commissioning period.

Reliable and efficient process control by a fully automated system, multiple oxygen injection points, and in-line quench in the tubular reactor.

Laboatory testing as precursor to a full scale plant is possible and a mobile and containerised demonstration unit is available for on-site pilot scale testing.

Comparison with conventional wet air oxidation

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Benefits

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Conventional System

- Treatment up to 260 °C at 80 bars
- Bubble column reactor
- Air as oxidant typically requiring 250 – 300 % stochiometric oxygen demand
- Erosion prone control valve as pressure release system
- Up to 90 minutes retention time

AquaCritox® SC

- Treatment up to 300 °C at 165 bars
- Compact multi-stage tubular reactor
- Oxygen as oxidant offering 120 % stochiometric oxygen demand
- Erosion resistant valveless pressure release system
- 5 to 20 minutes retention time

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