Eka Engineering: The HP-A® ClO_2 process

A proprietary technology which has several advantages over earlier atmospheric chlorine dioxide (ClO_2) processes.

The chemistry

Sodium chlorate ($NaClO_3$) reacts in a two-stage reactor system with a proprietary grade of hydrogen peroxide (H_2O_2) in sulfuric acid (H_2SO_4) solution to produce ClO_2. The reaction by-products are oxygen (O_2) and spent acid containing sodium bisulfate ($NaHSO_4$).

The HP-A® process offers the customer the opportunity to expand ClO_2 production capacity with the existing generator. The older atmospheric ClO_2 processes use other reducing agents as sulfur dioxide (SO_2) and sodium chloride (NaCl) form chlorine gas (Cl_2) as a by-product.

Benefits

The HP-A® process is an ideal choice for pulp mills that look for the below specifications:

- Additional capacity from existing units (Mathison)
- Low investment cost
- Low capital conversion/ expansion
- Easy to operate
- Very low production of Cl_2 as a by-product

Main reaction

Our patented HP-A® process produces chlorine dioxide (ClO_2) by reducing sodium chlorate ($NaClO_3$) with hydrogen peroxide (H_2O_2) in a sulfuric acid (H_2SO_4) solution, according to the following equation:

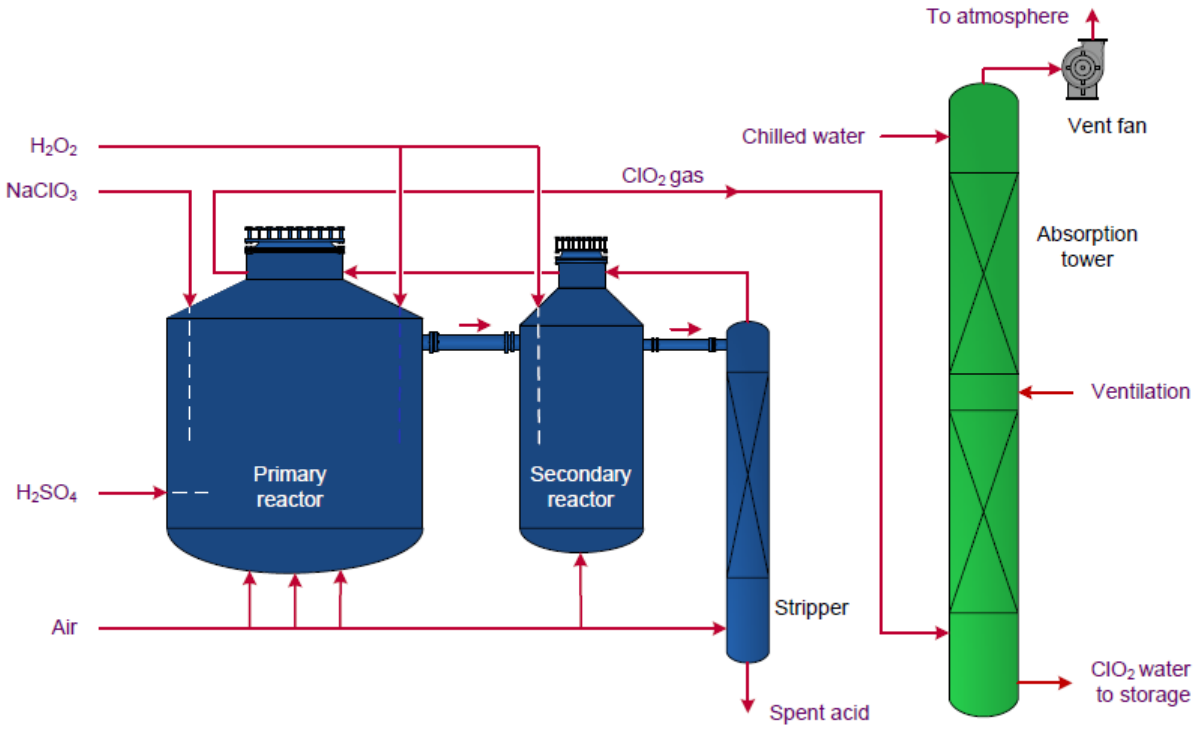
$$2\ NaClO_3 + H_2O_2 + 2\ H_2SO_4 \longrightarrow 2\ ClO_2 + 2\ NaHSO_4 + 2\ H_2O + O_2$$

Byproducts of this reaction are oxygen (O_2) and spent acid containing sodium sulfate ($NaHSO_4$): oxygen is released to the atmosphere and the acidic sodium sulfate is reused in other plant processes. Using hydrogen peroxide as a reducing agent brings a number of advantages, including higher capacity for existing generators, a more user friendly reducing which produces the purest chlorine dioxide available.

HP-A® overview

You normally need the following systems in association with the chlorine dioxide (ClO_2) equipment:

- Chlorate, acid and reducing agent storage and delivery
- ClO_2 product storage and delivery
- Chilled water supply



1. In the HP-A® process, reactants (sodium chlorate, hydrogen peroxide and sulfuric acid) are fed to a reactor system, consisting of the primary and secondary generators, and a stripper unit:
2. Heat used to balance the reaction derives from the dilution of the sulfuric acid
3. Large quantities of air are introduced into the generator for mixing and keeping the ClO_2 concentration (in the gas phase) within the safe operating range
4. Liquor from the second generator overflows to a stripper and remaining ClO_2 is removed before the spent acid solution is discharged from the system
5. Liquor from the primary generator overflows into the secondary generator where the ClO_2 reduction process continues
6. Gas is transferred from the reactors and strippers to the absorption tower where chlorine dioxide gas is absorbed, then transferred to storage tanks
7. Tail gas exiting the absorption tower is further scrubbed to avoid emissions
8. An emergency stop interlock system is in place that will shut down the process should pressure, temperature or flow parameters operate out of range

Get in touch!

Nouryon's Eka Engineering extensive experience has enabled Nouryon to become experts in the design and installation of customized systems. Learn more about our services and contact our technical experts for further information!

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