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Good Vibrations

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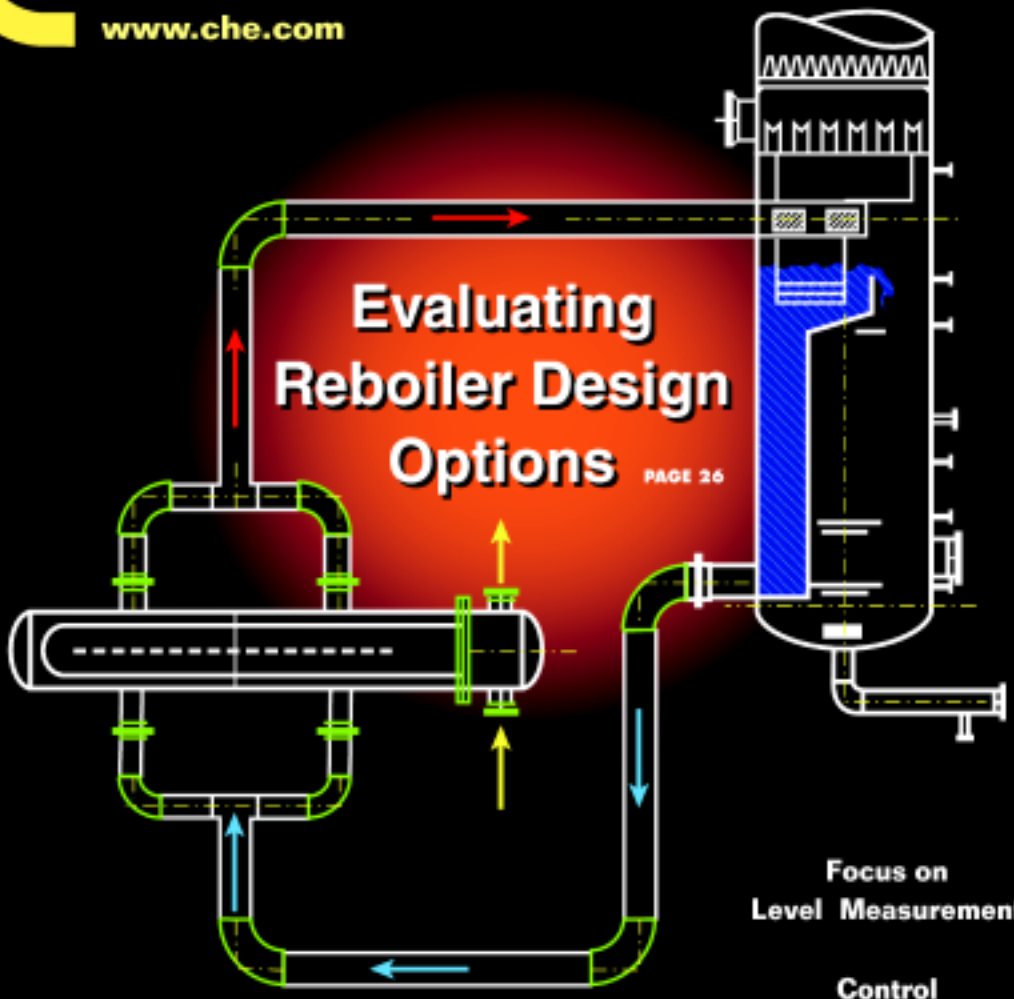

Evaluating Reboiler Design Options

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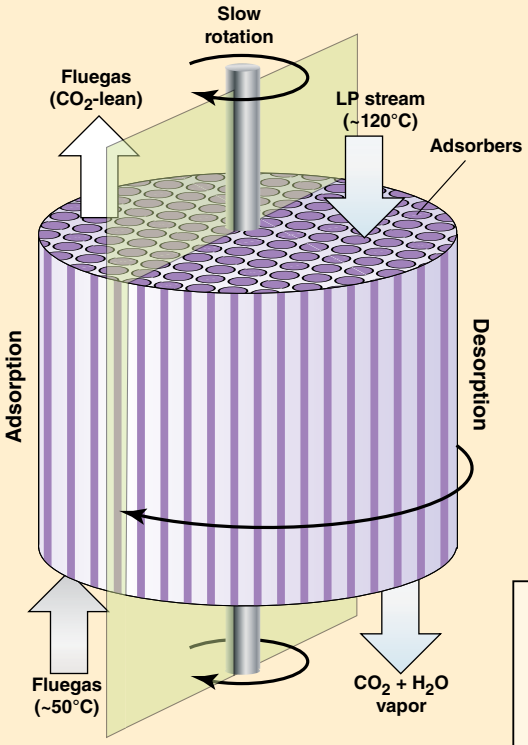
This TSA process promises to slash costs for CO_2 separation

A post-combustion process capable of separating CO_2 from fluegas at one-third the cost of alternative separation processes has been developed by Inventys Thermal Technologies Inc. (Burnaby, B.C., Canada; www.inventysinc.com). Dubbed VeloxoTherm (VX), the patented process is now being tested together with a consortium of industrial partners — Mast Carbon International, BP, Suncore Energy Services and Doosan Babcock Energy — in a $1.9-million project funded by Sustainable Development Technology Canada (Ottawa).

VX is an intensified temperature-swing adsorption (TSA) process that features structured, proprietary adsorbers (photo) instead of beaded adsorbents used in conventional packed-bed TSA processes. As a result, VX delivers enhanced heat and mass transfer at significantly lower pressure drop, says Darryl Wolanski, vice president of business development at Inventys. "The adsorption kinetics of the VX process is very fast — on the order of minutes to complete an entire adsorption-regeneration cycle, explains Wolanski. And because the regeneration temperature is lower than that required by conventional amine-based absorbants, energy penalties are also reduced — less than 1.5 GJ/m.t. of CO_2 versus approximately 4 GJ/m.t. to regenerate liquid solvents, he says.

In VeloxoTherm, the structured adsorbers are mounted inside a cylindrical vessel on a cassette that slowly rotates (diagram). The vessel is divided into two zones. Hot fluegas enters the first zone where CO_2 is adsorbed. As the cassette rotates, the loaded adsorbers



enter the second zone where low-pressure steam is used to release the CO_2, which can then be separated by condensing the water vapor. Because the operations occur at low (near ambient) pressure, a simple sealing mechanism can be used to separate the two zones, says Wolanski.

The company has demonstrated the technology in a bench-top unit, which is capable of processing several hundred liters of gas per minute. Upon completion of the SDTC project in Fall 2012, Inventys will be deploying a 100 m.t./d VX process designed for process heaters in chemical plants and petroleum refineries. The company is targeting applications whereby the recovered CO_2 can be compressed for enhanced oil recovery or for CCS (carbon capture storage) projects.

Compressor offers improved efficiency with smaller footprint

A new rotary gas compressor technology designed by OsComp Systems (Cambridge, Mass.; www.oscomp-systems.com) incorporates advantages of reciprocating piston pumps into a hybrid rotor compressor. With a carefully optimized interior geometry, the new compressor can achieve near-isothermal compression with a large-volume liquid injection system for internal cooling. The compressor offers the sealing and efficiency of an API-618 standard piston compressor, says OsComp CEO Pedro Santos, but with the cooling effectiveness observed with a liquid-flooded, rotary-screw compressor.

"We were motivated to revolutionize technology in the area of natural gas compression," Santos says. He and his partners tinkered with the compressor design for several years, and tested many ideas before arriving at the final design, on which they have applied for three patents.

In addition to the optimized interior ge-

(*Continues on p. 12*)

Water toxin biosensor

A new system for detecting chemical or biological contaminants in water works by analyzing the swimming pathways of one-celled protozoa that are introduced into the water sample. Alterations of the protozoa's swimming mechanics, relative to a clean water control, indicate the presence of toxins. The Swimming Behavioral Spectrophotometer (SBS) digitally records the movements of microscopic protozoa in water samples, then analyzes the motion with custom software that quickly evaluates 50 features of their swimming paths in three dimensions.

The system, invented by Woods Hole Oceanographic Institute (Woods Hole, Mass.; www.whoi.org) biologist Scott Gallager, allows virtually instantaneous feedback for only $1–2 per test. Existing water tests require 24–72 h for results and cost $50–250 per test. SBS has been licensed by Petrel Biosensors Inc. (Woods Hole, Mass.; www.petrelbiosensors.com), which is developing the system for commercial applications, such as monitoring industrial wastewater discharge, evaluating drinking water quality, and testing water sources associated with hydraulic fracturing (fracking) in the oil-and-gas industry.

Note: For more information, circle the 3-digit number on p. 58, or use the website designation.