Top 10 Technologies: Environmental Controls â€” Emission Reduction Inside & Outside

Valves are generally the largest source of fugitive emissions inside industrial facilities and can be the most difficult to contain to meet current emission requirements. The packaging used to reduce these emissions has always been limited by the friction that it exerts on the stem, which can hamper valve cycling.

Locking Up Fugitive Emissions After experimenting with several packaging materials and configurations, David Reeves of Chevron Texaco found that he could drastically reduce fugitive valve emissions by using a packing set that was denser in the outer rings, and softer and flexible in the middle. Using these results, Garlock engineered a modified version of Reeves' packing set, which consisted of four rings of Material B surrounding an inner ring of Material A in a two-one-two configuration. Material A consists of a proprietary yarn contained by a 0.004-in. (dia.) Inconel™ filament jacket that makes the braid non-scoring. Material B is braided from flexible reinforced graphite fiber yarns, high-purity graphite filament yarns and a zinc corrosion inhibitor, giving it greater tensile strength, low friction and excellent heat dissipation.

Tests showed that this system reduces emissions to below 100 PPM, spurring Garlock to release the 212 ultra-low emissions (ULE) compression packing set earlier this year.

Solving Carbon Capture The costs associated with first-generation carbon capture are high. According to a recent study at Harvard's Belfer Center, the price of energy could double at a coal-powered plant that captures CO2 emissions. However, the study also projects that the price of carbon capture could sharply decrease as the process is tested and refined, eventually becoming efficient enough to be a viable form of greenhouse gas reduction.

Dow and Alstom are in the final stages of construction at a carbon capture pilot plant in West Virginia, where they will perform large-scale tests on an advanced amine-based scrubbing technology designed to capture CO2 emissions from coal power plants and other industrial sources. After coal is burned in a boiler to produce steam, flue gas makes contact with a packed column where amine strips the CO2, resulting in a gas that consists mostly of nitrogen and water vapor. The CO2 in the amine is then boiled off in a separate column, compressed to a liquid state and stored.

While this type of CO2 scrubbing technology has been proven in natural gas and syngas purification, it is hoped that advances in three critical areas will significantly

improve the efficiency of the CO2 capture process:

- Solvent optimization using advanced amine solvents vs. conventional amine solvents.
- Process optimization that uses proprietary technologies or advanced techniques to integrate the process to the power plant.
- Component optimization to improve cost and performance for commercial-scale power plant applications.

As a result, Dow and Alstom expect that the system will have lower energy consumption, higher oxygen and trace contaminant tolerance, and lower solvent degradation than previous amine-based systems.

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