Active Balancing for Carbon Capture Intensified Solutions

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Abstract

Once controversial, CO2 carbon capture, utilization, and storage (CCUS) systems are being developed to take their place in the portfolio of technologies required to meet a net-zero emissions scenario by 2050. The recent global issue of billions in funding for CCUS projects, together with recent ambitions from developers to add capture capacity (an additional 115 Mt CO2 per year by 2030) are driving the development of CCUS projects with high negative carbon footprints. Reliability and cost for CCUS solutions to achieve a negative carbon competitive edgeare key, and scaling of design concepts must now be done to convert demonstration units to full-scale production.

Process intensification is defined as a set of innovative principles applied in process and equipment design that can bring significant benefits in terms of lowering the capital and operating expenses of any chemical process. Applied to CCUS, rotating packed bed (RPB) systems have great potential as the design fundamental is existent as far back as the 1930s, but are still undergoing the challenges to scale up to an industrial scale. For context, a power plant with a single generator with a capacity of 100 MW of electricity, generates 2,450 t of CO2 per day. Currently, there are only publications of RPB units for CCUS applications for treating single digit-tons of CO2 per day from post-combustion industrial flue gases.

Why have RPBs not been able yet to answer this capacity demand? The answer probably lies on the basis of the rotary and precision machinery design, which includes management of unbalanced forces that cause vibration, which in turn degrades robustness and increases maintenance cost.

In this talk we will address what we believe is an efficient strategy to monitor and control unbalanced forces to enable RPB systems to achieve cost-effective long life and 24/7 operation.

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