**IEAGHG Information Paper: 2017-IP29; Intensification of $CO_2$ Stripping from Amine Solutions by Ultrasonic**

Post-combustion by chemical absorption is one of the most advanced capture technologies. Continuous research on new configurations and new solvents are of high interest and new advances on faster absorption or cheaper regeneration are typically linked to the use of primary and tertiary amines respectively. Additionally, the use of mixtures of both primary and tertiary amines aims to obtain a cost-effective compromise between absorption and desorption.

Regarding the reduction of desorption costs, the University of Tel-Tek investigated on the use of ultrasound to achieve desorption of $CO_2$ from rich amine solutions at lower temperature than the traditional process. Solutions were prepared by bubbling $CO_2$ and the desorption was done by two steps, heating and using ultrasound. The set-up was considered low-cost, with a quick procedure and obtaining repeatable results.

In their study, they used loaded 30 and 70wt.-% MEA, and 50wt.-% MDEA solutions at ambient pressure on a small semi-batch rig (for further description, see link below). The parameters tested were:

- Addition of ultrasound treatment to the traditional heating
- Ultrasonic intensity
- Rich solution properties: temperature, $CO_2$ loading and amine concentration

The results on 50wt.-% MDEA solutions claimed the desorption of 3 times more $CO_2$ during the combined heating at 60 $^oC$ +ultrasonic treatments, compared to the case where only heating up to 60 $^oC$ was used. Additionally, after a second heating period up to 64 $^oC$, the desorption differences between heating+ultrasonic+heating and heating+heating were even more than 50 times higher. The authors declared that the same effect was observed on MEA solutions.

Increase of the ultrasonic intensity was favourable and, as expected, the desorption was higher as the temperature increased. Additionally, higher loading showed also higher desorption rate. In terms of amine concentration, other factors were influencing the results. The viscosity is higher as higher the amine concentration is, what made difficult the release of bubbles of $CO_2$ across the solution. 30wt.-% MEA solutions showed higher desorption than 70wt.-% MEA solutions. However, more concentrated solutions have a higher $CO_2$ capacity and the net desorption of those would be higher. Moreover, the authors concluded with recommendations on optimization of ultrasonic treatment to avoid an added costly heating.

This study opens a new pathway to cut down stripping costs, apart from the use of new solvents and process configurations. Although results at higher scale would clarify the quantitative effect of ultrasound and the cost in larger facilities, this study showed that the stripping at lower temperature was enhanced with the use of ultrasound.

For more information:
Ying et al. (2014), *Intensification of $CO_2$ Stripping from Amine Solutions by Ultrasonic,* Energy Procedia 63 (781-786) (http://www.sciencedirect.com/science/article/pii/S187661021401902X)

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