MASTER – management of CO2 capture solvents targeting cost and environmental impact reduction

Publieke samenvatting / Public summary

Aanleiding

AVR-Duiven will start commissioning and operation of their full-scale CO2 capture plant in June and July 2019, respectively. The project in AVR-Duiven is the world first full-scale CO2 capture operation in connection with a Waste to Energy (WtE) plant and is therefore a flagship for the industry. The plant provides opportunity for addressing open operational questions leading to de-risking and fast-tracking the deployment of CO2 capture in the WtE industry. The solvent used is an aqueous solution of 30wt% monoethanolamine, which is a first generation solvent. Nonetheless, current knowledge on solvent degradation in long-term operational campaigns is rather limited, particularly in connection with WtE flue gas. As a consequence, it is not possible to a priori establish a solvent management strategy. Instead, AVR has opted to operate the first campaign, monitor the solvent quality, the nature and amount of degradation products formed and, based on this information, decide on an efficient solvent management strategy to be applied in future campaigns (from 2020 on). This investigation is performed in the MASTER project.

Doelstelling

MASTER aims at identifying the most cost-effective operational- and solvent management strategies for the CO2 capture plant of AVR in Duiven. This is done by optimizing the operational parameters of the

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plant, as well as monitoring the solvent quality in a long-term operation and proposing technologies to minimize solvent degradation. By minimizing solvent degradation, the plant operational costs and environmental impacts will also be reduced. The lessons learned will be of value for amine based CO2 capture systems. Solvent degradation is connected to the nature of the solvent, the process and process conditions, and quality of the flue gas itself. The use of MEA in a WtE plant is novel, and therefore there are important knowledge gaps that must be closed before defining the most effective solvent management strategy. Within MASTER, the data and degraded solvent produced during the first campaign of the AVR plant in Duiven will be used to close these gaps. A technology for lowering the solvent degradation rate will be demonstrated, based on in-situ metal (metals are directly linked to the root cause of solvent degradation) removal combined with efficient solvent reclaiming.

Korte omschrijving

MASTER activities are divided into 3 work-packages, with the following focus: WP1 – Monitoring and optimizing the plant operation: advanced monitoring tools will be deployed, and the obtained data will be used to simulate the CO2 capture process. Various operational conditions will be investigated, and the optimal conditions to lower the CO2 production costs will be determined; WP2 – Efficient solvent management strategy: by assessing the solvent degradation rate, and developing and demonstrating degradation mitigation techniques, an efficient solvent management strategy will be determined; WP3 – Management and dissemination: organize project meetings, follow-up on the results, disseminate the results in workshops with other Dutch WtE plant owners.

Resultaat

MASTER will minimize the costs of CO2 capture and lower possible environmental impact at AVR Duiven, by proposing a two-folded approach. On one hand, the plant operational conditions will be optimized, lowering the utilities consumption. On the other hand, the most cost-effective solvent management

strategy will be determined, by demonstrating mitigation technologies with AVR's degraded solvent. This will reduce solvent losses due to degradation, and therefore lower the costs and environmental impacts associated with solvent replacement. AVR Duiven will provide CO2 to the greenhouse market. MASTER will help lowering the cost of CO2 production, thus accelerating the implementation of CCU projects. MASTER's impact is therefore extended from Duiven to the entire WtE sector, globally.

De data in deze applicatie is afkomstig van de Rijksdienst voor Ondernemend Nederland (RVO) en wordt in samenwerking met de Topsector Energie ontsloten.
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