GREEN FORMALIN

Feasibility study

Publieke verslaglegging

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Decision Analysis
Resilience
Energy Leadership

1. SUMMARY

300 kilotons of formalin are currently being produced in the Netherlands every year, predominantly using fossil-based methanol. If this formalin production capacity would be based on captured CO_2 using TNO's integrated carbon capture and utilisation (CCU) technology, 720 kilotons of annual CO_2 emissions can be avoided. This is equal to the CO_2 emissions of almost 36'000 Dutch households[1]. The aim of this study is to determine the feasibility of TNO's technology for large-scale production of Green Formalin.

Green Formalin is produced using a non-fossil energy source, such as renewably produced (green) methanol. Green Methanol is already being produced from Biogas, or by synthesizing renewable CO_2 and H_2. Both routes are predominantly used to make biofuels, but their costs are too high to compete with formalin production pathways based on fossil methanol. However, the advantage of green methanol-based routes is that existing formalin plants can be used.

Another route to Green Formalin is direct production from CO_2 and H_2. TNO has developed a process that combines carbon capture from flue gases with a conversion process to formalin, called the CHARLIE process. This study has revealed that CHARLIE is not feasible for large-scale production of Green Formalin, because residual ammonia levels would interfere with the formalin's end users' polymerization processes. For other applications outside the scope of this project where these low ammonia acceptance levels do not apply the CHARLIE technology is still a possibility. Furthermore, several process variants are developed within the CHARLIE technology family with several process and solvents variations. TNO has already started with an alternative absorbing agent called SOFIA, which is estimated to take 10 years to commercialize. This study has determined that the best location for a pilot plant in the Netherlands would be ChemCom's facility in Farmsum. Another sweet spot for a commercial "SOFIA"-plant would be Dupont's Delrin site in Dordrecht.

Whilst SOFIA is being developed, the EU ETS and the Dutch Carbon Tax are expected to drive up the costs of emitting CO_2, which will lead to increased costs for fossil methanol. New infrastructure, lower cost capture technologies and subsidies could make the decarbonisation of grey methanol through carbon capture, and storage (CCS) an economically attractive alternative by 2025. The resulting "Blue" Methanol would enable the production of Blue Formalin and is expected to reduce annual formalin-related CO_2 emissions by 228 ktpa. It appears that this technology can be best applied at BioMCN's

[1] Energie in Cijfers 2020, EBN BV

methanol plant in Farmsum. The authors recommend evaluating the feasibility of this pathway in a separate study.

The production of Formalin and Methanol based on captured CO_2 requires high amounts of Low-Carbon or Green H_2. First results show that the SOFIA route is expected to compete with the Blue Methanol route at an H_2 price below 2500 €/t. When Blue Hydrogen becomes available by 2025, this price level should be feasible.

For Carbon Utilization technologies to work on a larger scale, European & national legislation need to be expanded to facilitate and incentivise the capture of CO_2 emissions for use as feedstock, and accelerate the development of markets for carbon-neutral substances.