

Objective

Dow asks the Dutch government to consider including funding opportunities for e-cracking within the Dutch Growth Fund. E-cracking is a highly innovative technology that does not yet exist, but that nevertheless is crucial for the whole of society to transition to climate neutrality in 2050. Given the low TRL levels of e-cracking, we believe e-cracking could benefit from research, development and innovation funding, as embedded within the Growth Fund.

Introduction

Steam crackers form the backbone for the chemical industry as providers of many of the base chemical building blocks. These installations are characterized by the word BIG. They are expensive, complex and energy intensive. These installations have been incrementally improved over many decades and have reached full maturity with little room for further optimization.

That means through the use of methane as the fuel CO₂ continues to be released in the air. Several different routes can be thought of to resolve this issue. One could consider fully alternative routes with alternative feedstocks as well as processes. Examples of this approach are known. Each of these do have their own unique challenges. These range from ecological all the way to economical in nature. So far these have not created viable routes for replacing the steam cracking method and therefore fully mitigating CO₂.

Therefore, solutions need to be found within the cracking process itself. The ultimate solution within the realm of the technology is the use of CO₂-free electrical power to heat and drive the process. The by-product methane can be used in more useful applications. Several consortia have announced to work towards this solution. Pilots are planned and already announced. Please find a [link](#) here.

Relevance to the Netherlands.

Crackers are one of the most prominent sources of CO₂ emissions. Crackers account for about 5 million tons of CO₂ emissions a year. This is about 1.5% of all the emissions emitted within Dutch borders. About 3.4 million tons of those CO₂ emissions (68%) originate from the crackers at the Dow and Shell sites in Terneuzen en Moerdijk.

- **CO₂ reduction:** By replacing the methane fuelled crackers in Terneuzen and Moerdijk by electric crackers, Shell and Dow can significantly reduce CO₂ emissions. Eventually, Shell and Dow will be able to create a production process that is carbon neutral.
- **Energy efficiency:** By improving the use of heat (better integration of the furnace within the cracker) an e-cracker will use 30% less energy (585 MW). This amounts to the prevention of 3,4 million tons of CO₂ a year.
- **Circularity (I):** If the electricity that is used is renewable, for instance from wind and solar or even from recyclables, it can enable a production process that is fully carbon neutral across the value chain thereby enabling CO₂ reductions.
- **Circularity (II):** Crackers play an important part in chemical recycling. This will enable CO₂ reductions as materials that used to be incinerated (and thereby emit CO₂) can be used again in a circular loop. This also comes with other environmental benefits, as chemical recycling can also prevent waste from ending up in landfills.

CO₂ reductions, however, don't end in the Netherlands but are of a global nature. On a world scale there are about 300 crackers (24 are owned by Shell and Dow) that account for about 200 million tons of CO₂. This is roughly 1.3% of global emissions.

- **Global best practice:** The invention of e-cracking makes it possible for other crackers in the world to adapt this technology. This would enable all 300 crackers in the world to reduce CO₂ and lower the demand for fossil fuels.

Why do we need crackers (in NL) and what do they produce?

- **Crackers starting point complex value chains:** Crackers produce basic chemicals that are used for a wide spectrum of applications in the areas of health (pharmaceuticals and sports equipment), nutrition (animal feeds and protection of foodstuffs), clean water (treatment, disinfection and transport), energy (biotechnology, lightweight materials for amongst others wind turbines and storage facilities) and other areas such as housing (insulation materials), clothing (fibers) and mobility (battery technology, tires).
- **Job creation:** A mix of factors such as deep-sea access, good inland logistics, a highly educated workforce as well as a politically stable environment made the Netherlands an attractive destination for crackers. In turn, this attracted a lot of downstream users that include both large, medium and small companies.

How does this align with the Dutch ambitions?

The development of this technology is supported by the MMIP 8.4 category, the basis for the MOOI subsidy structure.

A growth fund category is called for to bring this technology to full development and deployment for the higher TRL levels and to bring the technology to full maturity.

The Netherlands can serve as THE steppingstone towards global deployment with all the spin off effects towards equipment manufacturers and system integrators.