

# THOR Induction Heating of Processes

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## Publieke samenvatting / Public summary

### Aanleiding

Climate targets call for industrial feedstock, products and processes to become climate neutral and circular and accordingly the climate agreement has identified the electrification of the chemical industry as an important element. Consequently, the development of electrically driven unit operations will open up opportunities for the deployment of electrification in industry, so that by 2030 industrial processes could fully incorporate the variable production of renewable electricity. Among the various electric heating technologies, inductive heating is among the most efficient and versatile options. While industrial processes have indeed been shown to benefit from inductive heating, its potential will only materialise with the practical development of inductively heated processes.

### Doelstelling

The objective of THOR is the development of inductively heated processes for the process industry. On three different levels, the potential of inductive heating will be investigated through a close combination of theoretical modelling and experimental validation. Vessel heating: The direct heating of vessels in the production of lubricant greases will be considered as a fast-track to (pre)commercial implementation of inductive heating in the process industry. Conventional catalysts, modified reactor: Taking the learnings from vessel heating, catalytic reactor technology for reverse water-gas shift (CO<sub>2</sub> conversion) will be re-engineered for heat management in the reactor, to make optimal use of the advantages of inductive heating while relying on proven catalyst technology.

### Projectinformatie / Project information

#### Projectnummer / Project number

TIND121010

#### Subsidiebedrag / Grant amount

€ 445.178,00

### Algemene informatie / General information

#### Penvoerder / Secretariat

Nederlandse Organisatie voor  
Toegepast-Natuurwetenschappelijk  
Onderzoek TNO

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This represents an ambitious step forward in applying inductive heating, yet allows implementation in the short term. Direct inductive heating of catalysts: Taking the reactor modifications yet another step further, existing reverse water-gas shift catalysts will be redesigned to enable direct inductive heating. This represents the highest benefit from a process point of view, allowing for minimal heat gradients

### **Korte omschrijving**

In three work packages that build onto each other, the three levels of inductive heating will be developed. TotalEnergies, Ambrell, and TNO will (1) establish the technical feasibility for rapid deployment of inductive heating of lubricant grease production vessels. TNO, Hybrid Catalysis, Ambrell, and TU/e will then investigate (2) the inductive heating of structured internals and (3) direct heating of catalysts, both for the reverse water-gas shift reaction. Experimental proof-of-concept will be delivered using materials developed by Hybrid Catalysis at the facilities of TNO using Ambrell inductive heating equipment. Reactor modelling by TU/e and TNO will allow reactor design and optimisation. For each of the three levels, an implementation plan (roadmap) will be made that addresses the technical, economic, commercial, organizational, and political/societal aspects with specific attention to the impact on CO<sub>2</sub> emissions and intermittency of electricity supply.

### **Resultaat**

THOR will produce three optimised designs and implementation plans for the inductive heating of industrial processes. This allows for rapid deployment of industrial electrification and CO<sub>2</sub> footprint reduction in the short-term, while maximising the impact of inductive heating in the long-term.

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