

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

TOPSOE, INC.,
Petitioner

v.

L'AIR LIQUIDE, SOCIÉTÉ ANONYME POUR L'ETUDE ET
L'EXPLOITATION DES PROCÉDÉS GEORGES CLAUDE,
Patent Owner

U.S. Patent No. 11,673,805

Filed: August 11, 2021

Issued: June 13, 2023

Inventors: Schmidt, *et al.*

TITLE: PROCESS AND PLANT FOR PREPARATION OF HYDROGEN AND
SEPARATION OF CARBON DIOXIDE

Inter Partes Review No. IPR2025-01173

**PETITIONER'S REPLY¹ TO PATENT OWNER'S PRELIMINARY
RESPONSE IN SUPPORT OF PETITION**

¹ Authorized by email dated October 29, 2025.

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The Board should reject Patent Owner’s claim rewriting and selective record treatment, and institute on all grounds.

I. “CONVERT” GLOSS CONFLICTS WITH CLAIMS

Patent Owner’s use of “convert” for reforming steps (POPR at 4-5) conflicts with the claims, which distinguish “reforming” (endothermic/autothermal) from “converting” (WGS step). EX1001 at Cl. 1. Patent Owner conflates these processes by ignoring the claims’ language and context. Patent Owner provides no reason why one term should be substituted for the other, which only creates ambiguity and uncertainty, and erases this deliberate distinction. Patent Owner itself admits that “formal constructions” are not needed (POPR at 4), and does not explain how its proposed constructions are relevant to the invalidity analysis.

The plain meaning of these terms suffices without separate construction.

II. CO₂ IN SG1 IS EXPRESSLY TAUGHT AND PRESENT

Patent Owner incorrectly claims Grounds 1-3 “rely only” on inherency for Element [1.2.1]. POPR at 10, 27. The petition cites explicit disclosures: that steam methane reforming—i.e., the endothermic-only reforming step recited in element [1.2]—yields syngas comprising CO₂ and unreacted methane. Reinertsen describes GHR-only embodiments (¶ [0075]) and states the reformer reactor output contains mainly CO, H₂, H₂O, CO₂ and some CH₄ (¶ [0076]). Read together, those paragraphs confirm that the outlet of the endothermic-only reformer (GHR/SMR)

comprises CO₂ and CH₄, directly satisfying element [1.2.1] for SG1. Patent Owner's ATR-only reading of ¶ [0076] fails because ¶ [0075] expressly includes GHR-only embodiments and the generic "reformer reactor" formulation encompasses that embodiment.

Rytter likewise describes reforming producing a gas mixture "mainly ... CO, H₂, H₂O, CO₂ and some CH₄" (EX1009 at 11:2-3), and recites the three reversible reactions that "take place ... by reforming of natural gas," including the shift reaction that forms CO₂ (*id.* at 9:15-17). Darde explains that SMR syngas is always in the form of a mixture containing mainly H₂ and CO and in smaller proportions CO₂, but also unreacted CH₄ (EX1008 at 2:30-32) and elsewhere describes reforming gas as "comprising essentially hydrogen and CO, but also CO₂, CH₄, water and impurities" (*id.* at 12:30-31). The '805 patent admits that SMR yields "a mixture of mainly hydrogen, carbon monoxide, and carbon dioxide." EX1001 at 1:28-30. These explicit teachings moot any inherency critique.

In the alternative, Dr. Klein opines—specifically for the GHR outlet in the Reinertsen and Rytter configurations—that CO₂ "will always be present to at least some degree" (EX1003 at ¶ 128) because, at GHR operating conditions, equilibrium establishes a non-zero CO₂ partial pressure at the outlet (*id.* at ¶¶ 123, 254). Zero CO₂ would be thermodynamically inconsistent with the reactions and

conservation of atoms at those conditions. *Id.* at ¶¶ 123, 254. Patent Owner’s selective quotation from a background paragraph does not overcome these explicit, embodiment-specific opinions.

III. PATENT OWNER APPLIES WRONG MOTIVATION-TO-COMBINE STANDARD

Patent Owner’s reliance on *Ex parte Rinkevich* (POPR at 18) is misplaced; it is non-precedential and has been criticized. *Vimeo, Inc. v. British Telecom. PLC*, IPR2019-00833, Paper 20 at 22 (Aug. 5, 2020). *KSR*’s flexible, common-sense framework governs; the Federal Circuit has clarified that a petitioner need only show the modification was a “suitable option,” not a categorical improvement. *KSR Int’l v. Teleflex Inc.*, 550 U.S. 398, 421 (2007); *Intel Corp. v. PACT XXP Schweiz AG*, 61 F.4th 1373, 1381 (Fed. Cir. 2023).

Nevertheless, the record supports motivation and reasonable expectation of success, as well as improvement. The references share the goal of hydrogen with CO₂ capture, teach compatible reforming, shift, PSA, and cryogenic separation, and allow process sequencing as claimed. Reinertsen discloses PSA as an alternative; Darde confirms the PSA to cryogenic as a known, predictable sequence. EX1003 at ¶¶ 146-48, 191-92. Patent Owner’s “inferior purity” argument (POPR at 17) focuses on one metric; a POSA considers broader factors, which Dr. Klein explains support PSA as a suitable—and preferable—choice here. EX1003 at ¶¶ 203, 235, 238.



Respectfully submitted,

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CERTIFICATE OF SERVICE

Pursuant to 37 C.F.R. § 42.6(e), I certify that on this 9th day of October, 2025, a true and correct copy of the foregoing **PETITIONER’S REPLY TO PATENT OWNER’S PRELIMINARY RESPONSE IN SUPPORT OF PETITION** was served by electronic mail on Patent Owner’s lead and backup counsel at the following email addresses:

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