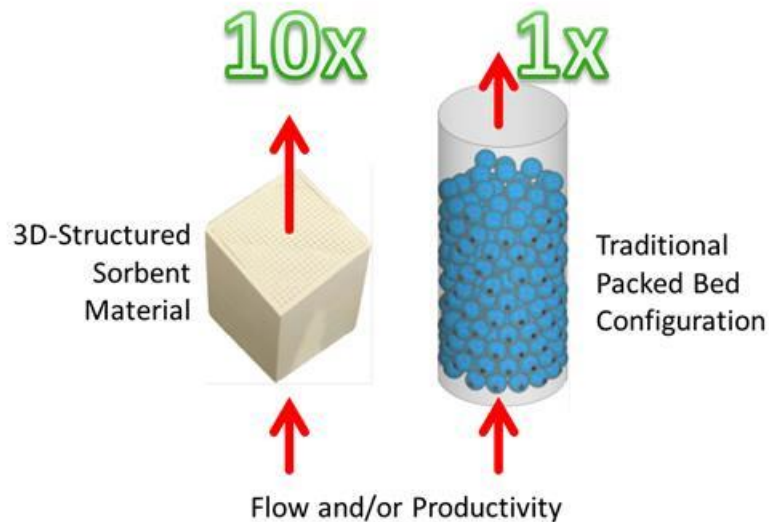




3D-CAPS Jaap Vente

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Headline results



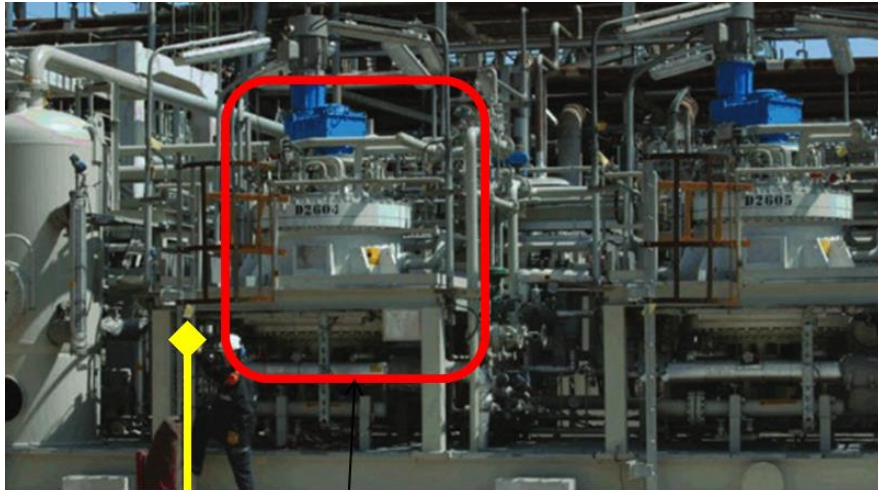
- Overall objective:
 - Productivity ($\text{kg CO}_2/\text{m}^3\text{hr}$) increase by a factor 10 of sorbent based capture technologies
- Means:
 - Additive manufacturing, 3D-printing
- Materials:
 - Hydrotalcite
 - Amine Functionalised Silica

COST REDUCTION BY INCREASED PRODUCTIVITY



More compact operation

- Structured sorbents vs. conventional technologies



Full Train PSA

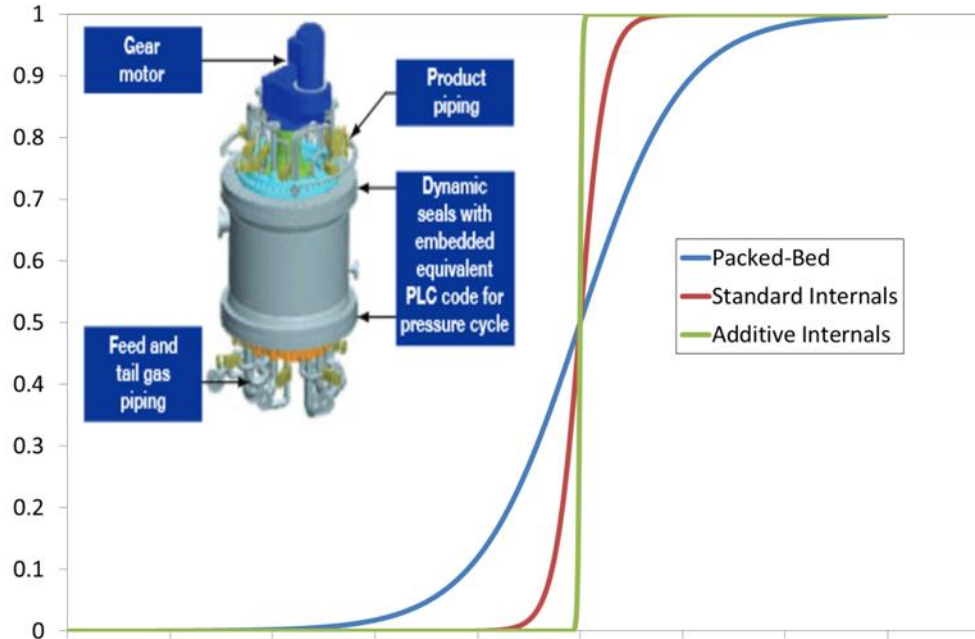


Full Train PSA

Key activities

- Design tailored structures by CFD modelling
- Develop appropriate manufacturing procedures
- Test the performance under relevant conditions
- Assess the economic advantages

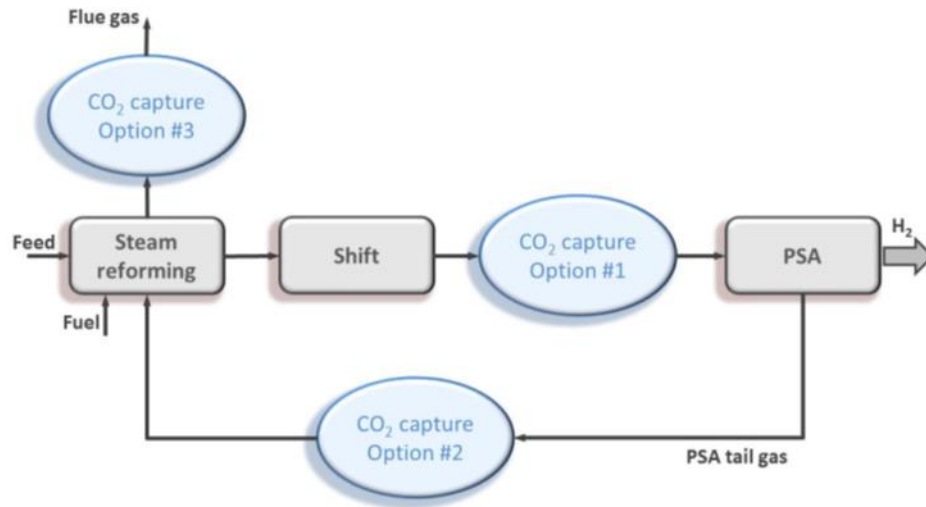
Advantages of Structured Beds



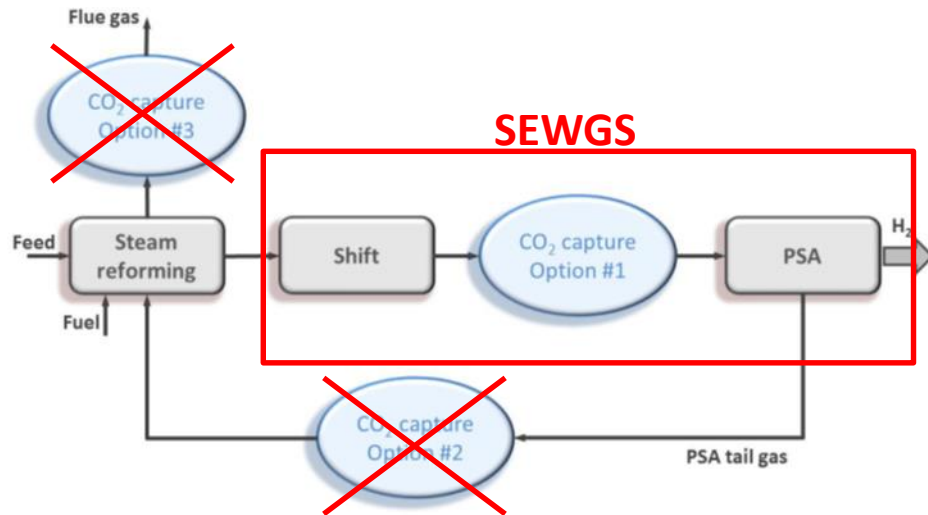
Two application areas

- SEWGS **Challenge:** WGS Conversion at very high throughputs
Medium temperature (300-500°C)
Reactive pressure swing adsorption technology using hydrotalcites; syngas processing with CO₂ capture; decarbonised H₂ production for refineries together with natural gas combined cycle
- ImmoAmmo **Challenge:** Heat management at very high throughputs
Low temperature (40-130°C)
Vacuum pressure / temperature swing adsorption Amine-functionalized silicas; replacement of solvent-based systems for CO₂ removal. Natural gas combined cycle post-combustion configuration.

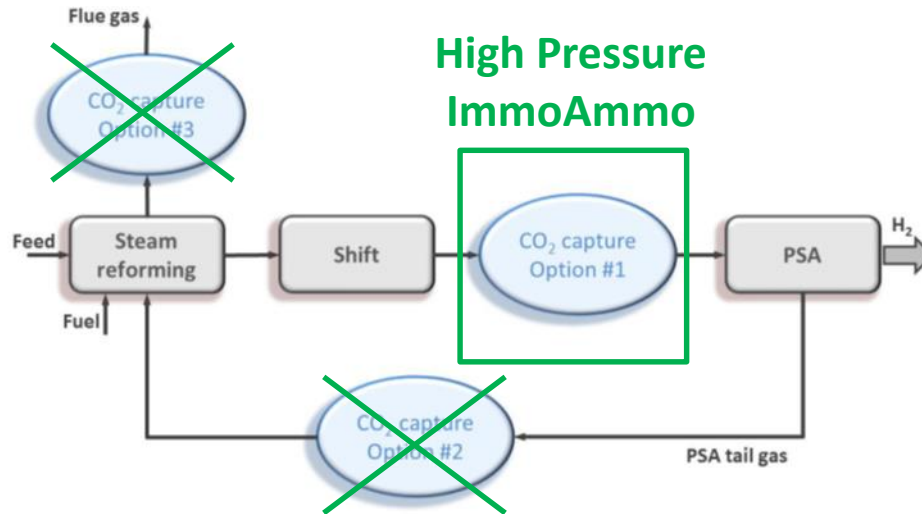
Applications in 3D-CAPS



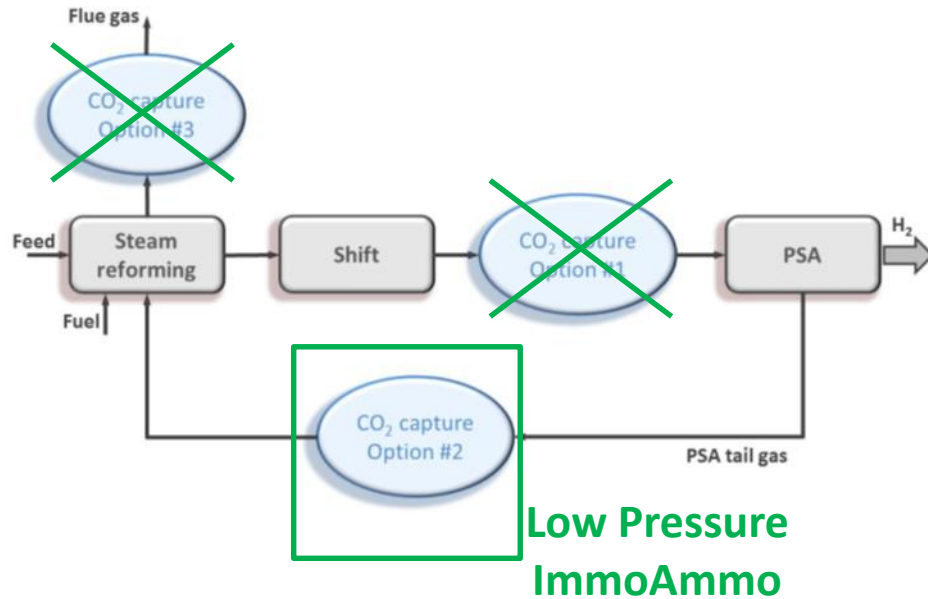
Applications in 3D-CAPS



Applications in 3D-CAPS

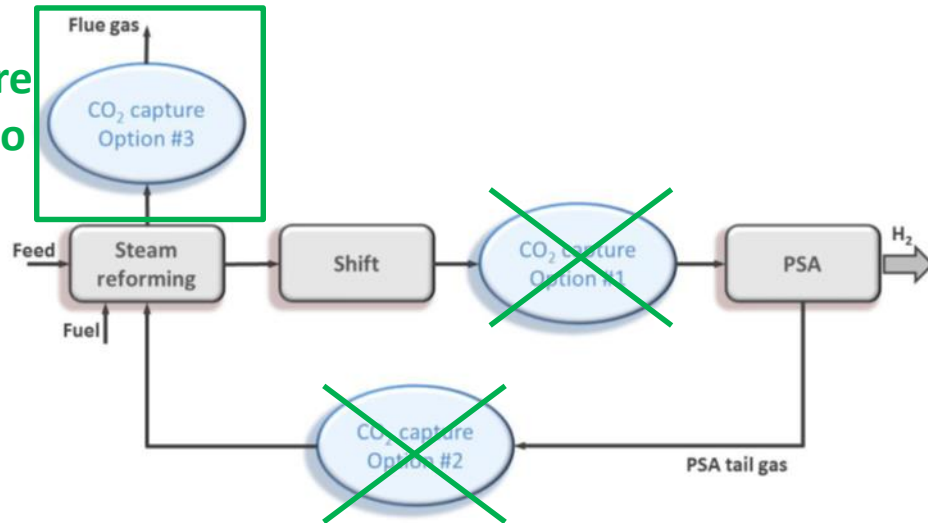


Applications in 3D-CAPS

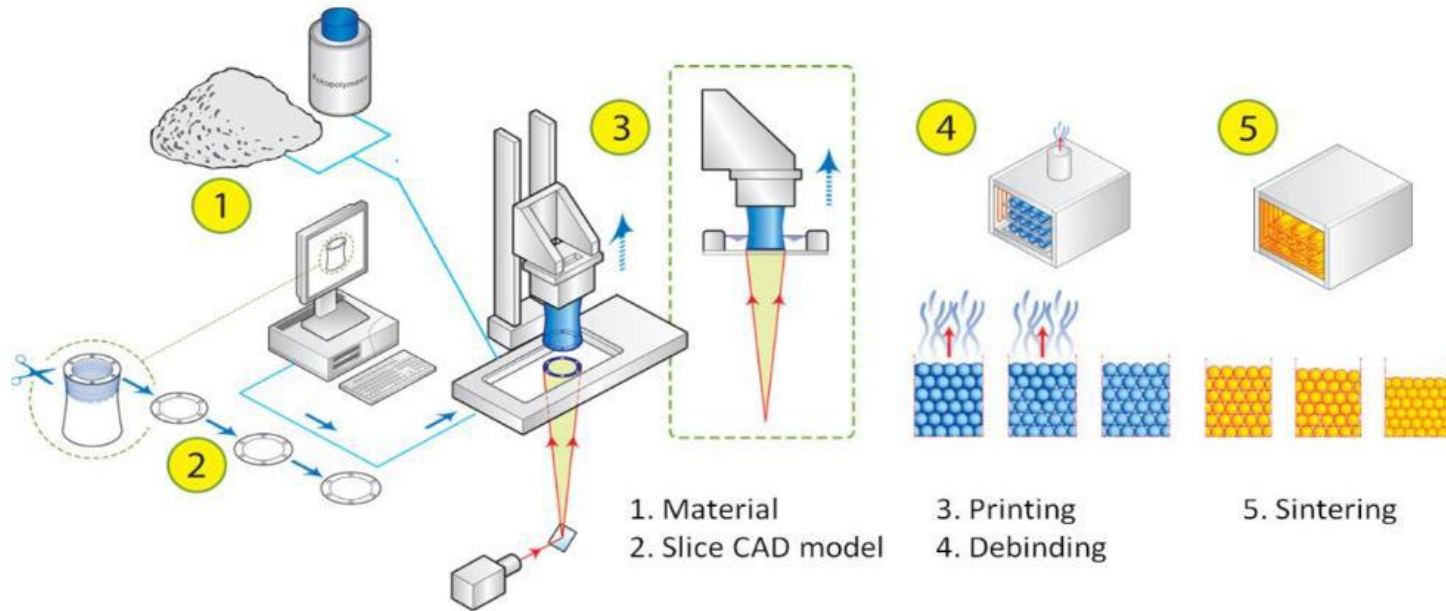


Applications in 3D-CAPS

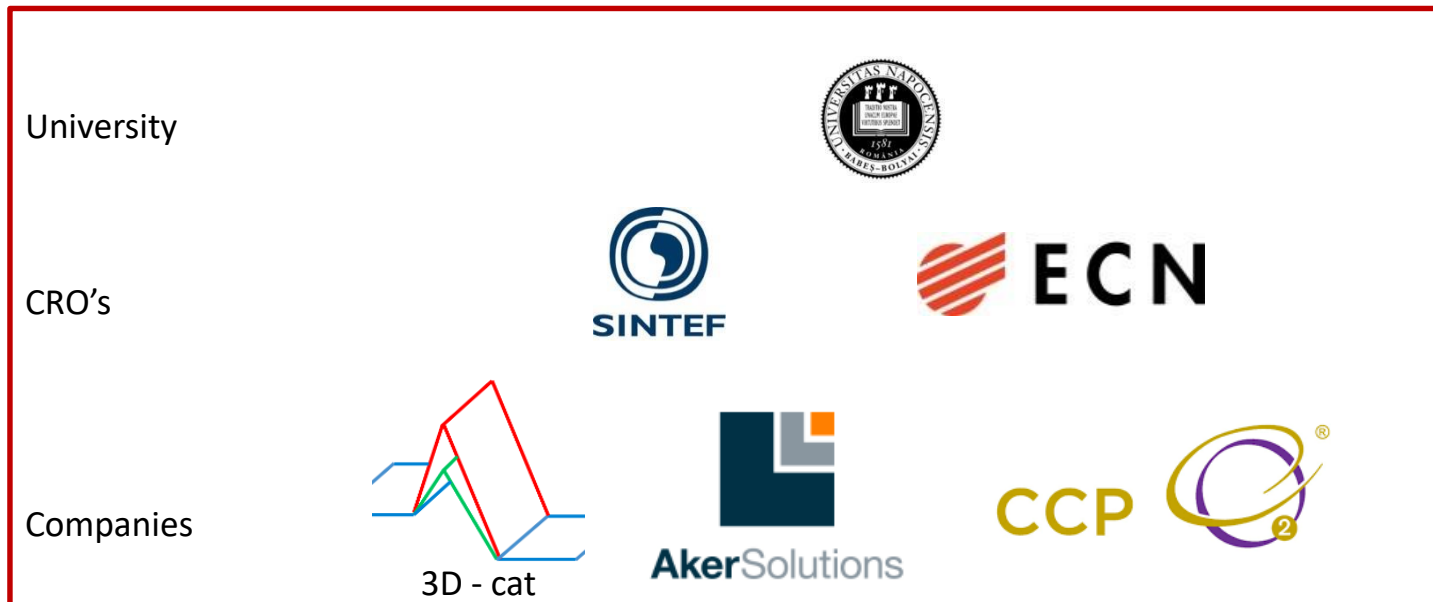
Low Pressure
ImmoAmmo



Additive Manufacturing of Porous Materials



3D-CAPS consortium



Roles

ECN	Coordination. Development of Paste and 3D-Printing. Modelling of SEWGS systems. Experimental testing for SEWGS sorbent at TRL4/5
3D-CAT	Business plan development, risk management of the project. Techno-economic analysis and business plan development.
CCP	Support techno-economic analysis and preparation for TRL6 demonstration. Representative of CO2 Capture Project
SINTEF	Testing for ImmoAmmo at TRL4/5. Modelling Silica-based materials. Alternative route of Silica functionalisation
AKSO	Techno-economic analysis of ImmoAmmo implementation and development of business plan for spin-off application areas
UBB	CFD optimum structure determination and cyclic modelling of SEWGS and ImmoAmmo systems

Budget

	2017	2018	2019	total
Personnel	432	727	670	1830
Operating	57	37	17	112
Equipment	11	12	10	33
Other	72	23	23	118
	571	800	721	2093

Delayed start of the project
will lead to an underspending in 2017

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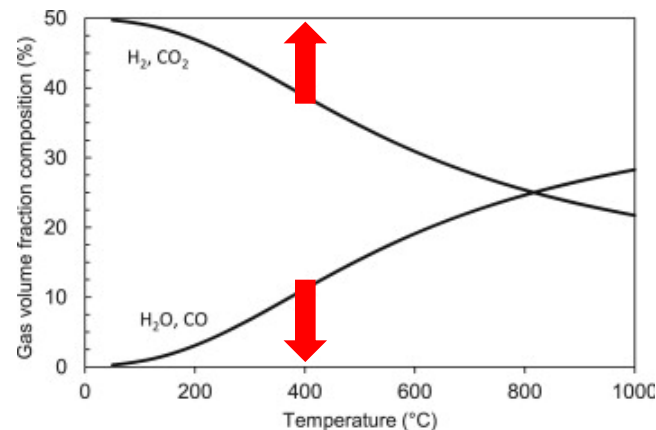
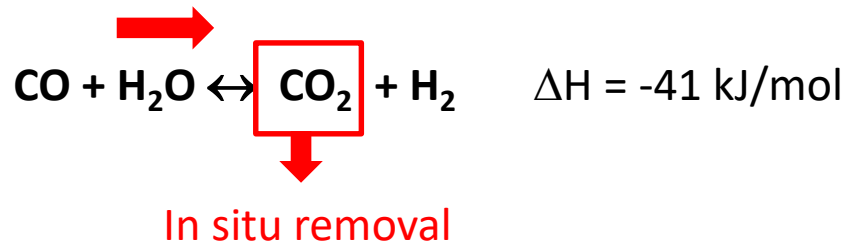
Acknowledgements

The ACT 3D-CAPS project # 271503 has received funding from RVO (NL), RCN (NO), UEFISCDI (RO), and is co-funded by the CO₂ Capture Project (CCP) and the European Commission under the Horizon 2020 programme ACT, Grant Agreement No 691712



Application 1: SEWGS

- Water gas shift reaction at 400°C is thermodynamically limited
- Combines the Water-Gas-Shift reaction with sorbent material to simultaneously produce H₂ at high temperature whilst also capturing CO₂



Application 1: SEWGS

