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UNIVERSITY OF GALWAY

High Performance Thermoplastic Composite Pipeline Development with Automated Tape Placement (ATP) Technology

for Energy Industry Applications

“ATP Pipeline” Project

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ICCM23 Conference

31st July 2023

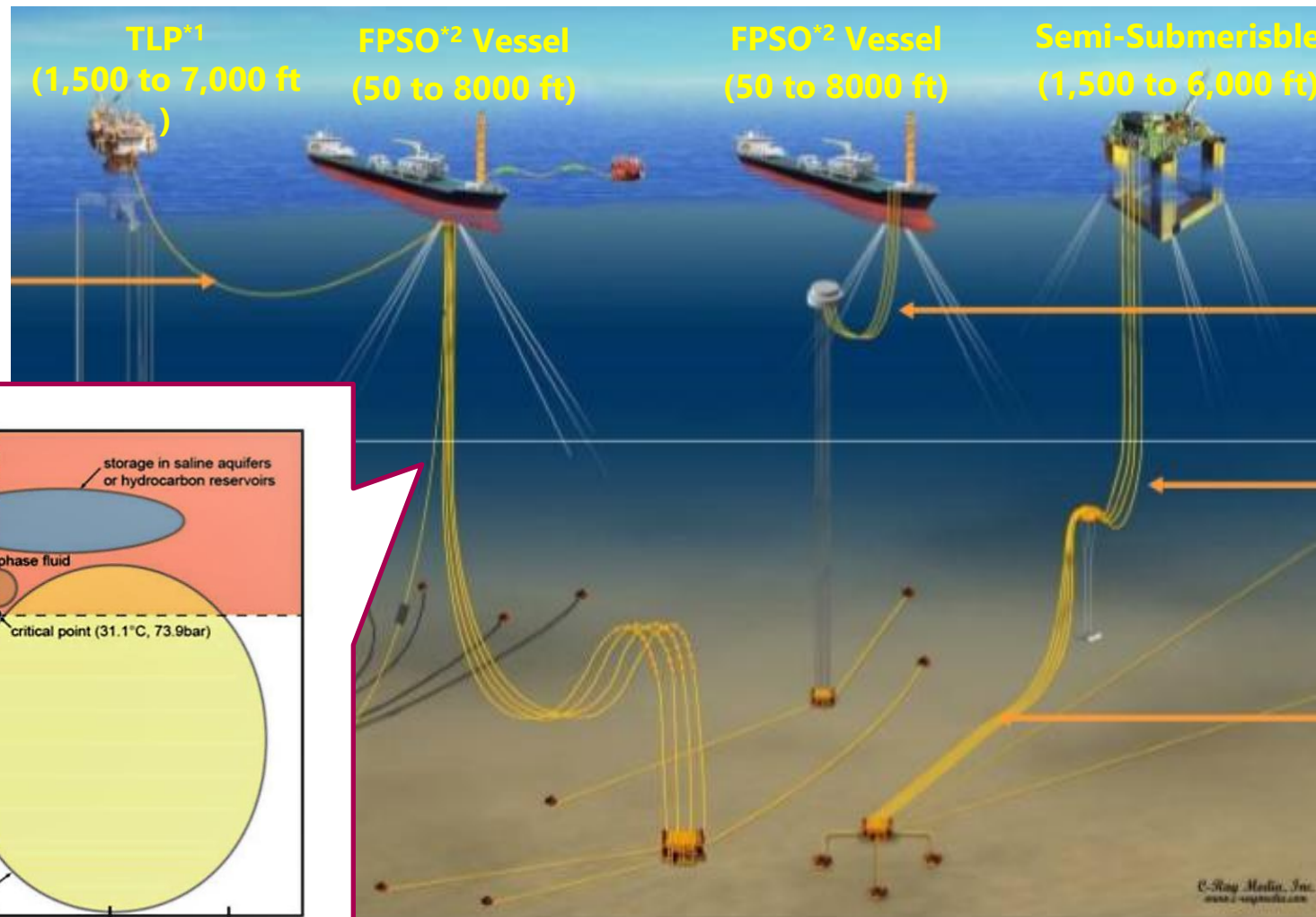


Offshore

Thermoplastic Composite Pipeline (TCP)

Application

Transfer Lines



What is a TCP Riser?

Jumpers

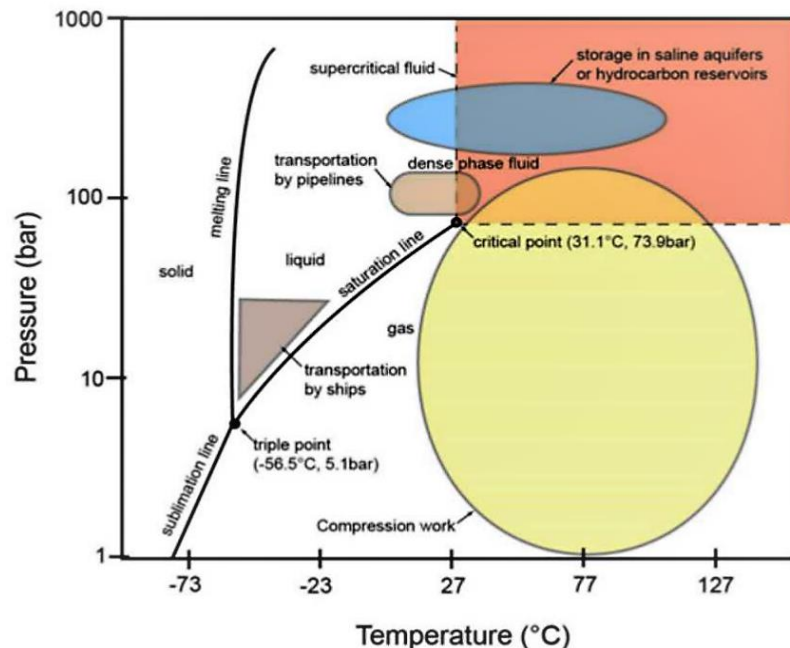
Risers

Flowlines

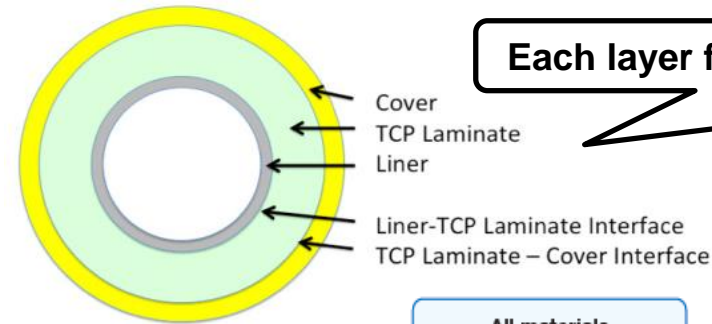
- Mix flow:
- Oil
 - Gas
 - Water
 - Sand

*1 → TLP stands for Tension Leg Platform.

*2 → FPSO stands for Floating Production Storage and Offloading.

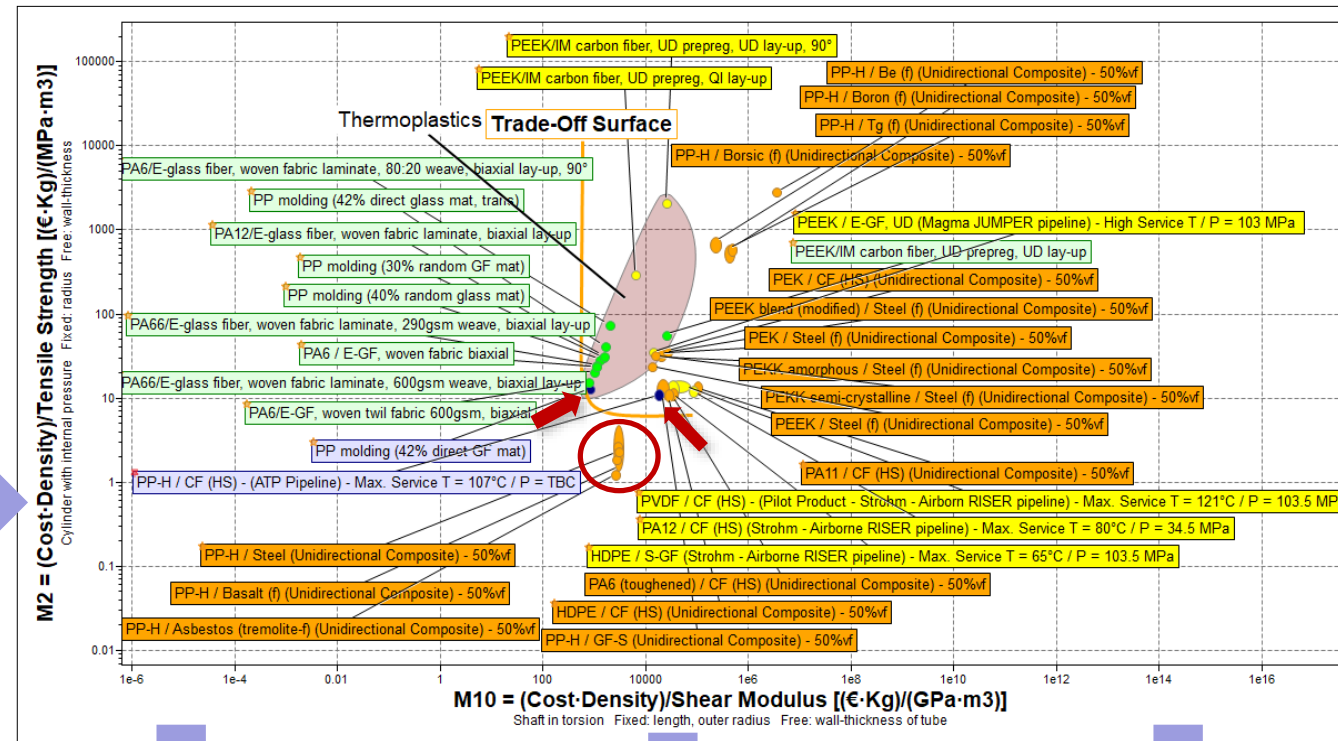
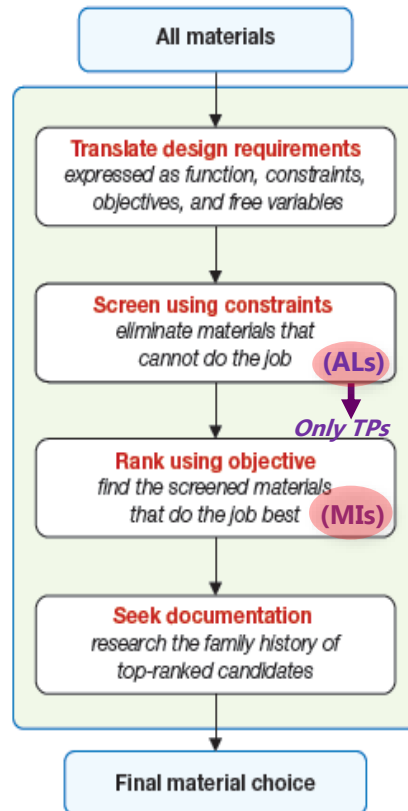


Offshore TCPs Materials Selection



Each layer fulfils a different mission → **One Materials Selection / layer**

Ranking using objective: Find the screened materials that do the job best.
Cost-effective mechanical performance. Most representative plot of out of 20.



Liner → HDPE

Intermediate Laminate → CF/PP

Cover → PE-100

Automated Tape Placement ATP Manufacturing

ATP – Pipeline Project

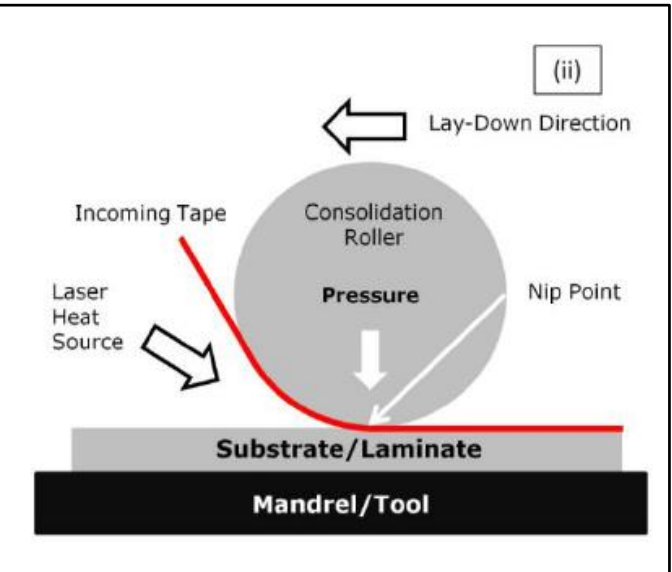
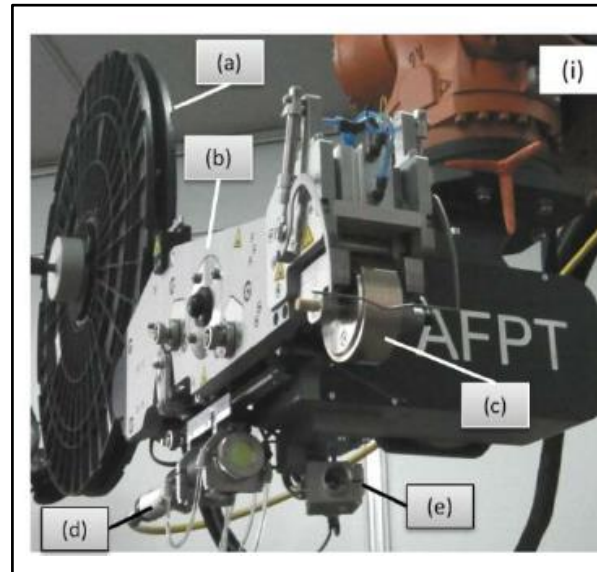
Manufacturing technique selected



Project ID: MF-2018-0036




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Fail it until make it!






A cost – competitive TCP proof-of-concept was developed compatible with Carbon Capture Utilization and Storage (CCUS) applications.



Testing was conducted at laminate and pipe levels to benchmark the chosen material combination.



Further research is needed to enhance liner-to-intermediate layer compatibility and avoid the employment of adhesives.

Research

INNER LINER LAYER

TCP **valid** for CCUS Applications

Permeability levels of ScCO_2 HCs & Water comparable to Oil & Gas benchmark (PAs)

COVER & INTERMEDIATE REINFORCED LAYERS

Layers are able to supply structural integrity & abrasion resistance



ATP – Pipeline Project



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THANK YOU



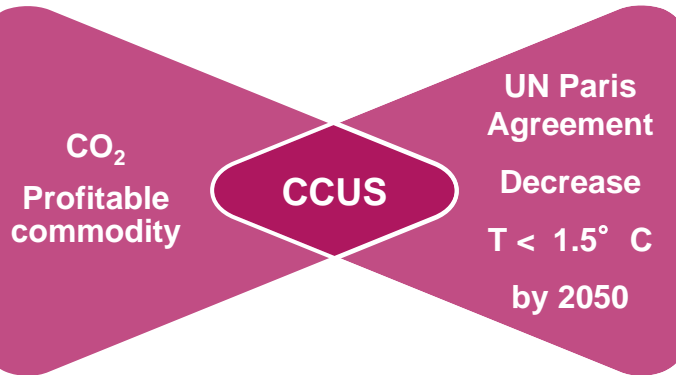
Acknowledgments

Career-FIT has received funding from the European Union's Horizon2020 research and innovation programme under the Marie Skłodowska-Curie grant agreement No. 713654

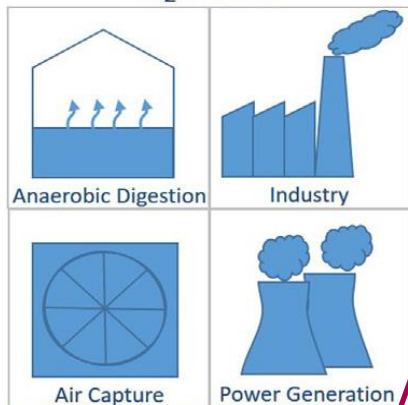
Supporting Information Project Framework

ATP – Pipeline Project
CO₂ valorisation scheme

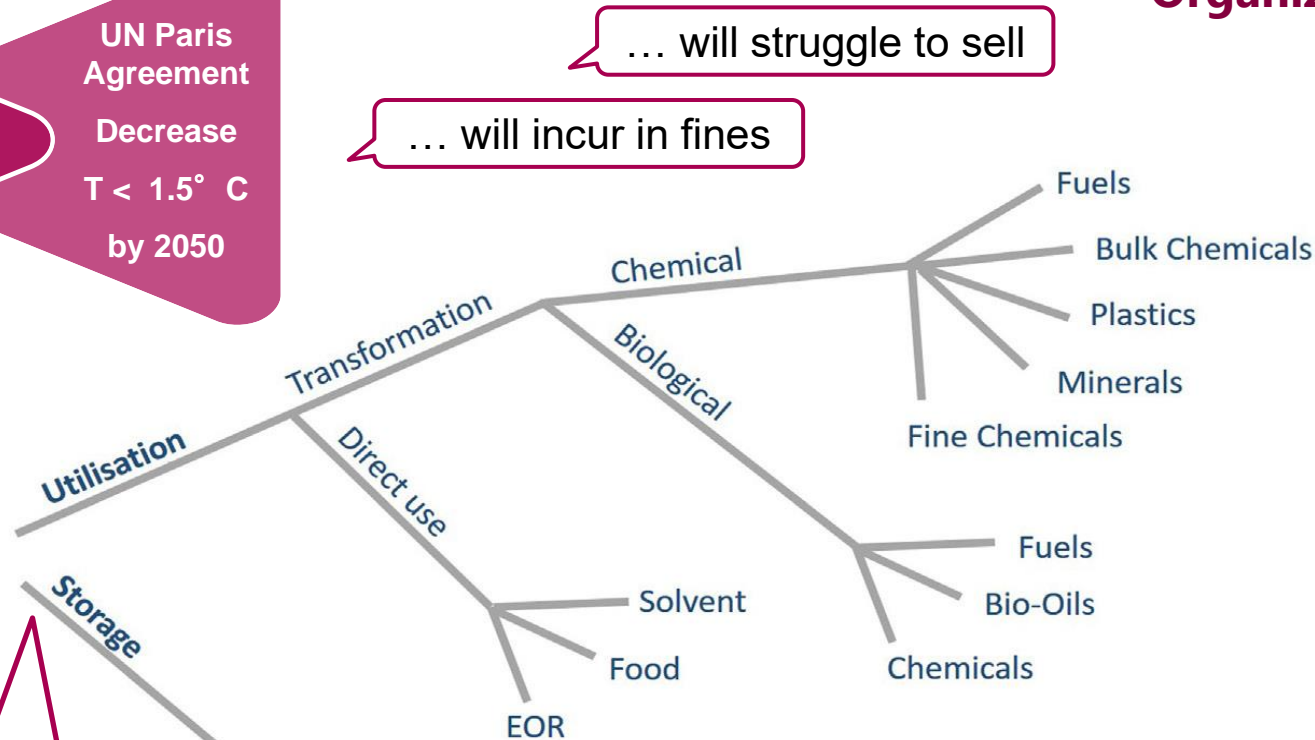
Carbon Capture Utilization & Storage (CCUS) Application



CO₂ Source



CO₂ Transportation



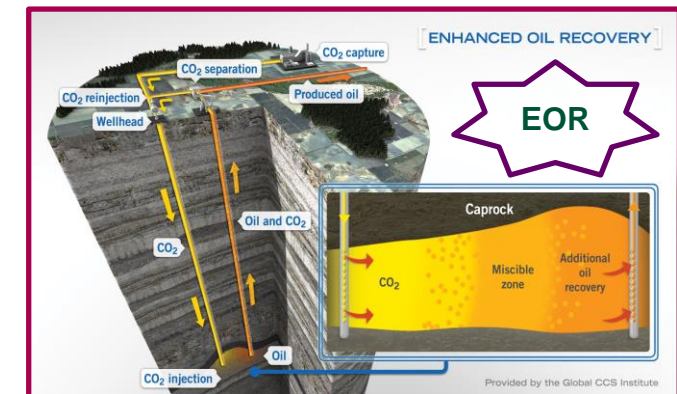
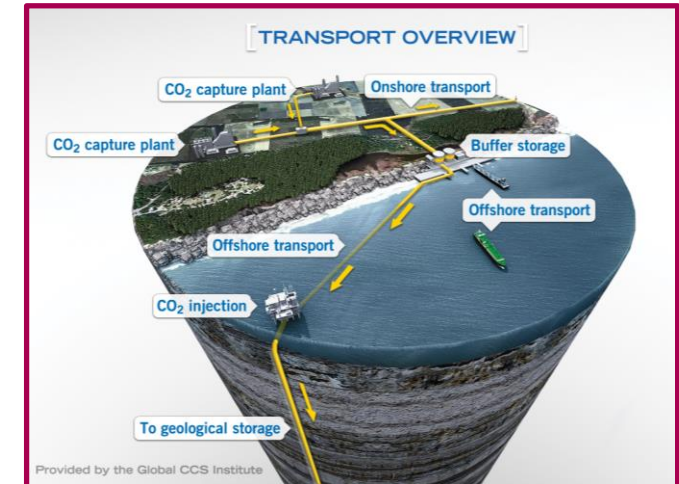
... will struggle to sell

... will incur in fines

Government Policies: US "45Q Tax credit"

\$287 million saved in taxes for disposing 500,000 ton CO₂/year in a secure geologic storage over 12 years.

Organizations without low-C products...



Source: C. R. Jones, B. Olfe-Kräutlein, H. Naims, and K. Armstrong, "The social acceptance of carbon dioxide utilisation: A review and research Agenda," Front. Energy Res., vol. 5, no. JUN, pp. 1–13, 2017, doi: 10.3389/fenrg.2017.00011

Strategy to get **compatibility** between liner and intermediate laminate



**To enhance
compatibility**



Match matrix
material with
Liner material



PP liner & CF/PP tape

PE liner & CF/PE tape

