CONSTANT COMPOSITION REACTOR FOR REAL-TIME CORROSION MEASUREMENTS (DCR-5)

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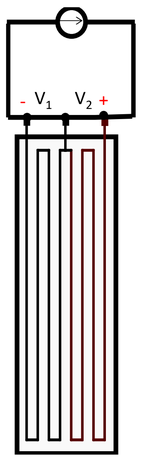
Aim and objective

- This project will develop a dynamic reactor configured with a fabricated Electrical Resistance sensor that fits the design, to enable in-situ real-time analysis of general and localized corrosion translatable to CO_2 pipeline transport.

Planned Secondments

- University of Leeds, UK.
- National Physical Laboratory (NPL), UK.

Electrical Resistance (ER) Sensor



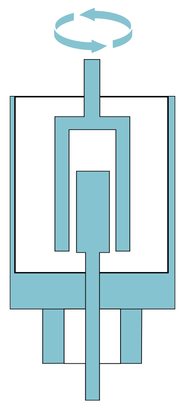
ER PROBE

Working Principle

- It measures the change in electrical resistance of a metal probe exposed to a corrosive environment.
- This increase in resistance is proportional to the amount of metal lost due to corrosion.

V = IR $R = \rho L/A$

Hydrodynamic Conditions


AUTOCLAVE SETUP

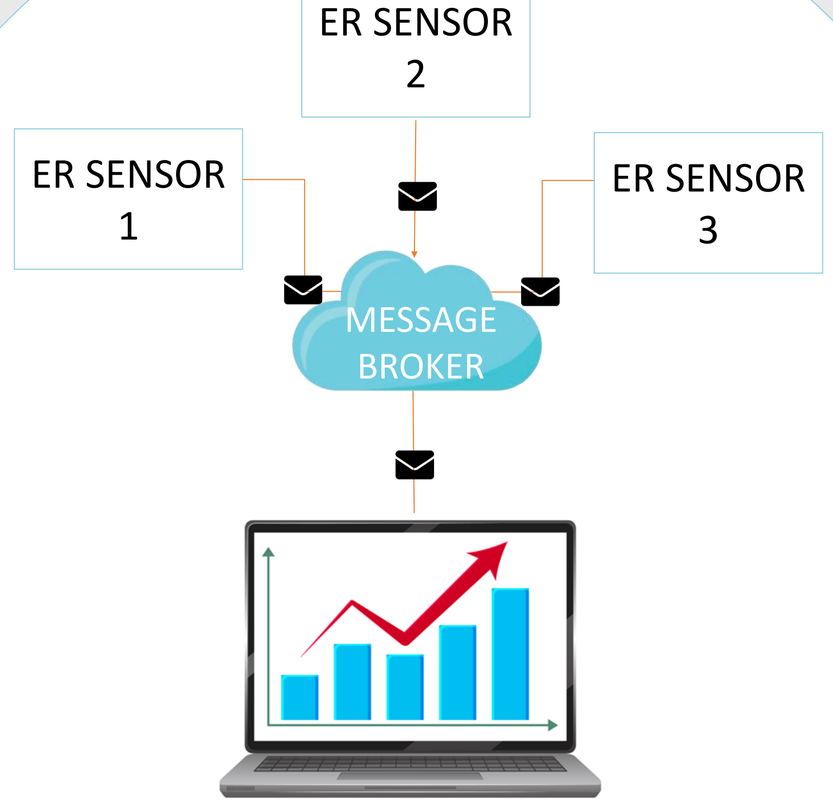
- Develop a reactor capable of maintaining impure CO_2 stream composition for prolonged periods.

- Generate hydrodynamic conditions translatable to pipeline transportation.

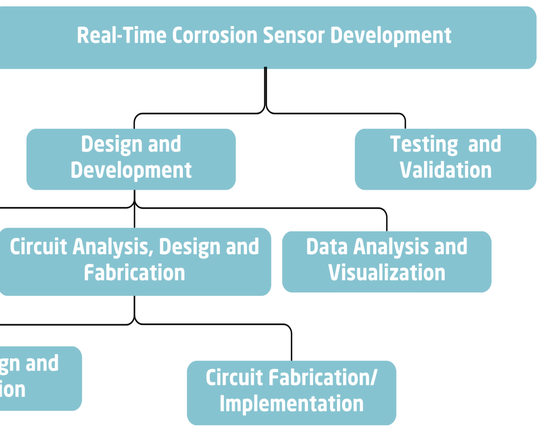
ER Sensor Taskflow

LASER CUTTING

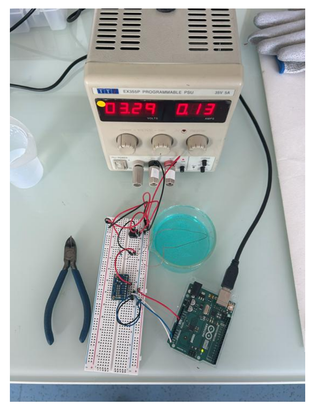
Various fabrication methods like UV Laser cutting and Photochemical machining are still being considered for the fabrication of the ER probe.



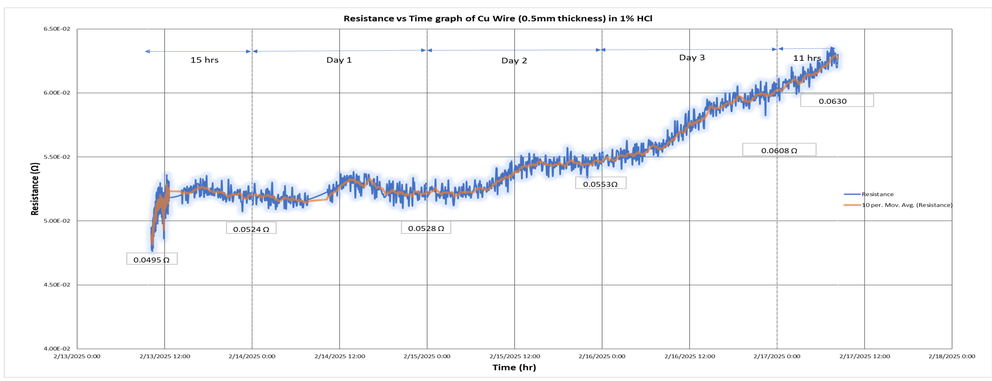
REAL-TIME CORROSION MEASUREMENT



First Results



Observe trends (in the Weight, Resistance and Thickness) of an exposed metal and relating them to corrosion rate.



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[2] Schrimpf, M., Esteban, J., Warmeling, H., Färber, T., Behr, A., & Vorholt, A. J. (2021). Taylor-Couette reactor: Principles, design, and applications. AIChE Journal, 67(5), e17228. https://doi.org/10.1002/aic.17228