

Key event sponsor



2024 Annual Corrosion Forum

**Topic: Corrosion Control & Management
with Carbon Capturing Systems**
by William Ritchie



KEY POINTS:

- The potential for CCS in our future industrial setting
- Carbon capturing technologies, their applications and process overview
- Common causes for corrosion and where to expect them
- Corrosion management
- Case histories

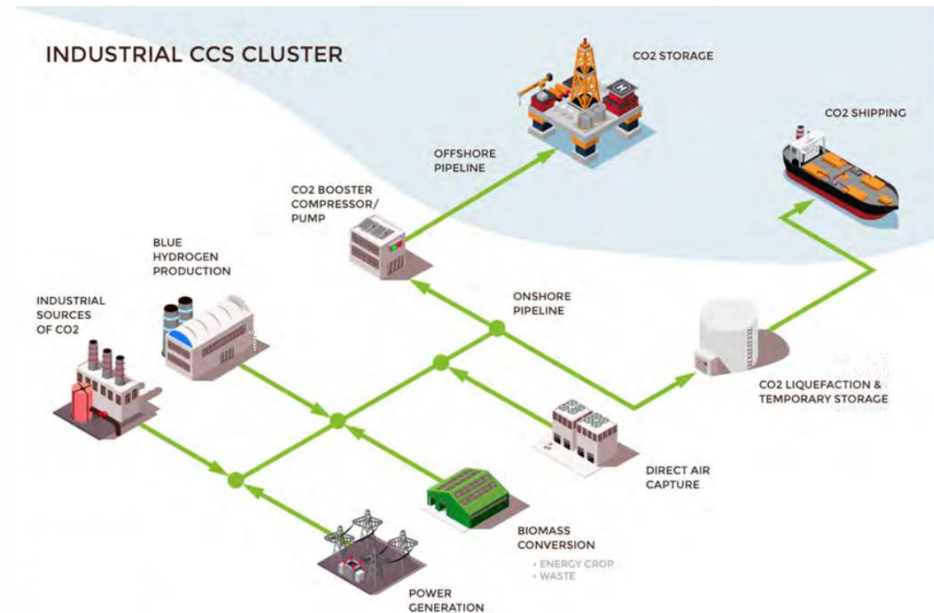
Background

- Europe has 119 commercial-scale CCS facilities in development, with the North Sea dominating as the preferred site.
- The UK Government had pledged to store 20 – 30 Mtpa CO₂ by 2030 and anticipated 50,000 jobs to be supported by this.

- Relevant to multiple industries:

- | | |
|--------------------|-------------------|
| • Power generation | • Waste-to-energy |
| • Refineries | • Biomass |
| • Steel | • Chemicals |
| • Cement | • Hydrogen |

- Both well-established and new technologies likely to be embraced



Main Technologies

Application

Pre-combustion

- Production of:
 - Ammonia
 - Biofuel
 - Hydrogen
- Steelmaking

Process

Syngas feed stream is scrubbed with a solvent. The solvent is regenerated, releasing CO₂

Post-combustion

- Cement making
- Incinerators
- HC gas processing
- Power plants

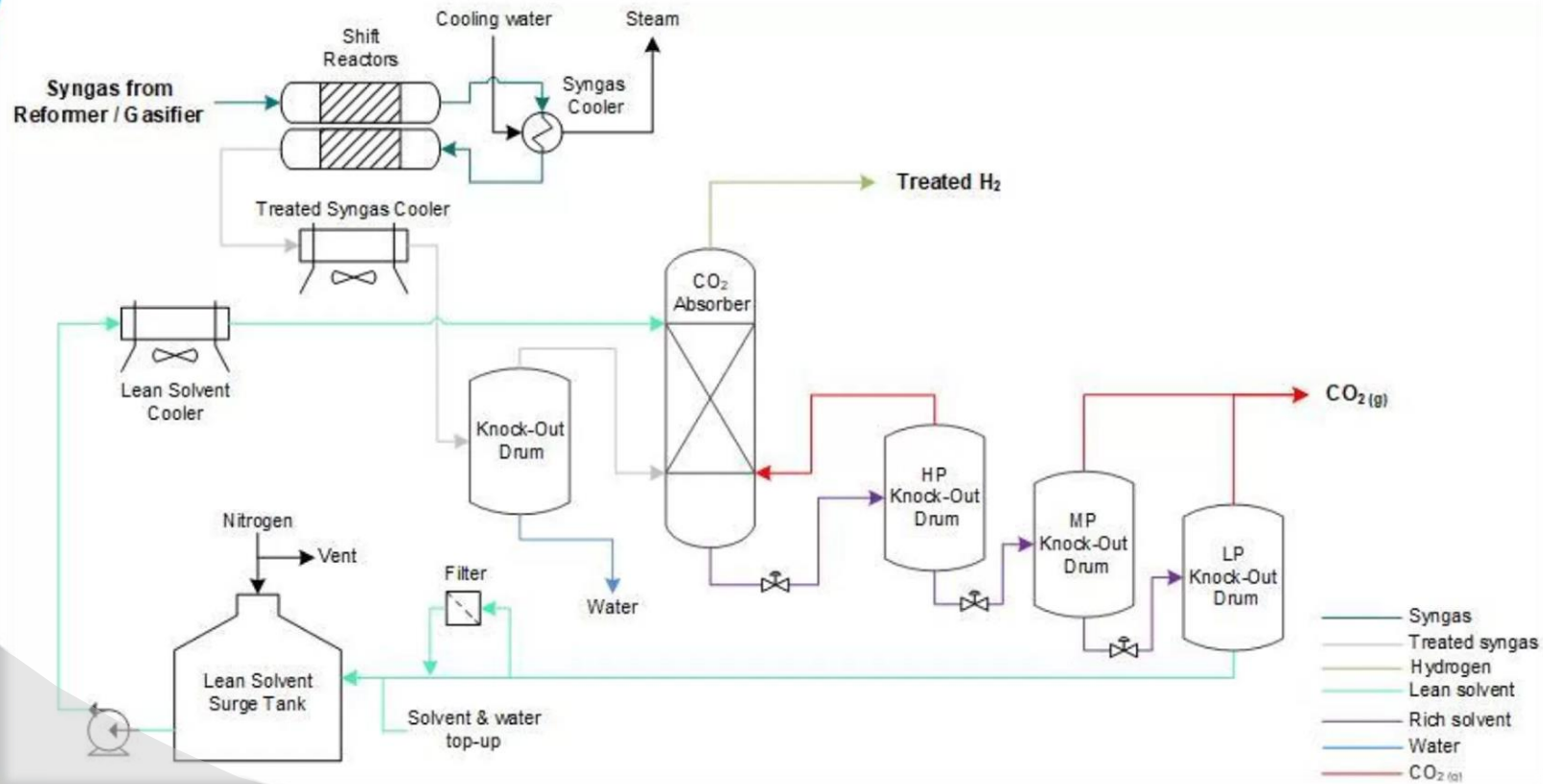
Flue / natural gas stream is scrubbed with a solvent. The solvent is regenerated, releasing CO₂

Oxy-fuel

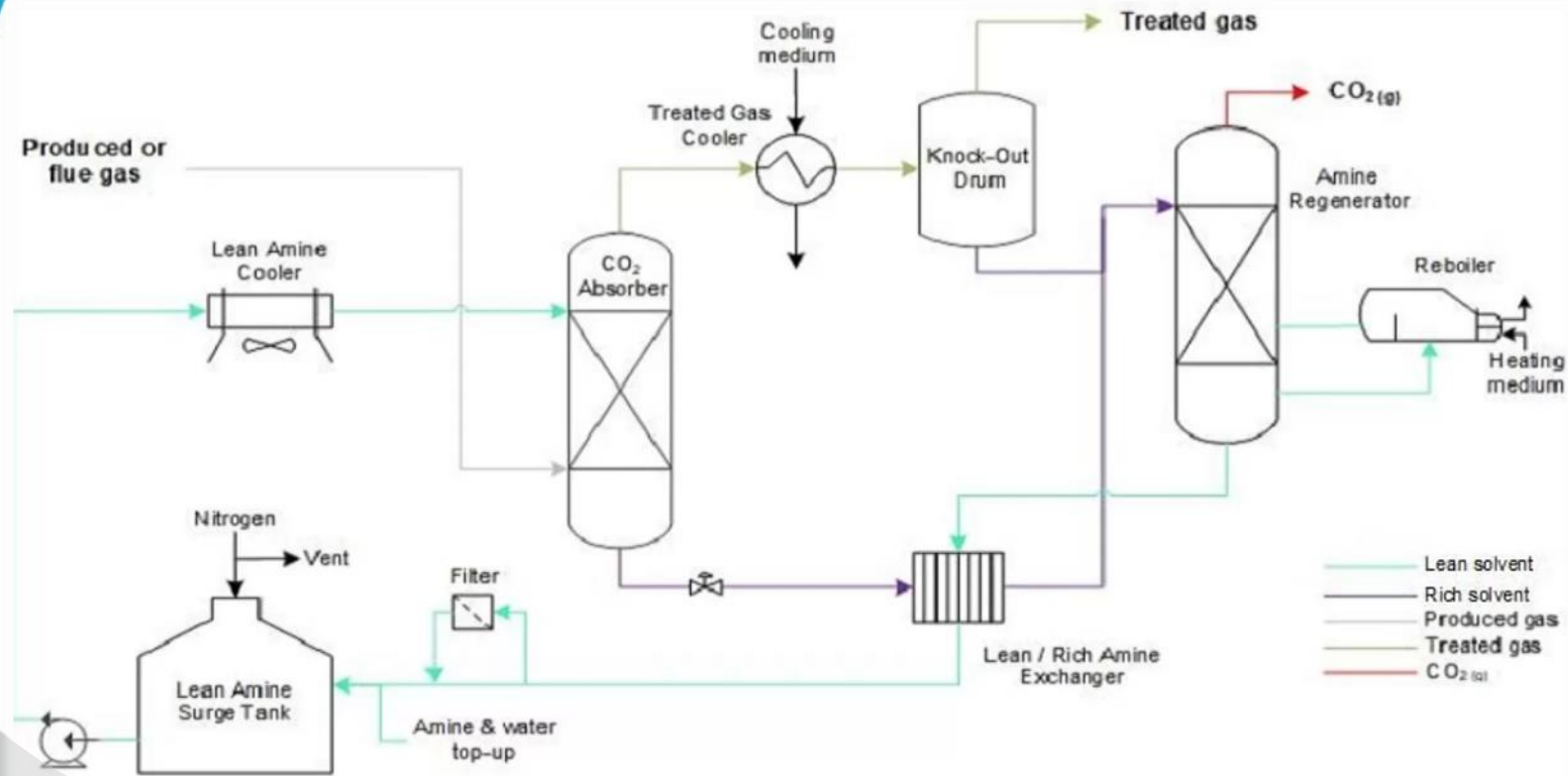
- Cement making
- Power plants

Flue gas is scrubbed to remove combustion contaminants, then cryogenically fractionated to remove gasses

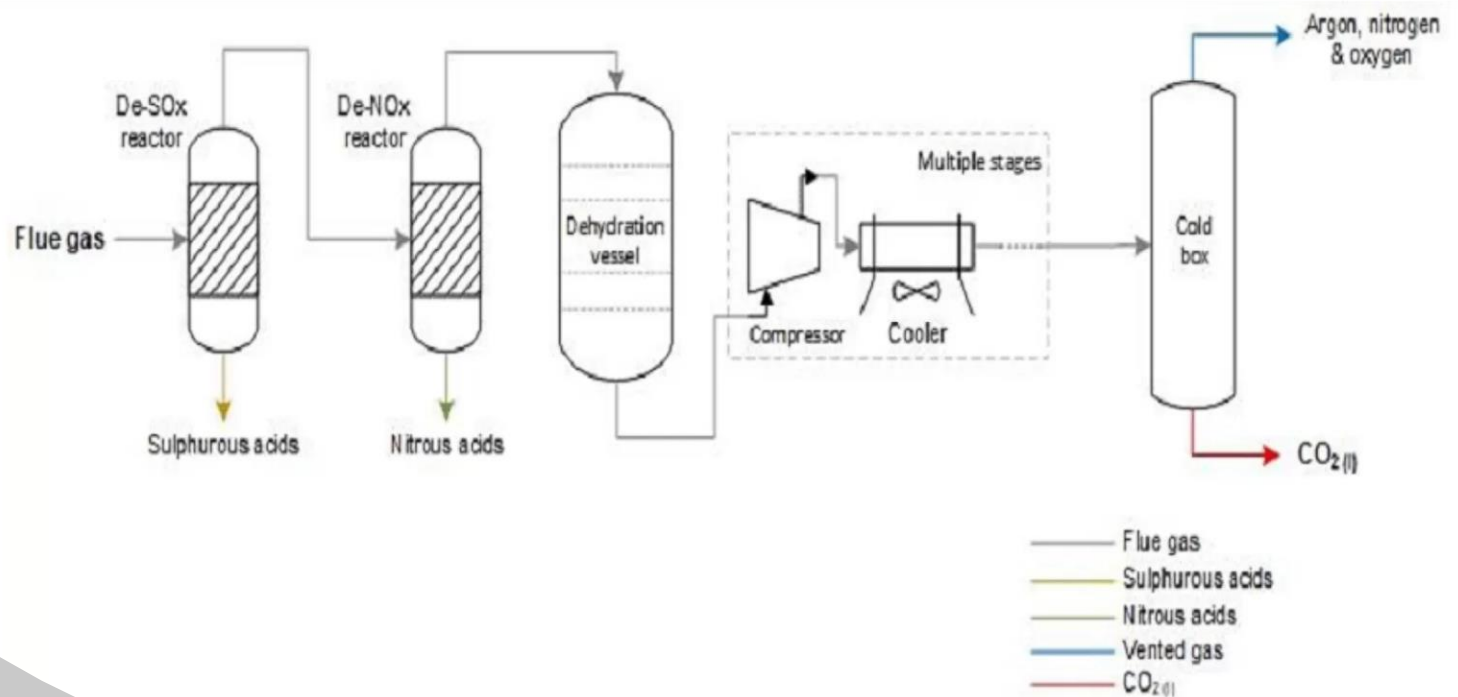
Pre-combustion



Post-combustion

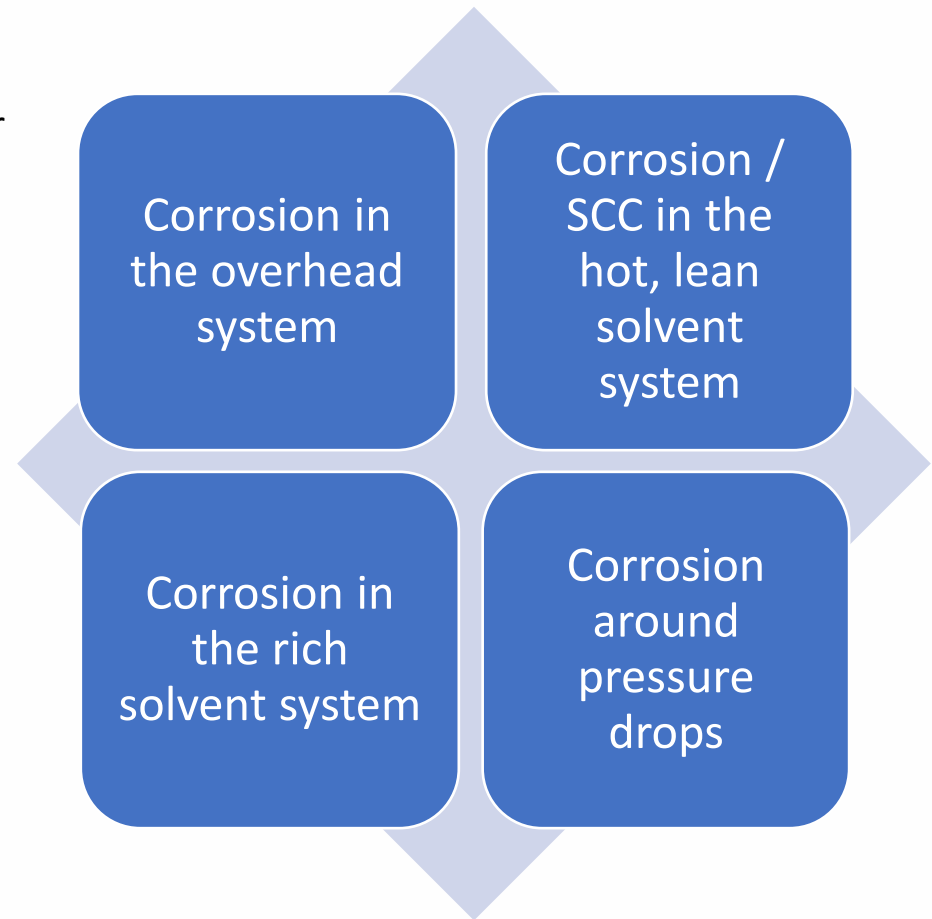


Oxy-fuel



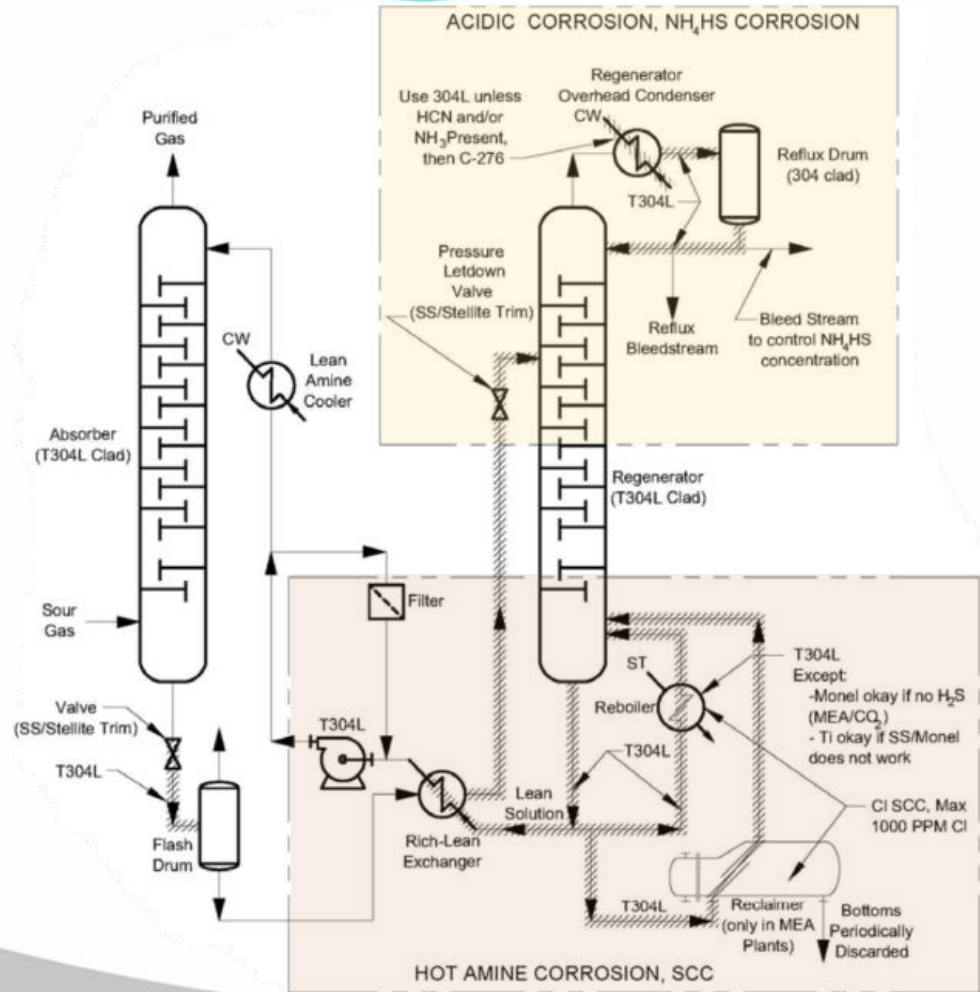
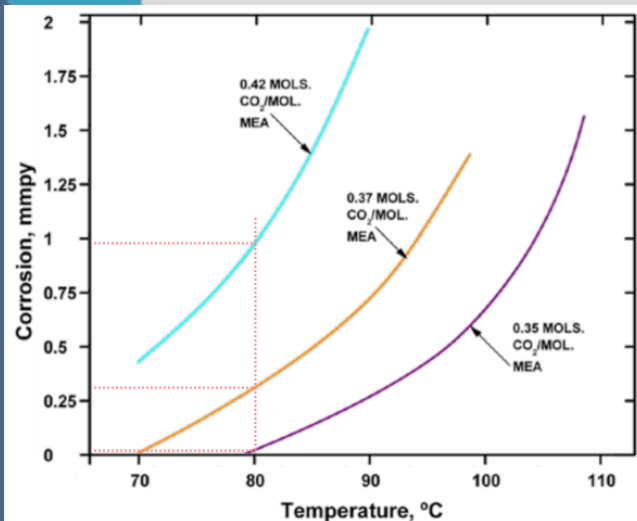
Main Problem Areas

- Change in feed gas composition or feed rate
- Excessive operating temperature
- Excessive solvent loading
- Inadequate solvent concentration
- Solvent contamination
- Excessive solvent velocity
- Solvent degradation
- Inadequate maintenance
- Inadequate design



Amine plant

- CS acceptable for many components within the plant.
- SS should be extra-low carbon or stabilised grades where welding or stress-relief is required
- Stress relief (to avoid amine-SCC):
 - All pressure vessels
 - All piping > 38 °C



Corrosion Management



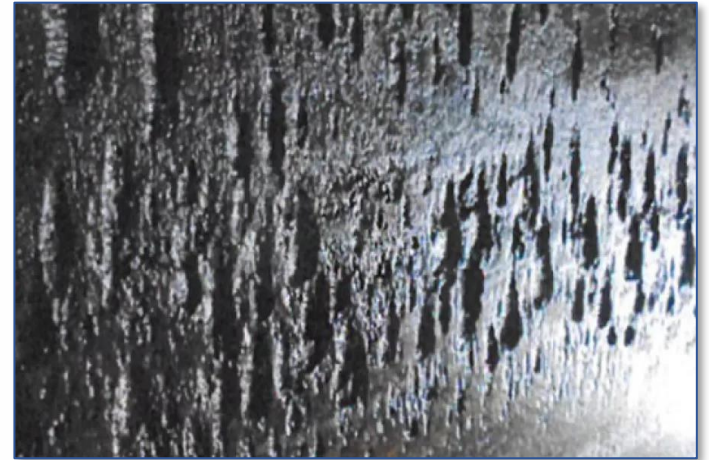
- Solution sampling and analysis
- Corrosion coupons and/or probes
- Iron monitoring
- Inspection activities
- KPI monitoring
- API RP 945 – Avoiding Environmental Cracking in Amine Units



Amine Absorber

- Case History

- CS absorber designed to handle feed gas with 4 % CO₂ was instead handling 25 % CO₂ due to new field tie-in
- Chemical absorption is exothermic, so high loading and high temperature caused CO₂ to boil-out of solvent
- Solvent loading capacity reduced by chemical degradation
- Severe localised corrosion discovered above the liquid line and opposite the gas inlet



Thank you

