Caplus®

Specialty Amine Technology for Acid Gas Removal

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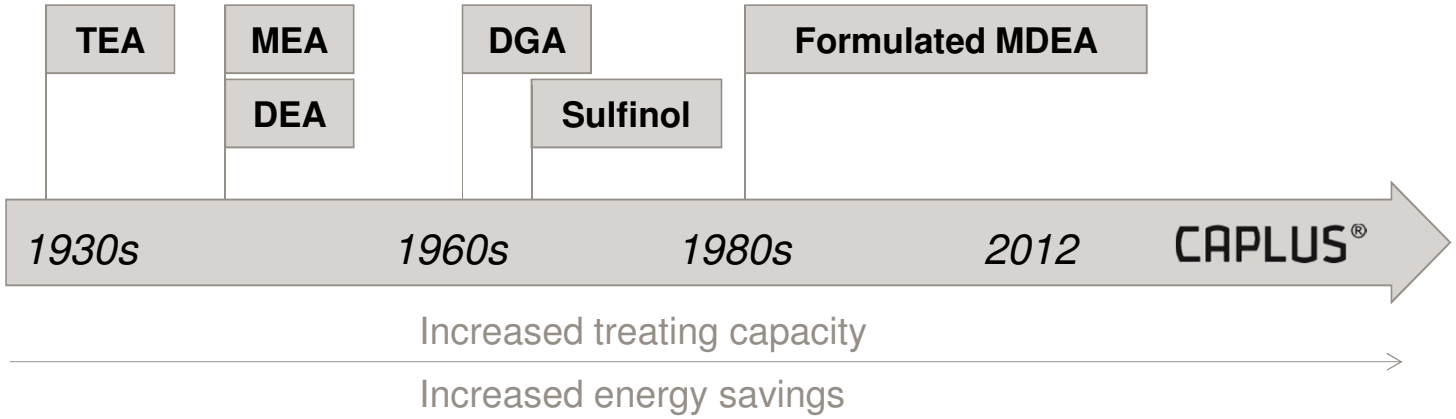
Caplus® is Evonik's next generation solvent for gas treating applications



Caplus® is a proprietary solvent allowing plant operators to push forward the performance of existing gas treating units

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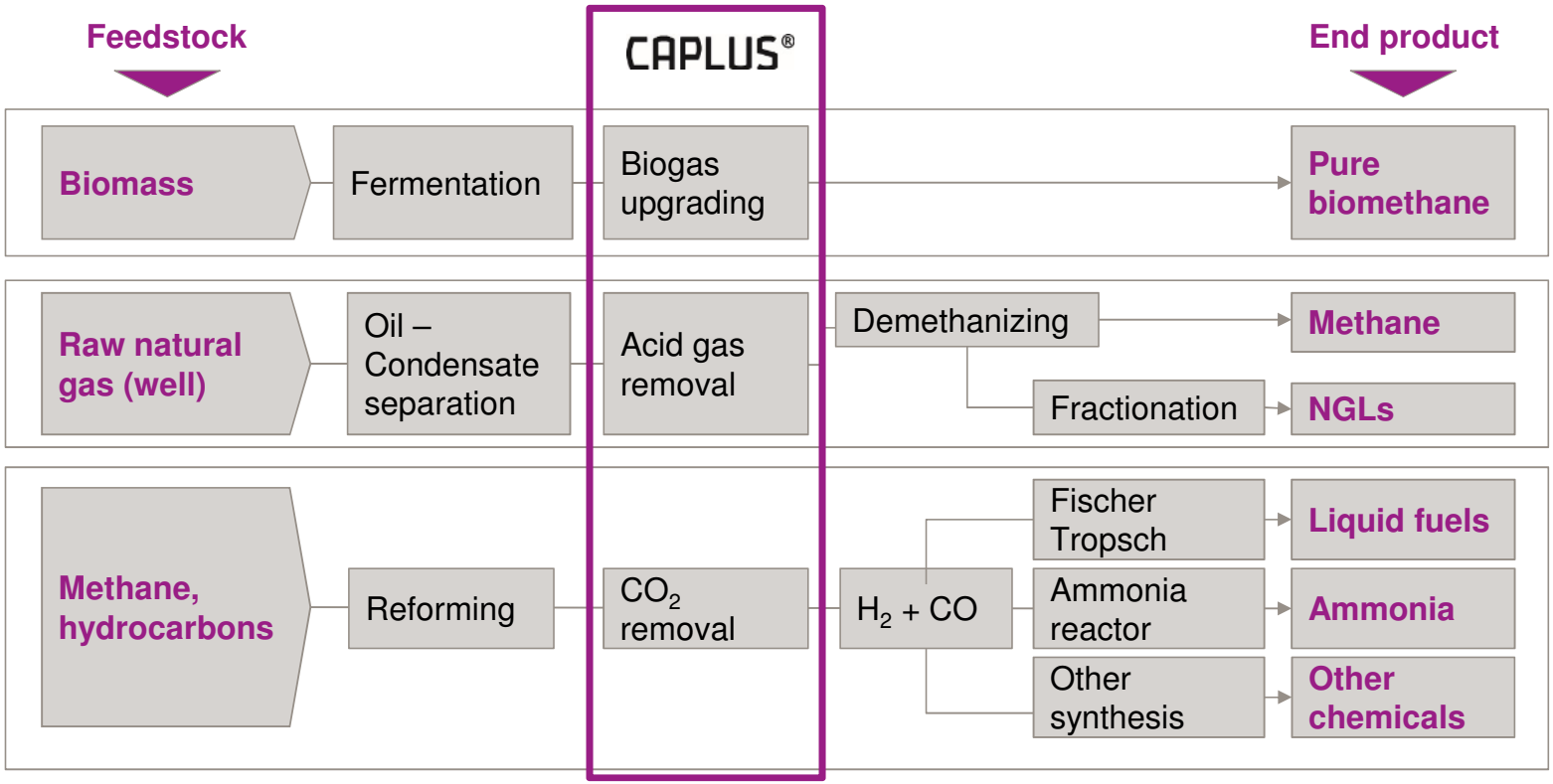
Currently used absorbents for acid gas removal may cause serious issues for customers



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Currently used absorbents for acid gas removal may cause serious issues for customers

State of the art solution

- MDEA + Piperazine
- Sulfinol
- Aminoethoxy-Ethanol (AEE)

Plant operation and gas treatment

Issues for plant operator

- Capacity limitations
- Foaming
- Corrosion
- Degradation
- Energy intensive

- Lower plant availability
- High maintenance costs/efforts
- High OPEX

Evonik's absorbent is able to overcome the existing industry issues

Characteristics of Evonik's superior absorbent Caplus®:

- Based on Evonik's 20 years of production experience in specialty amines
- More than one amine group per molecule
- Unique & optimized molecular structure
- Aqueous solution like state-of-the-art amines
- Drop-in at existing AGRU without process modifications

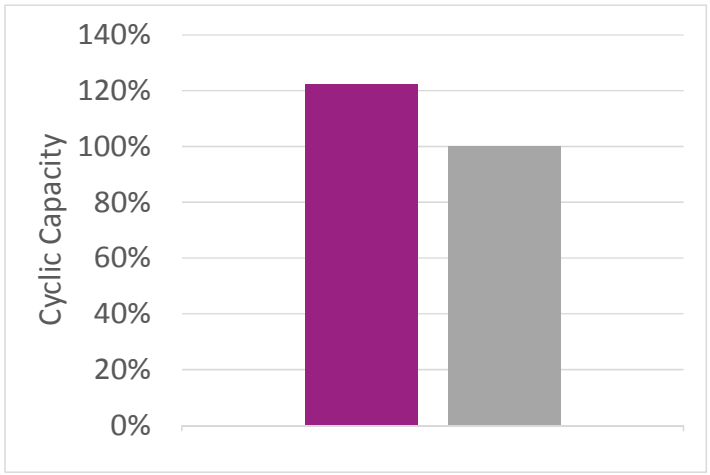
Performance Benefits of Evonik's absorbent

- Eliminate capacity bottlenecks
- Reduce your life cycle cost
- Reduce regeneration energy
- Minimize solvent degradation
- Increased operational flexibility

Caplus® is not based on MDEA

Caplus® offers capacity & flexibility. Increase the gas throughput or better cope with an increased acid gas content in feed gas of ageing wells.

CO2 Cyclic Capacity

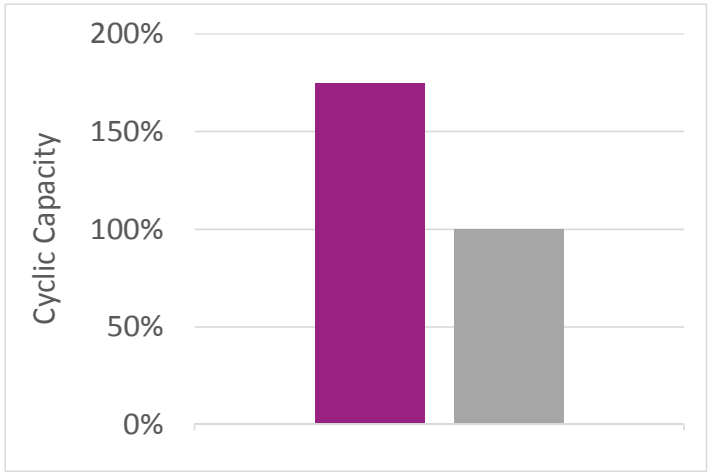


P_{CO2} = 1 bar (40 °C) & 0,1 bar (120 °C)

40 wt% promoted MDEA

40 wt% Caplus®

H2S Cyclic Capacity



P_{H2S} = 0,1 bar (40 °C) & 0,01 bar (120 °C)

40 wt% promoted MDEA

40 wt% Caplus®

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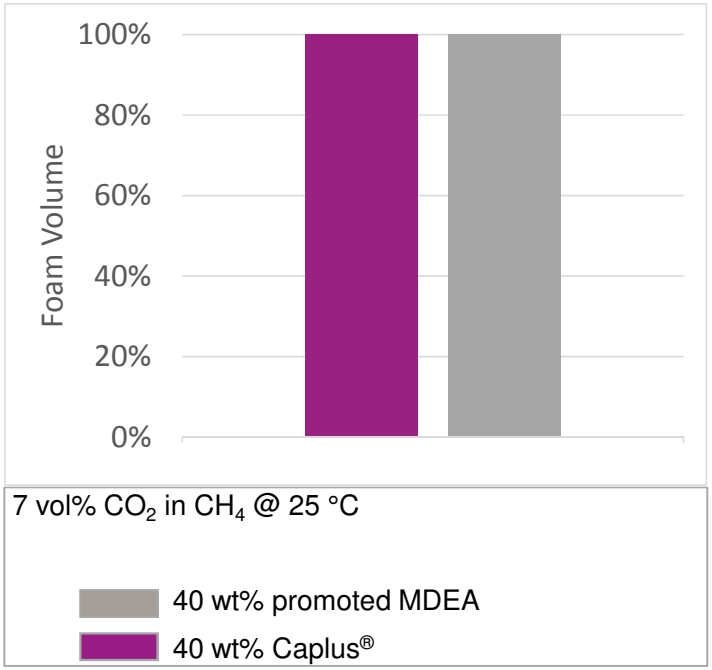
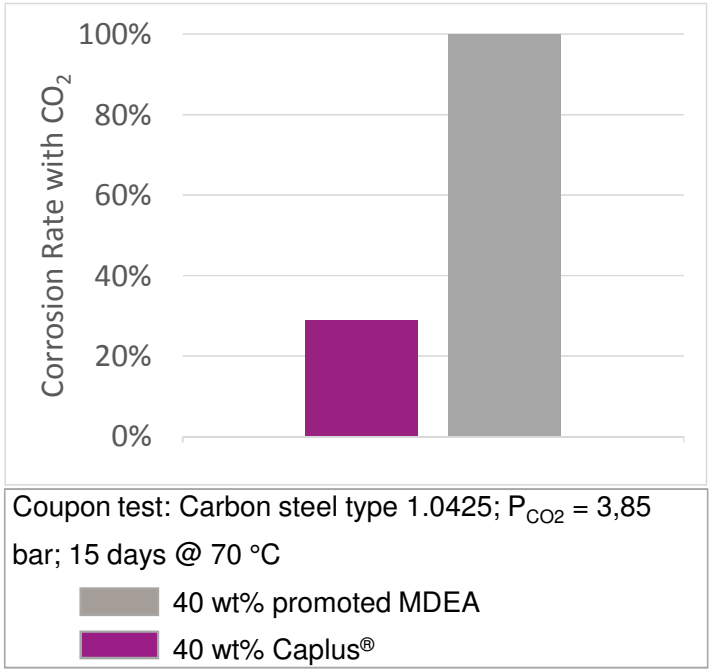
Caplus® ensures reliable operation due to low foaming and reduced corrosion compared to MDEA/PZ

Low Foaming



Low Corrosion



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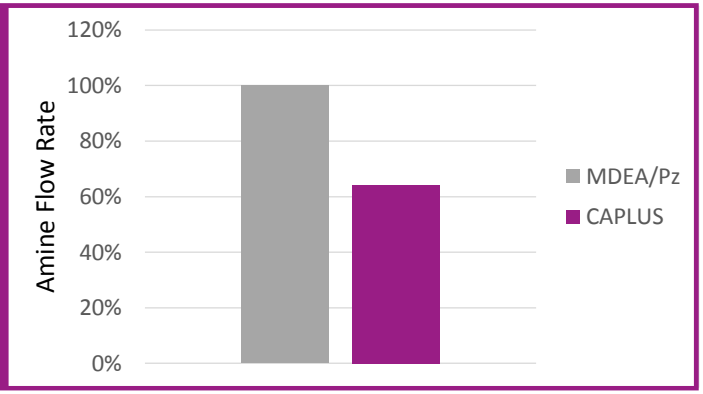
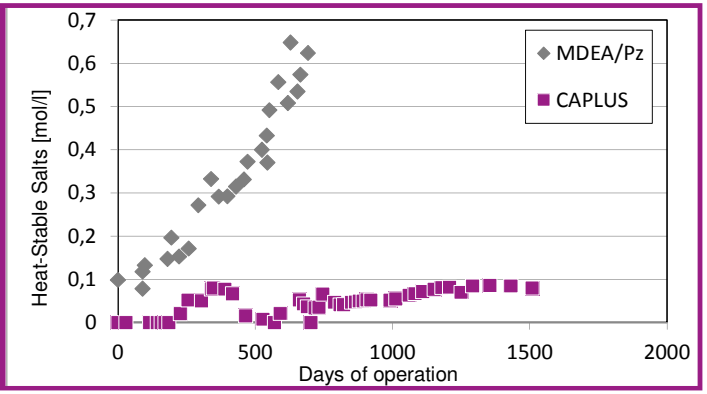
Commercial plant with Caplus®: Capacity Increase and/or Energy Savings together with a higher Chemical Stability lead to reduced amine life cycle costs an thus beneficial economics

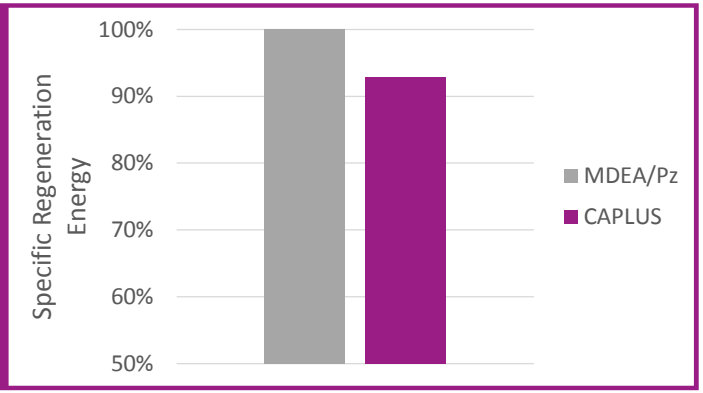
Capacity Increase



Chemical Stability



Energy Savings



Beneficial Economis

\+ Reliable Operation
\+ Significantly less Degradation
\+ Savings in Regeneration Energy
\+ Capacity Increase Potential

= Beneficial Amine Life Cycle Costs
= Lower Specific Gas Treating Costs

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Caplus® superior performance was already proven at commercial customer plant and next steps are prepared

Development status and outlook

- Evonik's absorbent is offering a strong value proposition
- Superior performance has been proven at commercial customer plant
- Further technology introduction is being prepared focussing on the pipeline natural gas market


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