Drivers of Dehydration

Technology, Developments & Opportunities

Disclosure

Forward-looking comments and projections are not to be construed as investment advice. CANUSA EPC is not responsible for outcomes related to commercial, investment, or technical decisions based on this material.

Why is Dehydration Important in CO2?

Corrosion

Cryogenic Processing

Transport

Injection

Drop Out

Injection of CO2 with Saturation

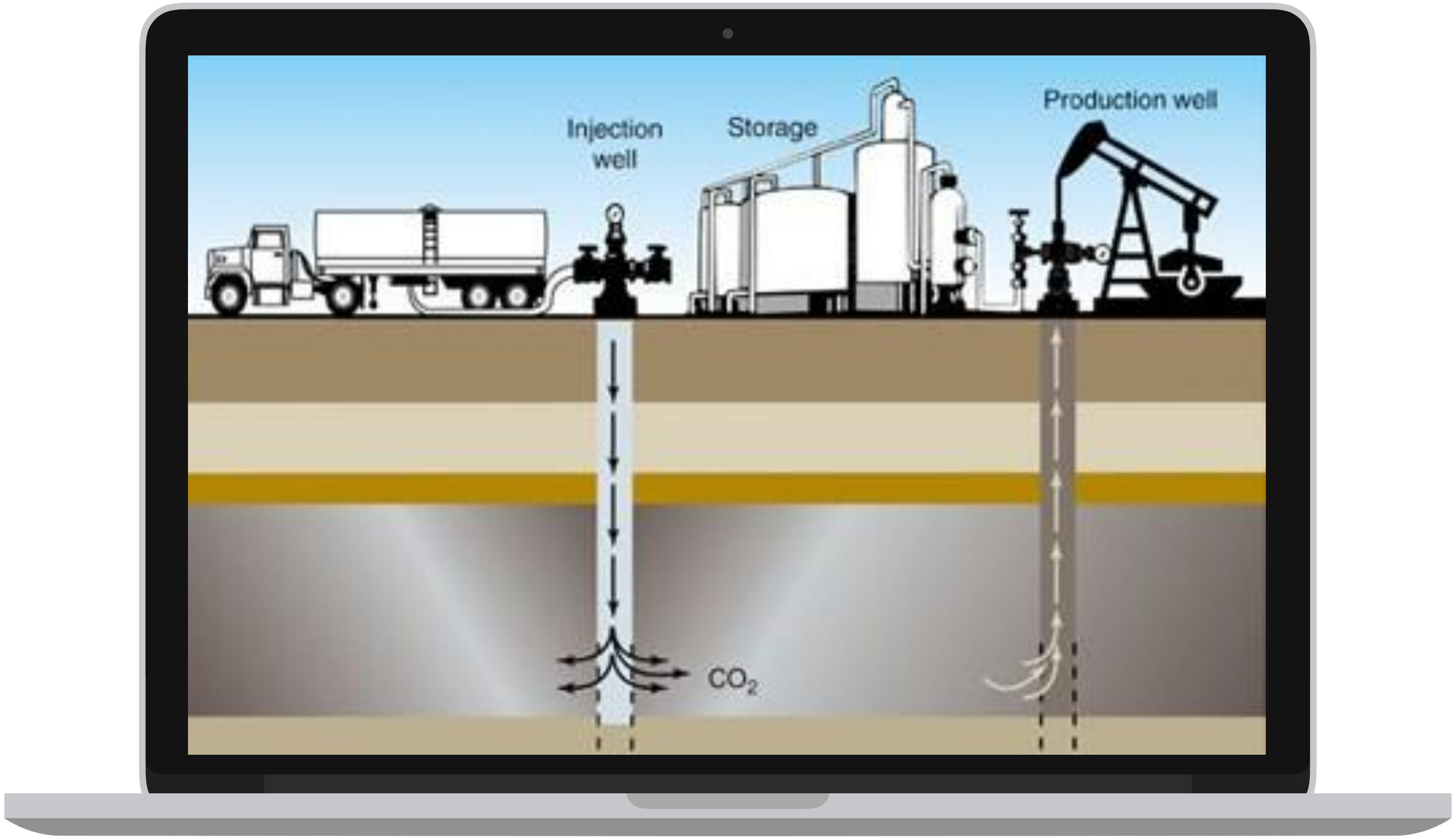
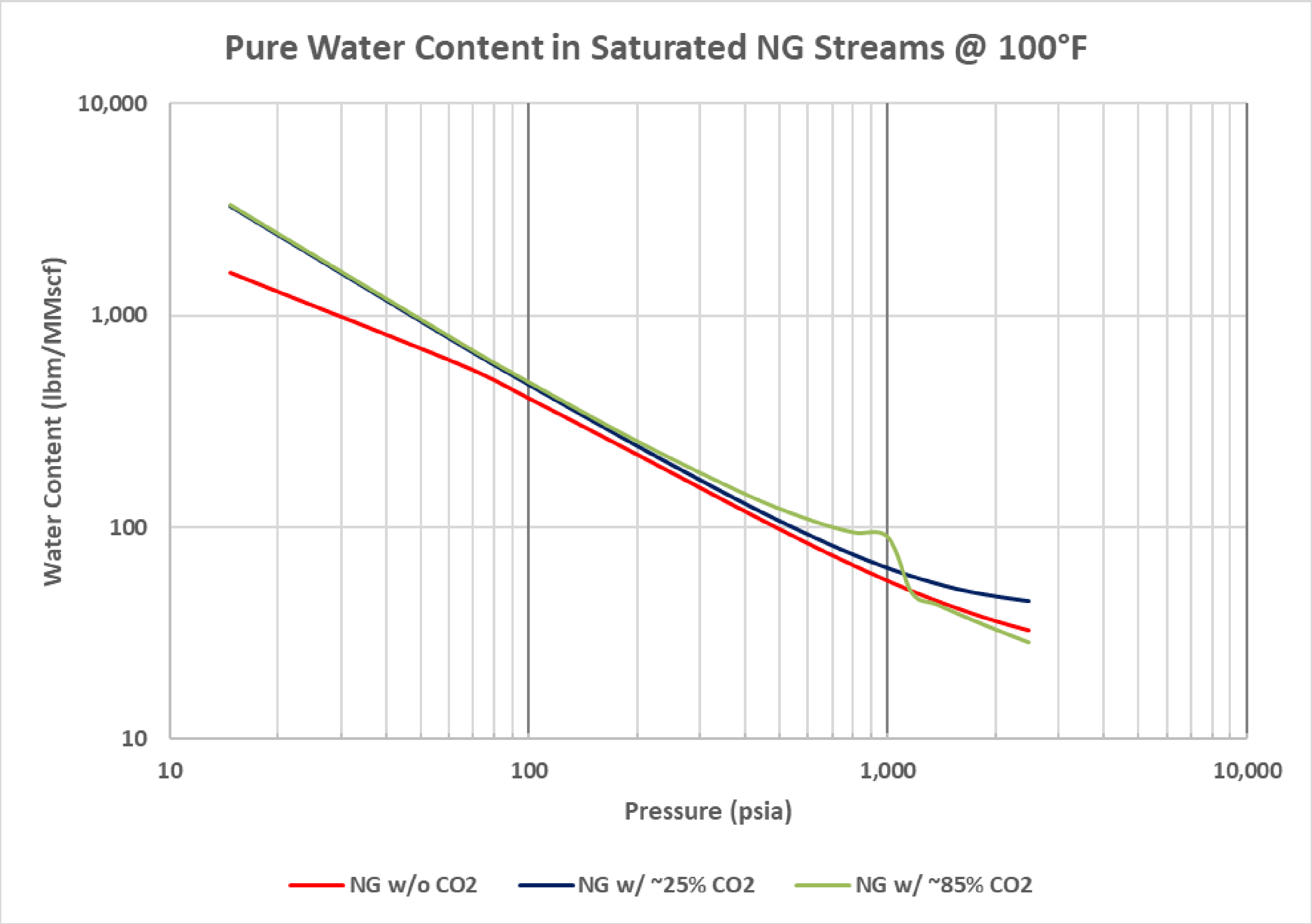


Image Source: Lawrence Livermore National Laboratory

Dehydration Curves



Carbon Capture Process

Pre-Conditioning → **Pre-Treatment** → **CO_2 Separation** → **CO_2 Utilization & Transport**

Pre-Conditioning

CHALLENGE

- Increasing atmospheric stream to manageable pressures (200 psig)
- Temperature removal

Pre-Treatment

CHALLENGE

- Removing containments with caustic or acid wash
- Reducing free water
- Combustion of O2

CO_2 Separation

CHALLENGE

- Selection technology will be proprietary
- Capital and operational costs are specific to the technology

CO_2 Utilization & Transport

CHALLENGE

- **What are sales/tariff specifications?**
- **Is Dehydration required?**
- **Is onsite storage required?**

CO2 Facility

Utility Requirement

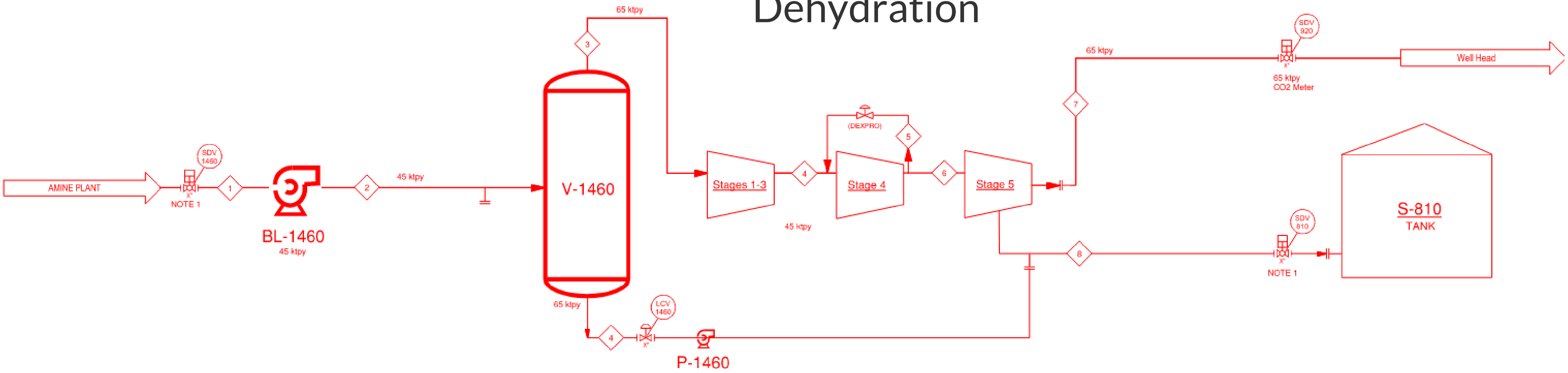
- Fuel gas
- Water
- Electricity

Major Equipment

- Piping and Blower
- Air Cooler
- Liquid Dropout

Compression

Dehydration



Traditional Dehydration Approaches

1 TEG

2 Chillers

3 Others

4 DEXPro™

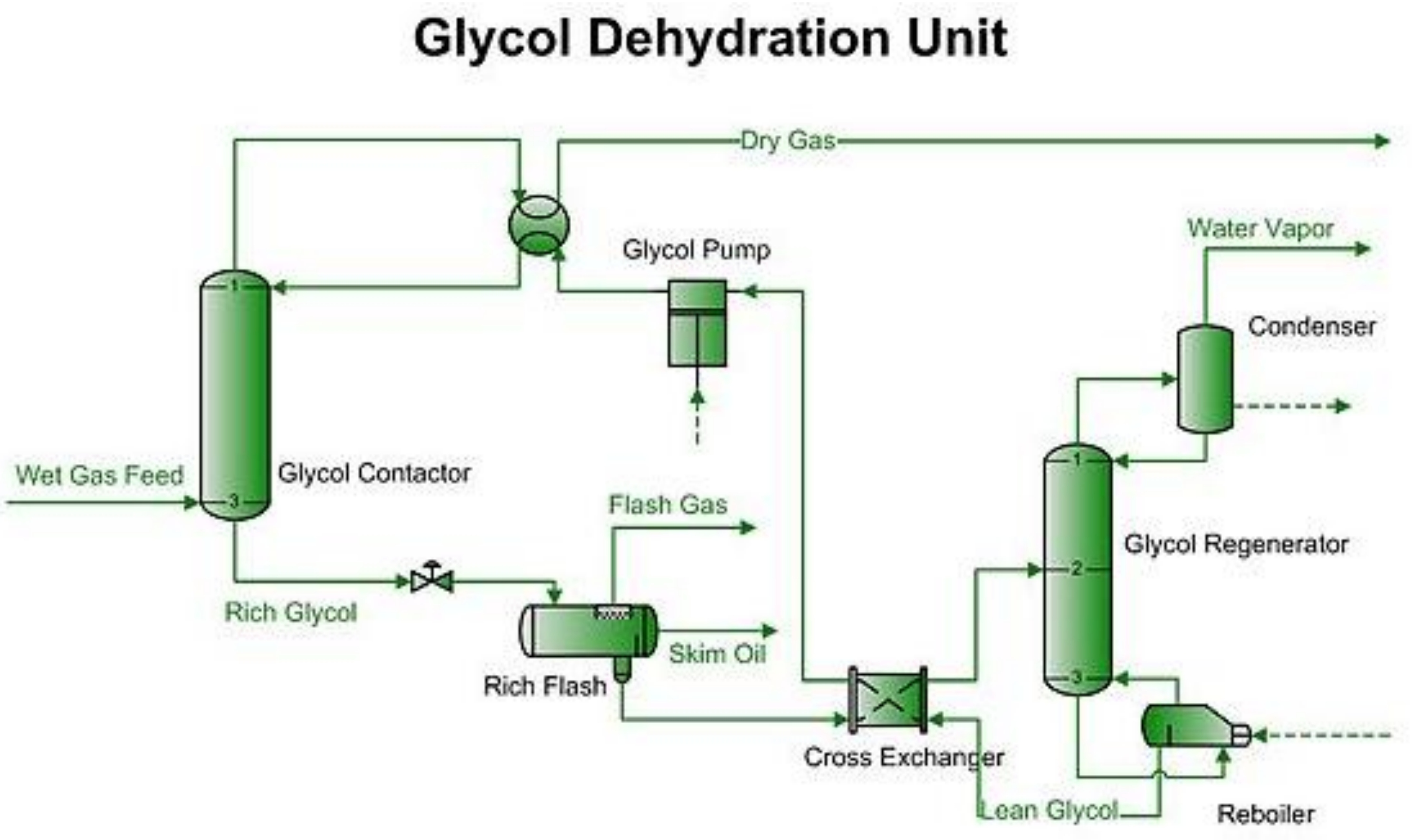
TEG

Great Option For:

- Long-term reliability
- Efficiency, Industry-tested
  - For our study ~ 25 lb/MMSCF
  - As low as ~7 lb/MMSCF

Considerations:

- BTEX Emissions
- Emissions from Regeneration
- Larger Footprint, cost



Chillers

Great Option For:

- Environmental benefits
- Efficiency

Considerations:

- Turndown challenging
- For our study ~ 47.97 lb/MMSCF
- Would need Methanol injection or Mole Sieve

Desiccant Adsorption Systems

Great Option For:

Achieving very low water content

Examples Silica gel or Mole Sieves

Considerations:

Higher Operations cost

Low amounts of water/trade off with disposable

Permeable Membrane Skids

Great Option For:

Efficiency

Achieving very low water content

Considerations:

Requires higher upfront investment

Higher DP pressures

Pre-treated gas required to remove fouling concerns

DEXPro™

Great Option For:

Reduce water to a **25 lb/MMSCF** limit

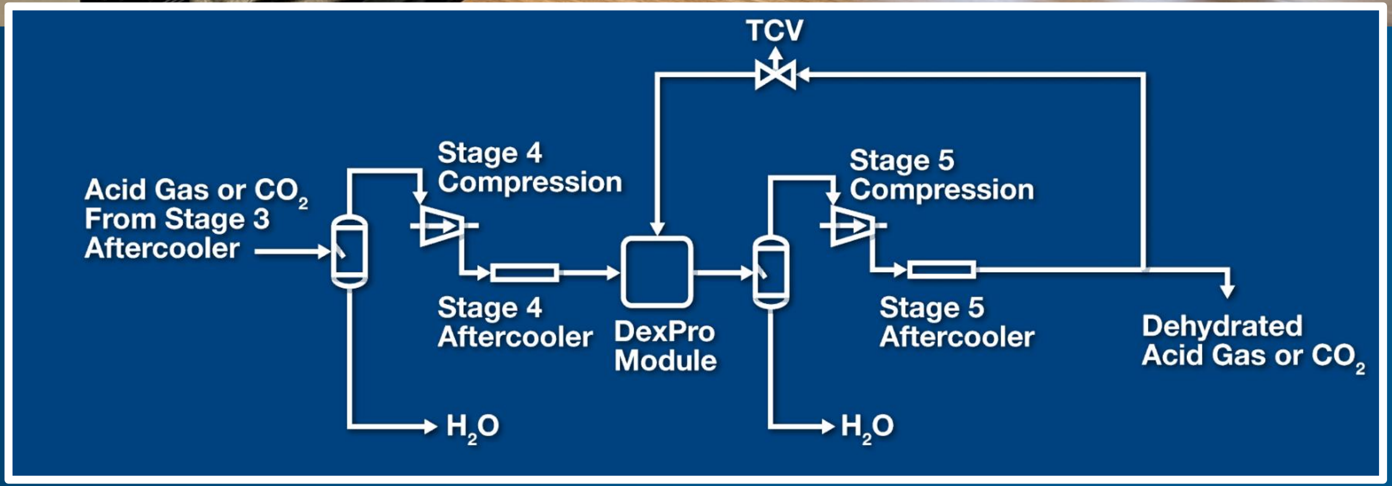
Small footprint

Closed Loop system

Considerations:

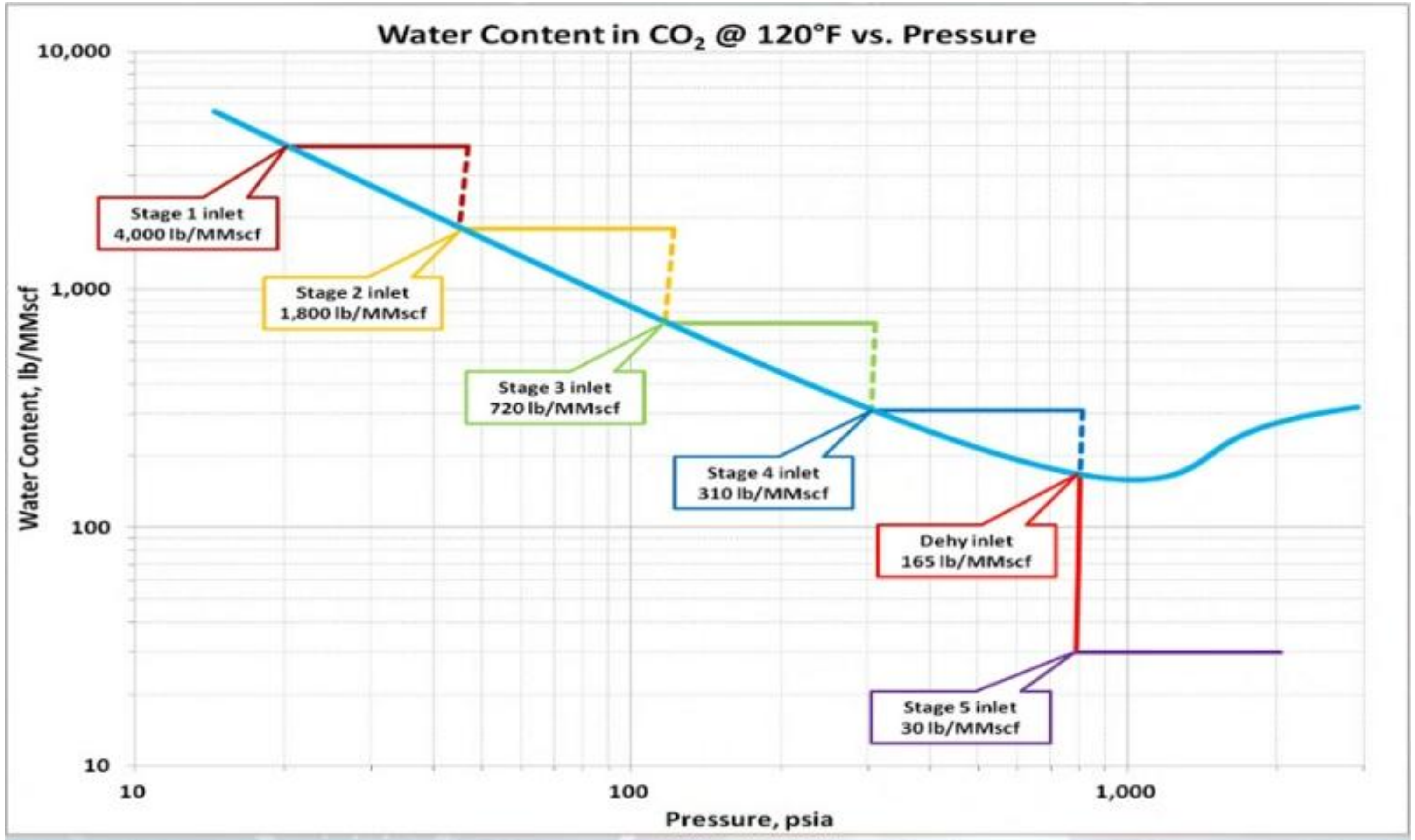
Proprietary

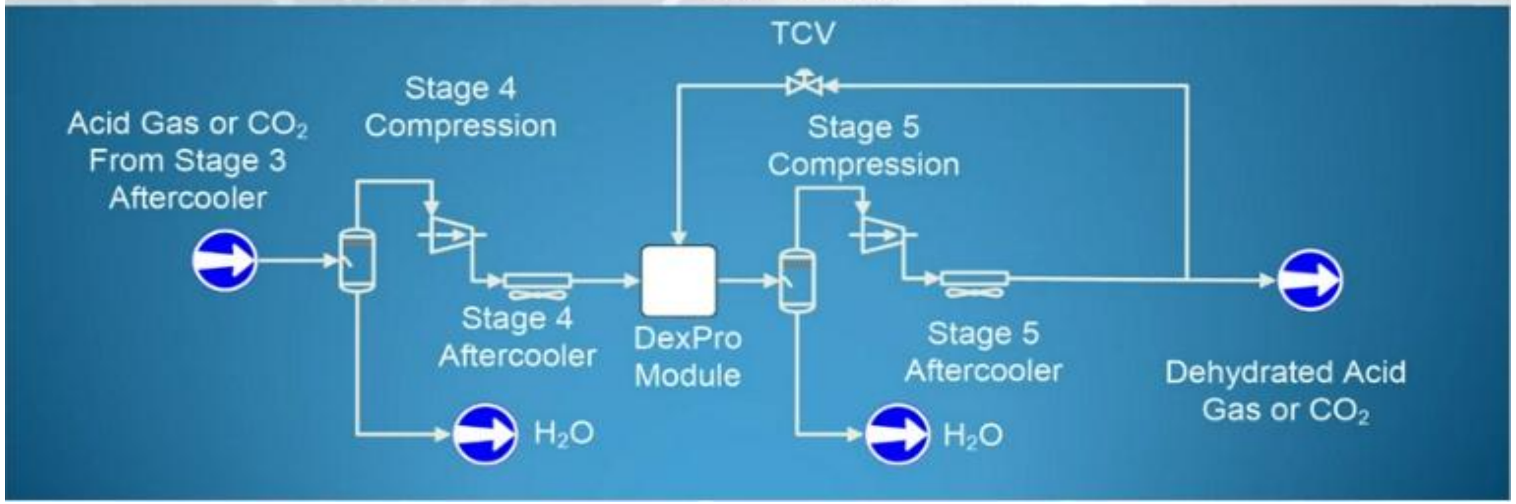
Possible parasitic load



Deeper Dive Into DEXPro™

- Overview of the process
- Use of JT effect
- Relies on Multi-stage compression





Summary of Findings

	TEG	CHILLER	DEXPRO
Reliability	Medium	Low	High
CAPEX	Medium $473k	Low $310k	High $715k (includes install)
OPEX	Mid/High	Mid/High	Mid
Water Content	7 LB/MMSCF	50 LB/MMSCF	20-25 LB/MMSCF
Environmental Impact	High	Medium	Low

DEXPro™ was chosen for this application as the integration and environmental impact aligned with the Client goals of the project.

Results may vary based on various factors.

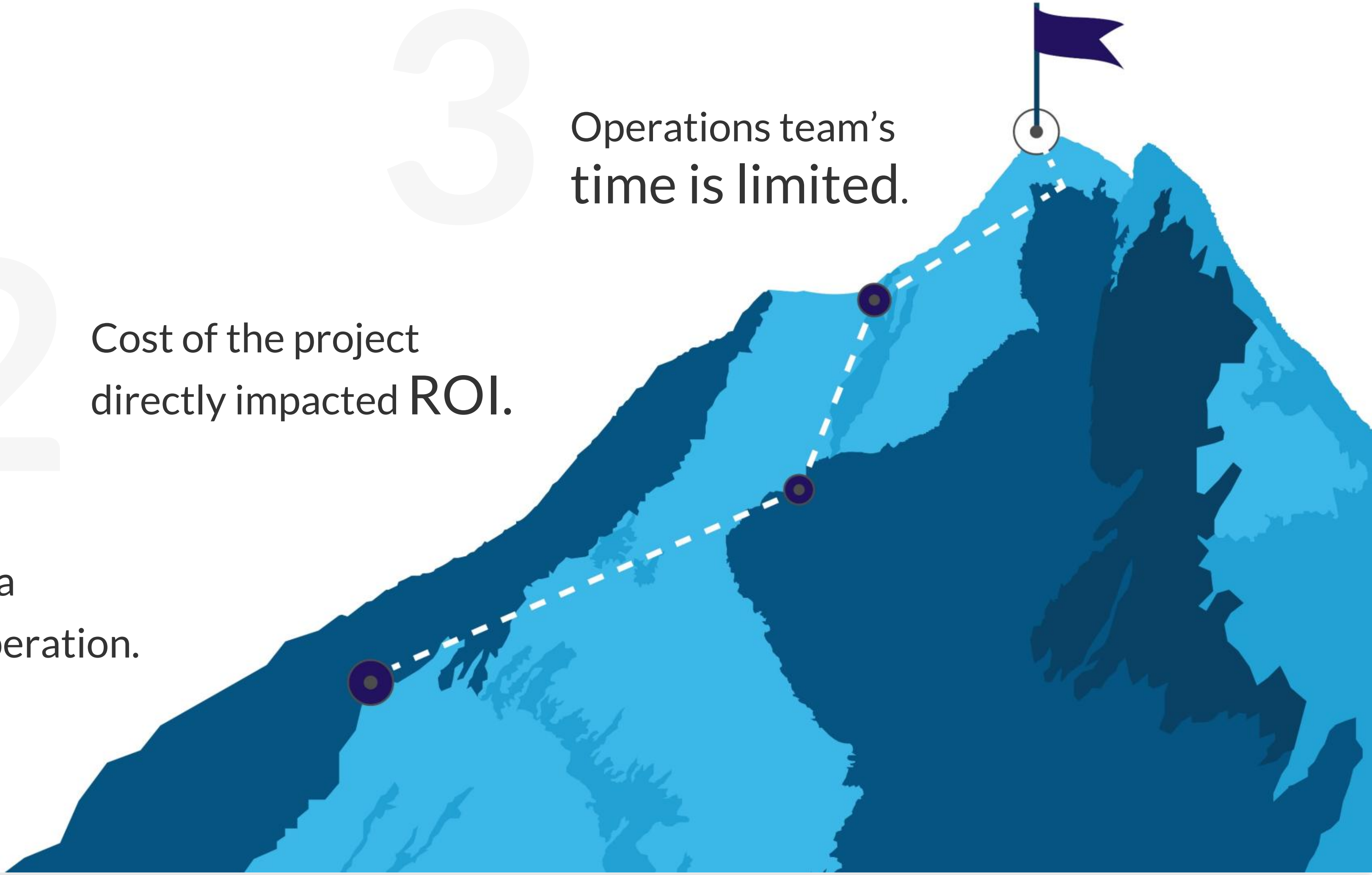
Applying Dehydration to Your Project

Why Was Water a Concern?

1 Client wanted to ensure a reliable and safe operation.

2 Cost of the project directly impacted ROI.

3 Operations team's time is limited.



Opportunities & Advancements

Future Applications

Vendor Input

STARTEC Compression & Process

DEXPro INNOVATIVE PROCESSING TECHNOLOGY

TITAN

CANUSAEPC.COM/RESOURCES

Questions?

Thank you!