Geological Storage of Acid Gases in Western Canada (since 1989)

Bill Gunter, Alberta Research Council Inc.

Edward Wichert, Sogapro Engineering Ltd.

Stefan Bachu, Alberta Geological Survey

Tom McCann, T.J. McCann and Associates Ltd.

Waste Acid Gas Streams H_2S and CO_2

- **Sulphur recovery**

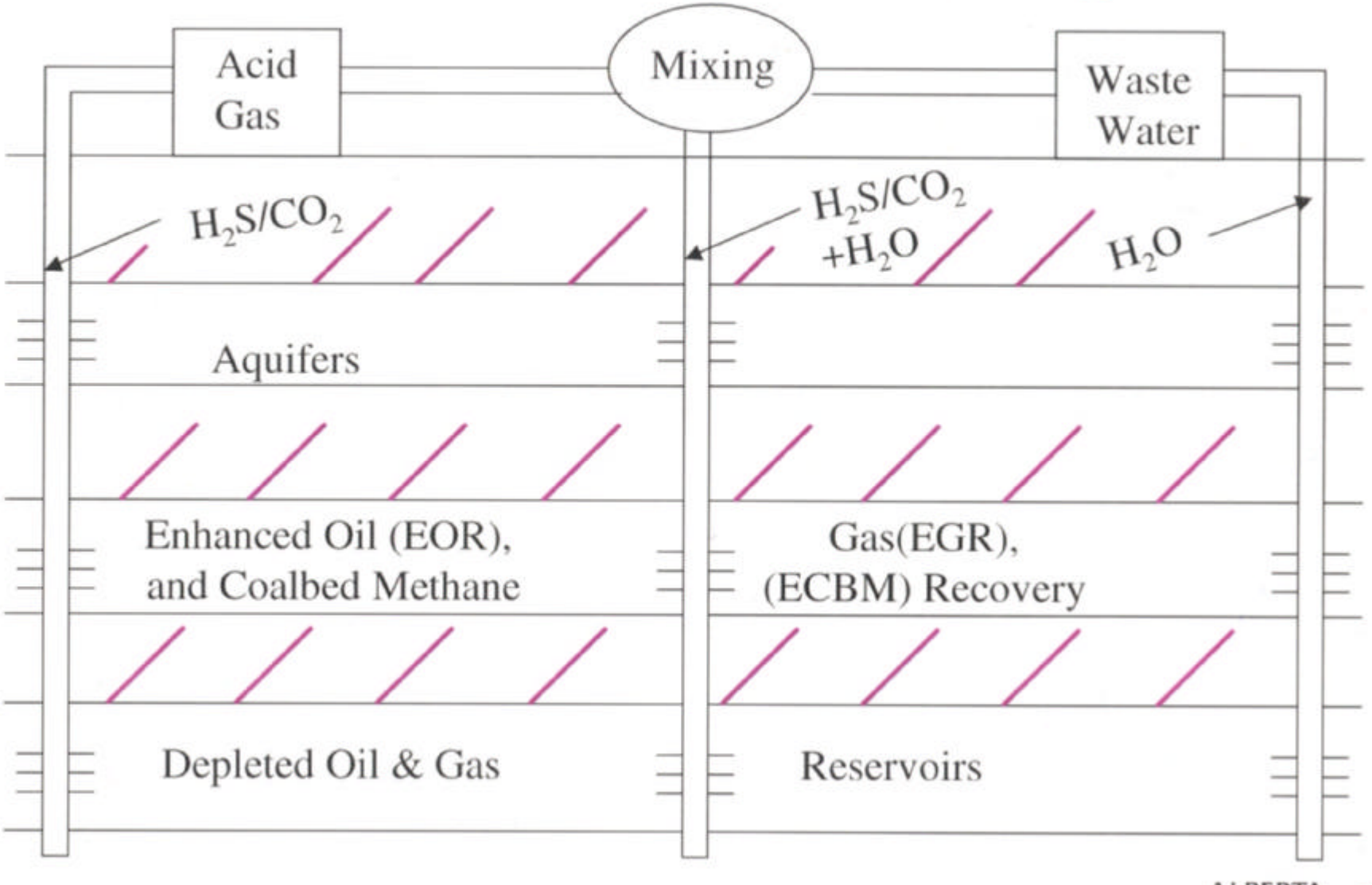
  - versus –

- **acid gas disposal**

  - versus –

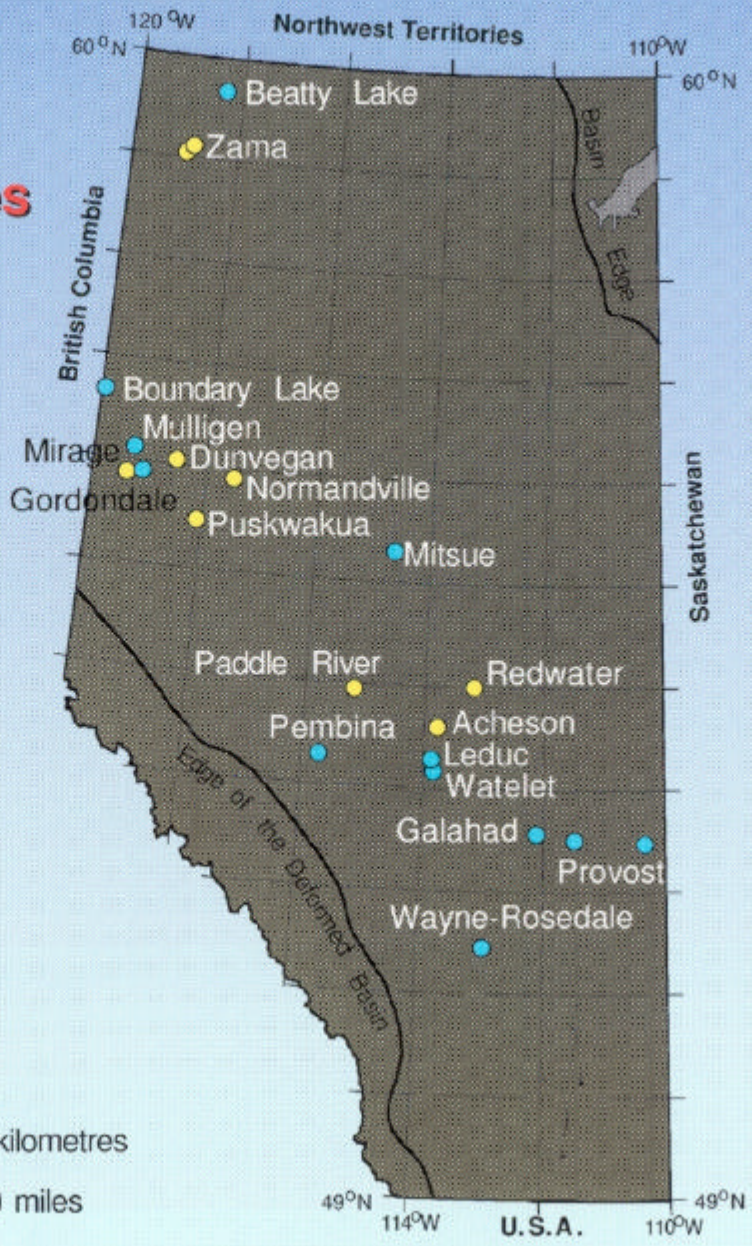
- **flaring**

Acid Gas Disposal Targets



EUB Alberta Energy and Utilities Board

Location of Current Sites of Acid Gas Injection in Alberta

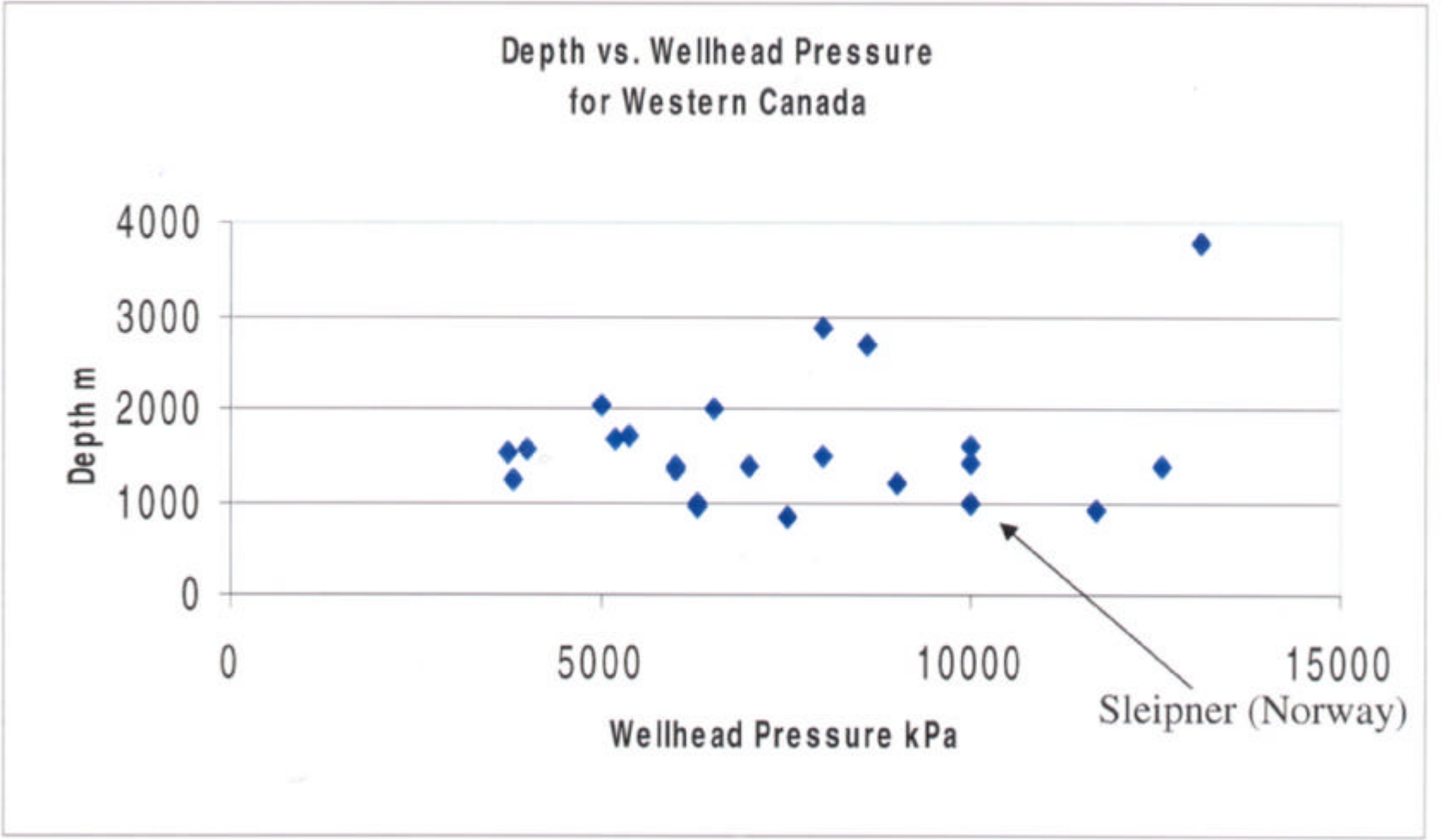


- Injection in depleted reservoirs
- Injection in deep aquifers

0 100 200 300 kilometres
0 100 200 miles

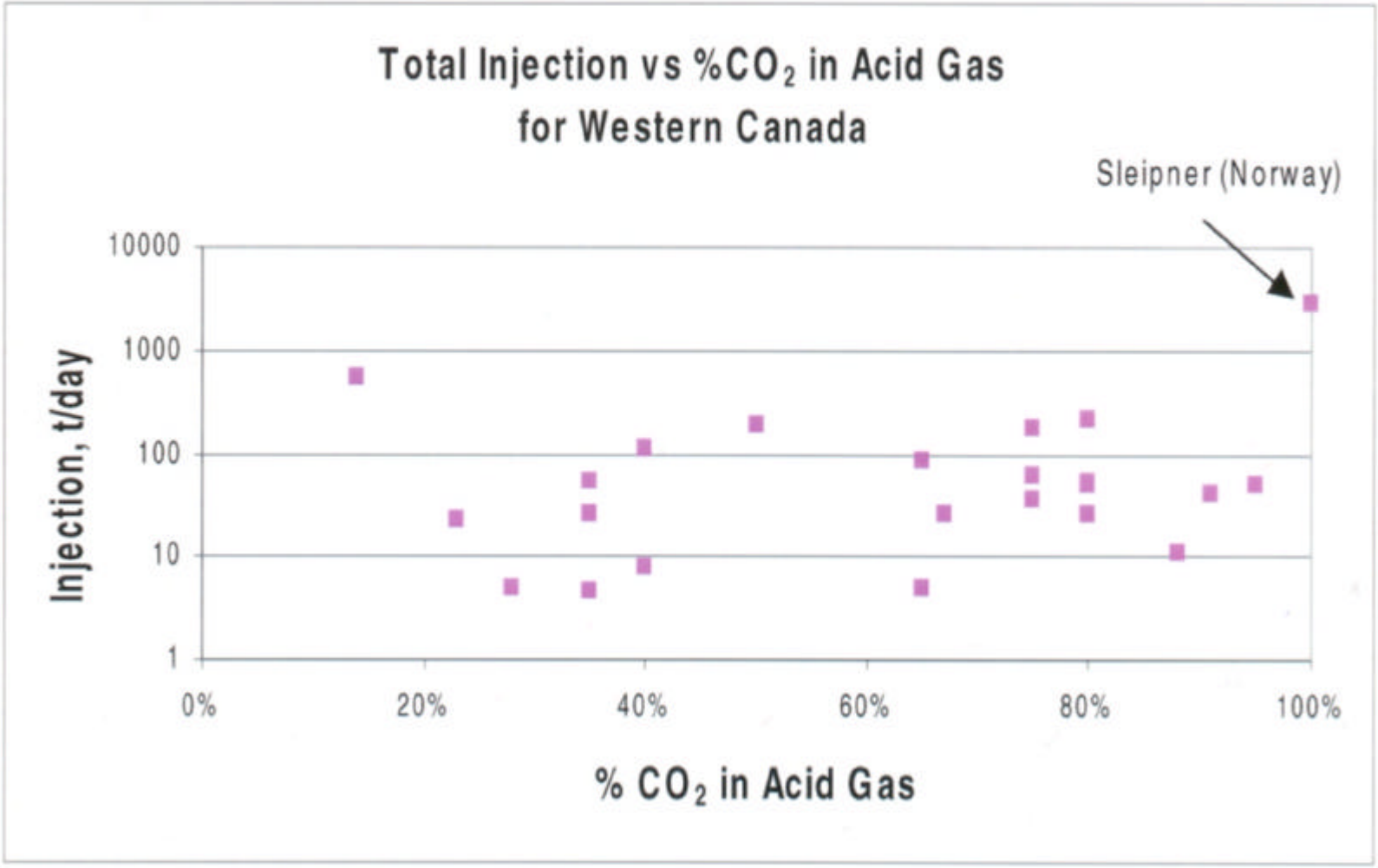
AGS

Acid Gas Injection Projects



ALBERTA RESEARCH COUNCIL

Acid Gas Injection Projects



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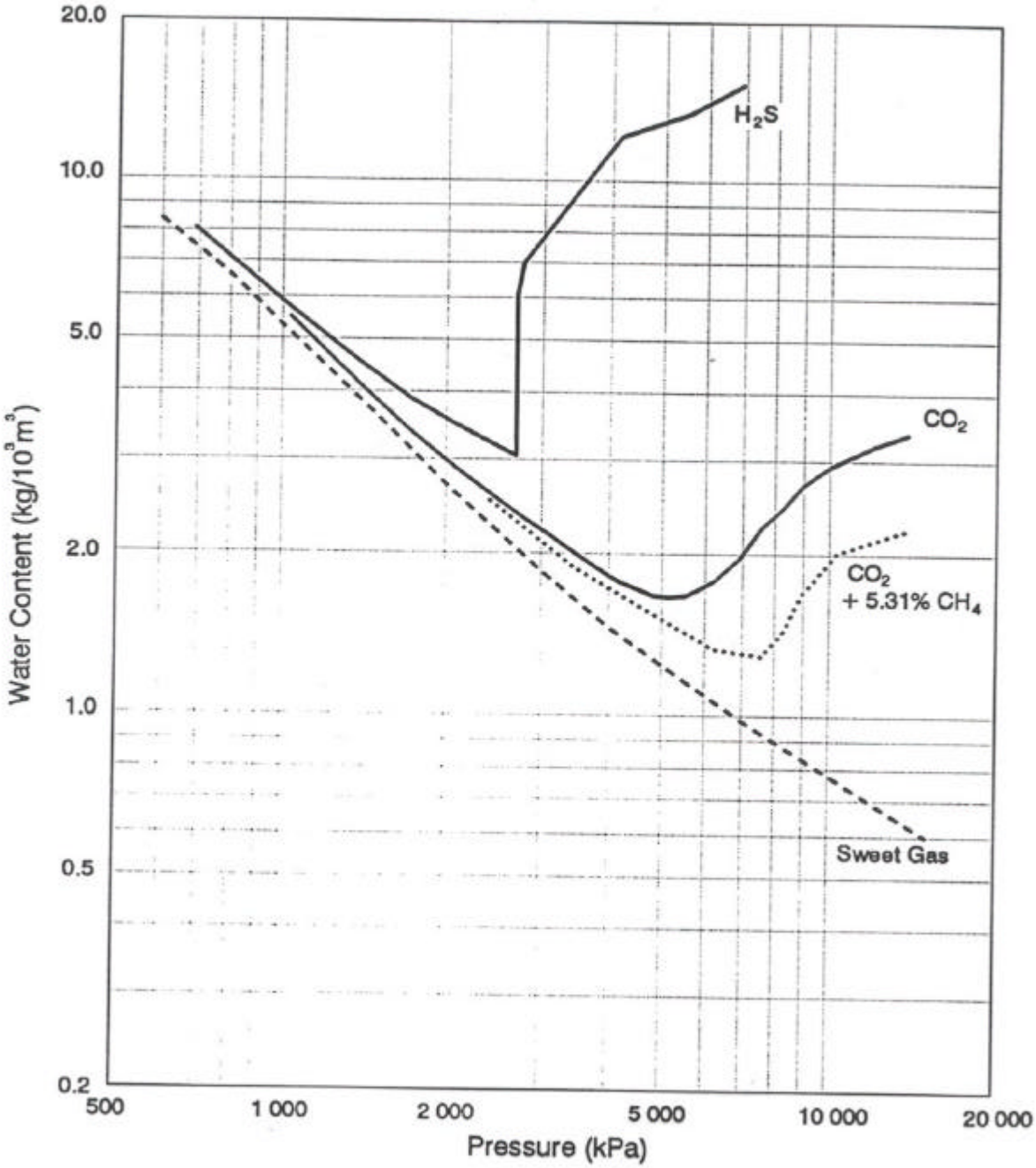
Tubular Damage

- **Corrosion**
- **Cavitation and erosion (liquid $\longleftrightarrow$ vapor)**
- **Hydrate scaling (H_20) present**

Water Content vs. Pressure at 37.8 °C



Wichert and Royan, 1996

Figure 2.4

Vapour Pressure vs. Temperature and Hydrate Conditions for H_2S and CO_2

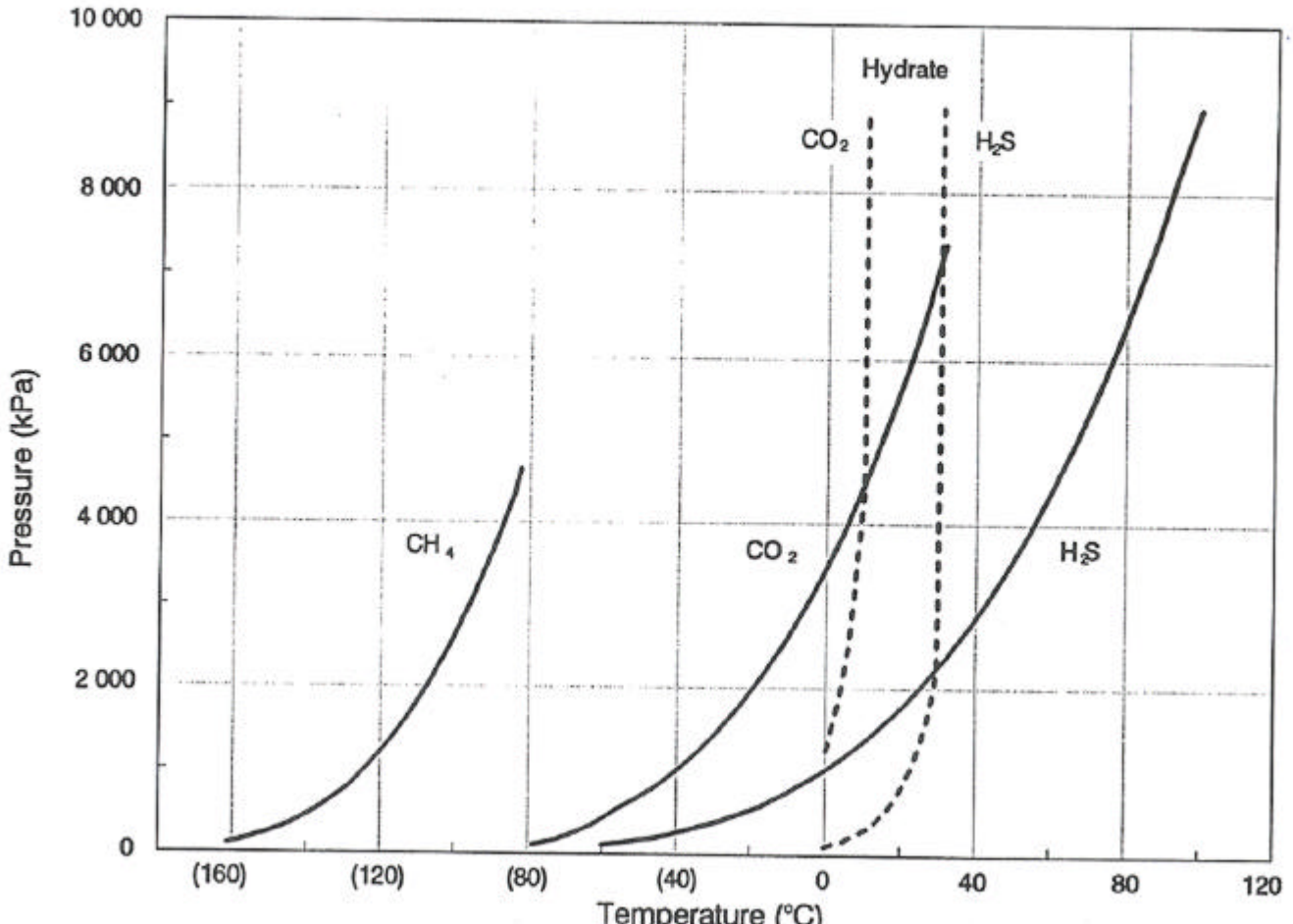
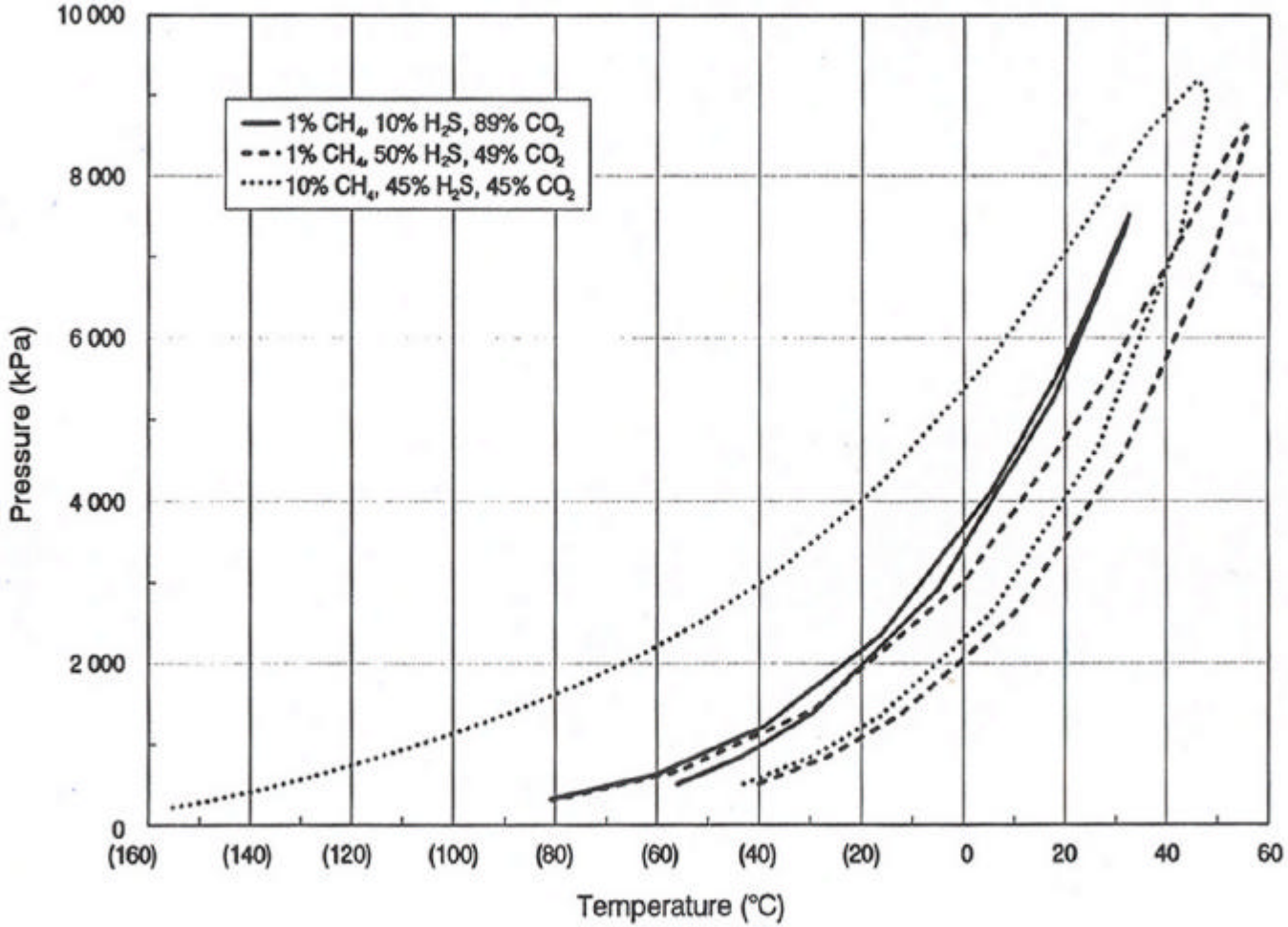


Figure 2.5

Wichert and Royan, 1986

P-T Phase Envelopes for Various Gas Mixtures



Which chart and Region, 1986

Figure 2.8

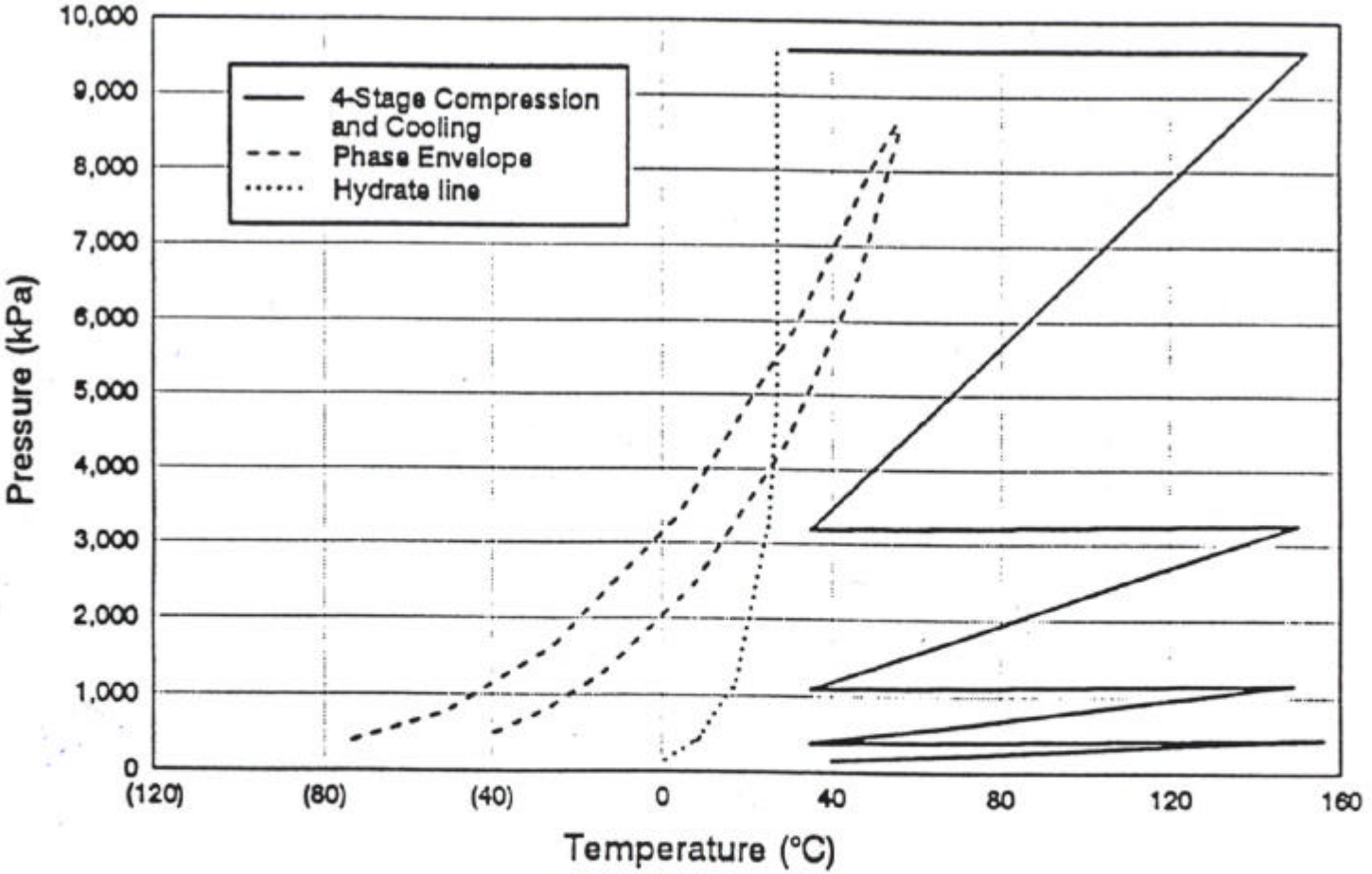


Figure 5. Four-stage acid gas compression showing pressure rise and temperature variations.

Wichert and Royan, 2000

EUB Requirements

Surface + Wellbore Concerns

- **Public consultation**
- **Groundwater protection and wellbore integrity**
- **Safety devices to control material failure**

EUB Requirements

Disposal Zone

- Capacity of disposal zone
- Thickness, integrity and extent of caprock
- Location and extent of bottom or lateral bounding formations
- Natural fluid flow rates and flow direction
- Seismic risk
- Drilling history of offsetting wells in area (2km)
- Effect on resources in disposal zone

Reservoir Damage

- Mineral dissolution
- Fines migration
- Mineral precipitation
- Oil or condensate banking
- Asphaltene and sulphur deposition
- Hydrate plugging
- Fracturing

Conclusions

- Increasing demand for natural gas requires methods for handling sour gas (H_2S)
- Injection of acid gas (H_2S +CO_2) is a solution to reducing emissions
- Compression of acid gas is designed so that minimum water content is achieved minimizing corrosion and hydrate formation
- Long term mineral reactions will render the acid gas components inert in a geological framework
- Storage targets are aquifers, depleted oil and gas wells, and EOR/EGR/ECBM reservoirs