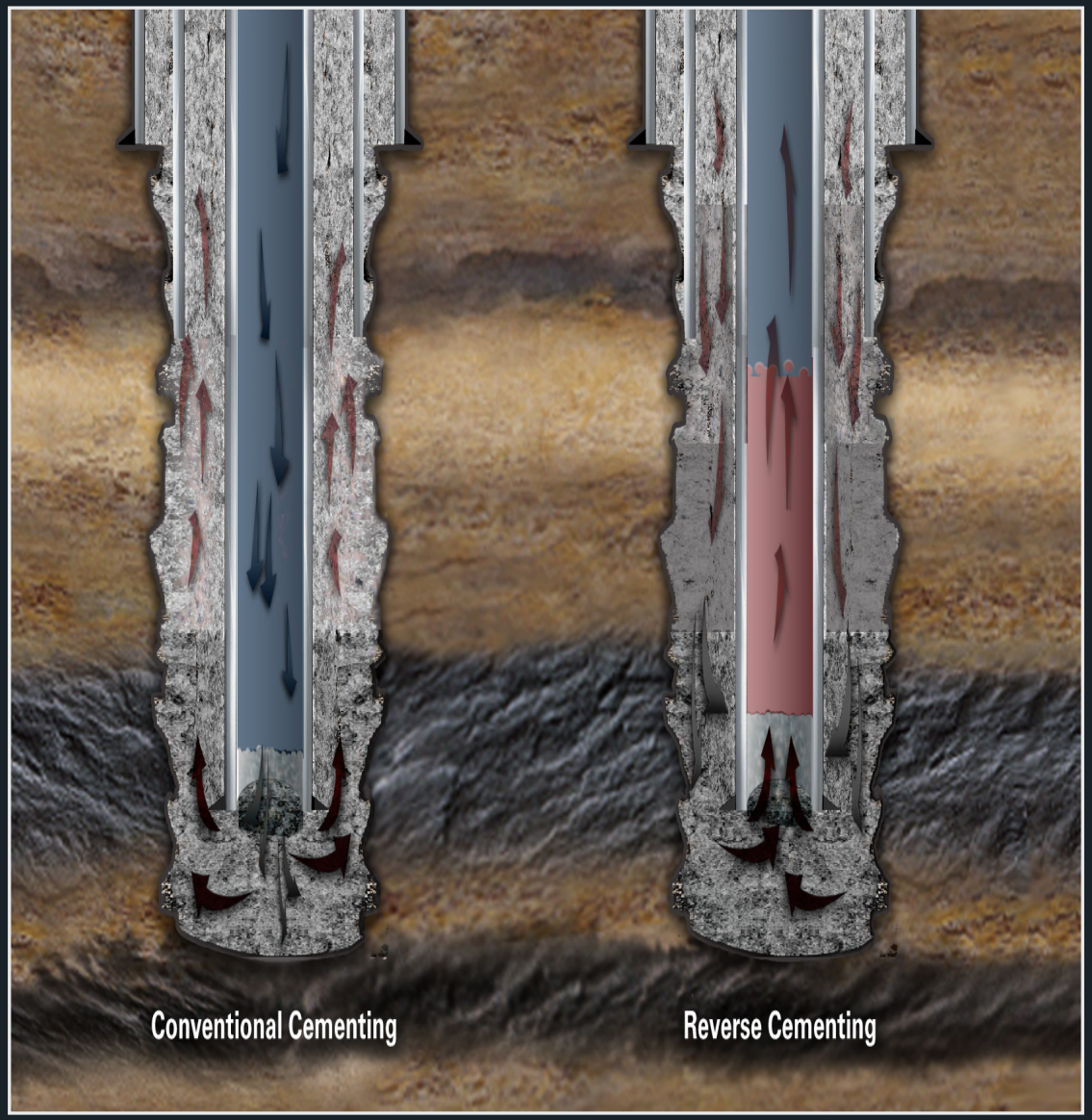
Reverse-Circulation Cementing and High Performance Geothermal Cements

Presenter: Rafael Hernández

Overview

- Reverse Circulation Cementing
  - Advantages of Reverse Circulation Cementing
  - Challenges of Reverse Circulation Cementing
- Geothermal Cements
  - Foamed Cement
    - Properties
  - Latex Cement
  - CaP Cement
- Summary

Reverse Circulation Cementing

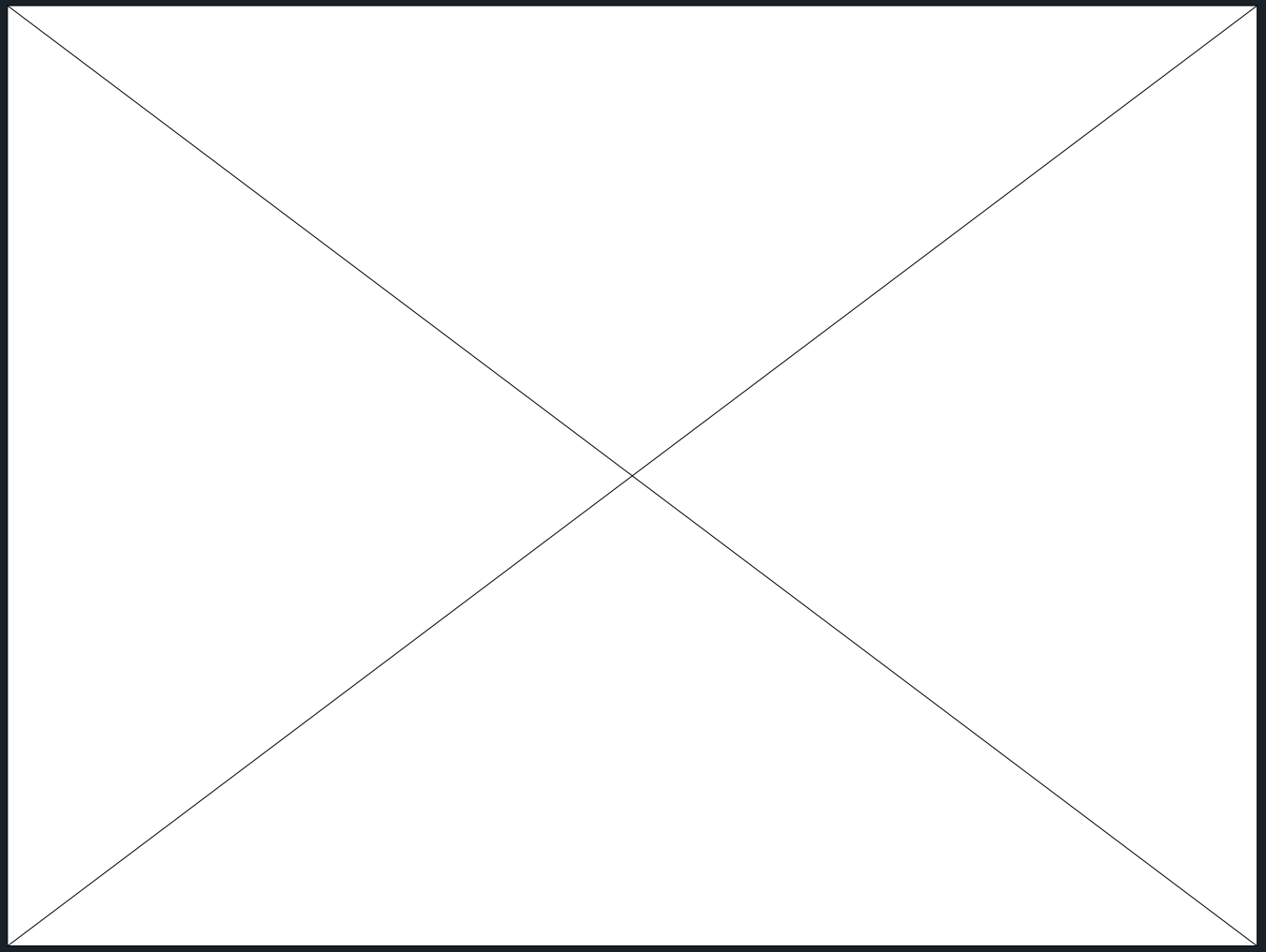


- In conventional cementing, the spacers and cement are pumped down the casing or tubing and the drilling fluid is returned through the annulus
- In reverse cementing, the spacers and cement are pumped down the annulus directly and the drilling fluid is returned through the casing or tubing

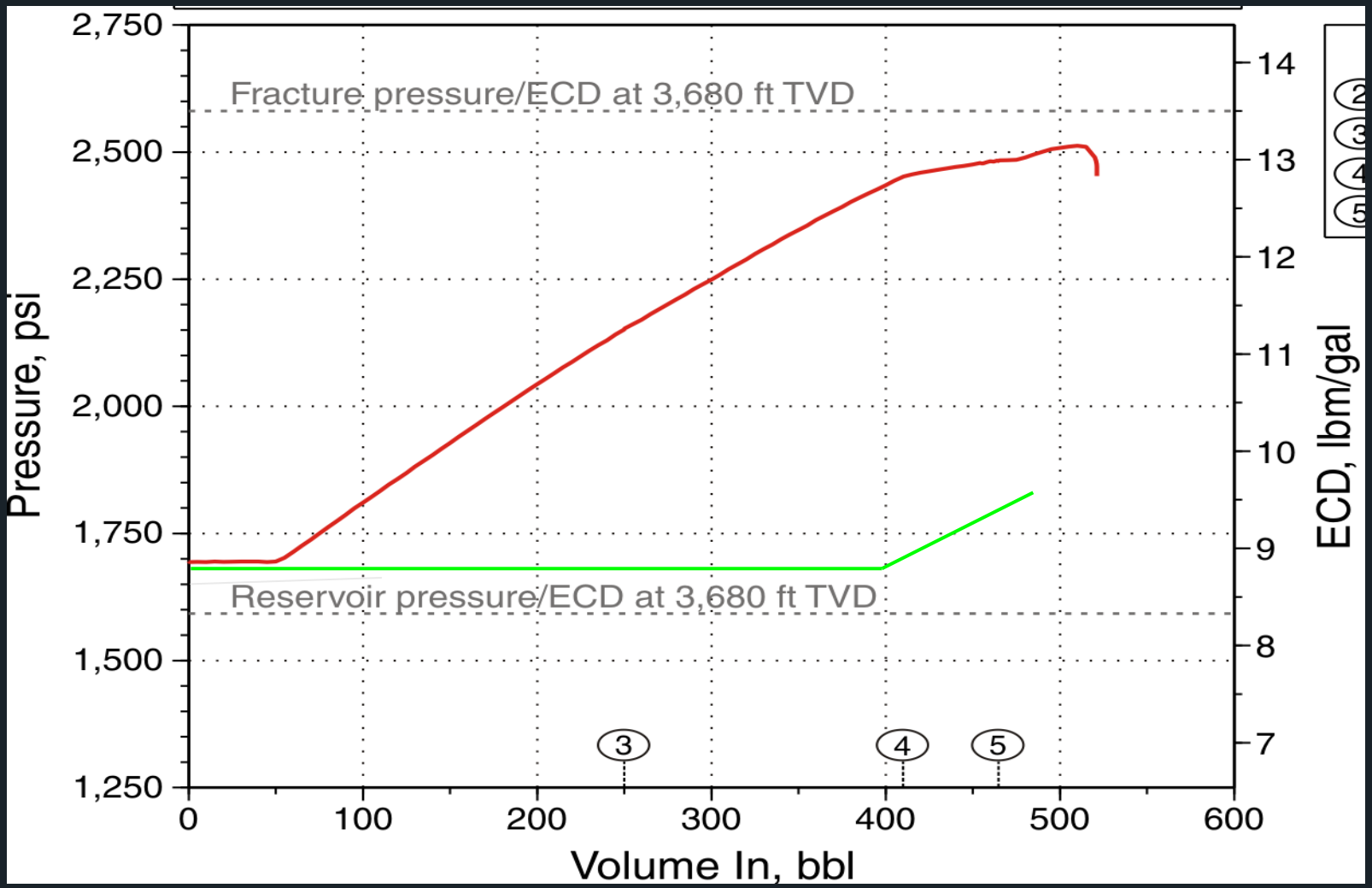
Reverse Circulation Advantages

- Reduced ECD
- Reduced job pump time
- Shorter slurry thickening times
- Improved early compressive-strength development
- Improved environmental management
- Easier cement-slurry selection and design

Reverse Circulation Advantages



Conventional vs. Reverse ECDs

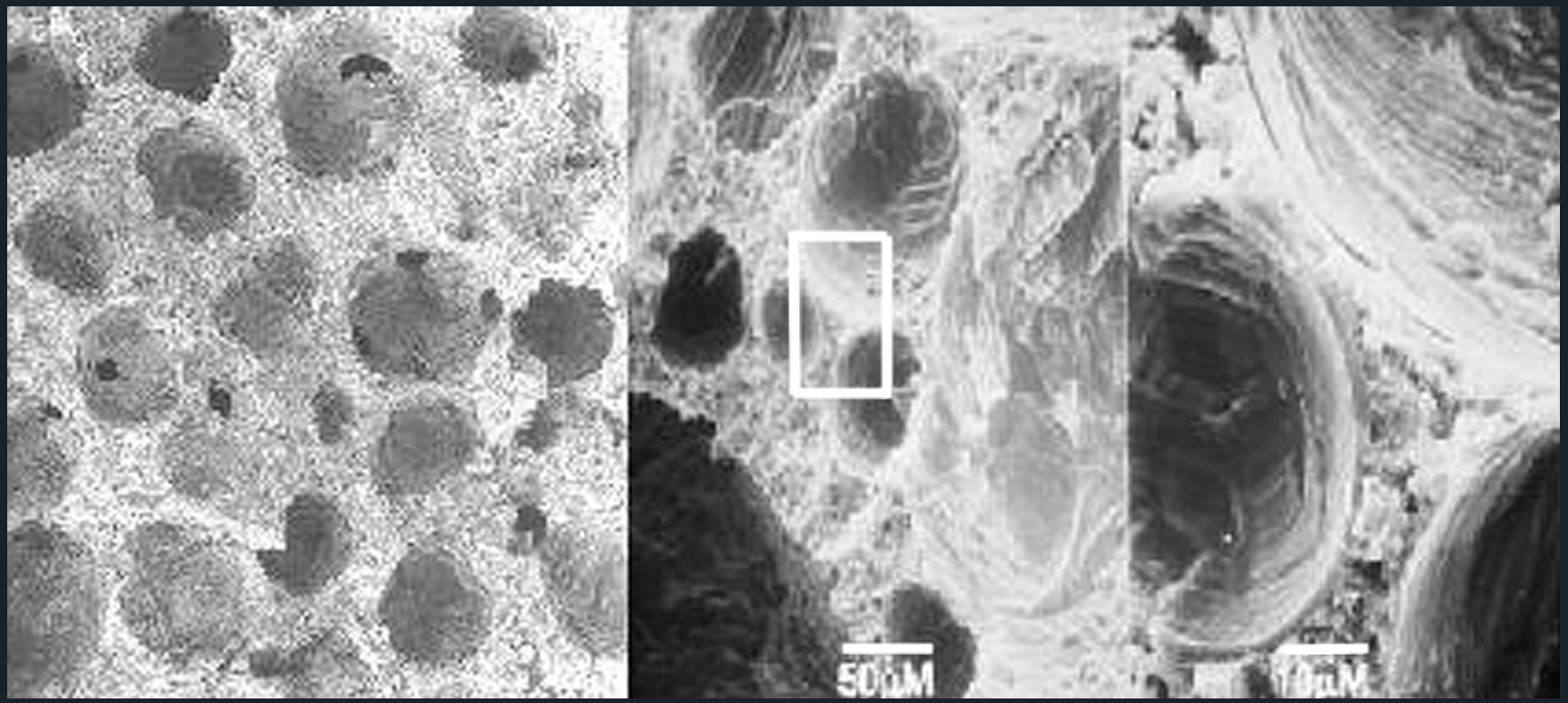


Reverse Circulation Challenges

- Determining cement location
- Rig up
- Job design and execution
- Float equipment
- Experience

Geothermal Cements

Foamed Cement

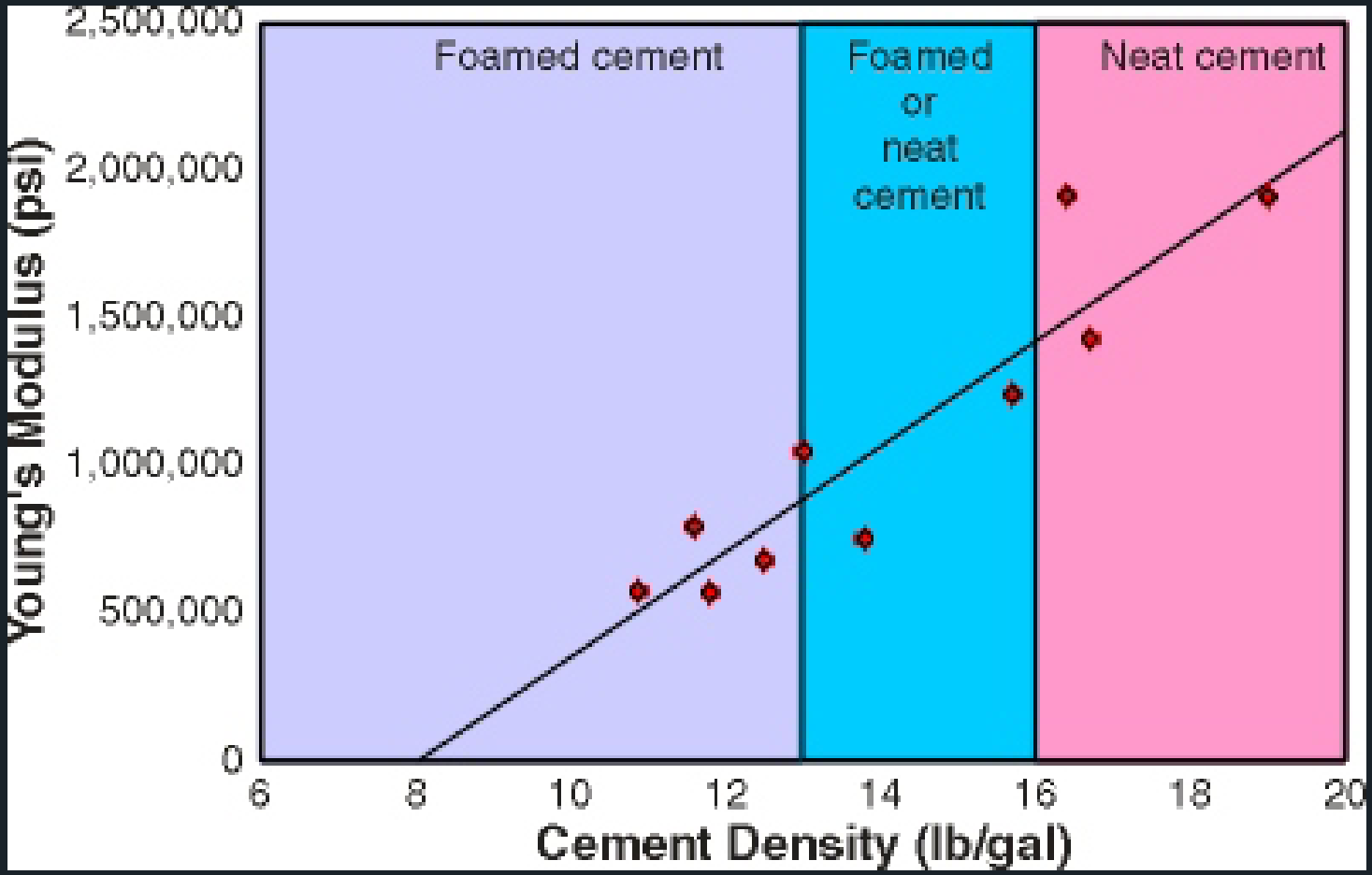


Geothermal Cements

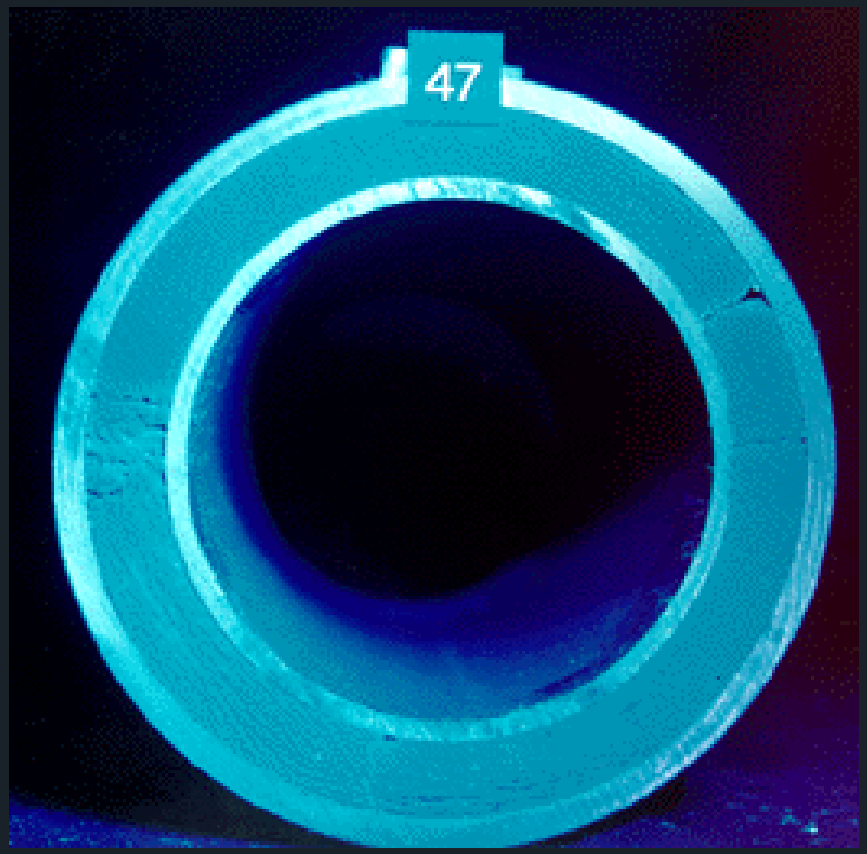
Foamed Cement Properties

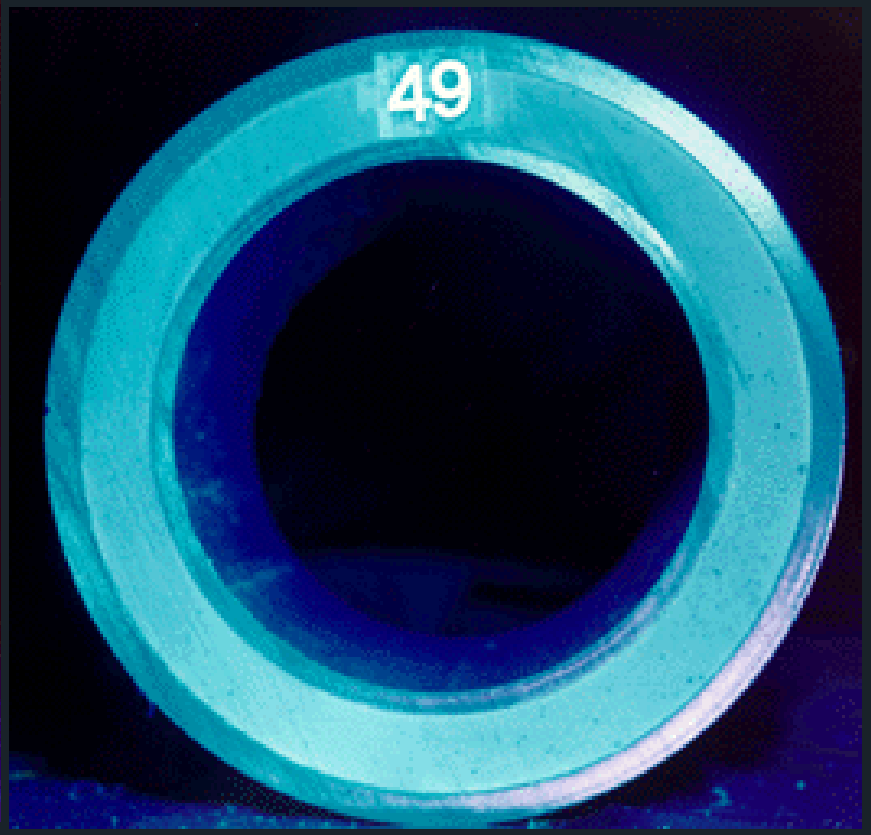
- Light weight
- Energized
- Improved displacement
- Ductily
- Low fluid loss
- No free water
- Variable density
- Gas migration control

Foamed Cement Properties



Foamed Cement Properties

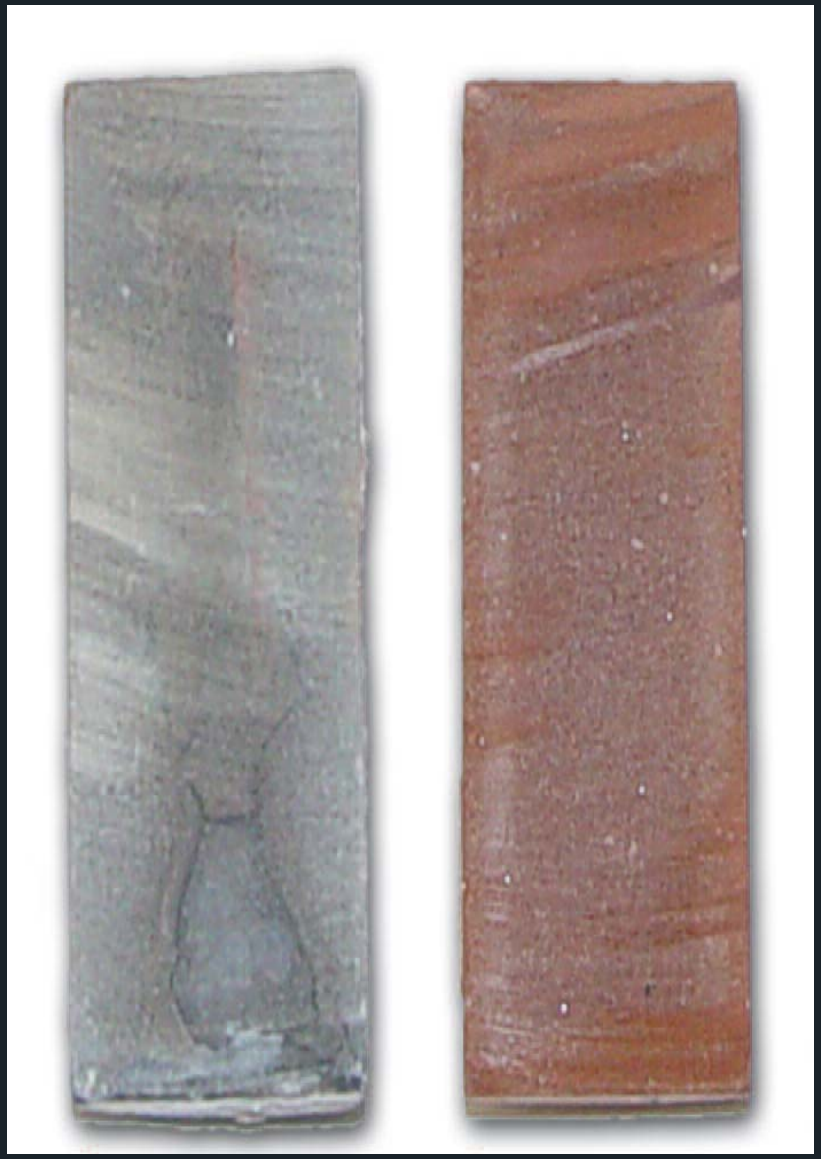




Geothermal Cements

Latex Cement

- Improved acid resistance
- Fluid-loss control
- Excellent wetting properties
- Improved bonding
- Increased resiliency
- Slows CO2 attack



CaP Cement (Calcium Aluminate Phosphate cement)

- CO_2 resistant
- Not subject to corrosion
- Not subject to strength retrogresion
- Does not shrink
- Good bonding properties
- Tested @ 700 F

Geothermal Cements

Geothermal Cements

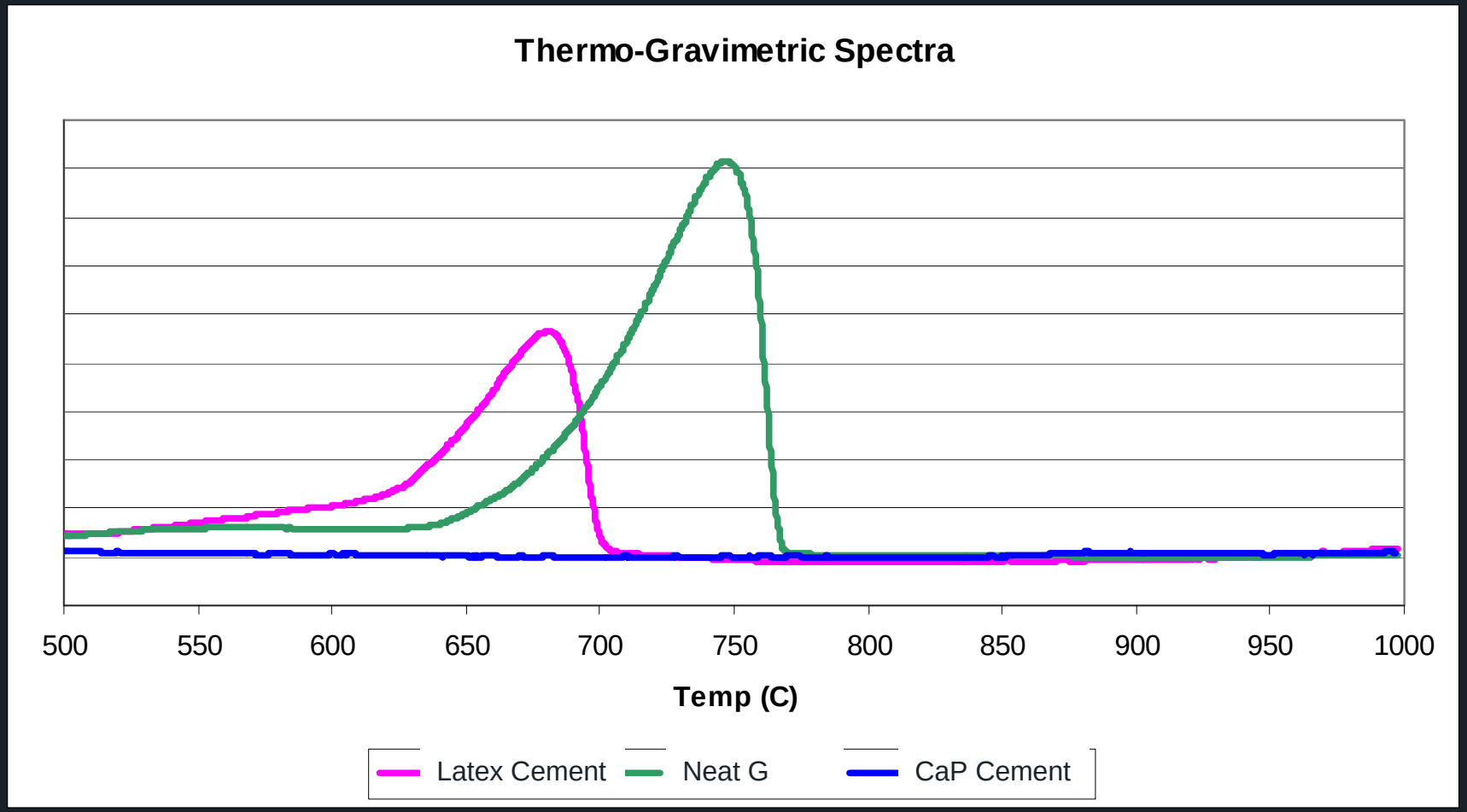
After 3 months CO_2 exposure @ 200F and 2000psi

Neat Class G cement

Latex cement

CaP cement

Benefits of CaP Cement



Summary

- RCC is a viable option available to the geothermal industry
- RCC is becoming a common and acceptable cementing technique
- RCC can be the best method used to cement a well
- RCC can increase the chances of achieving good zonal isolation
- Mechanical properties of foamed cement may enhance the life of the well
- Geothemal cements may reduce CO2 attack effects