

An aerial photograph of a geothermal field. The landscape is a mix of brown and green, with numerous small, dark structures representing wells or buildings. A large, prominent circular structure is visible in the lower right quadrant. The overall scene is a vast, open area with scattered infrastructure.

Reverse-Circulation Cementing and High Performance Geothermal Cements

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Overview

§ Reverse Circulation Cementing

- Advantages of Reverse Circulation Cementing

- Challenges of Reverse Circulation Cementing

§ Geothermal Cements

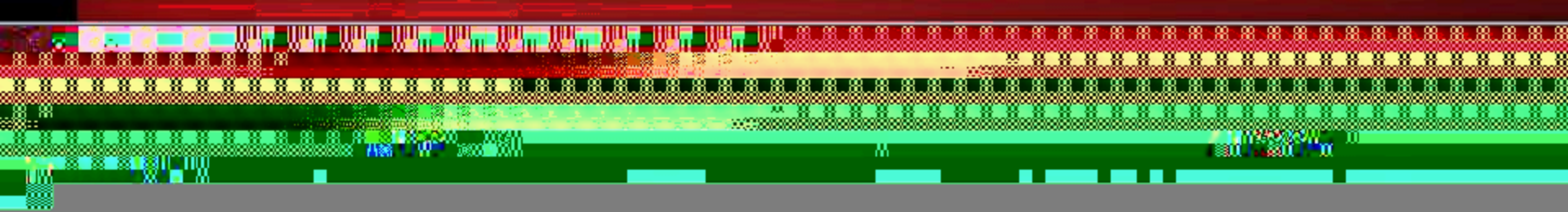
- Foamed Cement

 - Properties

- Latex Cement

- CaP Cement

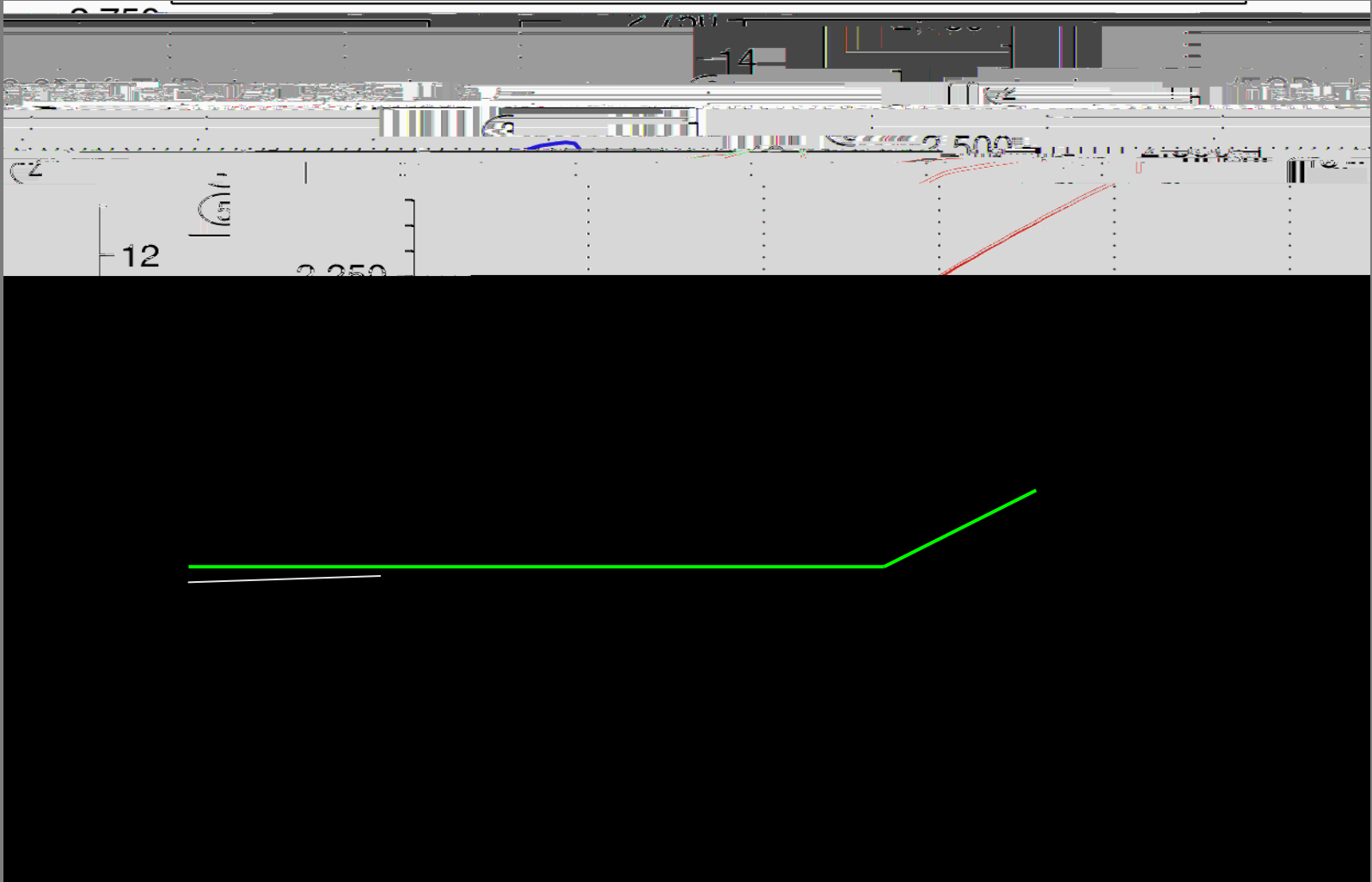
§ Summary



Reverse Circulation Advantages

- Š Reduced ECD
- Š Reduced job pump time
- Š Shorter slurry thickening times

Conventional vs. Reverse ECDs



Reverse Circulation Challenges

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

Geothermal Cements

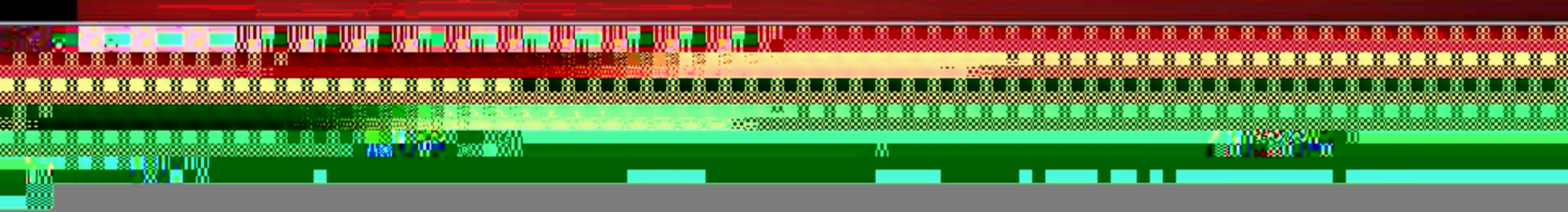
Foamed Cement



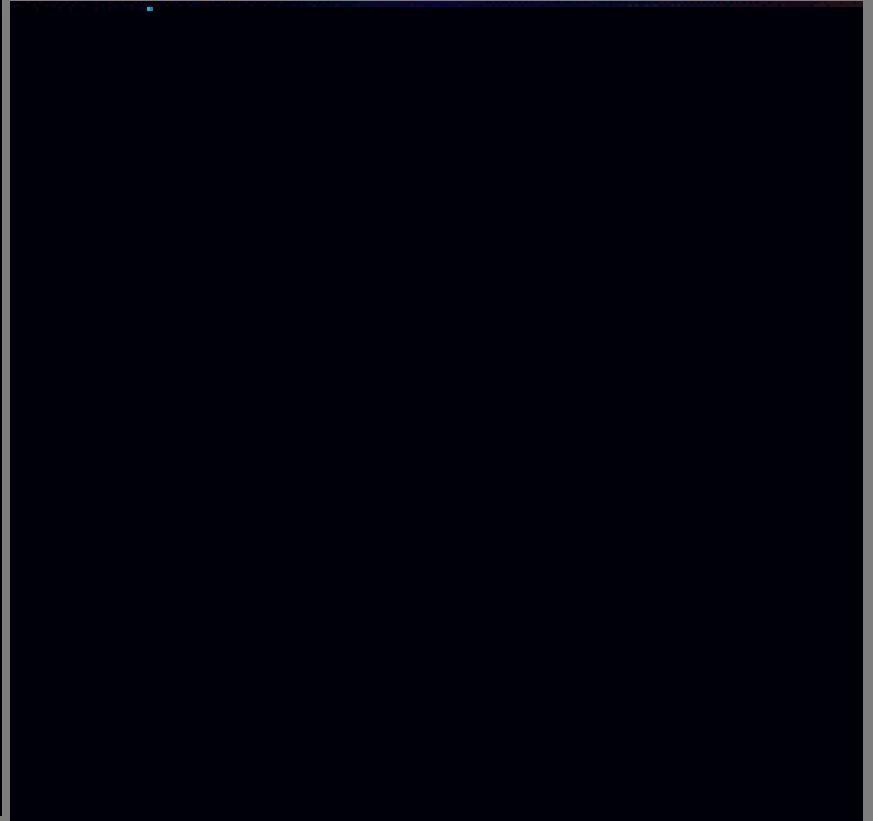
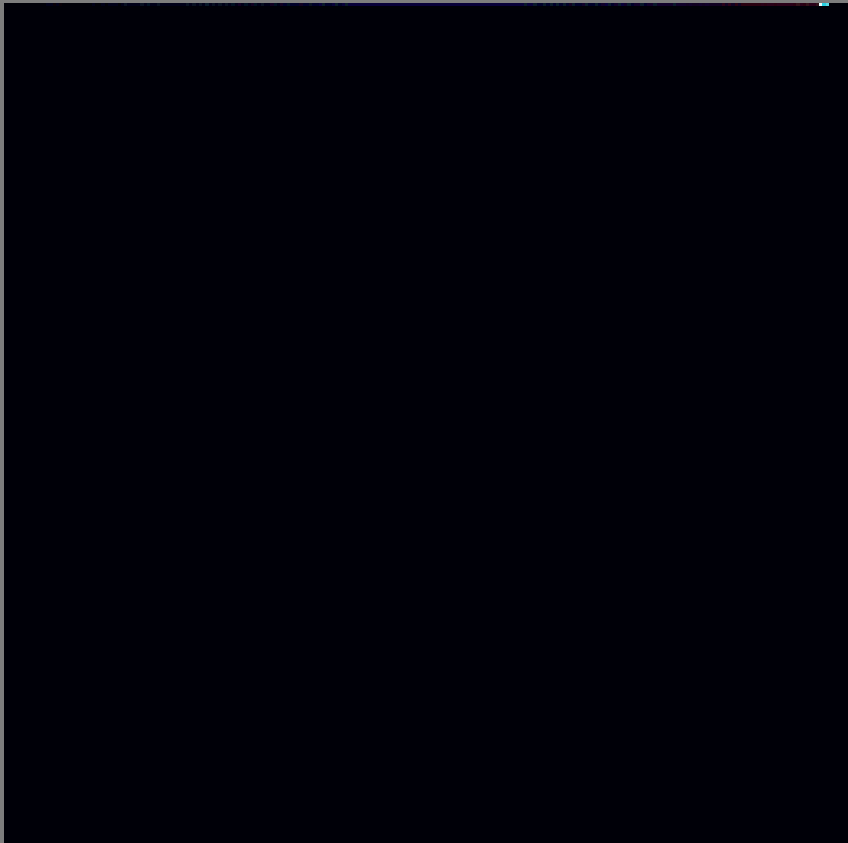
Geothermal Cements

Foamed Cement Properties

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



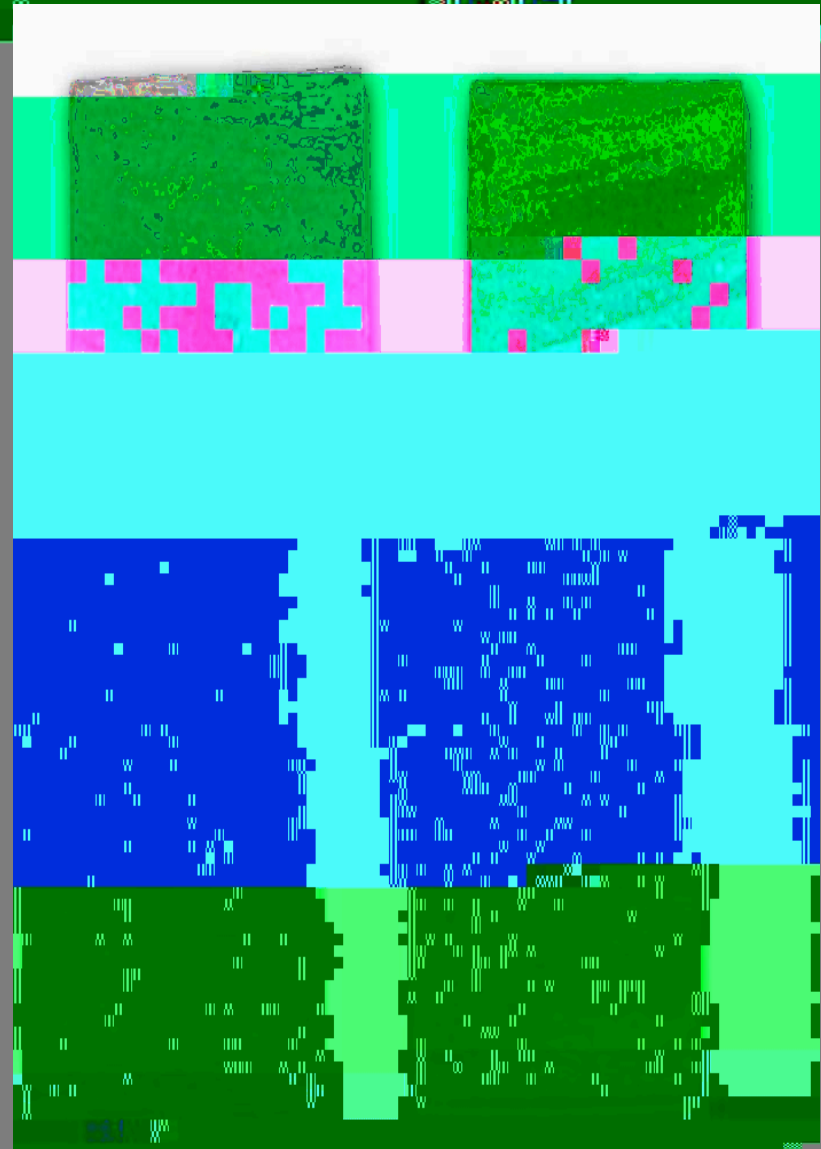
Foamed Cement Properties



Geothermal Cements

Latex Cement

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



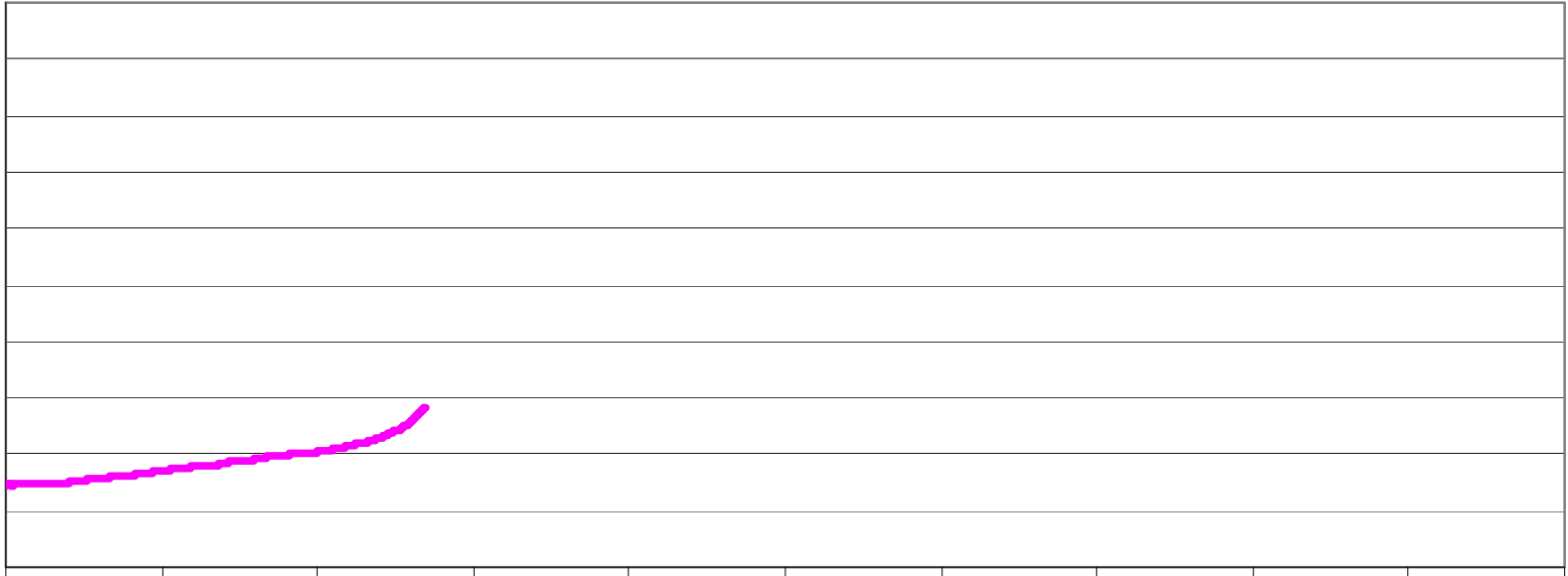
CaP Cement (Calcium Aluminate Phosphate cement)

- § CO₂ resistant
- § Not subject to corrosion
- § Not subject to strength retrogression
- § Does not shrink
- § Good bonding properties
- § Tested @ 700 F

Geothermal Cements



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
- § Geothermal cements may reduce CO₂ attack effects