TEAM M096

Sustainable Lightweight Oil Well Cement Using Fiberglass Waste with Controlled Mixing

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ME

PETE 3 CHE

Introduction & Objective

Oil well cementing requires sufficient strength, and controlled density for proper zonal isolation. This project introduces **fiberglass waste (FG)** as a sustainable partial replacement to reduce cement usage, which reduces CO_2 emissions. A custom mixer ensures consistent and controlled slurry preparation.

Constraints

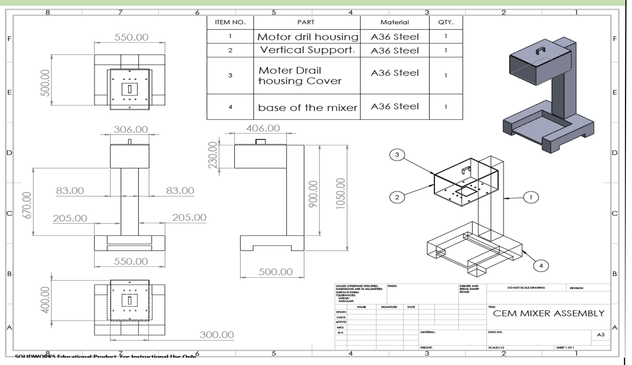
- Class G Cement
- Fiberglass Waste as Partial Replacement
- Mixing Temperature: 20–30°C
- Mixer Batch Size < 5 L

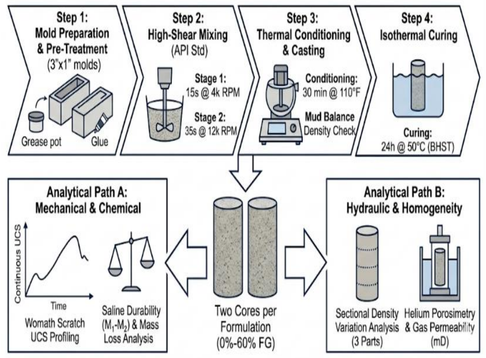
Specifications

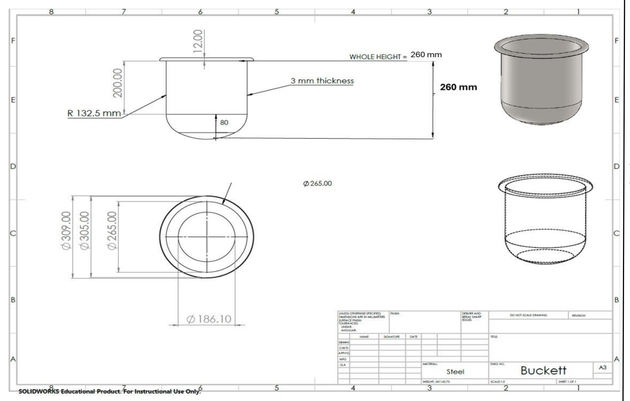
- Motor Power ≤ 1000 W
- Mixing Speed 300–850 RPM
- Bucket Size 10–15 L
- Slurry Variation < 5%
- Mass Loss After Chemical Exposure < 5%
- Porosity < 45%
- Permeability < 1.5 mD
- Compressive Strength ≥ 500 psi after 24h
- Cement Density 13 ± 0.5 ppg
- Flow Rate ≤ 1.5 mL/min at 200 psi

Prototype Design

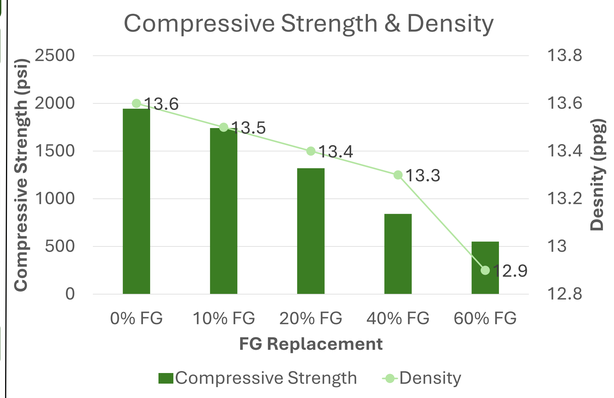
Cement Formulation	
Material	**Concentration (BWOC)**
Water	77
Dispersant	0.25
Fluid Loss	0.15
Retarder	0.1
Extenders	5
Defoamers (Drops)	5



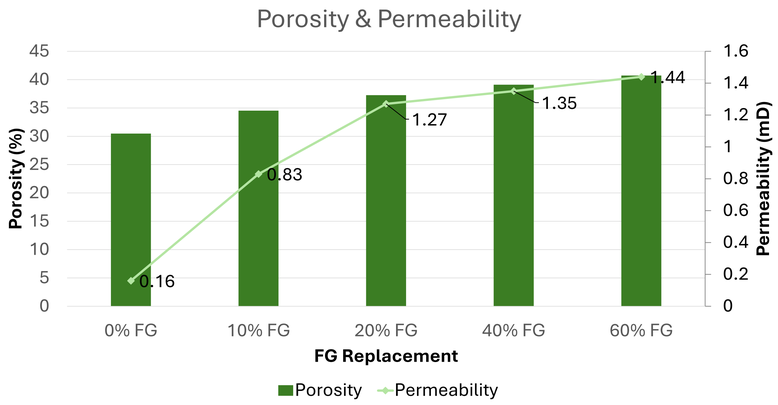


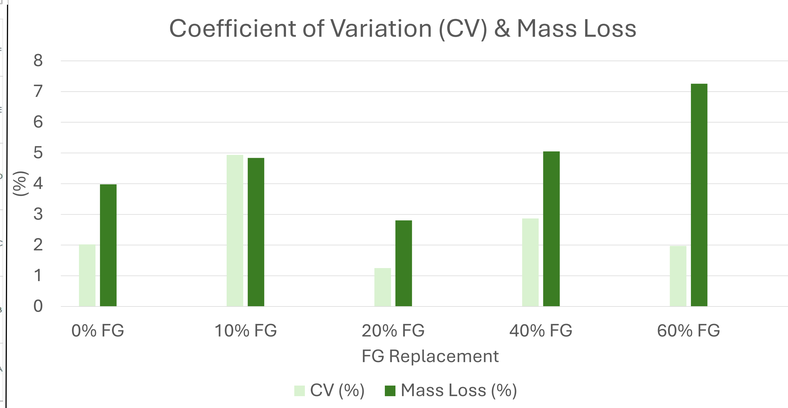


Testing & Validation



Flow rate test for each sample					
Parameter	**0% FG**	**10% FG**	**20% FG**	**40% FG**	**60% FG**
A (cm^2)	10.55	10.99	11.22	10.87	11.12
L (cm)	9.27	9.22	9.08	9.12	9.15
k (mD)	0.168	0.83	1.27	1.35	1.44
Q (mL/min)	**0.156**	**0.807**	**1.236**	**1.362**	**1.43**





Conclusion

- All samples satisfied the requirements
- Increasing FG reduced density but increased porosity and permeability
- 10–20% FG identified as the optimal performance range
- Further work needed to refine properties and evaluate higher FG content