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Parsons Infrastructure & Technology Group and

Battelle Memorial Institute

Advanced Remediation Technologies

Continuous Sludge Leaching
Mid-Year Review

Contract # DE-AC09-06SR22526

Department of Energy EM-21

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Presentation Outline

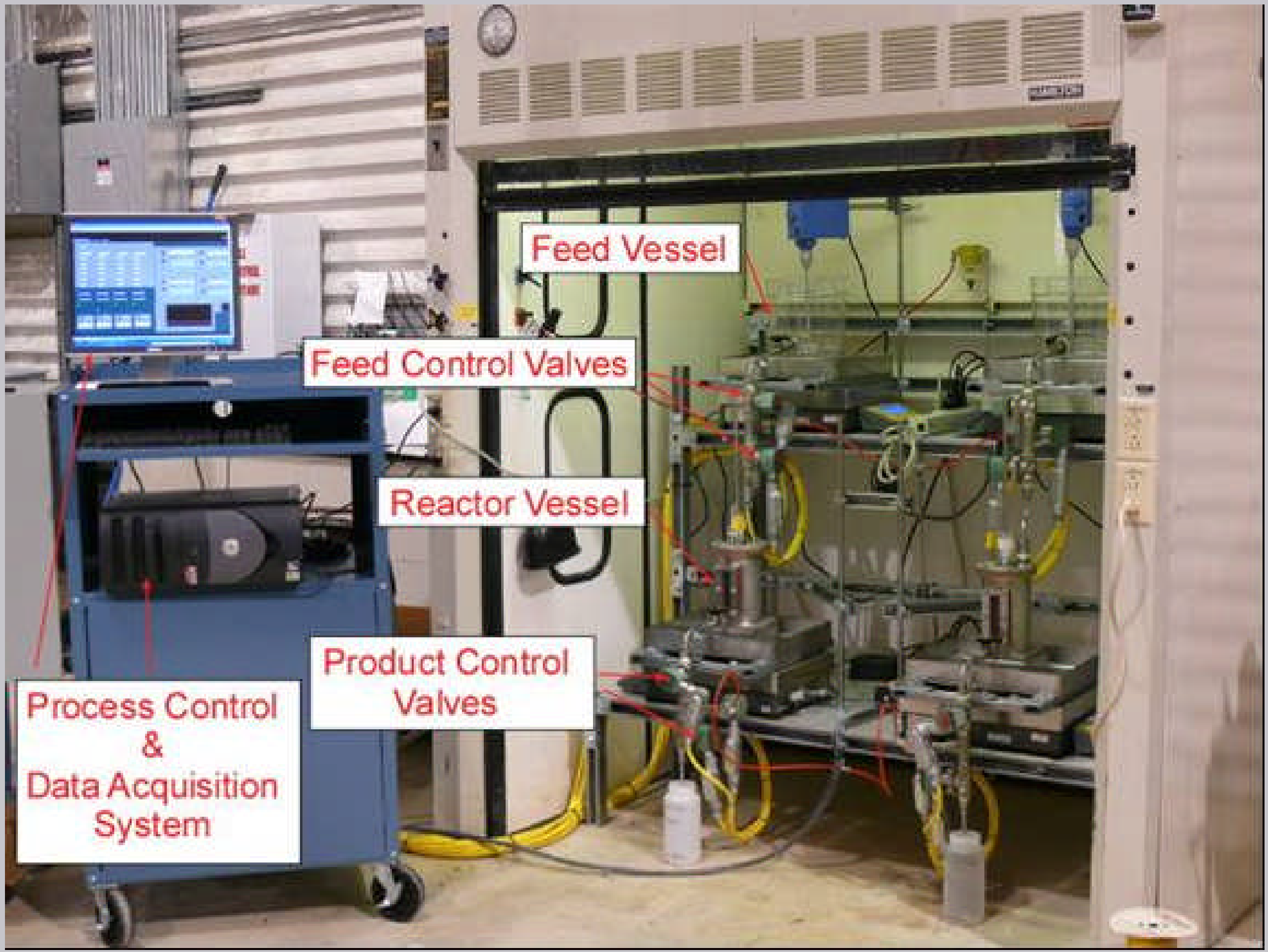
- **Project Description**
- **Technical Strategy/Approach**
- **Technical Results and Status**
- **Impact on High Risk/Cost Reduction or Avoidance**

Project Description

- The CSL process offers an solution that can readily achieve 90+% boehmite dissolution in a relatively small footprint employing a heated (90-100ºC) continuous stirred reactor and caustic to leach.
- Current estimates indicate that boehmite represents ~ 50% of the leachable Al in the Hanford HLW tanks.
- The WTP process has difficulty achieving greater than 40% dissolution of boehmite.
- Implementation of CSL would significantly reduce the number of HLW canisters by both reducing the waste mass to be vitrified and increasing waste loading in glass at Hanford and subsequently shorten mission duration.
- Also – implementation of CSL would remove a significant challenge to current WTP designs – thus reducing the technical risk and potential bottleneck associated with the WTP pretreatment processes.

- Phase II, Task 1 – Bench Scale Testing
  - Using the same simulated boehmite as used by WTP, test the CSL process under cold, bench-scale, semi-continuous operation to provide the required sizing data for implementation
  - Validate the kinetics equations developed from batch dissolution testing for use in describing continuous reactors
  - A slow acting and fast acting boehmite simulant will be tested

Bench Scale System Set-Up



Technical Status and Results – Fast Reacting Boehmite

Tests with fast reacting boehmite – provided system check-out and data for model validation – results indicate that continuous reaction kinetics ~ ½ of batch kinetics

	Hydroxide (M)	Boehmite (g/g)	CrOOH (mg/g)	Residence Time	boehmite dissolution (g/g)	Fraction Boehmite Dissolved
KB-1	5	0.0253	2.5	10	0.0163	0.65
KB-2	3	0.015	1.5	30	0.0086	0.57
KB-3	3	0.0226	2.3	10	0.0152	0.67
KB-4	5	0.0379	3.8	30	0.0165	0.44
KB-5	4	0.0262	2.6	20	0.0098	0.37
KB-6	4	0.0262	2.6	20	0.0098	0.37

Technical Status and Results – Slow Reacting Boehmite

Results with simulant B-3 – expect to see higher conversions with longer residence times

	Hydroxide (M)	Boehmite (g/g)	CrOOH (mg/g)	Residence Time	boehmite dissolution (g/g)	Fraction Boehmite Dissolved	CrOOH dissolution (mg/g)	Fraction CrOOH Dissolved
KA-1	5	0.0253	2.5	100	0.0089	0.35	0.143	0.057
KA-2	3	0.015	1.5	300				
KA-3	3	0.0226	2.3	100				
KA-4	5	0.0379	3.8	300				
KA-5	4	0.0262	2.6	200				
KA-6	4	0.0262	2.6	200				

Data available in next 4-6 weeks

Project Impact

- Because of the much longer residence time available – CSL can achieve much higher boehmite conversion and uses significantly less caustic to achieve the same extent of boehmite conversion
- Segregating of high boehmite wastes will further reduce Na requirements
- Task 1 will complete this FY
- Recommend proceeding with Task 2 – Cold pilot-scale testing of CSL