Treatment of Produced Water From Carbon Capture Sequestration Sites for Reuse, Mineral Recovery and Carbon Utilization

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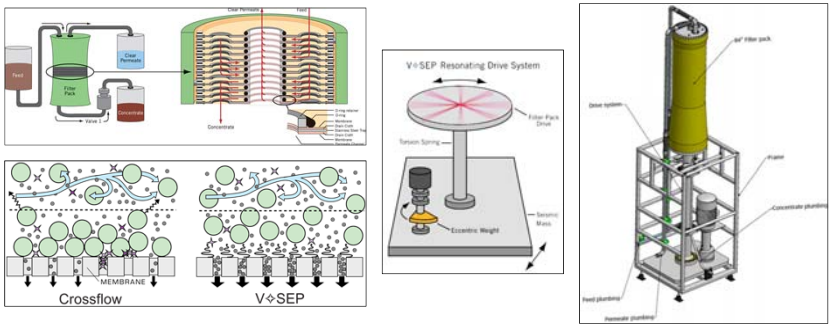
ABSTRACT:

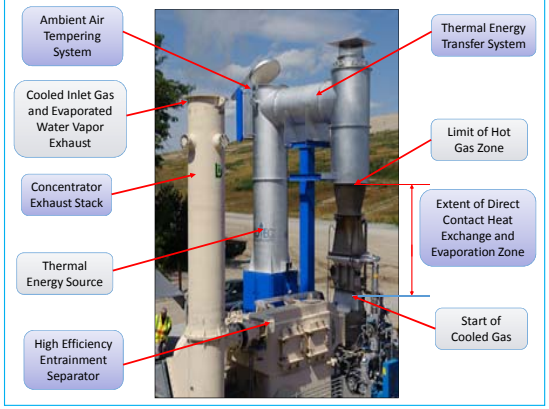
Southern Research is working with multiple industrial partners to develop robust cost effective solutions to treat and reuse produced water from CO_2 sequestration sites. The water produced during the sequestration of CO_2 can contain high concentrations of total dissolved solids which may include strategic and rare earth minerals (SREMs), naturally occurring radioactive materials (NORMs), hydrocarbons and metals such as lithium, zinc and magnesium. The effective reservoir pressure management can pose a significant challenge because of the need to discharge the produced water into the environment. To address these concerns, Southern Research and our project partners will characterize four reservoirs with regards to their chemical and geologic properties then develop commercially viable methods to treat the produced/impaired waters, create useable/potable water streams, stabilize the residual solids and quantify plant operating efficiency improvements.

New Logic Research Patented Vibratory Sheer Enhanced Processing (VSEP) Filter Pack Setup

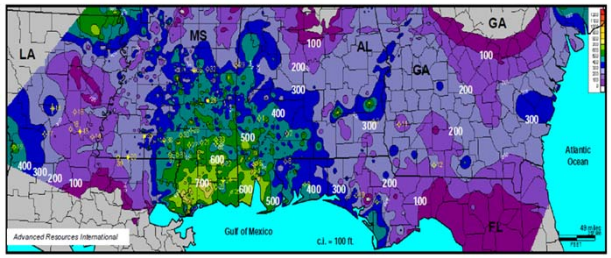


- Membrane tray elements arrayed as parallel discs providing "open channel" flow arrangement.
- Shear cleaning action lifts the solids boundary layer off the membrane surface.

Heartland Technology Partners Patented Adiabatic, Low Momentum, High Turbulence (LM-HT®) Concentrator



Tuscaloosa Formation



Isopach map of the Lower Tuscaloosa showing the thickness variation over the region. From ARI, 2009

The Upper Cretaceous age Lower Tuscaloosa Group and the equivalent Woodbine Formation form a large regional saline reservoir along the U.S. Gulf Coast. The formation's areal extent spans approximately 1,000 miles east to west, and 400 miles north to south, and covers the East Texas Basin, central Louisiana, southern Mississippi and southern Alabama, Georgia and the northwest Florida panhandle. The reservoir itself varies significantly in thickness and depth. Gross thickness ranges from 150 to >500 feet in the Lower Tuscaloosa Sands, and 100 to 1,000 feet for the Woodbine. These formations are found at depths ranging from 3,000 to 14,000 feet.

	Samples	TDS mg/L	Ca, mg/L	Mg, mg/L	Na, mg/L	K, mg/L	Alkalinity, mg/L	Organic Carbon, mg/L	Ba, mg/L	Sr, mg/L	pH	Temp, °C
MS Test Site *	1	180,000	13,000	1,200	46,900	800	122	78	42	761	6	21
Formation Average *	281	138,927	10,108	1,081	40,733	359	-	450	154	524	-	-
Formation Max *		212,572	25,500	3,375	68,484	650	-	569	1,026	982	-	-

* Tuscaloosa formation water quality data from the Mississippi Injection Test Site, and formation average and maximum values for 281 USGS Produced Water Database samples

SOURCE: Advanced Resources International, 2009. *Geologic Storage Capacity for CO_2 of the Lower Tuscaloosa Group and Woodbine Formation.* SECARB Phase III Work Product 1.1.c., Final Report. March 2009

Advanced Resources International, Inc. — Reservoir and Brine Characterization

Southern Research — Pre-Treatment and Concentration Process Integration, Solidification/Stabilization and Project Management

New Logic Research, Inc. — Patented Filtration Technology, Pre-Treatment and Process Optimization

Heartland Technology Partners, LLC — Patented Advanced Concentration and Process Optimization

DiFilippo Consulting — Economic and Technical Feasibility Assessment

EPRI Electric Power Research Institute

Southern Company

Diverse Project Team Incorporating Industrial Expertise, Power Generation and Utilities Focus, Advanced Technology Developers and Applied Research and Development

2015 NETL Crosscutting Technology Research Review Meeting

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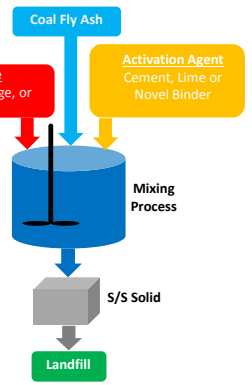
Solidification/Stabilization Technology

- S/S includes mixing waste wi… coal fly ash and an activation agent
- S/S consists of two processes:
  - Solidification – Physically encapsulating and improving the physical properties of the waste
  - Stabilization – Converting contaminants to a less mobile and less toxic form



LEAF – U.S. EPA Method 1314 Percolation Column