

PILOT-SCALE PLANTS TO RECOVER RARE EARTHS AND CRITICAL MINERALS FROM COAL AND COAL REFUSE

Extracting valuable rare earth element concentrates from coal and coal refuse.

PILOT RECOVERY PLANTS COMMISSIONED IN KENTUCKY AND NORTH DAKOTA

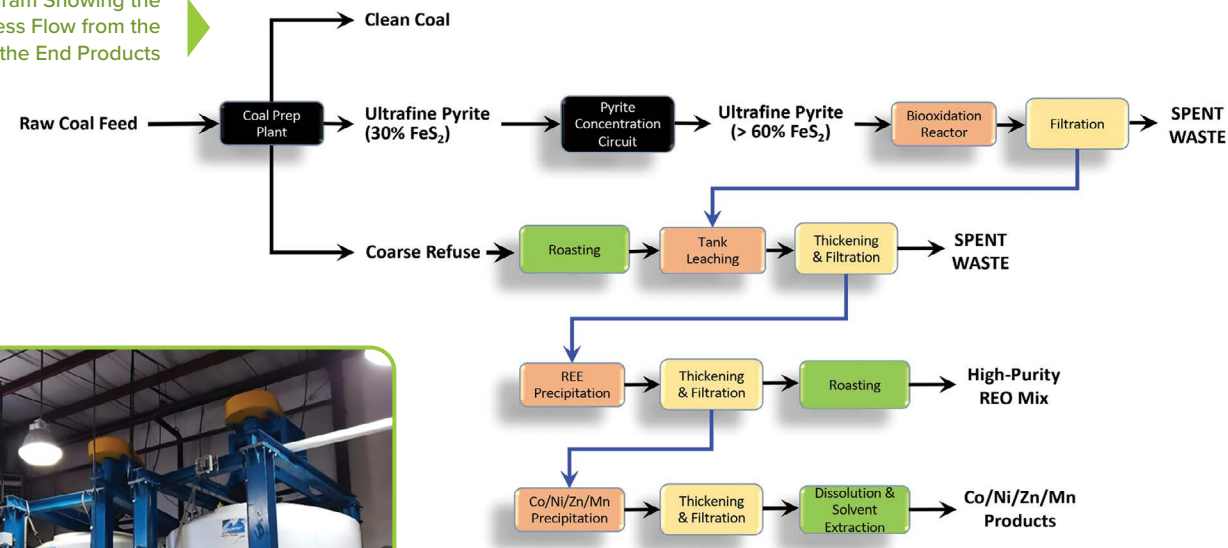
Rare earth elements (REE) and critical minerals (CM) are essential materials used in a broad range of technologies that are significant to domestic and national security, energy, and daily consumer products.

Two projects have made significant progress toward piloting technologies aimed at recovering REE and CM from coal and its refuse. The University of Kentucky (UK) installed and commissioned a pilot-scale plant near Providence, KY, while the University of North Dakota (UND) has begun to operate a pilot-scale plant in Grand Forks, ND.

UK PILOT PLANT EXPECTS MIXED RARE EARTH OXIDE PURITY OF GREATER THAN 90%

The UK plant will recover mixed rare earth oxides with an expected purity of greater than 90%, which could be refined in a future project to produce individual rare earths and rare earth metals. The pilot plant will also recover cobalt, manganese and, possibly, other critical minerals from coal refuse.

Block Diagram Showing the Generalized Process Flow from the Feed Source to the End Products



Three 3000-Gallon Bioreactors Used to Produce Two Gallons/Minute of Sulfuric Acid from Coal Pyrite at a Strength of Approximately 0.5M (One Bioreactor is a Feed Preparation Tank While the Remaining Two are Production Units Equipped with Denver Sub-Aeration Units Driven by 30 HP Motors and 8 Tons of Chilling Capacity)

UND PILOT PLANT TO PRODUCE MIXED RARE EARTH OXIDES WITH A PURITY GREATER THAN 75%

The UND Institute for Energy Studies is initiating operation of a pilot-scale, novel technology for REE recovery from North Dakota lignite coal and related feedstocks.

North Dakota lignite coal has been discovered with REE levels as high as anything ever reported previously for U.S. coals. In lignite coal, the REE are weakly bound as organic complexes, rather than in mineral forms that are typical of higher-rank coals.

UND is using a mild acid to leach valuable materials from the source, including mixed rare earth oxides with a purity greater than 75% and critical minerals such as germanium and gallium. UND plans to separate the mixed rare earth oxides into individual rare earth compounds.



UND Coal and Mineral-Rich Tailings Filter Presses, with the Liquid Processing Tanks Featured in the Background



UND Coal Washing Systems Associated with the Coal Filter Presses

PARTNERS



AWARD NUMBER
DE-FE0031827
PROJECT BUDGET
\$6.25M

- DOE\$5,000,000
- PERFORMER.....\$1,250,000

SCAN FE0031835 INFORMATION >>>



AWARD NUMBER
DE-FE0031835
PROJECT BUDGET
\$6.5M

- DOE\$4,989,255
- PERFORMER.....\$1,519,300

SCAN FE0031835 INFORMATION >>>



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FECM RDD&D PRIORITY



ADVANCE CRITICAL MINERALS,
RARE EARTH ELEMENTS (REE),
AND MINE REMEDIATION