



Integrated treatment of acid mine drainage and rare earth critical materials production

Paul Ziemkiewicz and Jeff Skousen

West Virginia University, Morgantown, WV

Abstract

Researchers at West Virginia University (WVU) have constructed and operated a Rare Earth Element/Critical Material (REE/CM) Facility that extracts, separates, and refines high purity rare earth metals from unconventional feedstock. Since 2016, our approach has been based upon a pioneering method using Acid Mine Drainage (AMD) and mineral tailings feedstocks developed in concert with USDOE. These earlier efforts culminated in both a commercial-ready technology package suitable for demonstration-scale deployment as well as an innovation ecosystem and research infrastructure. We project that our demonstration facility produces a concentrate with a purity in excess of 90% with over 50% heavy REE. Our approach additionally imparts a net positive social and environmental benefit, as successful deployment would create several new industries and jobs in the upstream and downstream supply chains while incentivizing the restoration and reclamation of longstanding environmental liabilities. Recently completed and current efforts in the program include pilot-scale production of mixed rare earth oxides, advanced process development for separation and refining, regional economic development, infrastructure, and technology assessment, and the pre-feasibility study for a vertically integrated 1–3 t/d separation and refining facility.

This first of its kind operation treats 3,000 L/min of AMD and is the first fully integrated REE oxide production operation in the United States in over 20 years.



Figure 1 Pilot Treatment Plant at Mt. Storm, WV, where Rare Earth Elements are extracted