SRC Rare Earth Processing Facility

First in Canada

In August 2020, the Government of Saskatchewan announced $31 million in funding for a Rare Earth Processing Facility, to be owned and operated by the Saskatchewan Research Council (SRC). It will be the first-of-its-kind in Canada and will begin to establish a Rare Earth Element (REE) technology hub in Saskatchewan, forming an industry model for future commercial REE initiatives and supply chain development.

The Facility will be built near SRC's other laboratories and facilities in the north industrial area of Saskatoon, Saskatchewan. Construction is expected to begin in the fall of 2020. SRC expects the Facility will be operational sometime in the fall of 2022. A private sector landlord is handling the construction of the building, which will be leased to SRC.

Why Does Canada Need an REE Processing Facility?

The value of the current REE resource industry in Canada is small but growing. It is dominated by small venture-funded mining companies geographically dispersed across Canada. The industry is growth-constrained due to little or no formal supply chain infrastructure, no commercial processing facilities and no coordinated commodity marketing or agreed upon product quality standards.

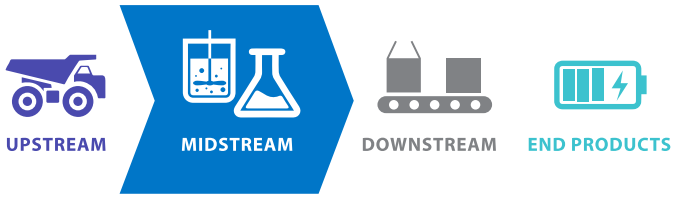
The SRC Rare Earth Processing Facility is positioned as a catalyst to stimulate the resource sector in Saskatchewan and across Canada, providing the early-stage supply chain needed to generate industry investment and growth.

The Processing Plant – A Midstream Initiative

A key element of the Facility is a commercial processing plant, which will include concentration and separation stages and treat monazite sands at approximately 60 per cent concentration. Monazite is a source of mainly light REEs (especially cerium, lanthanum, praseodymium, neodymium).

An intermediate concentrate of mixed rare earth carbonates will be produced from the concentration plant and further processed in a separation plant to produce separated rare earth oxides, as the market requires.

RARE EARTH PROCESS



The treatment capacity of the plant will be 3,000 tonnes per year, producing mixed rare earth carbonate product. Part of the mixed rare earth carbonate will be fed to the separation plant to produce 500 tonnes of separated, individual rare earth oxides, excluding cerium.

All wastewater will be treated and reused, resulting in no liquid discharge from the Facility; all solid waste will be handled and disposed of properly following regulations and procedures.

SRC SASKATCHEWAN RESEARCH COUNCIL

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The Case for SRC and Saskatchewan

SRC has decades of experience in concentration and separation technologies of REEs from various minerals, as well as operational experience. Jack Zhang and Baodong Zhao of SRC's Rare Earth Element Division are co-authors of various papers and a book on rare earths separation. SRC has developed and piloted many REE concentration and separation processes for mining companies in Canada and across the world.

Saskatchewan is a world-class mining jurisdiction that has a vibrant and sustainable uranium industry. This industry also produces a REE-rich solution waste stream (mainly heavy REEs) that can be an additional feed source for the plant, as markets require.

Services and Capabilities

We offer the following services through our existing service lines and facilities:

- Rare earth processing technology development and commercialization
- Uranium tailings processing and treatment; recovery of thorium and uranium
- Validation and demonstration of rare earth processing technologies at bench, pilot and semi-commercial scale
- Rare earth production from bastnaesite, apatite and uranium processing waste

Once the facility is operational, we'll offer these services:

- Potential toll separation of individual rare earth elements
- Potential toll processing of monazite

SRC plans to use this Facility as a starting point for the creation of an REE technology hub, which may include developing downstream and upstream aspects of the REE supply chain. Future development also includes new applications for lanthanum and cerium.

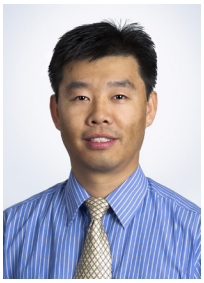
We are currently developing capabilities for:

- Downstream rare earth product development
- Production of magnets and alloys

SRC Mineral Processing

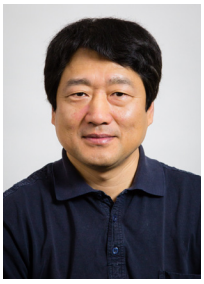
SRC's Mineral Processing team provides leading-edge research, development and demonstration services for a variety of commodities and mineral processing technologies. We help maximize your resource and improve productivity at every stage of the mining cycle, from exploration to closure. Our team of engineers and scientists can customize testing and design to meet the unique needs of mining companies.

Jack Zhang (PhD, P.Eng)



Jack Zhang is the director of SRC's Rare Earth Element Division. He has worked on mineral processing and hydrometallurgy for over a decade. In the past 12 years, he has worked on numerous rare earth projects involving all processes related to sorting, gravity separation, magnetic separation, flotation, leaching, fractional precipitation and solvent extraction.

Baodong Zhao (PhD, P.Eng)



Baodong Zhao has more than 25 years of experience in metallurgical engineering and project management, particularly in rare earth mineral processing and hydrometallurgy. Baodong has led and participated in laboratory and pilot plant test work, as well as Preliminary Economic Assessments covering sample preparation, mineralogical characterization, beneficiation, hydrometallurgy and REE separation.

Potential Collaboration Opportunities

SRC is open to develop the following potential upstream, midstream and downstream collaboration opportunities in the future.

Upstream

- Process different feeds – Bastnaesite, ionic clays and etc.
- Preconcentration unit operations – Gravitational, flotation – Monazite at < 90 per cent
- Process different Monazite sources - eg. oilsands, hard rock mining projects

Midstream

- Monazite Processing Unit expansion
- Separation Unit expansion
- Raffinate processing
- Separation technology and commercialization
- Tailings repurposing
- Thorium and uranium processing
- Renewable energy
- AI application

Downstream

- Metals Manufacture
- Alloys Manufacture
- Magnet Manufacture

Technology development and design

Upstream – Monazite Supply Requirements

SRC is currently sourcing preconcentrated Monazite from various jurisdictions around the world. SRC's Facility will require 3,000 tonnes per year of Monazite Concentrate on a 90 per cent basis (equivalent to 60 per cent Total Rare Earth Oxide). However, SRC would like to secure a stockpile of feed in advance of commissioning at the end of 2021. SRC will consider lower concentrations of Monazite, as well.

Tailings Management

For more than 60 years, SRC has actively engaged with the uranium and nuclear industry on numerous fronts. Our work has encompassed research to improve analyses and processes, project management and on-the-ground operational interventions with industry throughout each stage of the uranium production cycle. As such, SRC has years of scientific, technical and management knowledge dealing with tailings, as well as experience working with regulators, communities, Indigenous groups and industry. Our capabilities in this area also include holding a license from the Canadian Nuclear Safety Commission (CNSC) for a SLOWPOKE -2 reactor, which operated safely in Saskatoon for almost three decades before it was recently decommissioned, and we still hold one for the current work that we do.

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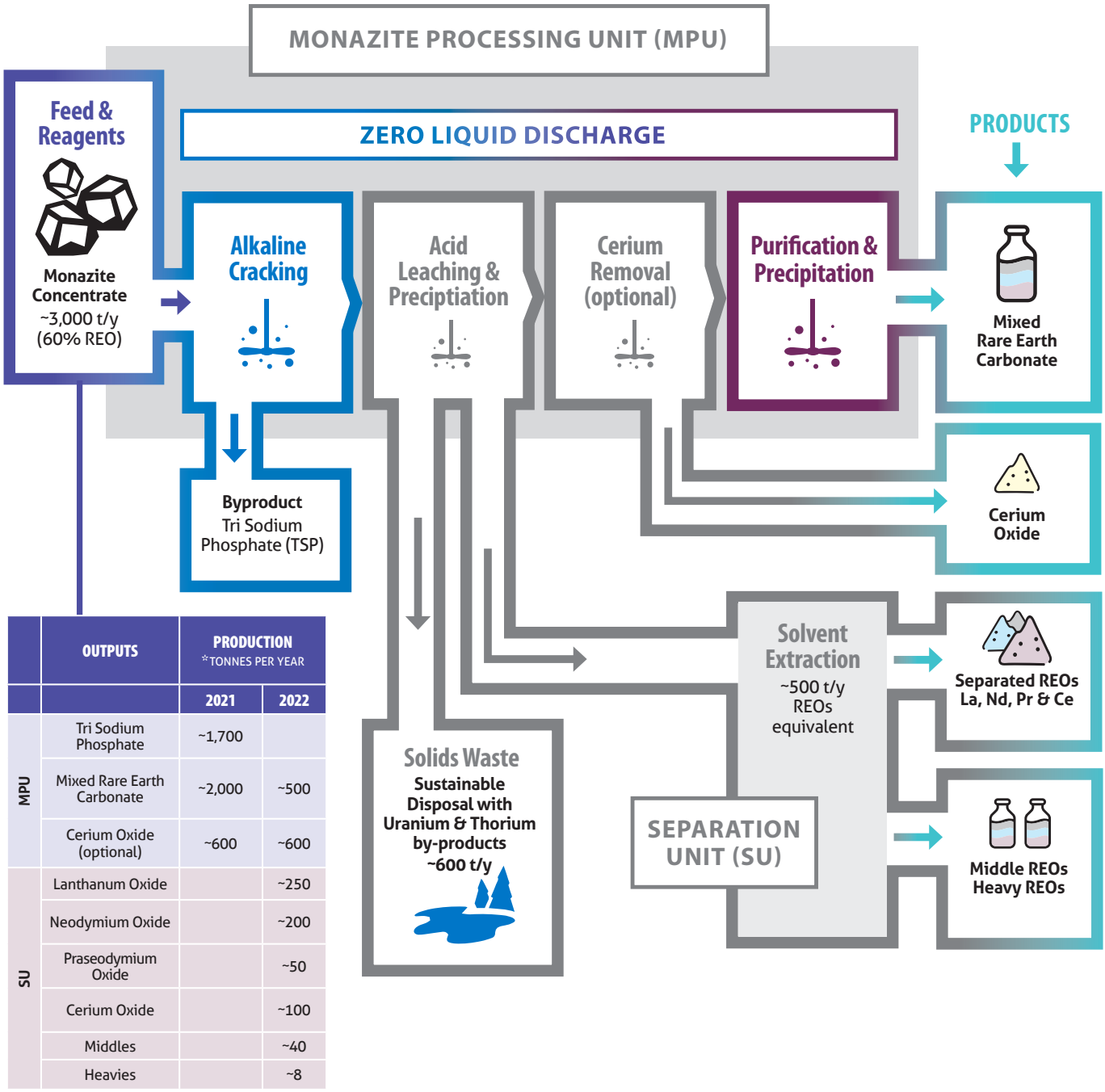

	OUTPUTS	PRODUCTION *TONNES PER YEAR	
		2021	2022
MPU	Tri Sodium Phosphate	~1,700	
MPU	Mixed Rare Earth Carbonate	~2,000	~500
MPU	Cerium Oxide (optional)	~600	~600
SU	Lanthanum Oxide		~250
SU	Neodymium Oxide		~200
SU	Praseodymium Oxide		~50
SU	Cerium Oxide		~100
SU	Middles		~40
SU	Heavies		~8