

Ethylene 2 (E2) Furnace Refurbishment

Project Overview

March 2018

In 2013, we began a **\$1 billion** expansion of our polyethylene facilities at the NOVA Chemicals Joffre Site. The Polyethylene 1 (PE1) Expansion Project included a world-scale polyethylene reactor (R3), which started up in December 2016. The PE1 Expansion Project increased our site's polyethylene production by approximately **1 billion pounds annually**, enabling us to meet growing customer needs.

To accommodate the PE1 expansion and to help maintain plant operating capacity at design levels, the \$350-million Phase 1 of the E2 Furnace Refurbishment Project to upgrade and modernize five of our 11 E2 furnaces was started in 2014 and start up of the fifth furnace was completed in Q1 2018.



The refurbishment of these furnaces is an important step in helping us meet our ethylene needs to support the PE1 Expansion. The project is a key component to address reliability challenges and ultimately enable the facility to operate at full design capacity. A number of other enhancements have been incorporated, including safety systems.

Full funding for Phase 2 of this project was approved in late 2017 and Alberta-based, Melloy Industrial Services was awarded the general construction contract in early 2018. Phase 2 will focus on refurbishment of four of the remaining six furnaces. This phase is expected to include capital investment of approximately **\$270 million**.

Melloy Industrial Services is expected to start field work in Spring 2018 with approximately 200 contract workers assigned to the project from July 2018 through to January 2021.

Recent Alberta projects completed by NOVA Chemicals have seen approximately **75% local spend**, and we expect to see similar numbers for E2 Furnace Refurbishment.

NOVA Chemicals develops and manufactures chemicals and plastic resins that make everyday life healthier, easier and safer.

Our customers make products like food packaging, collation shrink, heavy duty sacks, trash bags and liners and stretch film. Our employees work to ensure health, safety, security and environmental stewardship through our commitment to sustainability and Responsible Care. NOVA Chemicals, headquartered in Calgary, Alberta, Canada, is wholly-owned ultimately by Mubadala Investment Company of the Emirate of Abu Dhabi, United Arab Emirates.



NOVA Chemicals Joffre Site is one of the largest ethylene and polyethylene production complexes in the world. Joffre Site is located just east of Red Deer, and consists of five manufacturing facilities: three for ethylene production and two for polyethylene production.



We're proud of our start in Alberta 39 years ago. Today in Alberta, we directly employ over 1,300 people and hundreds of contract personnel.

E2 Furnace Refurbishment Project Overview

Environmental benefits from the E2 Furnace Refurbishment Project Phase 1 & Phase 2

- The E2 Furnace Refurbishment Project includes replacing the convection section of the furnace, while also replacing burner systems and new fuel and combustion air and burner management systems.
- The new burners will utilize best available technology (next generation low NO_x burners), utilizing fuel staging and flue gas recirculation (existing design only uses fuel staging).
- Improvements to refractory shaping design are expected to result in reductions in NO_x emissions. Collectively, the improvements could result in a **30 – 40% reduction in NO_x emissions** from each furnace stack annually.
- Phase 1 confirmatory stack tests to date have demonstrated expected reductions in NO_x levels.
- With the refurbishment of the convection section, there is also an expected improvement in efficiency which would result in some Green House Gas emissions reductions. This improvement has been demonstrated on Phase 1 furnaces.

A snapshot of our current Joffre Site economic impacts

We are the largest private employer in the region:



- About **945 permanent employees**
- **350 - 450 contractors**

We contribute over **\$300 million** directly into Central Alberta's economy annually:



- About **\$212 million** in salaries (base and benefits)
- Over **\$95 million** spent on goods and services in Red Deer and area
- **\$14.1 million** in municipal and pipeline property taxes

We believe community involvement is an important part of doing business. As partners with our community, we invest in the well-being of our communities by lending a hand to organizations making a difference and improving the overall quality of life in Central Alberta. An annual investment of about **\$1.4 million** in financial support includes a robust United Way fundraising campaign and employee engagement in community initiatives like river clean-ups, tree planting and Adopt-A-Highway program.



In 2017, employees volunteered about 1,400 hours of service in the community through the United Way Day of Caring® and other programs.



As part of our recent expansion, we developed an Environmental Legacy Project that resulted in a five-kilometer nature trail system within an 89-hectare (220-acre) natural area.

We are a Responsible Care company

We are committed to Responsible Care and sustainability in our daily operations as well as our future growth. As part of this commitment, community outreach is important to us. We make concerted efforts to understand and respond to concerns and seek input about our plans and operations through public consultation and communication.



Responsible Care®
Our commitment to sustainability.

Taking Care in all that we do

Society has high expectations of our industry and our products, as do we at NOVA Chemicals. We apply lifecycle management to our decisions and actions to ensure we take care of people, communities and the environment throughout our value chain. We continue to integrate our Taking Care framework into every aspect of our operations by including sustainability factors in business, project and product plans, strategies, decision criteria and goals.

To see our Sustainability Report, please visit www.novachemicals.com under Responsible Care & Sustainability.



Operations



Communities



Products



Environment

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