



2023 Canadian Consulting Engineering Awards  
Natural Resources, Mining, Industry & Energy

# Local, carbon-neutral biofuel at ArcelorMittal's pellet plant

# Innovation

**ArcelorMittal was trying to find solutions to reduce greenhouse gas emissions from its iron oxide pellet production processes. As a result, it decided to replace some of the fuel oil it uses in its Port-Cartier facilities with pyrolysis oil, a biofuel made from logging waste.**

BBA performed the feasibility study for this project to ensure the viability of converting the plant's fuel oil systems to pyrolysis oil. The consulting engineering firm also ensured that the pyrolysis oil facilities were safe and met industry standards, requirements and best practices for both worker health and safety and the environment, while also ensuring that iron pellet production and quality remained optimal.

The experts also helped:

- review the physicochemical properties of pyrolysis oil and its components and identify the points of emission of flammable (explosive) or odorous vapours.
- develop a summary of the exposure, explosivity and emission threshold standards to comply with applicable regulatory requirements in Québec, including NFC requirements.
- analyze the facilities and make recommendations based on the criticality level of the observations.
- issue recommendations for potential system expansion.

It is also a solution that can be transferred to other types of furnaces and kilns and is already attracting interest from other industrial players.



Pyrolysis oil heating station

# Innovation

## A biofuel with its own characteristics

Pyrolysis oil does not behave like standard hydrocarbons. The experts in BBA's Advanced Fuels and Chemicals team have built up the know-how for this biofuel and gained valuable knowledge that brought this project to fruition.

After interpreting the product's physical properties, the team adapted the packaging systems to bring the pellets to their ideal burning point. This would help prevent equipment clogging through polymerization. Given its mechanical properties, they also modified the piping design to maximize fluid pumping. Finally,

This project is the first in the world to use pyrolysis oil in its processes on a regular basis. It is also the largest consumption of a fuel made from forest biomass.

they selected a metallurgy and instruments that were adapted to its corrosive nature.

By successfully integrating all considerations, the plant can make tangible progress toward its greenhouse gas reduction targets while promoting synergies with local industries in Port-Cartier.



# Environmental benefits

The success of the feasibility study opens the door to the detailed engineering project that will allow the construction of a complex-wide pyrolysis oil system. Ultimately, the plant will use more than 32 million litres of pyrolysis oil per year—the entire output of the BioEnergie AE plant.

This will allow ArcelorMittal to cut its annual use of heavy fuel oil and coal by 23%, reducing its CO<sub>2</sub> emissions by 57,600 tonnes, equivalent to the annual GHG emissions of 14,000 vehicles.

Furthermore, almost all the site's infrastructure could be reused, and no modifications were made to the furnaces, thus extending the life of existing equipment.

⊖ 57,600  
tonnes of CO<sub>2</sub> per year

## **ArcelorMittal is showing the way to successful energy transition**

This decarbonization project is perfectly adapted to its region and surroundings. It not only lowers greenhouse gas emissions and the risks associated with transporting the biofuel, but it also simplifies operations.

The project at ArcelorMittal's demonstrates once again the importance of firmly rooting decarbonization projects into their regional, economic and historical context to ensure their sustainability and success.



## **A local and carbon neutral biofuel!**

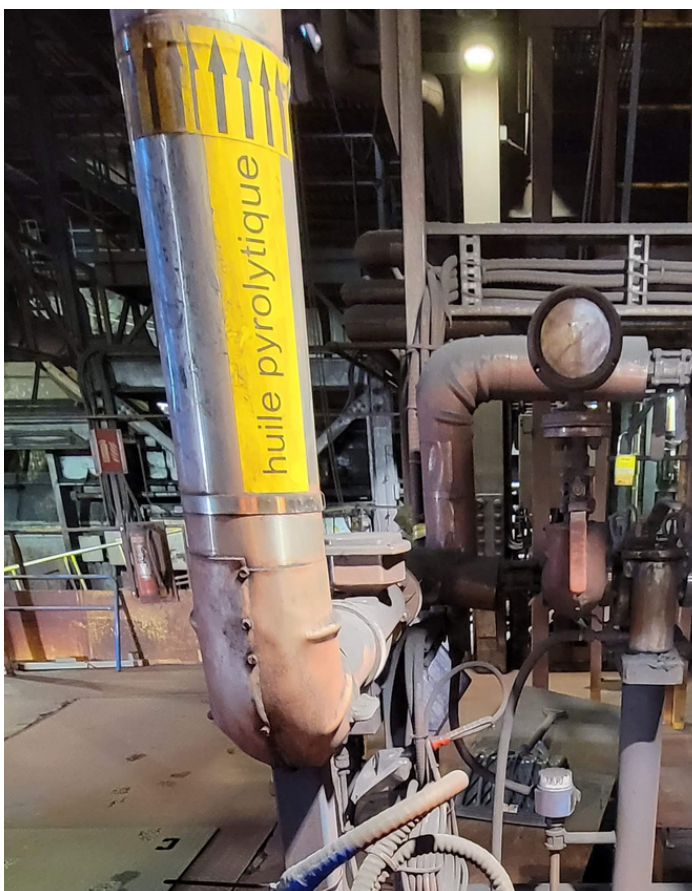
The project is using pyrolysis oil that BioÉnergie AE Côte-Nord Canada produces from forest waste. This waste comes from the Arbec sawmill in Port-Cartier and would otherwise have been burned. It is crushed, dried and then transformed by pyrolysis at very high temperatures. The product is then distilled to make pyrolysis oil

# Complexity

**The mandate was to ensure the quality and consistency of the iron oxide pellet firing process to maintain and even increase the plant's output. Using pyrolysis oil in this way had never been done on such a scale, so the project team had to be very resourceful in meeting the challenges.**

## **Defining a regulatory framework**

Therefore, BBA has based its analyses and recommendations on various rigorous standards and requirements: the National Fire Code of Canada (NFC), Québec's Regulation Respecting Occupational Health and Safety, Québec's Clean Air Regulation (CAR), CSA Standard B139, API Standard (610, 650, 660) and NFPA 30.



## **Live feedback**

For BioÉnergie AE to get its plant up and running, ArcelorMittal committed to consuming its minimum biofuel production during the feasibility study. This meant converting an additional area of the pellet furnace to pyrolysis oil with the system used in the 2015 pilot tests. Reusing the pilot test system allowed the BBA design team, in conjunction with the ArcelorMittal operations and maintenance teams, to observe some of the issues and opportunities for improvement when designing the permanent facilities.

## **Stakeholders fully involved in project success**

The team worked with ArcelorMittal to develop a commitment plan to ensure the various affected stakeholders accepted the project. The plan made it possible to gain the trust and support of the people involved—operators, maintenance staff, health and safety officers, environmental officers and management—and take their concerns into account. This collaboration was particularly valuable and helped improve the design along the way.

# ■ Social and economic benefits

## **Recovering wood waste to benefit the environment and local economy**

By combining two of the Côte-Nord's major natural resources—iron ore and wood—this local, carbon-neutral biofuel project is generating a great deal of enthusiasm in the community as well as very significant benefits.

First, the project directly creates several dozen quality jobs by restarting the Bioénergie AE plant.

By using pyrolysis oil, ArcelorMittal is also providing an outlet for forestry professionals who have had limited options for managing their wood waste since the Baie-Comeau paper mill closed. This in turn affects operations at the Arbec sawmill in Port-Cartier, which will be able to increase its production capacity and will no longer have to suspend its operations because of waste storage management problems. The production line now allows the forestry company to operate seven days a week.



Source: the Nord-Côtier newspaper

Port-Cartier is experiencing a demographic decline. Retention and attraction are priorities for the municipality.

# Social and economic benefits

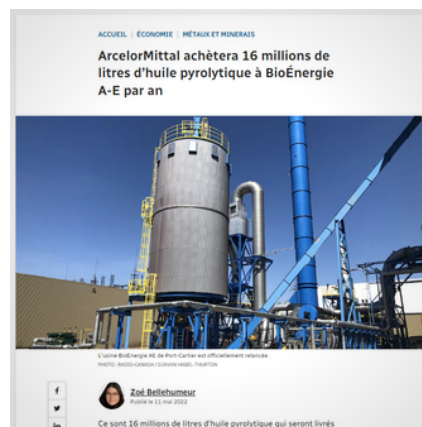
## Tangible local benefits

People in the region are very involved in this project and want it to succeed because it means that jobs will be created near their homes for the long term. Indirectly, this project will positively impact the operations of all the service businesses in this municipality of 6,516 people (2021, Statistics Canada).

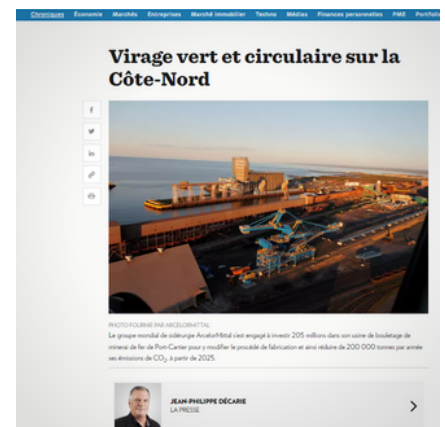
Moreover, the community is very proud that leading-edge expertise will make Port-Cartier known throughout the province.



“ArcelorMittal is going further with its conversion”  
source: Journal de Québec



“ArcelorMittal will be buying 16 million litres of pyrolytic oil from BioÉnergie AE per year”  
source: Radio-Canada



“Green and circular shift on the Côte-Nord”  
source: La Presse

# Meeting client needs

**Since June 2022, two out of nine areas of the plant—a total of five burners—have been operating with pyrolysis oil and have used over 10 million litres of the product. After a successful feasibility study to install a permanent system, ArcelorMittal decided to accelerate work in other areas to expand the use of pyrolysis oil in its facilities. The detailed engineering project is now underway, and the bidding process will start in April 2023.**

## Greater knowledge of the facilities

The project was completed on time and on budget, and BBA provided ArcelorMittal with a multidisciplinary analysis that gave an overview of the state of the client's facilities, with more than 50 items verified in relation to industrial safety, air quality, control systems and pellet furnace instrumentation. Subsequently, the feasibility study determined the final design of the permanent system and evaluated how much it would cost to implement it in the pellet plant.

This project marks the beginning of ArcelorMittal's energy transition in Port-Cartier and is a crucial step in converting the plant into a greener facility.

## One step closer to carbon neutrality

The mining company hopes to cut 30% of its greenhouse gas emissions by 2030 and become carbon neutral by 2050. This project is a step in that direction while still maintaining good operational and financial performance. It also reduces its dependence on fuel oil and secures its access to a local, carbon-neutral source of biofuel.

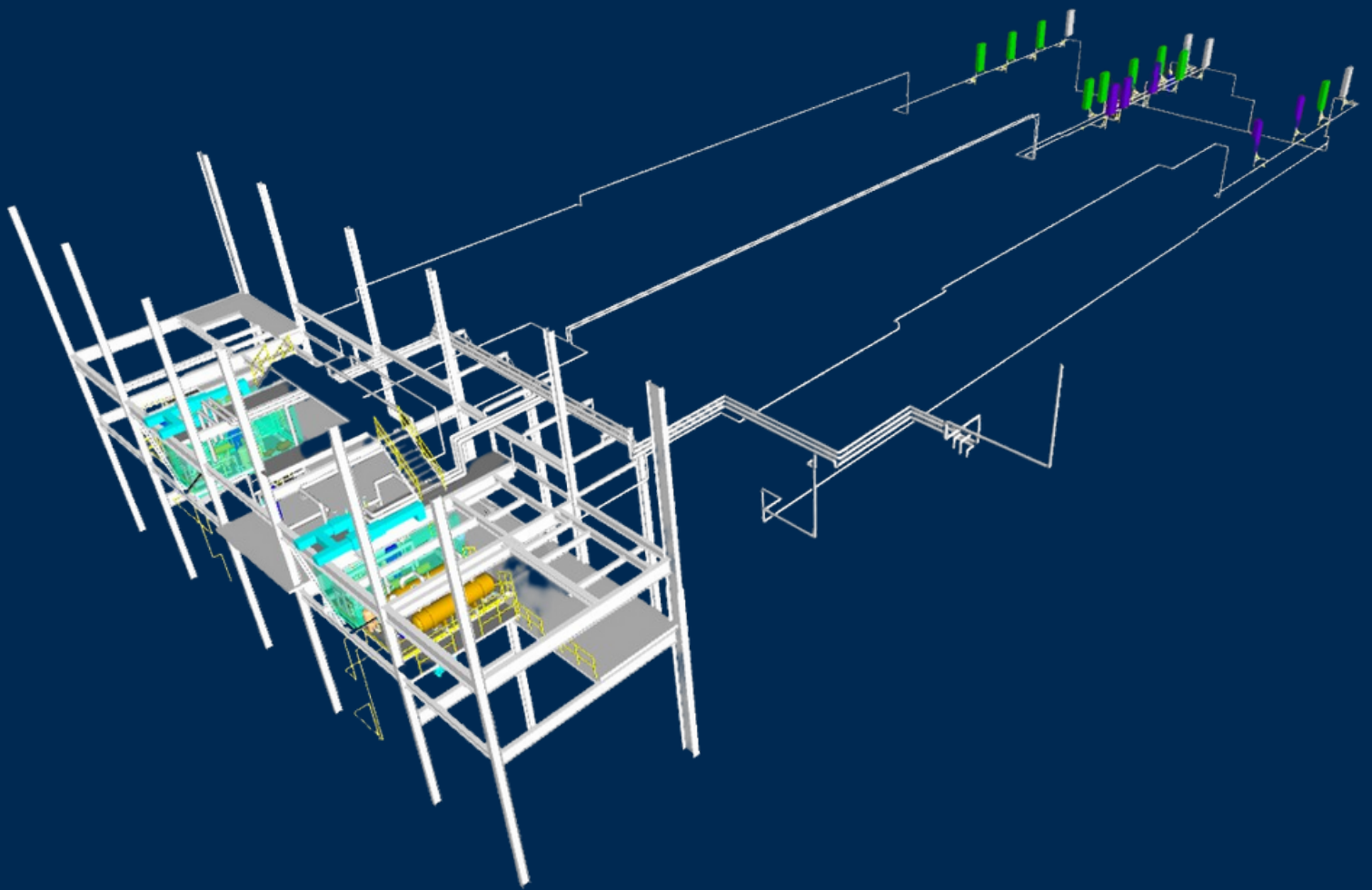


ArcelorMittal wins EnviroLys award



ArcelorMittal and BioÉnergie AE Côte-Nord Canada win Eurêka! Award from Écotech Québec





3D model – Using pyrolysis oil in the pellet plant

# About BBA

BBA has been providing a wide range of consulting engineering services for over 40 years. Today, its engineering, environmental and commissioning experts team up to quickly and accurately pinpoint the needs of industrial and institutional clients. The firm's expertise is recognized in the Energy and Natural Resources industry. With 16 offices in Canada and internationally (Chile), offering clients local support and field presence, BBA is recognized for providing some of the industry's most innovative, sustainable and reliable engineering solutions.



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