



SDTC SUCCESS STORY

COMPANY NAME: **AIREX ENERGY**
PROJECT NAME: **BIOMASS TORREFACTION DEMONSTRATION PLANT**



SUSTAINABLE DEVELOPMENT
TECHNOLOGY CANADA



Company Location: Laval, Quebec and Becancour, Quebec
Key Products/Services: CarbonFX™ biomass torrefaction systems, biocoal pellets, biochar, biocarbon
Operating Since: 2014 (Airex Energy was spun out of Airex Industries in 2014)
SDTC Support: 2013
Vision: Mitigate climate change by turning biomass into biocoal, a clean and renewable alternative to fossil coal.
Consortium Partners: Lauzon Bois Energétique Recyclé
SDTC Funding: \$2,700,000
Leveraged Funding: \$7,381,082
Total Project Value: \$10,081,092
For more information: airex-energy.com

“SDTC has been extremely supportive during the entirety of this project. We had a major setback right at the beginning of the project when we lost our strategic and financing partner. As a result, we had to find a new partner and engage in a new round of financing. SDTC funding and SDTC staff collaboration were instrumental to attracting and securing new investors for our project.”

Sylvain Bertrand
CEO
Airex Energy



AIREX ENERGY'S BIOMASS TORREFACTION DEMONSTRATION PLANT: At a Glance

Biocoal is an environmentally preferable alternative to conventional coal and heavy fuel oil. It can be made from a variety of available and renewable biomasses; burns “cleaner” and results in more energy produced than incumbent technologies, such as the wooden-pellet counterparts currently in industrial use. Airex has developed an innovative torrefaction—or roasting—process, and built a demonstration facility to produce biocoal from Canada’s abundant supply of waste biomass.

At Sustainable Development Technology Canada (SDTC), we fund Canadian cleantech projects and coach the companies that lead them as they move their ground-breaking technologies to market.

SDTC builds Canada’s economy by investing in its entrepreneurs and enabling the development of clean technologies. Our funding supports the development and pre-commercial demonstration of clean technology innovations.

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KEY FACTS

More than
40 MILLION
TONNES

of biomass could be sustainably harvested from Canada's forests.

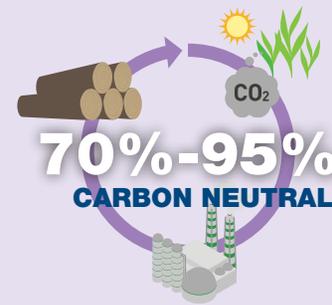


GLOBAL ELECTRICITY PRODUCTION FROM COAL-FIRED POWER PLANTS

41%

Coal-fired power plants currently fuel 41% of global electricity production; Canada alone consumes

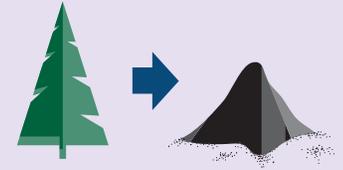
35 MILLION
TONNES PER YEAR
for power generation.



Lifecycle analyses show biocoal is about 70%-95% carbon neutral from baseline when used as a fuel for power generation.

The innovative reactor design of the CarbonFX™ technology can turn biomass into biocoal in just

THREE
SECONDS.



The Opportunity

By 2025, global wood-pellet demand is expected to reach 55 million tonnes per year. Biocoal pellets are a new class of processed biomass that is expected to capture a significant portion of that demand. Biocoal pellets have a number of advantages over traditional wood pellets: energy density is greater; capital investment requirements at power plants are lower; they are weather resistant; and they can be easily and cost effectively co-fired at coal burning facilities.

More robust European climate-change policies targeting 20 per cent greenhouse gas emission reductions, improved energy efficiency in power generation, and increased renewable power generation were the impetus for biomass advances. Biocoal is a response to that impetus, and there is a strong export potential for the product in Europe, where the industrial energy market is expected to increase from current levels around 12Mt/yr to between 29Mt/yr by 2025. Various jurisdictions in Canada and the United States, meanwhile, are phasing out coal-fired power generation, opening the door for biomass coal substitutes.

Project Overview

Airex Energy Inc. is a spin-off of Airex Industries Inc., a private company founded in 1975 that specializes in industrial air filtration and air-handling equipment. In 2010, in response to customer demand for a cleaner fuel than coal or bunker fuel, Airex Industries started developing a proof of concept of the torrefaction-based CarbonFX™ biocoal pellet technology. Torrefaction is a controlled carbonization process during which biomass is heated to high temperatures with little oxygen. The resulting product is biocoal, a renewable, carbon-neutral fuel that can replace fossil coal and fuel oil in combustion and metallurgical applications.

Airex's proof of concept initiatives led to the development of a 250 kg/h pilot plant in 2012. In 2014, Airex Energy was created following a successful financing with two venture capital firms. With the support of SDTC, Airex Energy began to design and build a commercial-scale torrefaction demonstration facility in Becancour, QC, with a production capacity of 2,000 kg/h. The plant was completed in 2015, and commissioning operations—testing equipment, testing control loops and producing small amounts of biocoal—are expected to take about 12 months, targeting 90 per cent uptime by December 2016.



Photo: Airex Energy's patented CarbonFX unit.



Photo: Airex Energy's torrefaction plant in Becancour, QC.

The Technology

The CarbonFX™ system is a small cyclonic bed reactor that was developed from the cyclones that were central to Airex Industries' dust-collection technologies. By adapting the cyclones with patented technology that injects hot gases into the reactor, residence times of particles in the reactor—in this case biomass feedstock—can be controlled by varying time and temperature. The torrefaction process, which effectively 'roasts' the biomass particles, can be completed in about three seconds, versus 30 minutes for incumbent technologies. The process produces a black powder, which is then sent through a pellet mill in order to increase its density; the resultant biocoal pellets are 6 millimetres in diameter and 20 millimetres in length.

A single 2,000 kg/h CarbonFX™ unit operating at 100 per cent uptime would produce 15,000 tonnes/year of biocoal. Users can run multiple units in parallel for easy scale-up to virtually any desired size, but plants are optimally rated at 5,000 kg/h, which is the typical intake capacity of pellet mills.

The Market

Target customers for biocoal are generally cement manufacturers and power utilities, but the target market for the CarbonFX™ technology is much broader in scope: virtually any wood product company that is interested in monetizing its waste to produce value-added products could be a potential customer, and so could any other company that produces large volumes of organic waste. In this respect, CarbonFX™ can be deployed around the world.



Partnering for real results. Meeting environmental goals. Moving cleantech to market.

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