AIREX ENERGY

INSPIRED ENERGY

ALTERNATIVES TO COAL IN INDUSTRIAL PROCESSES

February 15, 2023

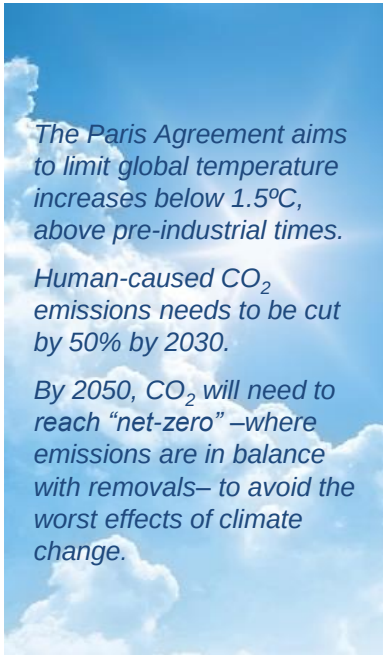
AIREX ENERGY IS A CANADIAN COMPANY BASED IN MONTRÉAL, QUÉBEC

OFFICE
Laval, Québec

PRODUCTION PLANT
Bécancour, Québec

- Distance from east to west: ~5,500 km
- Six (6) time zones

AIREX ENERGY AT A GLANCE



- **World leading climate solutions provider**, helping organizations in their journey towards net-zero emissions.
- Spin-off of Airex Industries, a manufacturer of air filtration, dust-handling and energy efficiency systems established in 1975.
- Proprietary CarbonFX™ technology platform **transforms biomass waste into value-added carbonized products.**
- Our business model is to **build, own and operate green carbon production plants,** in collaboration with partners.
- Plant commissioned in 2016 is still the **first and only biocoal pellet plant in operation** in Canada.
- Currently deploying **multiple production plants** in Canada, USA, Europe and Asia.

AIREX INTENDS TO CAPITALIZE ON THE GLOBAL TRANSITION TOWARDS NET-ZERO EMISSIONS

Solutions **to reduce greenhouse gas emissions**

- Biocoal, in the form of pellets, is a clean and renewable energy alternative for power generation and district heating.
- Fuel of choice to replace coal used in industrial processes:
  - Ironmaking and steelmaking
  - Reducing agent in metal production
  - Production of green hydrogen or Sustainable Aviation Fuel (SAF)

(Biocoal pellets)

Solutions **to remove carbon from the atmosphere**

- Biochar is a proven alternative to sequester carbon for hundreds of years in soils and materials.
- One of the five (5) negative emission technologies identified by IPCC (Intergovernmental Panel on Climate Change of the United Nations)

(Biochar)

Solutions **to decarbonize the metallurgical industry**

- Engineered green carbon product specifically developed for the metallurgical industry.
- Thanks to its high fixed carbon and low volatile matter content, biocarbon is a renewable biomass solution for the production of green steel and metal.

(Biocarbon)

TRANSFORMING SAWMILL, FORESTRY AND WOOD WASTE INTO CLEAN AND RENEWABLE CARBONIZED PRODUCTS

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Waste

Sawmill residues

Forestry residues

Recycled wood

Biomass Pyrolysis Plant

Clean and renewable green carbon solutions

Renewable energy

A powerful carbon sink

Green steel and metal production

Patented torrefaction and carbonization technologies developed and manufactured by Airex Energy

PROVEN TECHNOLOGY IN OPERATION 24 HOURS/DAY

- R&D activities on torrefaction technology started in 2010
- Commercial plant operation: 24 hours/day
- Completed the design and engineering of a 5 tons/hr unit (CarbonFX 5TPH)
- Currently completing the engineering of CarbonFX HT featuring a new carbonization technology

2010
EXPERIMENTAL
10 kg/hour

2012
PILOT
100 kg/hr

2016
COMMERCIAL
2 tons/hr

CarbonFX 5TPH

Modular system for **large-scale biocoal** production

CarbonFX HT

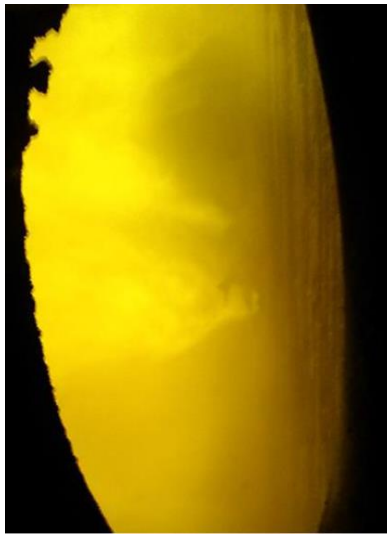
Optimized for **large-scale biochar and biocarbon** production

PRODUCTION PLANTS IN DEVELOPMENT

Undisclosed U.S. customer	• 5-Year Purchase and Supply Agreement worth $90M • First shipment in June/2021 • Another biocoal pellet plant is being developed in Canada: Commercial operation in Q1/2025
	• Collaboration Agreement with Suez, a global European industrial group, for the development of the biochar and carbon sequestration market. • Production of 350,000 tons of biochar by 2030 and over one million carbon removal credits • First biochar/biocarbon plant to be built in Canada: Commercial operation in Q2/2024
Strategic partner	• Seeking a strategic partner (wood pellet producer, feedstock supplier, forest operator or industrial company) for the construction of a biocoal pellet plants • To supply biocoal pellets in large volume for co-firing trials at coal-fired power plants

BIOCOAL PELLETS CO-FIRING TRIALS AT CUSTOMER SITES

Year	Application	Quantity (Metric tonnes)	Co-Firing Ratio	Country
Dec/2016	Power Generation	225	100%	U.S.A.
Jul/2017	Power Generation	50	17% to 24%	Canada
Feb/2021	District Heating	200	20% to 40%	France
Apr/2021	Gasification: Hydrogen	5	15% and 30%	Australia
May/2021	Gasification: SAF	66	100%	France
Sep/2021	Power Generation	75	Up to 30%	Japan
Mar/2022	Power Generation	40	Confidential	Japan
Apr/2022	Power Generation	25	10%	Japan
Oct/2022	Power Generation	200	Up to 35%	Japan
Dec/2022	Power Generation	150	Confidential	Japan
Feb/2023	Power Generation	1,000	100%	New Zealand



Flame quality with 100% biomass

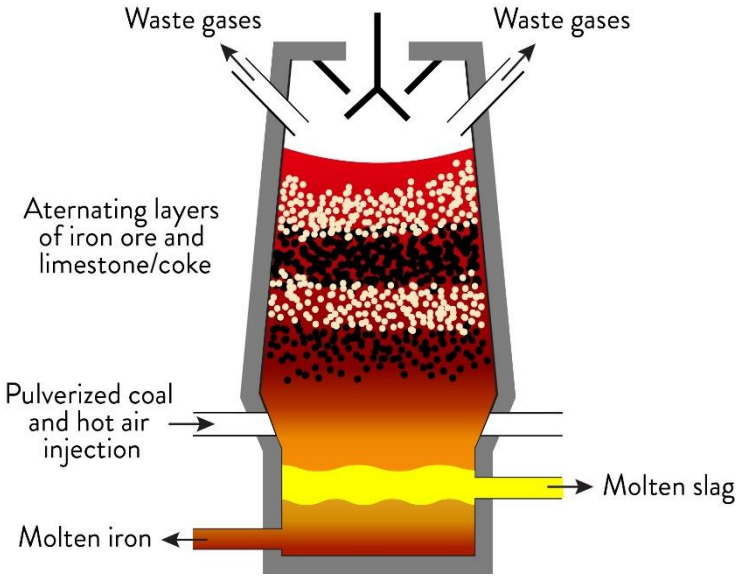
Successful combustion test without any changes to existing equipment and systems

ALTERNATIVES TO COAL IN INDUSTRIAL PROCESSES

PULVERIZED COAL INJECTION IN IRONMAKING

- Iron ore is reduced to molten iron in a blast furnace (BF), which is subsequently refined to crude steel in a basic oxygen furnace (BOF)
  - ~70% of the world's steel is produced via BF-BOF process
  - Emits 2.3 tonnes of CO_2 per tonne of crude steel produced
- Pulverized coal injection (PCI) is a source of heat and reductant
  - Involves the injection of large volume of fine thermal coal particles into the tuyeres of the furnace
- **Biocoal pellets can be mixed in a ratio of up to 50% with thermal coal for injection as pulverized material, reducing CO_2 emissions by 264 kg/tonne** of crude steel produced[1]
- Potential to reduce CO_2 emissions by 660,000 tonnes annually in a typical 2.5 Mt capacity steel plant.
- Biomass combustion also reduces nitrogen oxides (NO_X) and sulfur oxides (SO_X) emissions, while generating no toxic mercury emissions.

Blast Furnace

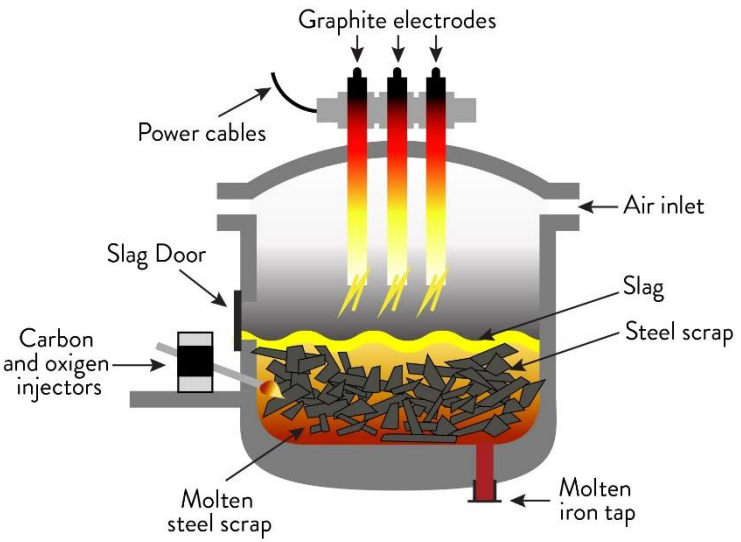


[1] Metallurgy and materials: Economic and environmental analyses of biomass torrefaction for injection as pulverized material in blast furnaces (October-December 2021)

CARBON USED IN ELECTRIC ARC FURNACE STEELMAKING

- Electric arc furnaces (EAFs) use electricity to melt steel scrap and coal is used as charge carbon and injection carbon
  - Account for approximately 25% of global steel production
  - Emits 0.6 tonnes of CO_2 per tonne of crude steel produced
- Charge carbon is used to carburize the melt (heat) and requires:
  - A high calorific value and a low reactivity to prevent premature combustion
  - Physical properties to ensure safe storage and handling
- Injection carbon is used to foam the slag and improve arc heat transfer efficiency and requires:
  - A high reactivity, a high carbon content and a low ash content
  - Particle size suitable for pneumatic conveying
- **Biocarbon briquettes and biocoal pellets could be used as charge carbon and injection carbon in EAFs, while reducing CO_2 emissions by 43 kg/tonne** of crude steel produced[1]

Electric Arc Furnace

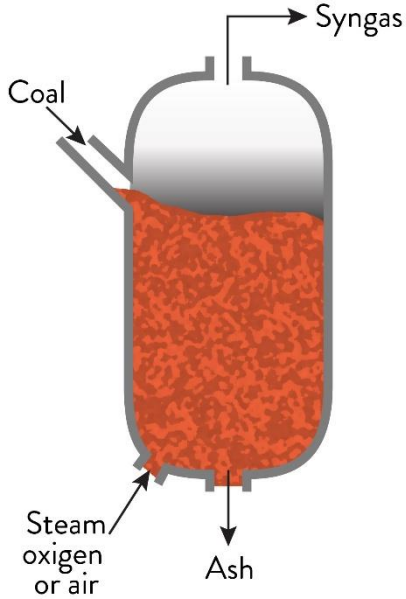


[1] Metals: Review of the use of alternative carbon sources in EAF steelmaking (2021)

COAL GASIFICATION FOR THE PRODUCTION OF HYDROGEN

- Gasification is a process that converts carbonaceous raw material into synthesis gas (syngas), which can be further converted into H_2 and CO_2 in a water-gas-shift reactor.
  - Coal gasification accounts for ~22% of global H_2 production
  - Emissions intensity of 22 kg of CO_2 per kg of H_2
- Fluidized-bed or Entrained-flow gasifiers are best suited for large-scale hydrogen production
  - Can accept a variety of solid feedstocks.
- Woody biomass is suitable to replace coal in large-scale gasifiers. However, **the torrefaction and densification of wood residues into pellets[1] improves gasification performance**, compared to raw biomass:
  - Increased syngas quality with higher yield of H_2 and CO, and lower CO_2 content.
  - Significant reduction in total tar content
  - Benefits in logistics and handling operations

Coal Gasifier



[1] Biomass and Bioenergy: Pilot scale CFB gasification of torrefied wood pellets. The effect of torrefaction on gasification performance (2017)

IN SUMMARY

- Proven technology currently operating 24 hours/day in Canada
- Airex is among a handful of companies worldwide that have achieved production at industrial scale
- Successfully demonstrated the superior performance of biocoal pellets at several co-firing trials
- Biocoal and biocarbon can be used in a number of industrial applications in replacement to fossil fuels
- Currently deploying multiple production plants in Canada, USA, Europe and Asia.

Thank you!

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