

About GCT:

For over 25 years, GCT has delivered excellence through innovative gas cleaning and energy solutions to reduce environmental footprint and to optimize energy utilization for our clients in the metallurgical industry.

In this Issue:

1. GCT Partnership for Supplying Hydrogen Fuel

2. Hydrogen Applications

3. Hydrogen Fuel
Characterization by GCT

About eCombustible:

eCombustible Products Holdings LLC (EPH) is a Florida-based company with presence in the US, Brazil, Colombia, Peru and Chile. EPH has developed a patented technology for generating hydrogen fuel from a novel process which consists of water electrolysis and a magnetic reactor.



Electrolysis Cell Stacks

1. GCT Partnership for Supplying Hydrogen Fuel

GCT has partnered with eCombustible Products Holdings LLC (EPH) to supply a turnkey hydrogen fuel solution that can be used in any process where thermal heat is needed. EPH has developed a patented technology that generates hydrogen from a highly efficient electrolysis process. The resulting hydrogen fuel, eCombustible, has a significantly higher calorific value than conventional molecular hydrogen and can be produced with up to 60% less energy, making it ideal for virtually any stationary thermal application.

GCT is assisting EPH in their technology commercialization and integration. Given our decades of expertise in process engineering and fuel conversion projects, GCT is uniquely positioned to act as EPH's technical arm to implement these conversion projects to eCombustible fuel so it can be supplied safely and reliably.

As a fuel, eCombustible hydrogen has the following benefits:

- Much higher calorific value compared to conventional molecular hydrogen
- Cost advantageous compared to other conventional fuel sources such as Diesel, LNG, LPG, etc., depending on regional fuel pricing
- Can be customized to replace conventional fuels in many applications as described in Section 2 below, with minimal to no modifications to existing equipment
- Replacing a carbon-based fuel with hydrogen resulting in an almost complete elimination of the existing **carbon footprint**

2. Hydrogen Applications

To date EPH has completed two small scale pilot projects that were installed in Peru. One application was for a boiler and the other was for a kiln. eCombustible replaced LPG and heavy fuel oil, respectively.



Demonstration Unit Installed in Peru

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Additionally, GCT, in partnership with EPH, is currently designing and delivering two full scale industrial systems to two large mining companies in South America. One application is for a boiler and the other is for a dryer and preheater. eCombustible will replace diesel and LPG, respectively, and both systems are expected to be installed by Q4 of 2020 and Q3 of 2021, respectively.

GCT is also working on future prospect applications where eCombustible can be used to replace conventional fuels, as described below:

- Hydrogen usage for metallurgical applications:

Hydrogen can be used either for reduction processes such as iron ore reduction or for thermal heating processes such as preheaters, dryers, kilns, furnaces, etc.

- Hydrogen usage for power generation applications:

Hydrogen can be used for power generation in a gas turbine, to replace natural gas, in a boiler to replace coal, or in a gas engine to replace diesel or other fuels. GCT will perform testing to evaluate and optimize the usage of hydrogen in such applications, as described in Section 3 below .

3. Hydrogen Fuel Characterization by GCT

At EPH's behest and in conjunction with input from one of the existing mining company customers, GCT has installed a one-third scale fuel characterization test setup in Dallas, TX to test and optimize EPH's hydrogen electrolysis production process and maximize the calorific heating value of the resulting eCombustible hydrogen. In addition, the testing will also evaluate the applicability of the eCombustible hydrogen into other applications. The testing is divided into 4 phases as detailed below:

- 1) Optimize the key process parameters for hydrogen electrolysis production to achieve optimal calorific heating value of the eCombustible fuel.
- 2) Evaluate the flame characteristics of the eCombustible hydrogen, and compare it to the flame characteristics of other conventional fuels.
- 3) Evaluate the usage of the eCombustible hydrogen in a gas engine for power generation.
- 4) Evaluate the usage of the eCombustible hydrogen in a gas turbine for power generation.

The completion of Phase 1 and Phase 2 testing is expected to be done by the end of Q3, 2020, and the completion of Phase 3 and Phase 4 testing is expected to be done by the end of Q2, 2021.



Fuel Characterization Testing:
Combustion System Setup



Fuel Characterization Testing:
Electrolysis Skid

