Advantages of Liquid Fuel vs. Hydrogen for Backup Power Fuel Cell Systems in Telecom Applications

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I. Introduction

With the rapid expansion of wireless communication systems worldwide, and the increasing socioeconomic benefits of mobile phone technology, the need for dependable and economical backup power is critical. Electric grid loss throughout the year, whether from severe weather, natural disasters, or limited grid capacity, is an on-going challenge for network operators. An alternative to the traditional backup power for telecom sites is the fuel cell. Telecom companies are increasingly choosing fuel cell systems as backup power because they are a clean, reliable, and low maintenance solution compared to batteries and diesel generators.

The type of fuel cell commercially available today and most appropriate for use with telecommunications sites is the PEM (Proton Exchange Membrane) fuel cell. A PEM fuel cell is fueled by hydrogen and produces electricity through an electrochemical reaction. These fuel cells are compact, durable, reliable, quiet, and operate at peak efficiency in a wide range of climates (-40°C to +50°C) and adverse weather conditions. In addition, they have few moving parts (thus needing minimal maintenance), come in sizes ranging from 250 W to 250 kW, can readily adjust their electronic output to meet shifting power demands and offer a high energy density. Also, fuel cells are fast starting and can begin delivering electricity within seconds of activation.

II. Liquid Fuel vs. Hydrogen

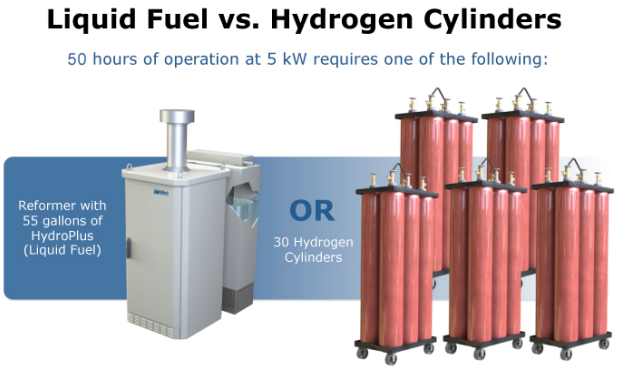
Typical backup power fuel cell systems use pressurized bottled hydrogen which powers the fuel cell stack and produces regulated DC power and clean exhaust and waste heat. Bottled hydrogen is suitable and cost effective for a range of telecom backup requirements, including 4-8 hours backup power time and at locations where convenient access to hydrogen refueling is available.

The typical run time for one of today's fuel cells operating on 6 cylinders* of hydrogen (*1 T-cylinder = 7,392 liters of hydrogen) is 10 hours at 5 kW of output power. For longer run times, additional cylinders of hydrogen can be hot-swapped into the hydrogen storage cabinet. However, there can be limitations as to how much backup power run time can be achieved by hot swapping cylinders of hydrogen. The run time can be limited by the amount of space for hydrogen storage at a telecom site and/or the remoteness of a telecom site, which makes hot swapping hydrogen cylinders less desirable.

Liquid fuel, such as a mixture of methanol and water, provides an attractive alternative to hydrogen gas for powering fuel cell systems. When critical sites require more than 8 hours, or even days of backup power, then a liquid fuel system with a "fuel processor" can be the more practical and economical solution.

A fuel processor uses a liquid fuel to make hydrogen on site and on demand. Fuel processing is the act of converting hydrogen rich fuels into pure hydrogen gas as needed, then feeding the pure hydrogen directly into a fuel cell stack. IdaTech has developed fuel processors for a variety of common fuels including methanol, a liquid found in windshield washer fluid and many other common products. Fuel cell systems with liquid fuel processors can provide backup power for days instead of a few hours by using energy dense liquid fuel.

In comparison between liquid fuel and hydrogen cylinders, 55 gallons of liquid fuel, and a fuel processor will provide the same amount of power for the same length of time as 36 hydrogen cylinders. In situations where hydrogen storage is difficult due to space and weight restrictions, a fuel cell system with a fuel processor may be the right solution.



III. Fuel Cell Installations

Backup power fuel cell systems have been installed at telecom base station sites worldwide. These installations have shown the benefits and ease of fuel logistics for fuel cell systems that run on liquid fuel. Fuel cell systems with built in fuel processors and integrated 220 liter fuel tanks can operate without interruption for 50 hours at full output (5 kW). Fuel can be easily stored, transported onsite and units can be re-filled even while in operation. Fuel is stored locally for rapid dispatch to sites when needed.

IV. Summary

The commercially available fuel cell with an integrated liquid fuel processor is an increasingly popular, highly reliable, and cost-effective backup power solution for telecom sites that require extended run backup power.