



ENERGY PIPELINE

COVERING THE ENERGY INDUSTRY IN THE ROCKY MOUNTAIN REGION

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TECH TALK

NATURAL GAS AC UNIT PRODUCES ELECTRICITY

BY GARY BEERS • FOR ENERGY PIPELINE

A FLORIDA-BASED COMPANY, BePower Tech, has developed natural gas fueled air conditioners, BeCool System, that can dramatically reduce operating costs by producing electricity.

Since natural gas is a lower-priced fuel than electricity, the value of electricity produced by the AC is higher than the cost of natural gas consumed. These AC units (10 ton) consume natural gas at rate of 43kW and produce 15kW of electricity. So, the economics breakdown in the following way:

- Price of natural gas, 43 kW x 0.03/kW, \$1.19/hr
- Value of electricity produced, 15 kW x 0.15/kW, \$2.28/hr
- Savings: \$1.09/hr

Thus, the user saves money when running their BeCool AC in comparison with typical commercial AC systems. An example of these savings is profiled in Table 1 based on information from New York City.

HOW A "BECool" SYSTEM WORKS

The BeCool system works in the following manner; a liquid desiccant stream flows between two proprietary system components: a dehumidifier and a regenerator. A liquid desiccant is a fluid that readily absorbs water.

DEHUMIDIFIER

Hot humid air to cool enters the dehumidifier. Within the dehumidifier, this air comes in contact with the liquid desiccant. In doing so the moisture in the air is absorbed by the desiccant. This process tends to raise the temperature of the air, so the air is maintained at a constant temperature by flowing a separate air stream through the

Table 1
12-Year Lifecycle Cost Analyses and Comparison for 2,500 cfm Air Conditioning System
(based on 10 ton commercial AC units; 2013 New York Electricity and Natural Gas Prices)

	High Efficiency (SEER 20) Rooftop AC Unit	Standard Dedicated Outside Air System (DOAS)	"BeCool" System
Capital Costs Plus Installation	\$ 15,000	\$ 48,200	\$ 45,664
12-Year Total Operating Costs (Assumes AC operation for 6 mos of year)			
AC Operating (hrs/day)			
20 h (i.e., hospital)	\$ 86,361	\$ 35,118	(\$ 39,060)
12 h (i.e., office bldg.)	\$ 51,817	\$ 21,071	(\$ 23,486)
Parts Warranty (Assumes fuel cell operates 20 h/day during cooling season)	Not accounted for	Not accounted for	\$ 29,160
System Total Cost (Capital + Operating + Warranty) Net Present value, 3 % cost of capital			
AC Operating (hrs/day)			
20 h (i.e., hospital)	\$ 101,361	\$ 83,318	\$ 35,765
12 h (i.e., office bldg.)	\$ 66,817	\$ 69,271	\$ 52,368
12-year Extra Cost by Using Standard Rooftop Unit or DOAS System (Percent saving shown in parenthesis)			
AC Operating (hrs/day)			
20 h (i.e., hospital)	\$ 65,596 (65%)	\$ 47,553 (57%)	0
12 h (i.e., office bldg.)	\$ 15,428 (23%)	\$ 17,882 (26%)	0

dehumidifier. This separate air stream cools down the dehumidification process.

The source of this air stream could be building exhaust air or outside air. The temperature of the dry air is dropped using an indirect evaporative cooler. In this component, water is introduced into the building exhaust air stream. This process drops the temperature of this air stream. We use this low temperature air stream to drop the temperature of the dry air stream produced in the dehumidifier. The result is cool, low humidity air that can enter a building.

REGENERATOR

The regenerator is a fuel cell system that consumes natural gas and produces heat, water and electricity. The heat produced by the regenerator is used to recover the water in the liquid desiccant. This water, coupled with the water produced in the regenerator, is used to drive the indirect evaporative cooler. The electricity produced is a byproduct of the regenerator operation. While air conditioning operation is transient (start-stop), fuel cell operation is constant. The use of the liquid desiccant system enables the storage of high concentration liquid desiccant for use when air conditioning is needed. In this way, the heat and water generated by the fuel cell system is never wasted.



For over 50 years, GARY BEERS, has worked in numerous fields of environmental science as a consultant, regulator and educator. This career included senior management position with major consulting, nonprofit and public organizations. He has founded several successful firms to capture emerging resource management markets. One of his latest ventures, EnviroScienceINFO, provides content for public media.

