



## INDUSTRY ENERGY RESEARCH AND DEVELOPMENT PROGRAM

### CLEAN ENERGY TECHNOLOGIES

## HOW WOULD YOU LIKE TO MINIMIZE YOUR ENERGY CONSUMPTION AND DRYING TIME?

*Drying time and energy consumption are two key elements that influence buyers' choice when selecting a new clothes dryer. Consequently, besides the cost, these are the main drivers for innovation in that industry.*

### Integrating Heat Modulation Capacity to a Residential Clothes Dryer

Montreal's manufacturer Camco is General Electric's residential appliances maker in Canada. Among other products, Camco produces GE Profile, GE, and Hotpoint brand electric and natural gas clothes dryers (Figure 1). The Natural Gas Technologies Centre has approached this manufacturer with a modulating combustion system clothes dryer concept, which would allow for a better drying heat management, in order to minimize energy consumption and drying time.

A first proof-of-concept step was undertaken, with the financial support of Natural Resources Canada's Emerging Technologies Program, Gaz Métro (Quebec) and Enbridge Gas Distribution (Ontario).

The proposed approach aims at using burner modulation in order to optimize water evaporation and burner on-off cycles frequency. Common practice, without heat modulation, requires a compromise when sizing the burner nominal capacity and this reflects negatively on the unit performance. From that perspective, heat modulation could be used to reduce both drying time and energy consumption.

Modulation was achieved using a two-step modulating gas valve from Italian valves manufacturer SIT (Figure 2). This new low-cost modulating device is available on the market for atmospheric combustion systems below 50,000 Btu/hr.



Figure 1  
GE Profile gas clothes dryer

## An Interesting Approach for Drastic Drying Time Reduction

Burner modulation alone has not proven to be interesting for energy saving purpose. It is likely that the reduction of burner off-cycles provided by the modulation feature, which corresponds to a better thermal inertia and higher drying efficiency in the tumbler, is outdone by gas savings inherent to more frequent burner off-cycles.

Thus, even if the dryer electrical consumption could be reduced, according to the reduction in drying time, the overall energy consumption stays about the same since natural gas is the major energy source.

However, combining a boosted-capacity burner and a modulation strategy has shown to be a winning approach to reduce drying time up to 30 to 40%. For optimal results, drying air rate must also be modulated to follow burner capacity variations.

Figure 3 shows the effect of burner capacity on water evaporation rate. During the first part of the drying cycle (first 10 minutes), the higher burner capacity of the modulating equipment provides a far higher evaporation rate compared to the one observed with the non-modulating equipment. This explains how drying time can be significantly reduced.

Overall, heat modulation applied to residential clothes dryers is a very interesting way to reduce drying time, especially in the perspective of lowering the drying time to be synchronized with the washing time, which is one of the major concerns of the clothes drying industry.



Figure 2  
SIT's two-step modulating gas valve

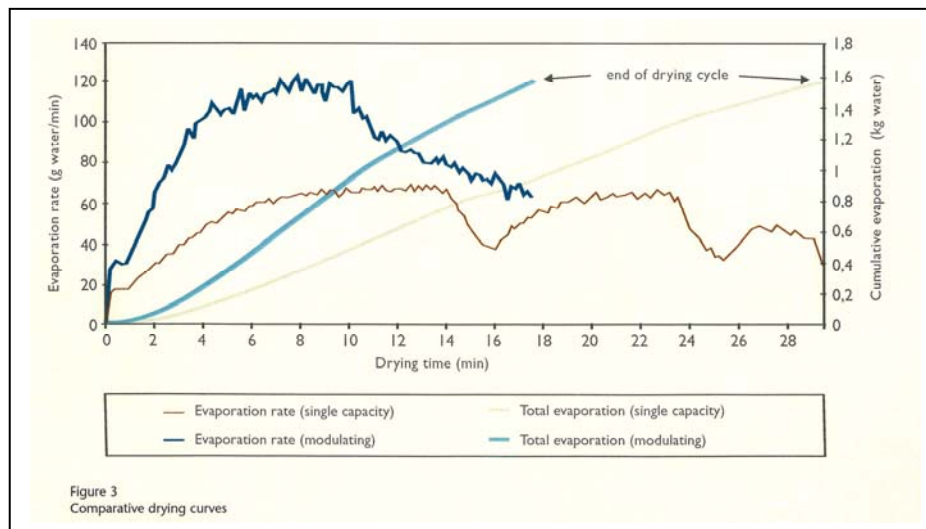


Figure 3  
Comparative drying curves

For Further Information Please Contact:

Stéphane Brunet, Eng., M.A.Sc.  
Manager, Utilization R&D  
☎ (450) 641-8130  
✉ [stephane.brunet@ctgn.qc.ca](mailto:stephane.brunet@ctgn.qc.ca)

Natural Gas Technologies Centre  
1350 Nobel Street  
Boucherville, Québec  
J4B 5H3  
Canada

[www.ctgn.qc.ca](http://www.ctgn.qc.ca)