

Ask Jon Eakes

Tri-Energy Controller -- a step further towards energy efficiency

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ABC Hybrid Inc. has really broken the code on heating comfort and economy. Your existing furnace goes totally on or totally off according to the demand of the thermostat. That is very much like having a stick shift car with only neutral and third gear – you would be in high gear, or out of gear. That's tough on a car and tough on you and your heating system – but that is the reality of today's heating systems. In an effort to deal with such a problem some variable speed heat pumps have come on the market, but they are expensive and subject to frequent mechanical problems.

The Tri-Energy Controller, customized to control any existing central heating system, smooths that all out like the best of automatic transmissions – giving even heat and lower operating costs.

You have heard me speak as a strong supporter of Dual Energy programs for a long time. Let me tell you the history of an engineer from Montreal that has sold me on backing “the next step”: Tri-Energy. That is Dual energy with a Heat Pump and a fuel fired Furnace plus one more heating element and a well-tuned orchestra conductor for all of that equipment. Yes I bought into the company but rather than trying to sound like a salesman, let me tell you why I got sold on the Tri-Energy system with its 3-FLEX Controller. It all started off with trying to make Dual Energy work better and ended up with a controller that can make any central heating system perform better, including all electric as well as hydronic systems.

A LOOK AT DUAL ENERGY TO BETTER UNDERSTAND TRI-ENERGY

Dual energy is a hydro rate system and control system that can save a lot of money whether you are heating with oil or even the currently less expensive gas.

For details on this good deal from your Utility company, follow this link to “Is the Dual Energy electrical rate program worthwhile?”

Basically, with Dual Energy, the utility gives you a preferred electrical rate for most of the day (all year long, including air conditioning costs) and then charges much more when it is very cold outside and they need the electricity for people who cannot jump over to a fuel fired furnace or boiler. Of course there is an automatic switch to change from your Heat Pump to your furnace so you are not using electricity to heat at the higher rate. Although I strongly support the Dual Energy program, it does have a few drawbacks.

There are some problems of blasts of uncomfortable cold air coming out of the heating system during the various switching and cycling functions of a Dual– Heat Pump / Fuel Furnace system because of delays in getting to comfortable temperatures. But we are willing to live with that if it is saving us 50% of our heating costs.

On the technical side, often the Heat Pump cannot supply all the heat you need even though it has not gotten cold enough outdoors yet for the control system to force you over to the fuel fired furnace and electricity is still cheap – but the thermostat itself will kick in the furnace just to keep the house comfortable. This also happens during regular thaw cycles of the heat pump. So you spend a fair amount of time using oil or gas when it would be more economical to use electricity. This is the primary financial imperfection in the Dual Energy system.

How do you know when your present system is wasting money?

You have learned to pay attention to that little light in the kitchen that tells you when your electricity

rate has changed from bargain electricity to expensive electricity. When it is cold enough outdoors to turn that light on, your electrical heat pump is shut down and the fuel fired furnace kicks in. That light usually goes on at -12C.

Think back to last winter, or if it is cold today, listen for when the furnace kicks in and then check to see if the "expensive energy" warning light is still OFF. If the furnace kicks in while the light is out, why are you burning expensive fuel while your electricity is still cheap? One of the reasons is that few heat pumps can provide all the heat for your house when below zero -- so the standard dual energy set-up is that as soon as your heat pump cannot do the whole job, it kicks out and the oil or gas furnace kicks in, even if it is only -3C, a long way from the Hydro cut-out of -12C.

Avoid fuel whenever electricity is cheap.

The important thing to realize is that modern heat pumps continue to provide some heat even when it is extremely cold outdoors. They continue to do that more economically than any other heat source, but when it is very cold outdoors it is not enough heat to heat the house – but it is still an important quantity of cheap heat.

The Tri-Energy concept is to put a multi-stage electrical heating element, like a mini-electrical-furnace, right in the ductwork of your system. This heater is strong enough to combine with the heat pump and furnish all the heat you need, right down to the Dual Energy switch over point, usually -12C, always using the heat pump to its maximum and using the multi-stage duct heater only as much as is needed to top it up. If the heat pump needs to go into a defrost cycle, no problem, the plenum heater goes up to maximum and takes care of the job without turning on the furnace. That means that you are heating the house with less money right up until the fuel fired furnace must kick in. At this point your electrical rate increases and both the electrical devices shut down. That is how you can save around 50% more, above and beyond the 50% you already saved by going to Dual Energy with the Hydro Quebec DT rate system.

Comfort above all

This electrical plenum heater is also being used to quickly warm up the ducts as the furnace or heatpump kicks in to prevent all those cold air blasts. In fact as I read through the comments of homeowners who have used this system for one winter or more, they confirm the money savings but seem to be far more interested in the even heat and increased comfort. Like this note:

"Everyone talks about money saved, but more importantly for us is how much more comfortable we are. The air is not dry because of burning fuel and excessive heat. We have a grandson now, and he enjoys playing with the air duct on the floor in front of the solarium and feeling the air blow in his face. It is always a comfortable temperature for him."

Control is the key

Adding in the electrical plenum heater is an important part of the Tri-Energy concept, but the most important is the small computer board, the 3-Flex controller, that without any moving parts manages to monitor temperatures as well as the real energy efficiency of your house by tracking how long it takes to warm up and then orchestrates the operation of each of the three heating devices – your Heat Pump, the Plenum Heater and the fuel fired furnace – all keeping in tune with the Hydro DT electrical rate at any given moment. That is really the part that ABC Hybrid Energy of Montreal has developed and patented to make this concept available and reliable.

You still control the thermostat. You set the desired temperature and the 3-Flex controller juggles all the rest to be sure you get the temperature you requested at the least cost possible at that moment of the day, night, fall, spring or dead of winter.

Equivalent to the efficiency of geothermal heating

When you sit down and study the numbers – in real houses – it is surprising to discover that the energy efficiency of this “heating with a system” is as economical as the operation of a geothermal heat pump – up to now the most efficient heating system available. The big difference is that the up-

front costs of the Tri-Energy system, especially when simply added onto an existing Dual Energy system, are a small fraction of the very large capital costs for a geothermal system. Follow this link for more information on when geothermal heating is a good choice.

Should I change to ALL-ELECTRIC heating?

If you are thinking of removing your Oil or Gas furnace and replacing it with an all-electric furnace, often recommended by heating contractors, you may want to look closer at the options rather than just having a knee jerk reaction to getting rid of a fuel fired appliance. When you have "all electric" heating, you no longer qualify for the reduced Dual Energy electrical rate. This means you pay more for using your appliances all year long, including a significant increase in air conditioning costs. Factor all of that in and "all electric", even with the relatively low Hydro Quebec standard rates, turns out to be the most expensive option after an oil furnace without dual energy.

With today's energy prices and the Hydro rate structure, all electric heat, even with a heat pump, is not the most economical option if the oil furnace is at the end of its service life and needs replacing. Instead, tri-heat -- a high efficiency gas furnace, heat pump and a plenum heater -- with the 3-Flex controller is most economical because gas is cheap and no chimney is required. In case no city gas is available, propane can be used, requiring only a small gas tank because the furnace runs little (provided there is no long cold streak). Even if oil is your only option to all electric, today's new high efficiency oil furnaces are worth taking a look at when combined with Tri-Energy. It's really all about control. There are detailed charts showing this on the ABCHybrid home page.

In the case where that fuel fired appliance still has service life in it (and if you go to tri-Energy that service life is extended because the furnace will run so little) you can have access to the very low Dual Energy rate offered by Hydro – or you may already have the dual energy system in operation. Moving to all-electric heating moves you back up to paying the full electrical rate for your heating and all other domestic electricity consumption as well, including air conditioning, which could wipe out the savings you thought to get by scrapping the oil or gas furnace.

When you have forced-air heating, using a heat pump always makes sense, but a heat pump with an electric furnace does not qualify for the Dual Energy rate. So a Heat Pump together with an electric furnace is better than an electric furnace or baseboard heaters all by themselves, but not more economical than keeping your fuel fired furnace which qualifies you for the Dual Energy electrical rate.

Any time you do have Dual Energy – moving to Tri-Energy is always a winner because you use the heat pump more and the fuel fired furnace considerably less.

Remember that integrating everything you have into a system is why ABCHybrid has developed controllers for a number of different heating configurations, always squeezing the most out of those appliances that cost the least to operate. In fact, running an electric furnace by measuring comfort and predicting changes, as does the 3-FLEX controller, rather than just using temperature as a guide, can actually save you money on your utility bills in a house that has nothing more than an electric furnace.

2-Flex and other stuff

If you go to the ABCHybrid.ca website you will discover that once this Engineer started looking at heating devices as systems, crossing over and combining a lot of manufacture and technology types, he was able to improve the operation of almost any heating system, including hydronic systems – just as modern electronic thermostats make things work much better than the old mercury thermostats that were so slow to react to changes. The key is getting everything reporting to one controller, which maximizes heat and comfort while minimizing costs. His website is a bit heavy (remember he is an engineer not a marketing man) but all the hard data is there if you want to study it.

Heating contractors

Most heating contractors that I have spoken with about this concept think it is great, but they don't want to try and sell "something else complicated" to their clients, or they have vested interests in a single manufacturer who does not provide a controller which integrates all the aspects of heating in your house including dynamic changes in indoor, outdoor and duct temperatures. I have gotten on

board because I have studied its reliability and from both a financial payback and energy efficiency point of view I believe that all heating systems should start using intelligent controllers like this, a controller born right here in our very cold climate. New patented ideas like this, unless they come out of giant corporations that can just push them onto the market, need all the support they can get to gain consumer confidence and become a standard item in a heating contractor's offerings. Full disclosure – yes I now have a financial interest in this product. Although I recommend a lot of products, I don't endorse very many. This is one that is simply the right technology for our time. Eventually there will be more Tri-energy systems than Dual energy systems in Québec, and from there, who knows. In the meantime you can increase your home's comfort and decrease its heating costs above and beyond what you have already done, with a 2 to 3 year payback. That's a better investment than the stock market.

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