turner drake + partners

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Update

Despite the fact that the Summer issue of Newsletter (Vol. 1, No. 16) was mailed ten days prior to the annual mail strike many readers do not appear to have received it. We are therefore including an additional copy with this issue (just so you won't miss the occasional pearl of wisdom that may have found its accidental way there!).

Keeping our Cool

Our premises on North Street consist of an elderly (circa 1920) two storey home which last year we gutted, filleted and renovated to provide rather pleasant offices. At that time we took the opportunity to insulate the walls (R12), roof (R20) and basement (R20) with fibreglass batts and a new vapour barrier. Although virtually everything inside the building was replaced we left the forced warm air system, with its 20 year old furnace, intact and consequently looked forward to the winter with a smile, a lot of hope, and a bottle of rum in the back pocket just in case. Happily we were as snug as the proverbial bug in the rug but come summer: that was a very different story! As temperatures reached 30°C, thoughts turned readily from appraising, to cool mountain streams and airconditioning. Since a 3 ton airconditioning unit, utilizing the existing hot air ductwork, was going to cost $5,000 we decided to hedge our bets by installing, for the same price, a similar sized reversible heat pump.

All You Want to Know About Heat Pumps (and more)

Heat pumps are reversible airconditioners and work on the same principle as a domestic refrigerator. They use Freon gas to transfer the heat, since Freon boils at -25°C to -35°C, depending on the atmospheric pressure. When the heat pump is in its heating mode the Freon is allowed to boil and evaporate in the heat exchanger outside the building. As it evaporates it absorbs heat from the surrounding air. The heated gas is then pumped inside the building through a heat exchanger inserted in the hot air trunking. It is then compressed and, as it condenses, it gives up the heat which is removed by the air flowing over the heat exchanger. The Freon, in liquid form, is then pumped back to the exterior heat exchanger where the process starts again. During the summer the heat pump reverses itself and pumps the heat out of the building to the exterior heat exchanger. The heat is dissipated by a fan into the atmosphere. Thus, a reversible heat pump functions as an airconditioner during the summer and then reverses to become the primary heat source during the winter. Although it will continue to extract heat from the outside air at temperatures down to the boiling point of the Freon, it becomes progressively less efficient with the fall in air temperature. It is necessary therefore to have a back-up unit to supplement the heat pump. A 'stand alone' heat pump usually has electric heater coils to provide back-up heat. In the case of an 'add on' unit such as ours, the existing furnace remains, and cuts in (we hope) as required, to provide additional heating.

Efficiency

Since heat pumps only *transfer* heat from one place to another they use less energy than conventional forms of heating which *convert* oil or fossil fuel to heat. The common myth that they only work when the external temperature is above freezing is easily discounted by comparing the comparative efficiencies of various types of heating. The coefficiency of performance is derived by dividing the heat output of the unit by the electrical energy input at a specific temperature. The higher the coefficient of performance, the more efficient the heating unit is of course.

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6182 north street halifax n.s. b3k 1p5 tel (902) 429-1811

The following C.O.P. figures were supplied to us by Energy Mines and Resources, Canada:

Temperature	Heat Pump	Electric Heat	Oil/Gas Furnace
10°C	3	1.0	N/A
0°C	2.3	1.0	N/A
-15°C	1.5	1.0	0.8
Average (Halifax)	1.9	1.0	0.6

Operating Costs

The savings in heating cost vary of course with the quantity of insulation and the present type of heating. We installed a York heat pump supplied by Nova Energy Ltd., Dartmouth. Barry Davis of Nova estimated that we would save 40% on our heating costs based on his survey of our particular building. Other literature indicates average savings of 33% over gas, 40% over electric heat and 30%/40% over oil, depending on the geographic location, amount of insulation, etc. The east and west coasts of Canada are the most economic areas of the country since heat pump efficiency rises with temperature.

In order to compare the economics of heat pumps, we have used as our benchmark, a 10 year old bungalow (3 bedrooms, 101 m2, fully finished basement), with the usual R12 insulation in the walls and upgraded R32 insulation in the roof and R20 in the basement. The oil furnace would burn approximately 2 700 ℓ (600 gallons) per year. Based on our interpretation of the Federal Government/Alberta Oil Pricing Agreement and assuming that the heat pump resulted in a saving of 35% in heating costs, it should be possible to achieve the following savings:

Heating Season	Oil Price/ℓ	Oil Cost	Saving at 35%	Comments
1981/82	$0.30	$ 810	$ 284	
1982/83	$0.36	$ 972	$ 340	
1983/84	$0.42	$1,134	$ 397	
1984/85	$0.48	$1,296	$ 454	Could be higher.
1985/86	$0.54	$1,458	$ 510	Oil Price Agreement ends.
1986/87	$0.64	$1,728	$ 605	Guesstimate.
1987/88	$0.76	$2,052	$ 718	Guesstimate.
1988/89	$0.90	$2,430	$ 851	Guesstimate.
1989/90	$1.04	$2,808	$ 983	Guesstimate.
1990/91	$1.16	$3,132	$1,096	Guesstimate.

If we deduct the additional $45 cost of a heat pump maintenance agreement over that for an oil fired furnace, escalate it at 10% for inflation, and then calculate the present value of the savings after allowing for cost of capital at 16%, the capital value of the savings in heating cost, over a 10 year time horizon, is $2,135.

Economic Feasibility

The approximate cost of a 2 ton reversible heat pump for our benchmark bungalow would be as follows:

	'Add On' Unit (In Existing Dwelling)	'Stand Alone' Unit (In New Dwelling)
Heat Pump	$2,600	$3,300
Installation	$ 500	$ 500
Ductwork Modifications	$ 450	Ø
Oversized Ductwork	Ø	$ 100
Wiring	$ 225	$ 700
Total Costs	$3,775	$4,600
Less Savings		
Chimney Stack and Flue	Ø	($1,700)
Heating Costs	($2,135)	($2,135)
Furnace and Tank	Ø	($1,550)
Heat Pump Benefit	($1,640)	$ 785