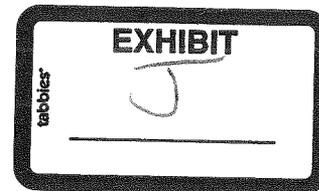


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Differences between water based (closed loop antifreeze / water mix or open loop) and DX geothermal;

Common Ground;

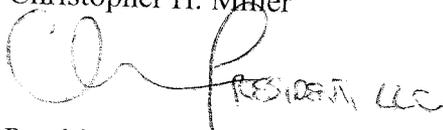
Most ground source heat pumps employ the refrigeration process (heat of compression & and change of physical state of refrigerant) to move heat from the earth to the house or vice versa. The beginnings of this process are inherently efficient due to the compressor / system cost of operation verses its energy moving capabilities. All ground source heat pumps must connect between the house or structure and the ground to work as a system. This is where fundamental differences between water based geothermal and DX geothermal begin to occur. Following is a general description of each type of system.

1. Closed loop water based geothermal systems use a propylene glycol and water mixture in Connecticut or grain alcohol and water mixture where allowed in other states. The primary purpose of the antifreeze / water mixture is to allow water, exposed to sub-freezing temperatures, to stay fluid while being exposed to the refrigeration process. This exposure occurs in the heating mode within the heat pump system. Water alone has the best temperature transfer properties but begins freezing at 32 degrees Fahrenheit. To combat this, an approved antifreeze is introduced to the water to prevent freezing. The drawback to an antifreeze mixture is it does reduce the temperature transfer properties of this mixture. As Connecticut requires Propylene Glycol antifreeze (due to its food grade quality) it has the lesser of water / antifreeze temperature transfer properties. The result, the refrigerant process needs to overcome an energy loss by transferring its native energy transfer to water 1st, then antifreeze mixture, with its lesser energy carrying capabilities as a second hurdle. Moreover, this mixture must be maintained under pressure and be pumped through the closed loops while the heat pump is operating. This process requires additional electricity consumption to the overall system operation.
2. Open loop water based geothermal does NOT use antifreeze but requires a water source with a relatively high yield measured in gallons per minute. This requirement does depend on the system size (its heating & cooling capacity measured in btu's) but commonly falls within 6 to 20 gallons per minute for average size homes. The water passes through the heat pump at a fairly high rate of speed, hence the larger gpm number. In traveling faster, moving water doesn't freeze but has to be transported with a positive displacement vane style pump (usually a larger horse power motor) which itself draws a large amount of electricity. The more energy the system consumes, the less efficient it becomes. Additionally, the water being pumped through the system has to be returned to another area. This secondary well or dump area has to be far enough away from the source to prevent gradual water temperature rise in the source well. These differences

between water in and water out of the system are required to successfully operate the heat pump.

3. The DX Geothermal heat pump does not use any secondary process to connect the house or structure to the ground. It simply moves one of the heat exchangers directly to the ground, removing any need for water in the entire process. The compressor and refrigeration system that all popular systems share use a similar amount of energy. DX systems remove the unneeded extra step. Simple physics illustrate that less energy required to move heat or cool leaves more of that energy for the house or structure. Why drive 3 miles to the store when you can walk next door and get the same products and services. They are closer, cheaper to procure and produce the same end result.
4. The bigger picture; The likelihood of us producing useable oil in our back yards is not likely nor is production of gas (natural or LP). We do have however reasonable ability to produce electricity via photo voltaic technologies. These technologies are advancing by leaps and bounds, although the more efficient we make this process, the more energy can be produced in a finite amount of usable roof area. Off the grid houses and systems are possible but do have to overcome hurdles. Heating and cooling is one of the largest energy draws in any home. If a geothermal heat pump can use less of this overall energy and still produce the same comfort, why not employ the lower energy use technology. This leaves more usable electricity for other processes.

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IGSHPA (International Ground Source Heat Pump Association)
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