



WATER-BASED HEAT TRANSFER FLUIDS

Water is an excellent heat transfer fluid, used to cool industrial processes and to generate steam for almost all thermal power generation. Water molecules are small, but bond strongly in all directions to give a dense and compact structure. This density and strong bonding means that water can carry a lot of energy without boiling at low temperatures. In addition, as the molecules are small, water has a low viscosity and is easy to pump.

There are many uses for water-based (aqueous) fluids in everyday heating and cooling:

- In radiators for domestic heating
- In cars for engine cooling, in supermarkets for food refrigeration loops
- For the ventilation and heating for office blocks
- General industrial process control, both heating and cooling
- For the transfer of energy from the ground (geothermal)
- For transferring energy from the air (air source heat pumps)

The main features of aqueous heat transfer fluids are therefore:

- Low viscosity
- High heat transfer capacity
- Useful over a wide range of temperatures

However, there are some drawbacks in the use of water in industrial systems. These include:

- The problems of metallic corrosion. Almost all industrial systems contain metallic components in piping, pumps or heat exchangers which can corrode in the presence of water, particularly if oxygen is also available.
- The potential of the fluid freezing. If the process involves either very cold temperatures, or may be subject to external ambient winter conditions, then the potential for water freezing must be considered. As water freezes, it increases in volume which can lead to burst pipes or vessels.
- Contamination with microbiological growth. Water is an excellent heat transfer medium, but also an excellent medium to grow bacteria, algae and other biological contaminants. As these proliferate, the flow through pipes and vessels becomes restricted. In addition, corrosion can be accelerated by the presence of these contaminants.

Hence, for most industrial and process uses, water is normally formulated with other additives to overcome most of these drawbacks, allowing the heat transfer properties to be supplemented with anti-corrosion, anti-freeze and anti-bacterial components. Choosing the right heat transfer fluid therefore requires a good understanding of the properties required and the fully formulated products that are commercially available in order to have a risk-free performance in the heating or cooling system.

Please see our "How to Select a Heat Transfer Fluid" guide for further detail and information for your application area.

