HT MATERIALS SCIENCE SMARTER HEAT TRANSFER FLUIDS™

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MAXWELL™

MAXWELL™

A REVOLUTIONARY COOLING SOLUTION FOR THE CHALLENGES OF A WARMING PLANET

Turn up cooling performance and turn down energy consumption….

HT Materials Science has developed the first truly innovative heat transfer fluid for commercial and industrial cooling and heating applications. Our patented nanofluid **Maxwell™ is proven to increase thermal energy transfer by 15% or more,** for closed-loop hydronic cooling and heating systems. Some of the major benefits of **Maxwell™** are:

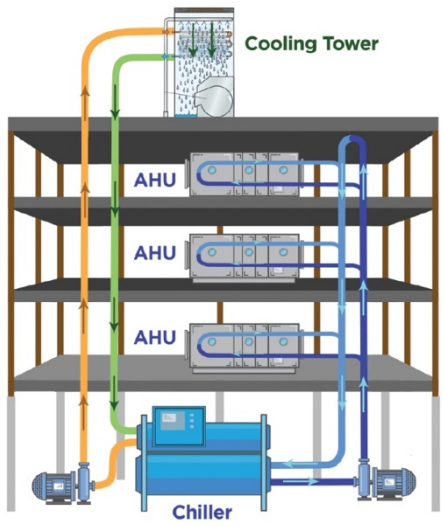
- Significant **reduction in annual energy consumption and carbon emissions**
- **Immediate energy saving** from the time Maxwell™ is installed
- **Increased cooling and heating capacity** for HVAC and other systems
- **Payback period of 1 to 3 years** (dependent upon utilization rates and energy costs)
- **Safe, non-toxic** and **non-corrosive additive** at only a **2% system concentration**

Typical Applications for Maxwell™

Chillers / Heat Pumps: Maxwell™ increases heat transfer in the evaporator between fluid and refrigerant, reducing compressor lift and energy consumption.

Pumps, Fans and Terminal Units: Maxwell™ increases thermal energy transfer throughout a hydronic system. Fan coil and air handling units, system pumps and supply fans can operate on lower power while maintaining comfort.

Energy Recovery Systems: Maxwell™ when added to the runaround loop increases heat transfer at the exhaust recovery coil and the air handler pre-heat/cool coil, allowing a lower flow rate in the loop and reduced pumping power.



How Maxwell™ Works in a Chiller System

Water (or a water/glycol mix) is circulated from the chiller in a closed evaporator loop (blue lines) to air handling units (AHU). Maxwell™ can also be used in a closed condenser circuit but not with an open cooling tower.

Maxwell™ increases the transfer of heat in the chiller evaporation cycle, reducing compressor "lift" or work

Maxwell™ also increases thermal energy transfer in the AHU coils, satisfying room setpoints more quickly, requiring less chilled water and reducing pump energy consumption

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Typical Industries for Maxwell™

- Commercial buildings
- Residential buildings
- Data centers
- Healthcare
- Manufacturing - process cooling
- Food & Beverage - process cooling

How Maxwell™ Increases Heat Transfer

Thermal conductivity or the ability to transfer heat is dependent upon the conducting material utilized. Maxwell™ is a nanofluid using sub-micron particles of aluminum oxide (Al_2O_3) which as a pure metal provides superior heat transfer capacity versus water or water/glycol. Therefore, when Maxwell ™ is added to a hydronic system's base fluid , it materially increases the heat transfer capacity of the system.

In a typical heat exchanger, fluids of different temperatures exchange heat according to the following equation:

$$\boldsymbol{Q[kW] = hA(T_s - T_f) = [\dot{m}c_p(T_{out} - T_{in})]_h = [\dot{m}c_p(T_{out} - T_{in})]_c}$$

where:

Q[kW] = heat transfer

$\boldsymbol{h}$ = convective heat transfer co-efficient, proportional to thermal conductivity

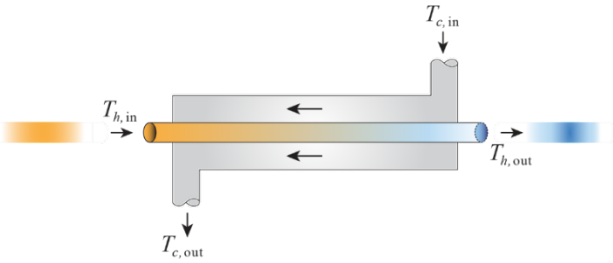
$\boldsymbol{A}$ = surface area of the heat exchanger

$\boldsymbol{T_s}$ = average surface temperature of the heat exchanger walls

$\boldsymbol{T_f}$ = average fluid temperature within the heat exchanger

$\boldsymbol{\dot{m}}$ = mass flow rate

$\boldsymbol{c_p}$ = specific heat capacity



At a given rate of heat transfer (**Q[kw]**), the temperature of the fluid within the heat exchanger with Maxwell™ (**Tf**) will be closer to the temperature of the walls of the heat exchanger (**Ts**) demonstrating heat being exchanged more efficiently – a higher heat transfer coefficient (**h**).

Furthermore, because of the higher density of Maxwell ™, the mass flow rate (**m**) is higher when compared to the base fluid, which further reduces the temperature differential between the inlet and outlet fluids (or between the fluid and air) at the same rate of heat transfer.

For more information

Refer to the Maxwell™ Technical Data and Safety Data sheets for product details

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Dec 21