A Comparison :
Thermal Fluid vs. Steam

Replacing steam in a broad range of process applications, thermal fluid systems provide precise, uniform temperature control leading to increased production and product quality, low maintenance, human and environmental safety and years of highly efficient service. Hot oil systems provide significant advantages in almost *every* category.

Efficiency
Thermal fluid heater manufacturers indicate that efficiencies can be as much as 5% to 8% higher than conventional steam systems. Hot-oil heated shell-and-tube steam generators can provide increased efficiency as well. They require less water treatment and are subject to decreased fouling due to the considerably lower heat flux.

And if you consider the flash loss of a typical steam system (including trap losses) of 6% to 14%, blowdown loss of up to 3%, and de-aerator loss of another 2%, the difference in efficiency becomes pronounced.

Thermal fluid systems suffer none of these losses and as a result can be up to 31% more efficient - *excluding* additional heater and steam generator efficiencies.

Licensed Operators
In many areas of the country, the law requires that full-time licensed stationary operating engineers supervise the operation of high-pressure fired steam systems. The annual cost *per engineer* can be well in excess of $60,000.

Unlike steam systems, most thermal fluid systems operate at atmospheric pressure and are vented to atmosphere at the expansion tank. Pressure in these systems is limited to the pump discharge necessary to keep the fluid in turbulent flow while overcoming piping frictional drag. Typical pump discharge pressures can range from 35 psi to 65 psi with somewhat higher pressures required for large systems. Because of safe, unpressurized operation, thermal oil systems seldom -- if ever -- require licensed operators.

Corrosion
Steam systems are well known for corrosion problems. Air in combination with hot water, salts and other reactive contaminants presents an extraordinary potential for metal corrosion. Steam is abrasive and has virtually no lubricity. Add scale and deposits from minerals found in most all water supplies, and system problems quickly compound.

Thermal Oil fluids are completely non-corrosive. 100% derived from natural source, they provide the same high degree of metal surface protection as the finest light lubricating oils.

Maintenance
Steam systems require constant, unending maintenance -- maintenance that is focused on steam traps, valves, condensate return pumps, expansion joints and water analysis and treatment. And when the power fails in a cold climate, steam systems are subject to freezing, burst pipes and damaged components.

Thermal fluid systems require no traps, condensate return, blowdown or water additives - and if the proper fluid is specified, can be shut down even in sub-zero conditions with no worry of freezing. If Paratherm fluids are cooled below their pour points, they contract upon solidifying, presenting no danger of burst pipes. Hot oil systems have proven to operate quietly, safely and efficiently for years with minimal maintenance.

Environmental Safety
The water in a steam system must be chemically treated to reduce corrosion, among other things. The chemicals cannot be discharged into sewers, as they present considerable environmental hazard. In addition, the temperature of discharge water is often regulated by law. Special provisions for cooling are required if water is to be drained into sewers (in many localities, water hotter than 140°F cannot be discharged.)

Thermal fluid systems require no blowdown, and unlike steam systems, are not subject to continual leakage. Should Thermal Oil fluids escape from the system, cleanup is handled using the same simple procedures followed for spills of light lubricating oil. And unlike heavily treated boiler feed water, most heat transfer fluids offer safe, easy disposal. They can be combined with spent lube oils, sent to the local motor oil recycler and processed into another useful product.

Safety
To deliver the kind of heat required in most process operations, steam systems would have to operate at exceptionally high pressures. At 600°F for example, a saturated steam system develops about 1600 psi. Even at 400°F, the pressure is still high -- about 235 psi.

In contrast, most thermal fluid systems are vented to atmosphere. Pump discharge pressure is just high enough to overcome frictional drag from

piping and components while maintaining turbulent flow. The vapor pressures of Thermal Oil fluids are *fractions* of atmospheric, even at their maximum operating temperatures of 600°F.

Temperature Control

Steam systems rely on the control of pressure to control temperature. With this dependence on delicate pressure balance, accuracy is generally limited to swings of ±10°F or so at best. Worse, as the system ages and corrosion takes its toll, control of temperature degrades.

Uniformity of heating can also be a problem due to varying rates of condensation and condensate removal in the heat user. And this is before taking the negative effects of metal surface corrosion and plating-out into consideration.

In comparison, thermal fluid equipment manufacturers report the ability to regulate temperature swings to ±1.5°F or less. This precision is accomplished by the metering and mixing of cooler return fluid with warmer fluid from the supply line. Adding high-velocity turbulent fluid flow to the equation, precision and uniformity of temperature control across the entire user surface is assured.

Thermal fluid systems not only provide efficient, uniform heat, but efficient, uniform *cooling* as well. And some fluids can provide efficient heating from over 600°F to cooling at -40°F and below.

System Cost

Purchase cost of steam systems can be less than thermal fluid systems. With less-complex thermal fluid systems however, there are paybacks: decreased operating costs, maintenance costs, and environmental concerns -- and increased production and product quality resulting from better control of heating and cooling.

Combine these with improved safety and reduced manpower cost, and the overall economy of thermal fluid systems will *far* surpass steam.