Drying Options:

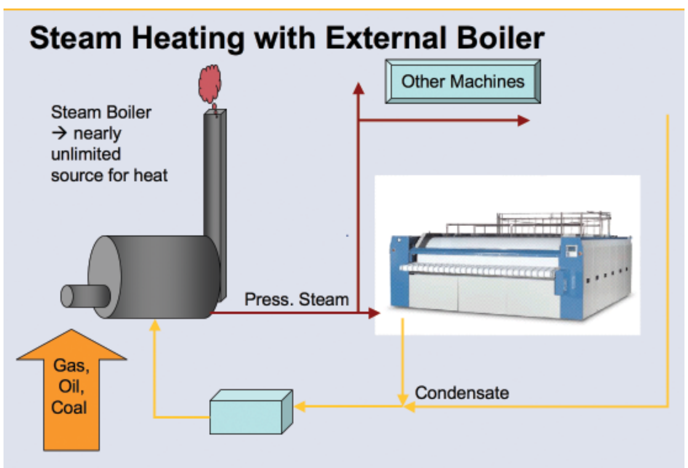
Thermal Fluid, Steam or Natural Gas Ironing

Systems that allow you to use energy as needed help control costs

By Bob Corfield

With today's innovations in flatwork ironing and escalating energy costs, many operators are asking questions about what might be the best choice for them. The most accepted methods for higher production processing facilities have been steam with a central boiler; thermal fluid with a central heater; and recently a gas-fired ironer with a self-contained thermal fluid system within each ironer.

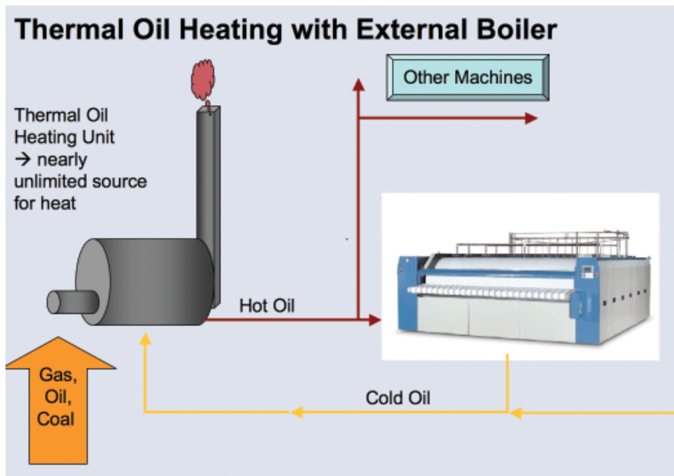
Traditional steam-heated ironers make up about 90% of the market in North America for laundries producing 1,500 lbs. per hour or more. In North America most steam systems are operated at 110-130 psi, resulting in a nominal temperature at the ironer of about 330-355º F.



The diagram above shows a boiler powered by natural gas or other fuels that can provide steam for an ironer or other laundry equipment.

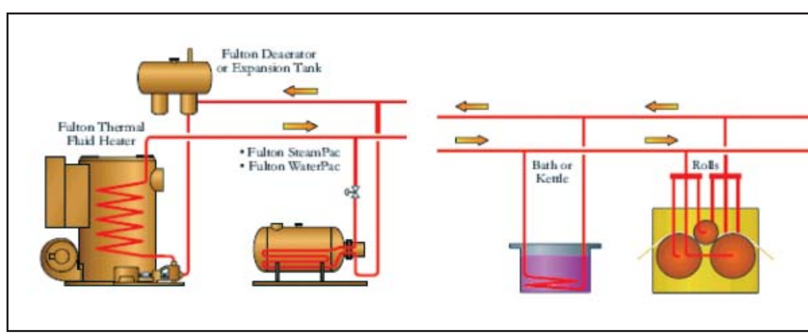
Thermal fluid heated ironers were first offered in the United States in the '80s and gained popularity in the early '90s. A large central heater maintains process temperatures with the thermal fluid circulating with a pumping system to the ironers, dryers and in some cases steam generators. Thermal fluid itself is a petroleum oil product that maintains high-energy storage properties or "thermal capacity."

The advantage of thermal fluid is the ability to operate at higher temperatures with less overall energy. But keep in mind that the



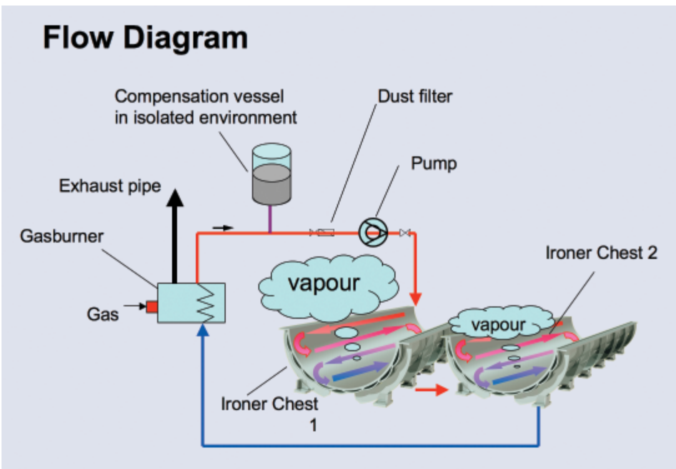
This diagram shows a boiler powered by natural gas or other fuels that can provide heat for thermal oil used in place of steam in an ironer or other equipment.

thermal fluid must be circulated constantly (usually 30-40 psi) which has an electrical cost. Usually, a main distribution line will operate at a higher temperature, and a modulating valve will allow heated fluid to circulate through each individual ironer chest. The modulating valve and ironer circulation pump regulates temperature for the ironer. This is a sound design for thermal fluid systems and is used in all industries from commercial kitchens, injection molding processes and heat trace systems.



Here is a diagram of a thermal fluid heater with an expansion tank that can be used in a commercial kitchen to provide heat for equipment such as ovens or fryers.

In June, *Textile Rental* addressed the trend of "steamless or less-steam" laundry design and self-contained ironers. The North American market has had access to self-contained gas-fired thermal fluid ironers for more than eight years. They use the same ironer chests as traditional thermal fluid ironers. The addition of the compact, integrated thermal fluid heater and pump system has allowed for the addition of this style of flatwork ironer to facilities that are short of steam capacity, or want to add ironing capacity in an area that doesn't have steam available.

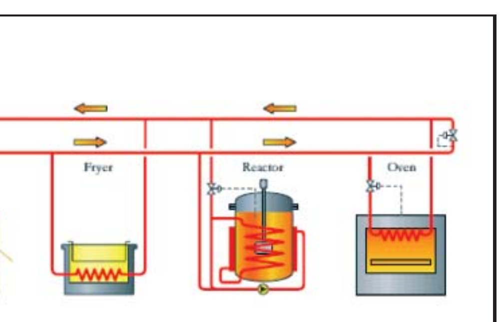


This diagram shows how steam is filtered and pumped into ironer chests. The water vapor then is recovered from the chests.

Steam vs. thermal fluid

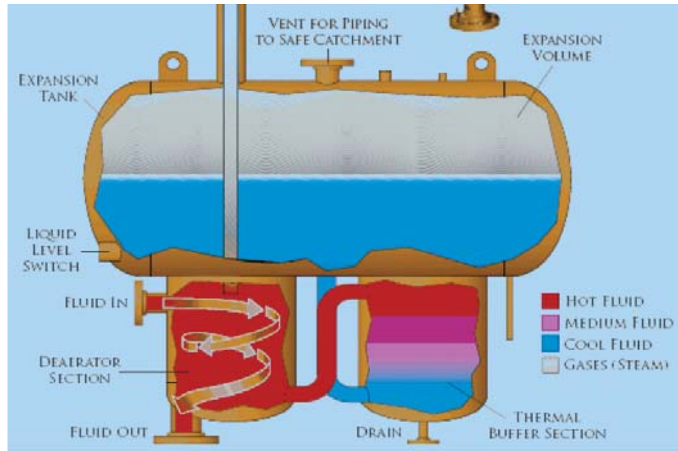
Steam as a medium of heat can be somewhat less efficient than thermal fluid in relation to thermal capacity. Thermal capacity is the ability of a medium to store energy over time. Also, before you create steam, you must treat the feed water with chemicals and softeners to avoid scaling and corrosion in the boiler, piping and ironer chests.

Both steam and thermal fluid operate in closed systems, with the exception that steam can be expended or injected into washers to create rapid temperature increases as needed. As important as the generation of steam, the condensate return system is critical to maintaining reliable temperatures at each ironer. A waterlogged steam system will have an adverse effect on surface temperature for ironing, and that, in turn, will have an impact productivity and quality.



While oil-heated systems can achieve higher and more consistent temperatures, two critical areas of concern for thermal fluid systems are the velocity of flow and protection from moist air. Thermal fluid usually is heated in a natural gas- fired heat exchanger. Then it's pumped through a closed loop system to the ironer chests. Most ironers are equipped with their own pumps to ensure proper circulation in the chests and gap pieces. In central heater systems with higher operating temperatures (+400º F) and where the ideal ironing temperature is much lower, modulating valves along with pump systems are required.

Before returning to the heater, the oil must be collected in an expansion tank, which is used to offset the expansion of the oil as it's heated in the system. Any contact with moist air can react with thermal fluid, causing an oxidizing effect. That, in turn, can create a scaling or "coke" buildup in the ironer chest, pipes valves and pumps, thus limiting the effectiveness of the thermal fluid. One of two types of expansion tanks generally are used—a deaerator system for continuous separation of noncondensable gasses, or an inert gas pressurization tank that uses external gas input (nitrogen is common).



Here is a detailed diagram of the deaerator system also shown on pg. 56. Oil collects in the expansion tank to offset the expansion of the oil as it's heated in the system. The deaerator section shown below the main tank provides continuous separation of noncondensable gasses.

Self-contained thermal fluid ironers use different styles of heater configurations. Some employ individual heaters for each ironer chest, and others use a single heater for the entire ironer. In either case, the heaters on these smaller systems tend to be less efficient than the larger central system design. Providers of central heaters typically claim that they operate at 85-90% efficiency (without considering pipeline losses), whereas the self-contained versions usually operate in the 60-75% efficiency range. Lower efficiencies notwithstanding, self-contained operation means that this system is easier to start and stop, based on your weekly, daily or hourly needs.

Energy costs

From a cost perspective, the efficiency of a steam boiler (manufacturer claimed 60-85% for well-maintained systems) is only part of the equation; the water used to make the steam also comes at a significant cost. Water used for steam production typically must be softened, preheated and boiler treatment chemicals added. Nationally, an average cost for of steam at 125 psi incorporating today's gas costs, are about $12-$15 for 1,000 lbs. of steam per hour. Ironers will consume different amounts of steam depending on the number of rolls, type of chest design, insulation etc. Typically, an ironer processing an average of 900 hospital sheets per hour at 35% moisture will use about 1,300 lbs. of steam per hour, or approximately $17.50 per hour of production.

Steam produced from a steam generator appears to be more efficient (80-95%) than a conventional steam boiler system and states lower operating costs ($10-$12 per hour). Most steam generators are installed in groups of 2-4 units and are then brought online on a demand basis. The estimated operational costs for this system to produce the same number of sheets per hour would be approximately $14.30 per hour.

If you take the direct costs of energy for ironing 900 hospital sheets per hour at 35% moisture with a thermal fluid ironer at the same temperature, you have an estimated cost of natural gas of $8-$10 per hour. But when you add up the nonheating operational costs, your cost actually is about $11.70 per hour for the same task. This includes the electric power for the pumps to maintain the flow rate of the fluid and the fluid replacement.

Maintenance

Thermal fluid heating, whether part of a central system or self-contained ironer, can require more maintenance than a steam system, depending largely on the system's design. Does it include a steam generator? Does it require modulation valves? Is the system using a nitrogen jacket for the expansion vessel and does the system have filter screens to protect the pumps? The monitoring of the oil and the addition of oil conditioners also is part of regular preventative maintenance with thermal fluid systems.

Normally, thermal fluid has an operational life of 4,000-5,000 hours (although some suppliers are indicating a 20,000-hour replacement cycle for thermal fluid). It will likely need changing once per year in a 2-shift operation. If this is a central system with +/- 500 feet of piping and serving 3-4 ironer lines, then an oil exchange could take as much as 1,500 gallons of fluid (about 27 barrels) at a cost of roughly $30,000, plus labor to perform the exchange and proper disposal of the used oil.

Due to the widespread use of steam, there's a broad and accepted base of knowledge among engineering and service personnel on how to maintain, evaluate and resolve most problems with steam systems. Typical problems surround steam traps, condensate return systems and boiler feed systems. In most locales, a boiler operation certification is required by at least one employee for steam systems of 100 psi or more.

One of the critical differences between steam and thermal fluid systems is what's involved in repair when problems occur. If a steam trap needs maintenance, no special equipment is required. If a pump or valve requires maintenance in a thermal fluid system, you are required to capture and contain the thermal fluid, using established fire and safety procedures before repairs can proceed. Since all pipes are welded and flanged, if leaks do occur, then the area to be repaired needs to be isolated and cleaned before welding can proceed. This work isn't extraordinary, but it will require additional training and experience for engineering personnel.

Higher Temperatures

One of the key advantages of thermal fluid is the ability to achieve higher operating temperatures. Are higher operating temperatures really advantageous?

If the majority of your products are a blend or spun polyester linen, then high temperatures are not needed. Polyester will begin to break down at temperatures above 375º F and can fuse if subjected to temperatures above 410º F. The ideal temperature for ironing most spun poly is 315-330º F. Also, some starch applications can become problematic due to rapid evaporation of moisture, carrying the starch away from the fabric, which can cause deposits on the ironer surface. Thus, higher temperatures aren't necessarily advantageous for synthetic fiber textiles.

Cotton table linen, cotton sheets and duvet covers are ideal for higher-temperature processing. In Europe, the higher steam pressures of 160-180 psi are used to achieve higher process temperatures. The additional 20-30 degrees achievable with thermal fluid systems can positively impact production of all cotton items considerably, or allow for the use of a more compact ironer to achieve the same result.

Applications

If you have a steam system now and plenty of capacity, then you should probably stay with steam. The good news is that the latest generation of steam ironers is more efficient in terms of energy consumption and productivity as opposed to the Hypro and Sylon equipment still in use today. The technology and metals incorporated in heating band or flexible chest ironers provide superior heat transfer compared to conventional ironers, while also using less steam.

If you are at the limit of your steam capacity and the addition of a steam generator or boiler upgrade isn't feasible, then the addition of a self-contained gas heated thermal fluid ironer could offer the ideal way to increase productive capacity. Additionally, a self-contained system can operate independently from the existing steam system. This allows shift work to occur without steam flowing through the entire laundry.

If you are designing a new facility, you need to carefully weigh the upfront capital costs of a central thermal fluid system (about 30% more) in line with the long-term benefits in energy efficiency. Considering the fact that piping for a central thermal fluid system necessitates the use of welded and flanged connections that require thorough cleaning with a nitrogen purge before use, it will add to the overall cost of the material. Another factor to consider is the availability of companies specializing in this type of assembly.

Using a combination of steam generators for presses, garment finishers, washroom steam, etc., and a self-contained thermal fluid ironer for the flatwork production could be the correct combination for new construction or remodels of some laundry plants. Ideally, consuming energy and productivity only when and where the laundry requires it is the ultimate solution. Always remember that with individual machines a commitment to maintenance is the biggest challenge. TR

*Bob Corfield is vice president Regional Operations-West for American Laundry Systems, a Division of E & O Mechanical Inc., Thousand Oaks, CA. Contact him at **805/375-2390** or **bcorfield@eomech.com**.*