Babcock Wanson UK
CNIM Group
Energy made to Measure

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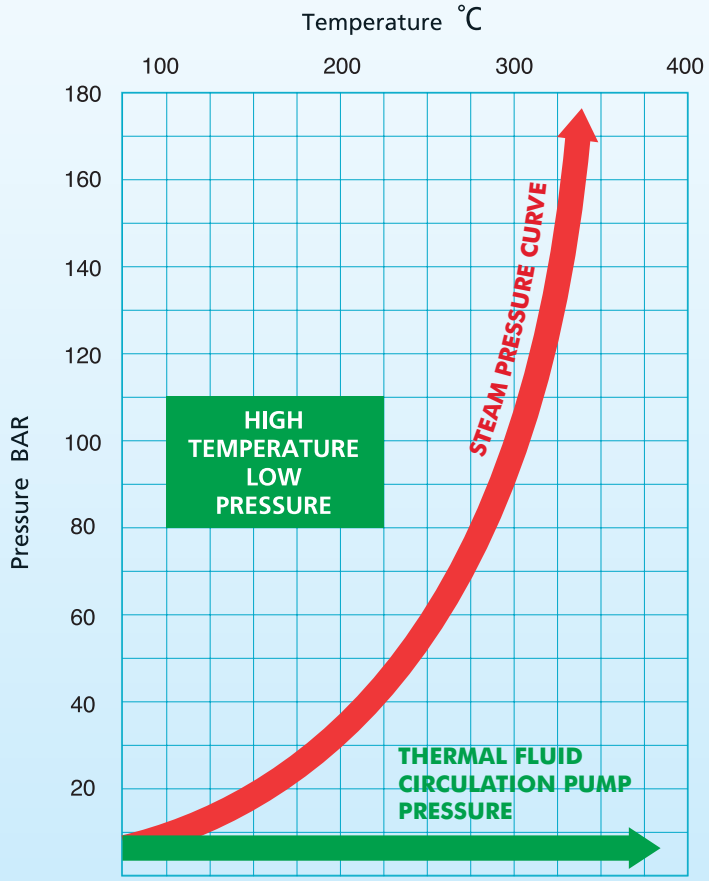
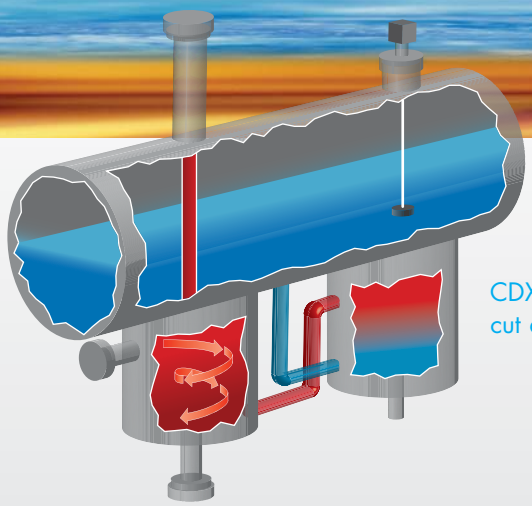


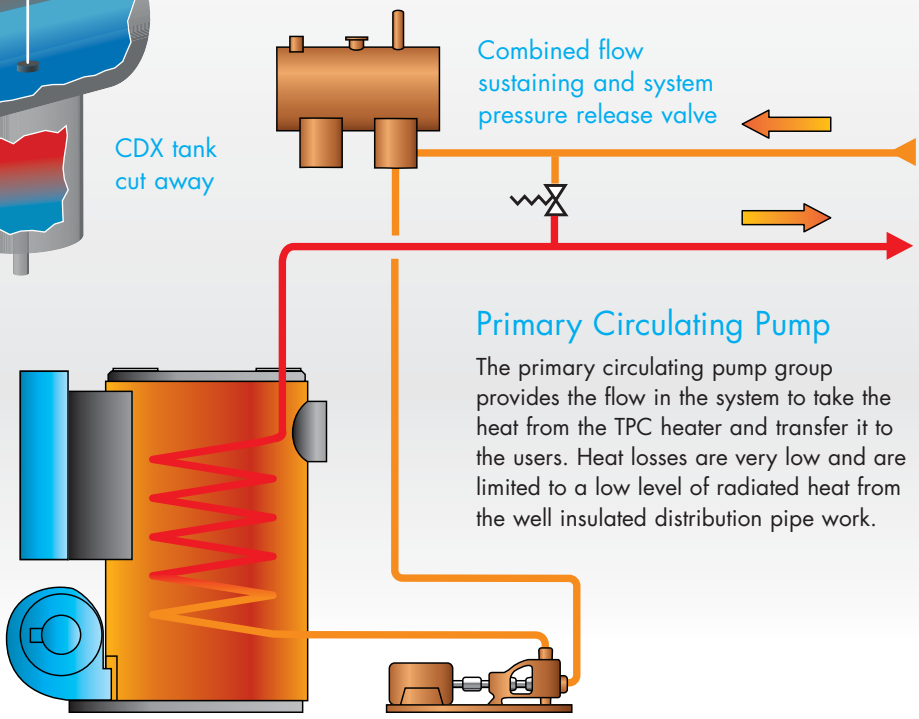
The Practical Application of Thermal Fluid Heating

BS EN ISO 9001:2000
FM 29856

PED97/23



CDX tank cut away



Combined flow sustaining and system pressure release valve

Primary Circulating Pump

The primary circulating pump group provides the flow in the system to take the heat from the TPC heater and transfer it to the users. Heat losses are very low and are limited to a low level of radiated heat from the well insulated distribution pipe work.

Combined Deaerator Expansion Tank

Effective fluid expansion and deaeration systems with thermal buffer are critical for the good, long term operation of a Thermal Fluid system. With a Babcock Wanson system a Combined Deaerator Expansion Tank (type CDX) will achieve all these functions with the simplest practicable installation and can include intermittent or continuous power venting.

TPC Thermal Fluid Heaters

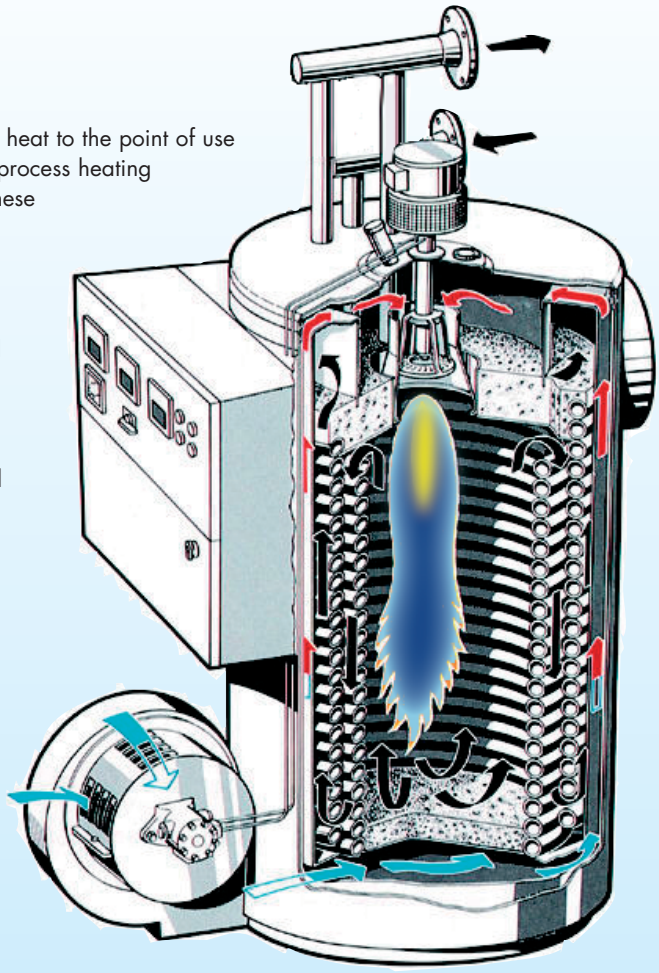
The Babcock Wanson Thermal Fluid heater with integrated gas, oil or dual fuel burner meets the needs of a modern system. Also available: Electric Thermal Fluid heaters and waste heat recovery systems.

Why Thermal Fluid?

For nearly 150 years steam and its associated methods of delivering heat to the point of use have dominated the industrial scene for both power generation and process heating needs. Babcock Wanson has been involved with steam for most of these 150 years and has witnessed first hand the changing industrial scene. In many ways steam is a beautiful product with excellent heat transfer capabilities and is reasonably easy to handle and engineer into industrial process requirements. Steam drove the industrial revolution in all respects in a time of cheap fuel, low cost labour and phenomenal growth.

Today steam boilers are at or very near to their maximum potential with overall efficiencies of 95% based on the net calorific value of the fuel now readily available. Minor improvements can be achieved by the use of low grade waste heat recovery economisers and by preheating combustion air but this can only achieve a further one or two percent improvement which is not going to achieve the massive reductions in operating costs needed in modern energy management. In other areas the technology and complexities of steam generation have increased the need for higher quality feed with, better controls in all areas and more inventive mechanisms for collection of heat from condensate, blowdown and other areas of loss, which to date have been reluctantly accepted as unavoidable running costs.

Without the option of large increases in combustion efficiency the hunt for cost savings has now been re-focused on operational cost reduction.



Typical heater cut away

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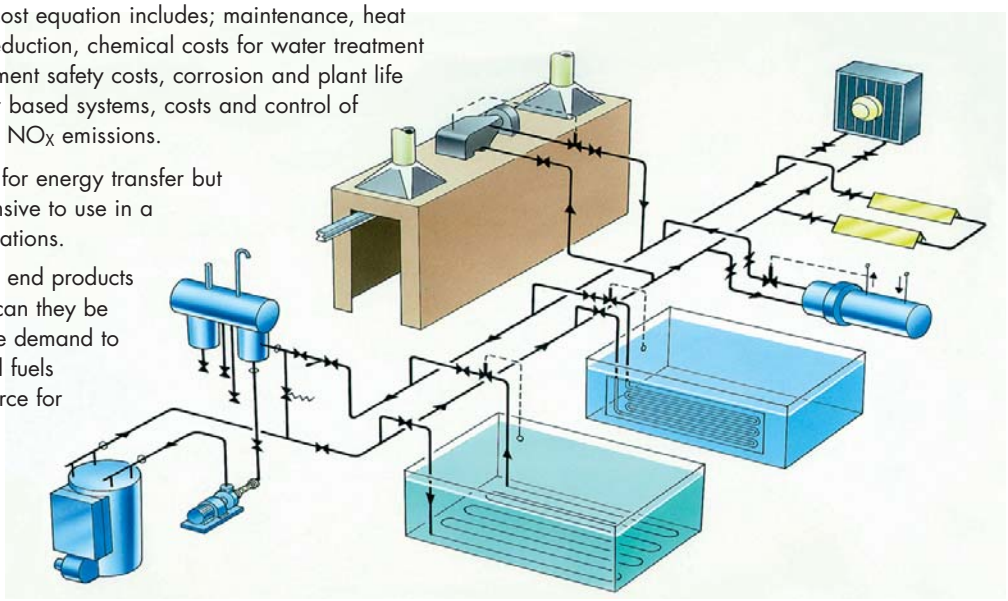
In today's World the total plant life cost equation includes; maintenance, heat recovery, water treatment, effluent reduction, chemical costs for water treatment and scale reduction, pressure equipment safety costs, corrosion and plant life questions, freezing hazards of water based systems, costs and control of corrosion and reduction in CO_2 and NO_X emissions.

Steam remains an excellent medium for energy transfer but has now become prohibitively expensive to use in a large percentage of industrial applications.

In a very competitive world industrial end products cannot absorb these extra costs nor can they be easily passed onto the end client. The demand to reduce our precious resource of fossil fuels wherever possible is a key driving force for the future.



How does Thermal Fluid help?

Whilst it can often be challenging to change an established steam system to Thermal Fluid heating the rewards and payback time cannot be ignored by the modern energy manager. The principal problem is that steam is a vapour phase system where heat is primarily transferred by condensation. The latent heat of the steam (often now referred to as the enthalpy of evaporation) is given up to the heat transfer surface. Condensate is collected using a steam trap with as much as possible being returned for reheating at the boiler. Even in the most well engineered system condensate loss can easily occur and without the use of flash steam recovery a high proportion of the total energy is lost when the condensate is cooled to boiler feed water temperature.

Thermal Fluid, however, remains entirely in the liquid phase throughout the complete operation and is able to achieve a temperature of up to 350°C at atmospheric conditions. The heat is transferred by turbulent liquid flow at the heat transfer surface. The fluid then passes in a closed circuit back to the Thermal Fluid heater for reheating without further loss of energy.

The maximum benefit is achieved with Thermal Fluid when it is integrated into new processes or planned additions which can be operated independently of existing systems. In such cases it is quite possible to locate the Thermal Fluid heater locally to the new plant process users thereby further reducing the cost of installation and energy losses.

If for any special reasons e.g., a process requiring live steam, such as humidification or for providing heat to the existing steam heated plant which cannot be immediately converted to Thermal Fluid, steam may be produced from a steaming calorifier at any pressure that may be necessary in complete, compact safety.

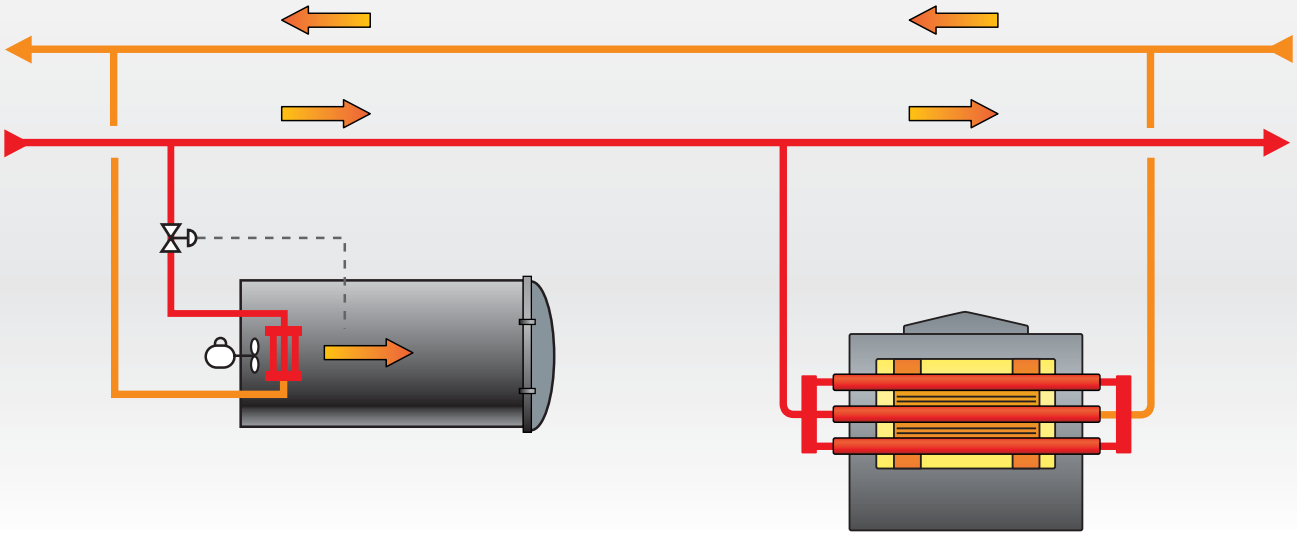
The remaining pages in this leaflet look at some of the variety of applications across industry which have benefitted from the change to Thermal Fluid heating.

The thousands of Babcock Wanson customers throughout the world that have used our Thermal Fluid systems are happily reaping the cost saving benefits every day and are always prepared to confirm these savings and are indeed our best references:

Savings
- Energy – gas/oil/electricity
- Manpower
- Plant replacement and repair costs

Benefits of Thermal Fluid

- Non pressurised
- Closed circuit no loss system
- Point of use location possible
- No water treatment or chemical usage required
- No effluent disposal costs
- No freezing hazards
- Unattended automated operation
- Thermal fluids protect plant from corrosion deterioration and therefore long plant life is assured
- The very lowest maintenance costs
- Whole life service contracts are available from Babcock Wanson to ensure plant remains at optimum performance
- Rapid start up and shutdown with lowest standing heat losses
- No boiler blowdown loses
- No condensate losses
- Simple plant design
- Easy and accurate precise temperature control
- Heating and cooling can be undertaken in same system
- Energy consumption reduced by 20 to 50% compared with steam
- CO_2 and NO_X proportionately reduced
- Mixed temperatures can be easily achieved for different users in a single system



Autoclave

Platen (Daylight) Press

Pressing, Curing and Moulding

Many processes involve changing the shape or form of material using heat. Where steam, electricity or direct fuel firing have been traditionally used, Thermal Fluids offer greater control, higher quality and lower cost.

Design of the system flow characteristics to suit the process ensures even heat distribution across the face of multi daylight presses without the risk of condensate logging associated with steam systems.

Simple and accurate temperature control is readily achieved using a variety of techniques that have been developed and proven over many years.

Steam, when required for direct contact with the process, can be easily and safely generated as part of a Thermal Fluid system using one of our Unfired Steam Boilers.

Pressure and vacuum autoclave heating for controlled laminating and curing of technical products for a wide variety of industries.

Multi platen - multi daylight laminating and curing process.

Compact Thermal Fluid heated steam generator. Unfired and inherently safe rapid response for processes where live steam is absolutely necessary, eg humidity control and for existing users not easily converted to thermal fluid heating. Steam at up to 90 bar if required.

Applications and Industries

- > Press heating and cooling
- > Extruder heating and cooling
- > Moulding processes
- > Laminating
- > Drying and Forming
- > Furniture
- > Plastics
- > Automotive manufacturing

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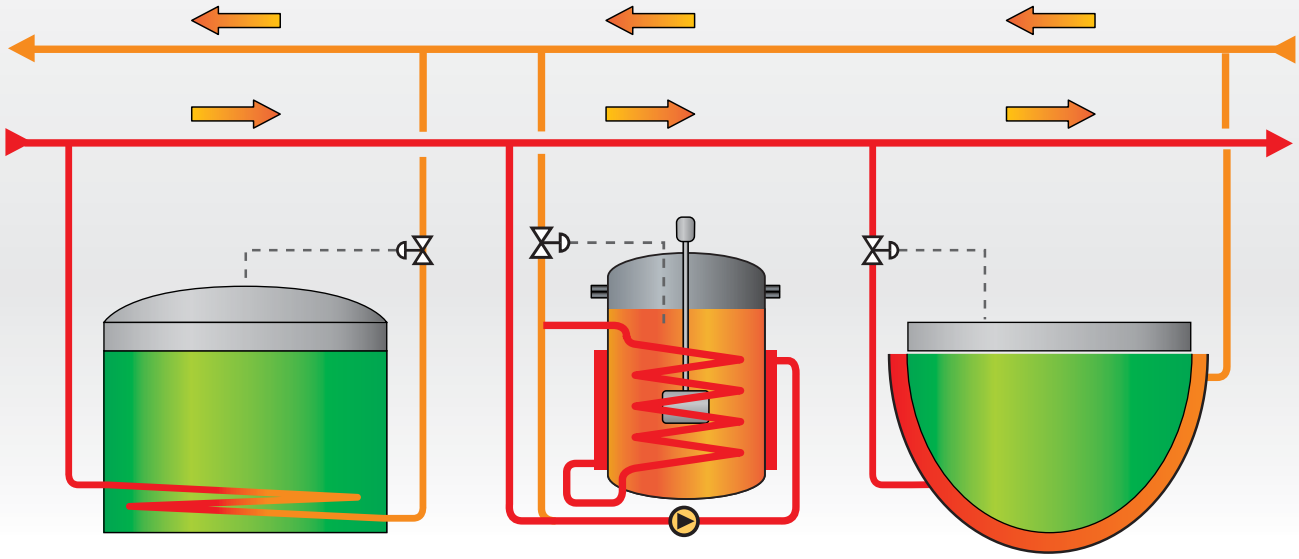

Storage Tank | Reactor | Jacketed Vessel

Tanks, Vessels and Cookers

Storage of product which must be maintained at any given temperature is achieved at the lowest practicable cost when Thermal Fluid heating is used. Individual tanks or multi tank systems such as can be found on continuous metal treatment plants demonstrate the flexible nature of these systems with each tank controlled at the required temperature using the simplest automated techniques.
Reactor and blending vessels for food, chemical and pharmaceutical applications with and without differential temperature control are a key application.

Secondary circuits can be readily incorporated to provide higher fluid flow rates, different temperatures and very close control, all fed from the primary circuit. This enables several different temperature processes to be used on a single system.

Individual precise temperature control of process vessels. Computer controlled as required.

Thermal Fluid heating for all types of food processing, metal finishing and chemical industrial applications. Fully automated with close tolerance temperature control.

Barrel plating and heated metal finishing processes with fully automated control and vessel selection. Heated driers and ovens avoid use of direct combustion products.

Applications and Industries

- > Tank heating
- > Reactor heating
- > Bulk liquid storage
- > Food processing
- > Metal finishing
- > Anodizing
- > Pharmaceutical
- > Refining and Blending
- > Marine
- > Precise temperature control

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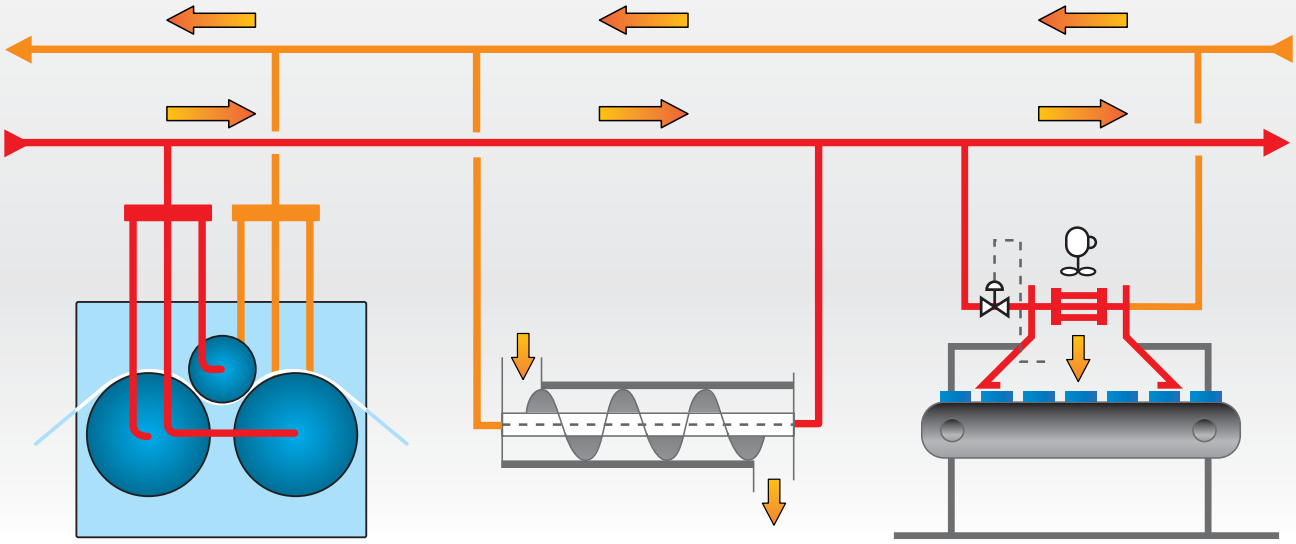

Calender (roll) Screw Dryer Drying Tunnel

Printing, Coating, Laminating and Drying

Roller heating, continuous drying and laminating is achieved with greatest accuracy and lowest operating cost with Thermal Fluid heating due to its advanced temperature control, simple automation and unattended start/stop design. All this means the highest quality products at the lowest production cost.

Multi heater installations can be sequenced remotely to match the demands of production and are easily automated with the latest controls to provide ethernet LAN integration for remote monitoring of the complete process.

Where required Thermal Fluid heating can be integrated into VOC abatement technology from Babcock Wanson to offer a complete energy and environmental solution.

Multi station printing, coating and laminating process. Drier and roll heating applications with cooling if required.

Volume batch production drying for powder and polish manufacture.

Centralised plant room serving complete factory for coating and laminating of specialised technical textiles.

Applications and Industries

- > Paper and foil coating
- > Stentoring
- > Textile transfer printing
- > Calendering and Ironing
- > Printing and Laminating
- > Batch and continuous dryers
- > Waste treatment
- > Drying and Curing

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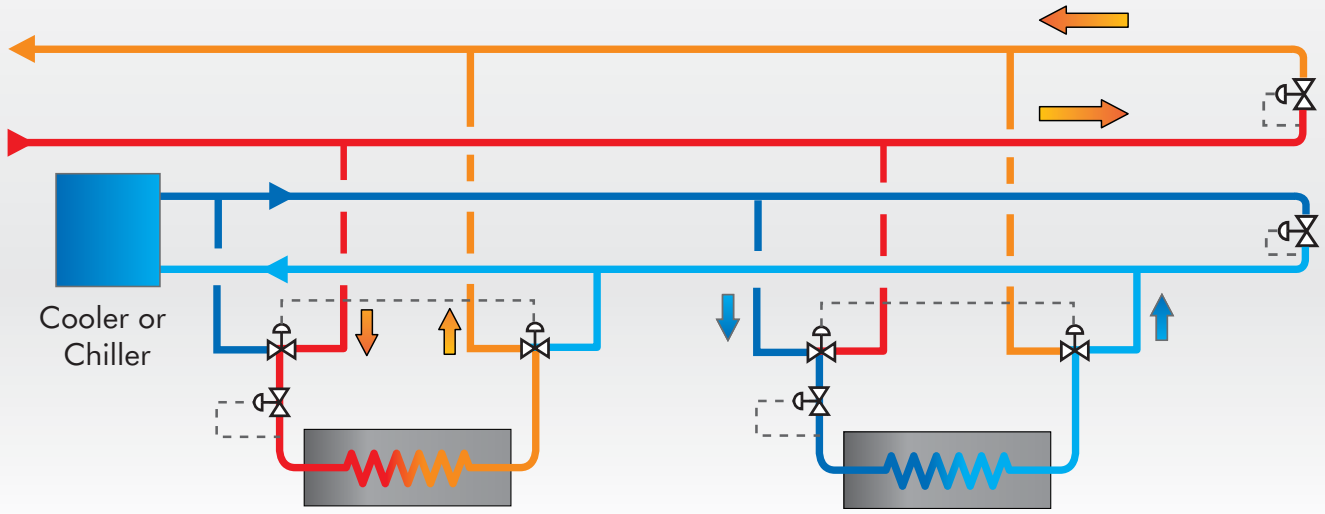

Controlled temperature
heat exchanger (Heating mode)

Controlled temperature
heat exchanger (Cooling mode)

Heating and Cooling Systems

Combined, simple, Heating and Cooling circuits operating independently within the main system provide for special applications which demand fast process times and very accurate control of temperature. Secondary pumps and individual coolers working together with the primary heating circuit at different temperatures can be installed to meet any particular process requirement.

Proven system design provides combined heating and cooling on a single system for exothermic reaction control or simply to maximise the use of a plant. Babcock Wanson Thermal Fluid systems offer fully integrated control to ensure the process demand is met.

Fluids are available for processes requiring cryogenic temperatures down to minus 100°C and up to plus 350°C.

Thermal fluid mixing and temperature control station for heating and cooling secondary circuit.

Applications and Industries

> Controlled temperature heating and cooling

> Exothermic chemical reaction control

> Multiple independent variable temperature processes

> Chemical manufacture

> Pharmaceutical manufacture

> Press and moulding processes

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Service After Sales

Babcock Wanson's extensive team of service engineers are fully qualified and trained to respond to any service needs throughout the world. Spare parts are held at key locations to ensure client's plant continues to operate at the highest availability level.

Thermal Fluid systems require the lowest practicable amount of maintenance by design and incorporate system components that are long lasting. However, it should not be forgotten that any continuously operating plant should be inspected and adjustments made to ensure that the substantial cost savings resulting from the use of these systems are maintained by keeping plant efficiencies at optimum levels.

Babcock Wanson recommends a dedicated Service Contract to suit the system need during which their highly skilled and specialist engineers, using state of the art equipment, make whatever adjustments may be necessary. Spares and on-call service are also available as part of our comprehensive service facility.

Babcock Wanson systems are designed for a very long and productive life during which system upgrades for both technical and legislative developments can be made to further enhance performance and reduce operating costs.

Thermal Fluid - Care and Service

Fluid analysis report sheet

Thermal fluids are very adaptable to specific duties; not only for heating but also for cooling and combined heating and cooling duties. Fluids are available for use at sub zero temperatures and up to 350°C in standard form and for use in the vapour phase using specialist grades.

Fluid life depends on many factors including operating hours, system temperature, heater design, system design, type of fluid and its suitability for the given duty. Typical fluid life of between 5 and 15 years can be expected.

The Thermal Fluid is a key factor in these systems having the most arduous duty of any system component and it really benefits from regular inspection and testing.

During the recommended service visit schedule Babcock Wanson engineers are able to undertake any corrective measures required to ensure fluid quality and maximum effective life is maintained. The fluid can be monitored using our comprehensive checking and analysis service, the results of which are recorded to plot its full life characteristics.

Eventually when the fluid has reached the point at which replacement is necessary, sufficient time to plan the event can be predicted. Babcock Wanson can undertake the emptying, cleaning and system refilling quickly and expertly as part of one of the service visits. Babcock Wanson engineers are fully trained and equipped for this service and used fluid is disposed of in strict accordance with prevailing regulations and customer safety procedures.

130 years of Babcock – 80 years of Wanson – 50 years of Babcock Wanson UK.
"There is no substitute for experience."

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