THERMATECH® 'SUPERHEATED WATER' SYSTEM

Explanation

Unlike a conventional hot water pressure washer, the ThermaTech system combines continuous **high temperature** and **pressure** and **lower water volume**. This is delivered as a **liquid spray**, even at temperatures close to 155ºC. This is referred to as '**Superheated Water'**.
It achieves this by using less water, high heat capacity and specific nozzle design and specification.

Description

The 'standard' ThermaTech system comprises pump, 'heater module', high pressure hoses and 'gun'. The system is modular, the pump and fuel tank can be lifted away to aid vehicle loading and site mobility. Selection of lances and nozzles and the adjustment of temperature and pressure are made to suit the substrate and soiling or coating. A gauge on the pump and digital display on the Module, register the working pressure and temperature.

Cold water from a tap or water tank is pressurised by the pump and passes through a blue high pressure hose to the Heater Module. Heated by diesel or kerosene, hot water exits through flexible red high pressure hoses to the gun.

For vertical surfaces, a short lance can be used more accurately for surface detail or paint and coating removal.
For increased performance, it is possible to connect the pump to two Heater Modules and back to one gun. This provides full temperature at the full pressure rating.

All ThermaTech systems have been built with Digital Temperature Control. The critical feature of this is not that it provides a digital instantaneous display of the temperature, but that the temperature fluctuation is kept to a minimum. Conventional hot machines (including many other superheated/steam types) use capillary thermostats, which result in a wide temperature range at lower operating pressures and thus equally wide changes in the spray shape and intensity through the heating cycle (the thermostat regulates the temperature by switching the boiler in and out). The controls built into the ThermaTech maintain much tighter temperature control and therefore spray shape over the cycle. The standard 110v system and trigger arrangement has a water flow rate of 4-8.5 litres min^{-1}. Standard option pressure is adjustable from 30-140bar*.

However alternative, additional options allow for, ThermaTech systems being used on delicate substrates that can routinely be operated in conjunction with pressure reducing guns. This enables a maximum pressure to be set at the pump but then the same or a reduced pressure to be set on demand at the gun. Whilst the minimum pressure at the pump is normally 30bar, setting at the gun can be as little as 0bar. At low pressures (≤50bar), a ThermaTech can also be set up and used to supply 2 operators simultaneously at full temperature, whilst allowing each operator to select a different pressure if required.

Specification

The **standard electric pump** is 110v and has a water flow rate of 4-8.5 litres min^{-1}. Pressure is adjustable from 30-140bar*. The optional 230v pump has a maximum pressure of 160bar*.
The **standard heater module** is 110v but is made 'dual voltage' by use of the optional 'drop in' transformer. The fuel is red or white diesel, or central heating oil (kerosene). Kerosene should be used with a combustion additive to prevent 'sooting up'. With adjustment, cooking oil is also permitted.
Temperature is adjustable from 30-155ºC. With one Heater Module, 155°C can be maintained at pressures up to 90bar*, 120°C up to 120bar* and 100°C up to 155bar*.
High pressure hoses are twin wired and supplied red, in 10m or 20m length. For lengths longer than 30m, it is recommended that the additional hosing be located between pump and Heater Module to minimize temperature loss.
**One 'bar' is a unit of pressure equivalent to 14.5 pounds per square inch (P.S.I).*

Cleaning

The intensity of cleaning for delicate substrates is reduced by (a) Reducing the pump pressure setting (b) Changing the nozzle specification e.g. a nozzle of wider spray angle exerts a lower surface pressure at a given distance (c) Increasing the temperature so that the spray becomes diffuse (d) Increasing the working distance of nozzle to surface.

For delicate surfaces, full temperature but reduced pressure is used (see the explanation under 'paint/coating removal' below). The minimum practical pump pressure is 30bar*.

The temperature at which the spray becomes diffuse varies one nozzle design to another and so one with a lower diffusion temperature but operated at a higher temperature, will provide a 'softer' (diffuse) clean (see nozzle selection).

For tenacious soiling, it will be found advantageous to develop 'the clean' in stages, leaving an interval between. This 'dwell' period often acts to soften or release deposits more readily e.g. for removal of light sulphation, or deep organic soiling from wall copings.

Prolonged or close contact is unable to raise the temperature higher than the setting which, at a maximum of 155°C, is regarded as well below that which will induce chemical or physical change in most mineral substrates. However, direct contact with glass must be avoided. The use of hot water greatly accelerates drying. Precautions must prevent wet substrates being subjected to frost.

Paint/Coating Removal

The closer a nozzle operates to the surface, the higher the temperature but also the higher the surface pressure (because the water exits the aperture in a 'fan' shape). In general, it is high pressure (and/or volume) that will potentially damage a substrate and not the temperature. Therefore, if a given temperature/pressure setting proves to be too aggressive, one should lower the pump pressure and use the nozzle closer to the surface. The pressure effect that would be induced by moving the nozzle closer is counteracted by reducing the pump pressure. The reduced distance will, however, raise the temperature at which the water strikes the surface thus aiding the yield of the coating.

If the coating proves too resistant, or the substrate is too weak, a chemical to soften the coating should be employed. This will allow the nozzle to be operated at a greater distance (lower surface pressure) and to reduce the action time.

Nozzle Selection

Choice of nozzle is important. For the ThermaTech system, we presently have a number of nozzle types.
The standard nozzle (Lechler type) loses sharpness at temperatures greater than 140ºC. This produces an even spray with good cleaning and paint removal characteristics. The spray angle used for cleaning is normally 40° but a nozzle of 25° can be used where the substrate allows.
An alternative nozzle ('Spraying Systems' type) causes the spray to become diffused once the water temperature significantly exceeds 100ºC. This is used selectively to generate a very soft and hot vapour for the most delicate cleaning. This is not normally necessary for sound surfaces and is generally inappropriate for paint removal.

Health and Safety and Documentation

The ThermaTech system has been designed and built in the U.K specifically for use with restoration and conservation projects and for all kinds of site work generally.
The design utilises 110v as standard. The Heater Module is fitted with twin safety relief valves, twin temperature controllers, direct temperature readout and the controls are 24v. It uses a jerry-can tank to reduce site fuel handling. Fuel tank 'bunding' and 'drip tray' options are available. The switches of both the pump and the Heater Module have current overload **and** low voltage cut-out protection.
Hot high pressure hoses have been manufactured in red, specifically for the ThermaTech, to denote high temperature. External plugs and connectors are of IP67 'watertight' construction.
In addition to this '**Technical Information Sheet**', Restorative has produced a family of documents to support project specification and management. These are for general guidance and include the '**ThermaTech Risk Assessment**' and '**ThermaTech Safe Working Procedure**'. These have been written in conjunction with our independent health and safety advisors, the NFU, and are reviewed by them and re-issued on an annual basis. These are available for architects, specifiers and contractors for the use of equipment and products supplied by Restorative Techniques Ltd.
Where applicable, '**Health and Safety Data Sheets'** are issued for products used in conjunction with this equipment such as that for 'ThermaTech Descaler Concentrate'.
Restorative can be engaged to produce on-site trials and reports and to aid decision making in specification and implementation. 04/07/2012.

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