



BKB PUMPS & TANKS PTY LTD

SPECIFICATION FOR *THERMOPACK* SKID MOUNTED HOT WATER SYSTEM

SYSTEM OVERVIEW

The *Thermopack* Hot Water System is designed for installation in applications where hot water could be required at any time of the day or night, with the demand varying significantly between the peak periods, for example early morning, to low demand periods at night.

This system is perfectly suited to Hotels, Apartment Buildings and Resorts, where users will expect a rapid response to a demand for hot water for showers, basins, sinks etc., with a minimum wastage of water while the flow from the outlet comes up to temperature.

This demand profile is best achieved utilizing a “Peak Hour Demand” system, where the size of the package is selected to meet the highest calculated user demand at the desired set temperature. We use proven industry sizing criteria to determine the number of heaters required to achieve this performance and support these heater banks with buffer storage units, so that the flow and return system can be maintained at the desired operating temperature with only a low level of gas consumption. The storage tanks provide instantaneous hot water to outlets at any time of the day or night. The system is demand responsive, by the initiating multiple heaters to suit the demand profile at any point in time. In this way, the temperature being maintained at the pre-set level up to the maximum flow rate of the system.

The system will respond to two parameters:-

- 1) The preset temperature of the system- as demand increases, so more heaters will be initiated to maintain the pre-set temperature in the storage tank
- 2) Flow demand – as more outlet points are utilized, the flow will increase to satisfy this demand up to the maximum system flow rate for the calculated peak hour demand.

System pressure is maintained by using true mains pressure from the cold water feeding the package. In the event the mains pressure is insufficient to meet the demand at all points in the installation, then Primary pumps can be installed to boost the pressure to the desired level at these locations.

The *Thermopack* system offers users great flexibility, because it is based on a modular design.

- Heater Module
- Storage Module
- Pumping Module
- Control module

Each module can be optimized to meet the specific requirements of an installation, eliminating over-sizing of any particular module, but offering the flexibility to meet operating conditions at the lowest capital cost and with minimum space requirements.



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1) Heater Module

The **Thermopack** uses multiple gas heaters as the primary heat source. The Rinnai Infinity HD 200 instantaneous gas fired heater is at the heart of the Heater Module. The number of heaters installed will cater for the peak hourly demand of the installation and maintain the preset temperature in the storage tanks. The heater banks are controlled via solenoid valves which are operated by the PLC in the control panel to initiate the correct number of heaters at any point in time. Temperature sensors detect the rise and fall of temperature in the storage tank and then initiate the correct number of heaters to match the demand. In this way we constantly monitor the system temperature and minimize overall gas consumption. The heater units are mounted on a rigid frame and assembled to cold and hot water manifolds so that there are single point connections to the BKB package. Manifolds are insulated to minimize heat losses in pipework. The lead heater maintains the temperature of the “flow and return” line to prevent any dead-spots in the piping to outlets, ensuring a rapid response to short term demand. However, the lead heater can be cycled to equalize the load on individual heater units. Because the Rinnai Infinity heaters are well known in the market, the maintenance and service of the heater module can undertaken simply and economically.

2) Storage Module

Well insulated stainless steel storage tanks of suitable capacity are mounted at the end of the skid and are able to provide a rapid response to short term demands. Hot water is drawn for the top of the tank and as the thermostat senses a drop in tank temperature at the lower level, heaters are progressively initiated to re-instate the set temperature. The storage tanks are supplied with temperature sensors to determine the level of heating required to maintain or restore the desired tank temperature. The tank is supplied with cold water at the base of the tank at full mains pressure. This is often sufficient to provide the desired pressure at the system outlets for many installations. However, if pressure boosting is required, we supply primary pumps to maintain the system output at the desired flow and pressure to satisfy user expectations.

As an option, BKB can also supply the Rotex calorifier storage system, which offers a 5 star thermal efficiency, with very low levels of heat loss over time. The Rotex units are compact and reliable, thereby offering exceptional performance for a green and clean environment

3) Pumping Module

a) The flow and return line – which maintains the temperature in the reticulation pipework to ensure a rapid supply of hot water to any outlet that is opened. This line is a continuous loop and therefore is not subject to static head, irrespective of the number of storeys of the building. The pump must overcome friction losses in the pipework at a flow rate sufficient to maintain the required set temperature in the flow and return loop. For this reason, small hot water pumps of Grundfos UPS all bronze construction are ideal and very cost effective. BKB recommends the use of a duty/standby combination, such that either pump can be removed for service and maintenance as required.

b) The primary pump – This pump is sized to boost the mains pressure to the required level at outlets within the system. In most cases this can be achieved with a constant speed pump, which responds to the flow demand at any point in time. These will be of the Grundfos CR type in all SS 304 construction. BKB offers a duty/standby combination for reliability and ease of maintenance. When more than two heater banks are initiated, then these pumps operate in parallel to upgrade the hydraulic performance.



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By sizing each of these two pumping systems correctly, it is possible to significantly reduce the capital cost of the pumping module, while simplifying maintenance and fault finding in the event of operating problems. For installations with a complex reticulation system, these fixed speed pumps can be replaced by pumps with variable speed drive, thereby increasing the range of flow variation that can be accommodated.

4) Control Module

The two parameters of principal interest to users are:-

- Water temperature - controlled by the thermostat in the heater and storage tank system
- Water flow rate at outlets – controlled by the primary pump capacity

As a result, the control system should be capable of monitoring these parameters and adjusting the performance of heater and pumping modules to match the system demand up to the maximum peak hour demand of the installation.

Since most packaged hot water systems are designed to operate automatically and adjust to system demand, users of the system expect that hot water can be provided when required and at the desired temperature. This will place high demands for reliability on the control system. Even in the event of system faults, there will be an expectation that standby capability is built-in and that the package can be quickly and easily brought back into full service.

Our standard control panel incorporates all the necessary switchgear for proper functioning of the system, including acceptance of signals from temperature sensors, flow sensors, which monitor overall system performance. The panel will also include an audible alarm to alert maintenance staff that the system has experienced a problem.

The panel will include the following:-

- Main isolator switch
- Indicator lamps to show flow & return pump is operational
- Indicator lamp to show primary pump is operational
- Pump selector switch for primary pump (MANUAL/OFF/AUTO) with associated relays
- Pump selector switch for flow & return pump (MANUAL/OFF/AUTO) with associated relays
- Low temperature alarm warning light
- Audible “fault “ alarm
- Volt free contacts to Building Management System

Optional features

- System alarm warning bell
- Pump hours run meters
- Record of total flow



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Electrical Panel

- The control panel shall be fabricated from 2 mm thick mild steel with exterior quality powder coating applied to properly prepared surfaces
- A minimum of IP 54 protection shall be provided
- The switchboard shall have DIN rail terminals located in the bottom half of the panel
- All control wiring shall be in multi-stranded multi-cored cables at least 1 mm sq. All wiring shall be numbered to conform to the “as-built” wiring diagrams
- The control panel power supply shall be 240 volt, single phase, 50 Hz and shall be suitably protected from unauthorized access. Control voltage is 24v and supplied via a transformer.
- All electrical work must be installed to AS 3000 and comply with regional power authority requirements.

All electrical installations shall comply with the relevant Australian standards which include but not limited to:-

- AS 1202 – AC motor starters (up to 1000 V)
- AS 1431 – Low voltage switchgear, control gear and control circuit devices
- AS 1675 – Current transformers. Measurement and protection
- AS 1930 – Circuit breakers for distribution circuits
- AS 1930 – Degree of protection of electrical equipment
- AS 2184 – Moulded case circuit breakers
- AS 3000 – SAA wiring rules
- AS3008 – Cables for alternating current
- AS 3190 – Current operated earth leakage devices
- AS 3439 – Low voltage switchgear and control assemblies
- AS 1345 – Rules for the identification of piping conduits and ducts

7) General Requirements

- The complete skid shall be designed to be lifted by 4 lifting lugs for ease of site installation
- The control panel shall be located in a position to protect the equipment from the elements and direct sunlight
- The complete package shall be subject to function testing at the manufacturers works. Function testing may be witnessed by a client representative if required
- The manufacturer shall have a QA system in accordance with AS 9000 – 2000, and provide full QA documentation on the finished packaged hot water system

8) Documentation

The manufacturer shall provide the following:-

- Package GA and foundation plan within 2 weeks of order
- Quality Plan outlining all test and inspection activities during manufacture
- Signed ITP by manufacturer's inspection staff.
- “As built” general arrangement drawing
- “As built” P&ID
- “As built” wiring diagram
- Detailed Installation & Operating Instructions for the plant



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