SHELL & TUBE HEAT EXCHANGERS

INSTALLATION OPERATION & MAINTENANCE INSTRUCTIONS

This heat exchanger will attain its optimum performance and achieve best service life, provided it is properly installed, operated within its design limits and adequately maintained. These instructions are to assist personnel with these objectives and should be thoroughly read prior to any of these procedures being carried out. Queries should be referred to the original supplier for response.

INSTALLATION

Upon receipt check heat exchanger for possible transit damage and verify correctly sized unit has been received and report any discrepancies immediately. Leave port plugs in place until just before the pipe work or hoses are to be connected. The units are flushed immediately after being manufactured, however check ports for dirt or foreign matter that may have entered during shipment / storage. Mount the heat exchanger firmly on a steady surface before connecting the fluid lines. Normally there are no restrictions as to how the unit may be mounted. The only limitation which may influence final position is access to and location of ports for the hot fluid and / or coolant drain plugs. To accomplish draining one of the drain ports must be located at the lowest most point of the heat exchanger.

Typically the hot fluid will pass through the shell around the outside of the tubes, and the coolant should be directed through the inside of the tubes via the ports on the end bonnets. Optimum performance is achieved by counter flowing hot and cold fluids, in single pass type units. With multiple pass units the effect is negligible. See separate diagram for common connection options. Threaded connections must be properly sealed and a thread sealant or tape may be used. Care must be taken to avoid over tightening the fittings as excess force may cause the castings to crack rendering the unit unusable. Hoses and pipe work must be adequately supported. All solid pipe work should ideally have flexible joints to prevent external vibration from inducing stress on the heat exchanger. Shock absorbing mounts should also be used where vibration is excessive.

When automatic water regulating valves are to be included, these must be installed on the coolant inlet line. Arrange the water outlet piping so that the exchanger remains flooded with water, but at little or no pressure. The temperature probe should be placed in the reservoir or other suitable position so that it will be exposed to high temperature fluid and quickly allow cooling to begin. Contact your supplier for DYNACOOL water valve recommendations.

Water strainers are recommended to be installed on the water inlet lines to reduce possibility of blockage of the unit due to dirt water or debris entering. Contact your supplier for a DYNACOOL “Y” strainer to suit your application.

Fixed bundle type heat exchangers are designed for fluids which operate at relatively close operating temperatures. Ensure the fluids do not exceed the units maximum rated capacity and check differential temperature is not too high. Contact supplier for review of application if differential is expected to exceed 80°C. Special cooling jobs such as those involving steam etc should use floating bundle type units, contact your supplier for selection assistance.

A fast acting relief valve can be appropriately installed to protect the cooler from exposure to high flow and pressure surges. Ensure such a valve is adequately sized to suit possible extreme circumstances. During cold start up the fluid passing through the shell typically has a much higher viscosity and a high pressure would be required to force flow through the unit. As no cooling is necessary it is important that oil be by passed to avoid an over pressure failure. Contact your supplier for a DYNACOOL thermal by-pass valve or 3 way valve.

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FORM DC 114 11/02
ABN 11 003 908 496
PRINTED IN AUSTRALIA

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OPERATION

Prior to operating the unit a close check of all joints should be carried out to ensure system integrity and correct connections have been made. In cold environments which may lead to water freezing, the unit must be drained to prevent damage. Continually running the water flow may also stop ice from forming.

Use only fresh clean water of neutral pH in units with copper tubes. Where saltwater is to be used a model with cupro nickel tubes is a better choice and zinc anodes are recommended. Heat exchangers with anodes should be checked regularly and the anodes replaced when 70% of the original material has been corroded. Ensure coolant flow has been isolated before removing the anodes. Initially inspect the anode/s after two weeks of operation. At this time an assessment can be made to determine frequency of future inspections based on rate of zinc deterioration. Use only DYNACOOL supplied anodes with correct sacrificial metallic properties. Other corrosive fluids such as brackish or mine water supplies, may require special materials of construction. Consult supplier for DYNACOOL options, a coolant chemical analysis will be required to more accurately decide on materials of construction.

Once in operation performance information should be monitored and recorded so that any reduction in effectiveness can be detected. Such a loss can normally be traced to an accumulation of sludge or scale in either or both the hot fluid and / or coolant passages. See maintenance instructions below for rectification procedures.

Whilst equipment is operating personnel must be warned not to contact hot surfaces either on adjacent pipe work or the heat exchanger external faces. Guarding is essential if hot surfaces are exposed and may otherwise be touched by personnel permitted in the immediate vicinity of the heat exchanger unit.
Allow equipment to adequately cool before attempting any maintenance procedures.
Any signs of severe vibration or other evidence of physical stress to the unit should be reported urgently to appropriate superiors for isolation / rectification.

MAINTENANCE

Keep the heat exchanger clean by regularly wiping with a clean damp cloth, but do not use strong detergents or solvents which may effect the materials of construction.
If performance decreases from usual levels then typically the flow paths have become blocked and cleaning will be necessary. All units will require some degree of cleaning during their life.
Typically the coolant flow decreases when scale, oxide deposits, chalking etc blocks the tube side passages. The end bonnets can be removed to facilitate cleaning, however ensure fluid lines have been isolated from flow and any residual pressure released before disconnection. After removing the end bonnets, gaskets must be replaced. Tubes can be washed out using a weak solution of muriatic acid followed by thorough flushing with clean fresh water. For severe build up problems mechanical cleaning using a foam pellet (for example the PSI AIR MATE system available from DYNACOOL sales distributors) or a soft bristled brush may help, but care must be taken to prevent scouring of the tube surface.
Shell side sludge deposits can normally be readily flushed out by using a suitable solvent and pumping it through the cooler in the opposite direction from normal direction of flow. Repeated soaking and back flowing may be required, depending on degree and nature of the build up.
Be certain to remove all chemicals used in cleaning the unit before returning it to service.
Replacements parts should be genuine DYNACOOL items to achieve best continued service life. When ordering parts or requesting information on the heat exchanger be sure to advise model and code numbers as shown on the nameplate. Service life and original order details are also useful when available.

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