



# ADVANCED TECHNICAL PRODUCTS LTD

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ATP is a supplier of Trench Heating – PICV & Dynamic Balancing Valves – Door Curtains Heat Exchangers – Calorifiers - Radiant Panels – Pipeline Products.

## INSTALLATION, OPERATION, MAINTENANCE INSTRUCTIONS FOR STORAGE CALORIFIERS AND BUFFER VESSELS

### INSTALLATION

**Lifting & Handling:** Use lifting eyes were fitted. Do not lift a Calorifier using the insulation (if fitted). Straps may crush the insulation. The shell of the Calorifier may be made of relatively light gauge metal and care should be exercised when handling and moving the unit not to damage the shell. Do not lift the calorifier using chains directly in contact with the shell. Do not allow operatives to stand on the calorifier.

**Siting:** Unless specifically ordered for outside siting the calorifier must be sited indoors. Foundations must be firm and level to prevent settling, pipe strain or distortion of the calorifier. Unless specifically ordered differently, the calorifier should be installed in a level position. For Calorifiers with removable tube bundles, ensure enough room exists to withdraw the bundle from the shell. For calorifiers with inspection openings ensure enough room exists to gain access to the opening.

Protective covers/plugs may be fitted to connections to protect them in transit. These must be removed prior to use. If a connection is not required seal it appropriately. Check for and remove any foreign material, which may have got into the vessel. Pipe-work connected to the calorifier should be supported to prevent loads being transmitted to the calorifier. Provide for thermal expansion with bends and expansion joints. To avoid corrosion do not use copper or galvanized pipework. Fit isolation valves prior to calorifier connections (NOT TO THE VENT) to facilitate servicing. For flanged connections tighten bolts in a diametrically opposite sequence to load the flanges evenly onto the gasket. For screwed connections use a thread sealant approved for use with potable water by the local water authority. Ensure that the tube bundle can be isolated and easily disconnected for removal during maintenance. The vent must not be blocked so, if the unit may need to be isolated from the vent, fit a 3-way vent valve. Ensure adequate venting for air removal during filling and operation ("sealed" systems should have an auto-airvent and a manual air vent valve for this).

Pressure and temperature relief valves (and bursting discs if fitted) should have their outlets piped away to a safe disposal point, preferably via an air-break and tundish so that discharge is unrestricted and easily visible. Water expansion must be accommodated by separate expansion vessel on the cold feed side (on sealed systems) or via the vent pipe on vented systems. Allowing expanded water back into the cold feed tank on vented systems is not recommended as the resultant warm water will encourage bacterial growth.

To avoid damage in transit the pipe-work and pump of an anti-stratification set (if included) may be supplied loose for fitting on site. The pump should be installed to circulate water from the top of the cylinder to the bottom. To ensure that the anti-stratification pump does not adversely affect performance of the calorifier during peak demand periods the power supply to the pump should be timed to come on during periods of low demand if possible, but often enough to guarantee heating the calorifier contents fully for a period of at least 1 hour per day. The unit should be flushed thoroughly with clean water prior to operation.



## COMMISSIONING & OPERATION

Do not operate the equipment at pressures or temperatures in excess of those specified on the nameplate of the vessel marking. Do not subject the equipment to conditions of vacuum or partial vacuum. This is particularly vital for calorifiers. For example partial vacuum can be caused if the cold feed or the vent are restricted during draw off or drain down. Please always install an anti-vacuum valve.

It is assumed here that the secondary pipework is already full of water.

For sealed systems it is assumed here that any cold-water booster set and/or pressure-reducing valve is already commissioned and set to the correct pressure.

Start with primary, secondary flow, return and cold feed valves closed, anti-stratification and secondary recirculation pumps off.

Close the drain valve.

For sealed systems ensure auto-air vent is operational

For sealed systems open manual vent valves

For sealed systems open expansion vessel isolation valve

Open the cold feed valve and slowly fill the calorifier with cold water.

For sealed systems when water reaches the manual vent valve, close it.

When the calorifier is full slowly introduce the hot fluid to the tube bundle. Allow the unit to heat up.

Adjust the temperature control gradually and ensure that the correct operating temperature is maintained by it.

If the calorifier is open vented and shares a vent with other calorifiers, connect it to the common vent using the 3-way valve.

Carefully open the secondary flow and return valves

Open anti-stratification pump isolation valves

Switch anti-stratification and secondary re-circulation pumps' power on

Check that all gaskets are effective when the unit is operating - some bolt tightening may be necessary after the unit has been first heated and subsequently from time to time. Following installation and commissioning it is advisable to remove, clean and re-assemble any strainers. All fluids must be drained when the unit is out of operation to prevent freezing or possible corrosion.

## MAINTENANCE

Annual maintenance should include cleaning debris from the base of the calorifier to comply with guidelines on prevention of legionella bacteria proliferation. Also the site insurers may require annual inspection of tube bundle and shell condition.

If a loss of performance or increase in primary pressure drop has been observed the following are possible causes: -

a) Primary fluid restriction (blocked strainer, faulty control valve etc.)

b) Air lock on primary side.

c) Scale deposits on the heater battery tube surfaces (primary or secondary side). This can severely affect heat transfer rates.

### To drain the calorifier down (secondary side)

Obtain a complete set of replacement gaskets.

It is assumed here that all isolation valves (except drain) are open at the start.

Isolate the primary fluid inlet and outlet - switch off primary pump and boilers if necessary.

Switch off the secondary system return pump and isolate secondary return to calorifier.

Switch off anti-stratification pump power.

Isolate the secondary flow

Isolate the cold feed

For sealed systems reduce the residual calorifier pressure by manually operating the safety valve - some hot water will come out

For sealed systems open the manual vent valve to allow air in during drain-down

**Ensure that the anti-vacuum valve is not stuck shut - also ensure that a vent is available at the top of the calorifier of flow area at least one half the flow area of the drain connection. Remove one of the fittings on the top of the calorifier if necessary to achieve this. Partial vacuum, caused by inadequate venting of calorifiers during drain-down**

If the calorifier is open vented and shares a vent with other calorifiers, isolate it from the common vent using the 3-way valve (it will now vent to atmosphere).

Pipe the drain to a drain point and open the drain valve.

The calorifier shell internal condition can be inspected by removing the inspection cover or the tube-bundle (see below) to allow visual examination.

Re-fit new gaskets and re-fill the calorifier according to the commissioning instructions above.

#### **To check for leaking tubes**

Drain the secondary side as above. Mark all relative positions of covers, etc., to ensure correct re-assembly.

Isolate the primary side. Remove primary pipework and header. Bolt the tube plate fully to the secondary shell. Isolate the secondary flow and return. Fill the secondary shell to normal working pressure (or to test pressure if isolated properly from the system). Inspect tubes for leaks. Do not leave unit standing under test pressure for longer than necessary. Before making repairs reduce the pressure to atmospheric. Leaking tubes can sometimes be sealed using plugs. If the leak is between tube and tube-plate it may be possible to effect repairs using roller expanders. Re-test, drain, re-fit header (with new gaskets) and re-fill as above.

#### **Removing and cleaning tube bundles**

Drain as above. Remove header as above. The tube bundle may be heavy. Ensure that adequate facilities are available to withdraw the bundle without distortion or damage. Avoid damaging surfaces of flanges.

When lifting or working on the tube bundle support it by the tube plates and the support plates - ideally on wooden blocks cut to fit the curvature of the tube bundle. The tube bundle must not be supported on the tubes. Do not bend or distort supports and baffles.

Because U-tube bundles are fairly tightly packed, chemical cleaning, e.g. using acid solution containing inhibitors, will generally give the best results. Take care that the chemicals used will not cause any adverse or hazardous reaction with the materials of the tube bundle or the deposits being cleaned.

Do not blow steam through single tubes - this will cause the tube to expand and disrupt the tube joint. Do not blow air through tubes if they may contain inflammable fluids (explosion hazard)

Re-fit the tube bundle using new gaskets and re-fill the calorifier. Check all gaskets and joints for signs of leaks.