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Rycroft Storage & Non-Storage Calorifiers

Installation, Operation & Maintenance Manual

The Ormandy Group: Ormandy Offsite / Ormandy Rycroft / Ormandy Electric
Ormandy H&S Boilers / Ormandy Newade / Ormandy Dreh / Ormandy Aquatherm
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Installation

Lifting

Lifting eyes are provided on the top of large Calorifiers and those fitted with 'M' type lagging. This form of insulation is not suitable for lifting by straps, which can crush the outer casing.
Avoid the use of chains, particularly with light gauge copper vessels or where screwed connections may be damaged by the links.
When transporting or lifting storage Calorifiers keep them in the upright position. If it is necessary to tip them through 90°C first remove the battery.

Foundations

Calorifiers should be mounted on prepared foundations which are level. Even a slight tilt can cause an airlock inside the tubes, which will restrict the flow of heat, It is also important that the vessels stand firmly on the ground to prevent movement when batteries are removed or other forms of maintenance undertaken. Horizontal Calorifiers are normally supported by loose cradles, which need to be positioned clear of the drain connection and leave access to any flanges for tightening bolts.

Pipework

Check for compatibility of materials between pipework and Calorifier. In particular avoid a combination of copper and galvanised mild steel. Make sure pipework flanges are square with those on the Calorifier and correctly spaced before bolting up. See that the weight of the pipework is taken by external supports and not by the vessel. Allowance should be made for expansion of the pipes either by suitable bends or flexible joints. Tighten the bolts in a diametrically opposite sequence and not consecutively round each flange.

Screwed Connections

Screwed connections may be sealed with hemp and paste, or PTFE tape, providing the male thread is tapered. However, parallel threads, such as are found on primary connections to double tube heaters, require a back nut and joint ring. Use TWO spanners when joining screwed connections to avoid undue torque on the Calorifiers fittings.

Relief Valve

It is recommended that a short length of pipe is fitted to the discharge side of any relief valve or bursting disc to deflect the fluid in a safe direction. A long pipe may restrict the discharge, raise the blow off pressure and prevent an operator from detecting a weeping valve.

Cold Feed

With storage Calorifiers the pipe carrying the cold feed make up should be at least equal in size to the secondary flow and a check made to see that there are no unnecessary restrictions on the supply side.

Secondary Vent

Most Calorifiers have their secondary outlet situated at the top of the cylinder, which prevents air collecting in the top of the shell. However, it is necessary to provide an atmospheric vent at the high point in the system. If the system is pressurised and an automatic air vent is fitted adequate provision must be made for air to enter when the system is drained down.

Primary Vent

It is equally important to make provision for venting the primary system, whether it is water or steam. The majority of steam traps are fitted with automatic air vents, but if the steam line is long and subject to frequent shut downs an additional vent is useful.

Liquid Expansion
Changes in volume with temperature of the secondary and primary water must not be overlooked. The system pressure will rise dramatically if there is nowhere for the water to expand. It is not advisable to use the relief valve as a means of releasing the excess water. Open systems use the atmospheric vent as an expansion pipe with discharge back into the make up tank. Closed systems require a separate expansion vessel partially filled with air or nitrogen to accommodate volume changes.

Expansion Vessel
Specific O&M instructions are enclosed with the product on despatch.
Only qualified and licensed personnel may install, operate and service this equipment.
Note; certain Expansion Vessels incorporate a threaded top connection, provided to allow for the installation of a 3 way connection on which a pressure gauge and relief valve may be installed.
When supplied as a loose item, the Expansion Vessels are despatched with a plastic cap to prevent dust particles entering the membrane during transit/storage.
In instances where no gauge or relief valve is to be fitted to the threaded connection, it is the responsibility of the installer to fit a suitable brass cap.

Thermostat
For non-storage Calorifiers the correct position of the thermostat is on the secondary outlet, adjacent to the heat exchanger. If possible arrange for the primary medium to be cut off if the secondary pump fails with a non-storage unit.

Control Valve
Many control valves operate by direct action of liquid expansion in the thermostatic element. This method is simple and sufficiently accurate for most applications. However, the time lag associated with this class of equipment may produce temperature oscillations at reduced load. Under these conditions a more sophisticated, modulating valve is required. It is advisable to fit a strainer in front of the control valve and with wet steam the supply line should be kept free of condensate. This can be done with a separator or simply a T-piece and trap.

Steam Trap
The steam trap after a Calorifier must be adequately sized and mounted below the heater battery. When starting from cold the quantity of condensate may well be twice the normal full load rating. It is recommended to fit a non-return valve after the trap, particularly if it is necessary to raise the level of condensate in the return line or overcome a measurable back pressure. With low pressure steam there may be insufficient pressure to return the condensate. In these circumstances a condensate pump should be fitted.

Fitting
Before filling the secondary system with water, check the drain valve is closed and all air vents are open. Do not fill the circuit too quickly otherwise pockets of air may become trapped. Subsequent release of these air bubbles can cause violent shock waves which may exceed the working pressure of the Calorifiers. Similarly, when filling a primary hot water circuit allow time for the air to vent freely. Flush out the system before installing the control valve to remove any foreign matter. Close any manual air vents and run the circulating pumps. Crack the vents to release air accumulated by motion of the water.

Anti-Vacuum Valve
All copper lined steel Calorifiers must be protected from the risk of partial vacuum in the cylinder by fitting an anti-vacuum valve. Light gauge copper cylinders also risk damage since they can only withstand internal pressure and not external pressure. A partial vacuum may be caused by improper drain down procedures, excessive draw off at low level or an inadequate vent system. Water hammer or sudden release of pressure can also induce negative pressures.

Operation

Initial Running
During initial trials adjust the thermostatic control valve to maintain the correct secondary temperature. This is best done by raising the setting gradually so that the desired temperature is not exceeded. Clean out any strainers after preliminary running. Tighten bolts all round after the first heat up and again at regular intervals. Compare the working pressures on the primary and secondary sides with the data on the nameplate.

Steam Heaters
With steam heated Calorifiers air in the tubes can delay steam reaching the heater. If this is a source of annoyance fit an automatic air eliminator or manual blow down adjacent to the trap. When starting from cold with low pressure steam plant there may be complete loss of pressure in the tubes. Under these circumstances the trap cannot discharge condensate and the tubes will become flooded. One solution is to fit a larger steam valve to cope with the overload conditions or alternatively fit a small vacuum breaker before the trap.

Noise
These are occasions when a high temperature primary medium will cause surface boiling which can be heard as a crackling sound inside the Calorifier shell. Increasing the secondary circulation or raising the working head will help to eliminate this noise. Steam hammer associated with the control valve opening against a column of condensate is an indication of inadequate trap arrangements. This can be confirmed by removing the trap and discharging the condensate to atmosphere through a temporary drain.

Recovery Time
It is difficult to establish the output of a storage Calorifier under normal working conditions.
If it is desired to check the performance, isolate the secondary return and check the time to raise the contents from cold with no draw off from the system.

Primary Circulation
Both the primary inlet temperature and the circulation rate are important to achieve the design output. In many cases it is not sufficient to merely achieve the correct mean primary temperature. Similarly any reduction in the primary flow will give a corresponding reduction in heat transfer. During the recovery period of a storage Calorifier the temperature drop of the primary water will exceed design figure when the contents are cold but will be less as the final storage temperature is approached.

Maintenance

Inspection

Where possible a detailed examination of the Calorifier after six months can give a good indication of the future maintenance requirements. If the internals are clean and there is no sign of corrosion it can be safely assumed an annual inspection will be sufficient for future service. However, deposits of scale or corrosive products on the heater will draw attention to the need for prompt treatment.
Isolate the Calorifier and drain the shell before attempting to remove bolts or equipment.
If a manhole or end cover is fitted, a great deal can be learnt by removing this. Double tube heaters and coils are not normally withdrawn for cleaning but treated 'in situ'.

Chest Removal

When removing a large chest use the lifting ring provided to take the weight. There may be starting screws in the flange to break the seal between the chest and tube plate, and collar bolts fitted to the tube plate. These are readily identified because they are screwed into the tube plate and cannot be withdrawn like the plain bolts. Leave the nuts on the back of the collar bolts until the chest has been pulled off.

Battery Withdrawal

Remove any thermometer or other insertion in the shell which may obstruct the withdrawal of the battery. Prise the tube plate from the shell using a fine wedge piece driven into the joint at several points around the periphery. When the heater is partly withdrawn support may be shifted to a strap around the battery or a block of wood across the centre row of tubes.

Arrangement

Note the position of mid feather joints and whether the hairpins are vertical (2 pass) or horizontal (4 and 8 pass). Likewise make a note of any tube supports or baffles and their position relative to the connections. Large batteries are fitted with rollers to aid withdrawal and non-storage Calorifiers with a 2 pass shell require brackets to act as supports between the upper and lower sections of the battery.

Refitting

Use fresh joints for re-assembly and clean all faces thoroughly. With copper Calorifiers the joint face may be distorted during strip down. If so, refit the chest without the tube plate or joints and pull up the bolts using the backing ring to flatten the copper face. Slip the joint ring over the battery before insertion and make sure the battery is the right way up. See the mid feather joint is secure before replacing the chest. Pull up the bolts diametrically opposite one another and not round in a circle.

Relief Valve

The relief valve can be tested on the vessel by raising the working pressure to the set pressure or by transfer to a test line. If the valve does not reseat properly there is every possibility that foreign matter has become trapped under the seat. A further discharge using the easing lever may dislodge and offending particle or it may be necessary to strip and clean the valve.

Deposits
With very hard water, scale deposits will form on the tubes, particularly above 60°C.
Low finned tube used in the majority of Rycroft Calorifiers will shed this scale if the tubes are subject to wide temperature changes. However, this is only effective with hard scale and high primary temperatures. Low temperature primary systems cannot provide the thermal shock necessary to crack the scale. Similarly, soft deposits are not easily shed. Under these circumstances the tubes may be cleaned, manually using 'combing wire' or by chemical treatment. Other forms of deposit may collect on the tubes as a result of incorrect water treatment or from natural solids in suspension. These may prove injurious if they destroy the natural oxide film which normally protects copper. At the first signs of corrosion seek the advice of a water treatment expert.

Chemical Cleaning
Most scales can be removed by soaking the tubes in a dilute solution of hydrochloric acid or commercially available solvents. However, where possible a sample of scale should be removed manually and tested in the solution. If it does not readily react, advice should be obtained from a local expert. After de-scaling it is most important to neutralise the traces of solution left on the battery with alkali. Washing soda or slaked lime is most effective for this purpose.

Anodes
There are isolated cases of copper cylinders being attacked by aggressive water. However, such areas are generally well known to the installers and an aluminium rod can be fitted to new plant to produce a protective film over the copper. It is not necessary to replace the rod once the film has been formed. Sacrificial Magnesium anodes may be fitted to galvanised steel shells to protect the zinc coating. When these dissolve they should be replaced and it is advisable to monitor their life to ensure continuity of protection.

Electrically Heated Calorifiers
WARNING: This equipment uses dangerous high voltage and can present an electric shock hazard!
The following precautions must be observed:
Suitably qualified personnel should carry out the installation.
The equipment must be correctly earthed, with the integrity of earth proven and maintained.
Covers must not be removed with the power on.
Ensure the vessel is full and the area is dry and leak free before putting into service.
The equipment must be installed to relevant standards and good practices. Use only appropriate tools.

Immersion Heater
All immersion heaters are thoroughly dried out before leaving the factory. However, storage conditions after despatch are not always ideal and some moisture may collect in the heater, particularly if it is several months before the equipment is commissioned. Control panels and immersion heaters are supplied with bags of moisture absorbing silica gel crystals inside. During long periods prior to commissioning the bags need to be periodically removed, dried out, and returned to the control panels and heaters. This process should also be adopted should the heaters be out of service (cold) for any length of time.
Before connecting an immersion heater to the mains check all the connections for tightness, do not over tighten. Carry out an insulation test between each of the three phases on each of the heater stages, both to earth and each other. If the insulation resistance is less than 500,000 Ohms, the heater must be dried out by placing in a low temperature oven (100°C) or by passing a low voltage through the elements in air. This voltage should not exceed 25% of the working voltage. Do not allow the heater sheath temperature to rise above 60°C. Switch off at intervals to prevent over-heating.

Control Panel
Before putting the control panel into service check that all the circuit connections are tight throughout. Care should be taken not to over tighten, torque settings are supplied for some isolator and bus bar connections. It is important that the incoming supply cables are inspected to ensure that there is no undue stress being put on the isolator and that any debris created during the cable installation has been removed. Ensure that the fuses are well seated.

Thermostats
Check that the thermostats are as far into their pockets as possible.

Putting into service
Set the high limit thermostat to a low value say 45°C. Turn the Test/Off/Auto switch to the off position, replace all the covers and power up the control panel. The 'Power On' 'High Temperature' and 'Low Water' (When fitted) indicators will now be illuminated. Press the reset button and the fault indicators will go out. Turn the Test/Off/Auto switch to the test position and prove the control circuit by operating the test button(s) – the heater on lamps will illuminate after a few seconds. Now turn theswitch to the auto position. The auto indicator will illuminate and the Calorifier will now begin to heat.
At 45°C the high temperature lamp will come on the heater switch off. It will not reset until the temperature drops. When this has occurred, switch the Test/Off/Auto switch to the off position and isolate the control panel supply. Remove the covers of the control and high limit thermostat and set to 60 and 70°C respectively. If low water protection is fitted, remove the probe cover, disconnect the cable, replace the covers, and power up the Calorifier. Check that the low water indicator will not reset and the heater will not come on. Isolate the Calorifier as previously described and re-connect the low water probe. The Calorifier is now ready to put into service by operating the reset button and switching to auto. Ensure that the water temperature is being controlled at the desired temperature adjusting the control thermostat if required.

Replacing elements
Some immersion heaters have 'replaceable core' elements, which can only be changed after the Calorifier has been drained and the heater removed from the cylinder. Others have 'Removable core' elements, which can be withdrawn without draining the Calorifier. Do not withdraw them for inspection but only for replacement.

Maintenance
The unit requires little routine maintenance. However the satisfactory operation of the safety devices and the integrity of the electrical connections should be checked on a regular basis. Make sure the floor is dry before handling electrical equipment.

Spares
It is advisable to carry a minimal amount of essential spare parts in order to recover hot water supply in the event of failure. When ordering spare parts always quote the reference number printed on the nameplate. This will save time and ensure supply of the correct items.