Design, Installation & Protection of Closed Loop Systems

By Les Bekesi – Executive Building Services Manager

All is not what it seems
Design, Installation & Protection of Closed Loop Systems

Agenda:

Design of Systems:
1. Know your Legal obligations
2. Material selections as a complete system, not individual components

Installation Process:
1. Know your contractors!
2. Material storage
3. Pre delivery testing of supplied components
4. Banned products

Protection of systems:
1. When do I put water in the system?
2. Products available
Who are Lend Lease?

Lend Lease is a global developer with circa 17,000 employees.

Re Development - Elephant and Castle
                Greenwich Peninsular

Olympics - Athletes Village – Now The International Quarter

Government - The Treasury (HMRC), Houses of Parliament
              MoD
              MOJ

Education - 40 Schools and Academies across the UK
              4000+Rooms, Student Accommodation, UoS

Ireland - The Maritime College, Cork

Retail - Touchwood Shopping Centre, Solihull
         Golden Square Shopping Centre, Warrington
         Blue Water Shopping Centre
Design, Installation & Protection of Closed Loop Systems

**Design:**
1. Know your Legal obligations
2. Material Selection as a complete system, not individual components
Guidance – Regulations

Don’t panic!!!
Know your legal obligations:
Guidance & Regulations

British Standards
European Standards
HSG 274 - ACoP L8 and HTM (04 01)
Other Guidance can be obtained from:
- CIBSE
- BSRIA
- BRE
- Health Protection Agency (HPA)
- World Health Organisation (WHO)
- Health & Safety Executive (HSE)
- Water Supply (Water Fittings) Regs
- WRAS
The Illustrated Guide to Mechanical Cooling

By Kevin Pennycook

BSRIA
A BSRIA Guide
www.bsria.co.uk

Table 3: Overview of vapour compression chillers.

<table>
<thead>
<tr>
<th>Type</th>
<th>Cooling range kW</th>
<th>Refrigerant type and typical operating range</th>
<th>Capacity control</th>
</tr>
</thead>
<tbody>
<tr>
<td>Semi-hermetic</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reciprocating (2, 4, 6, 10 &amp; 12 cylinders)</td>
<td>10-10000</td>
<td>All types (-25°C to +10°C)</td>
<td>Cylinder, unloaded</td>
</tr>
<tr>
<td>Single screw</td>
<td>100-2000</td>
<td>HFC and HFC</td>
<td>Cooling tower</td>
</tr>
<tr>
<td>Twin screw</td>
<td>200-3000</td>
<td>HFC and HFC</td>
<td>Sliding plate</td>
</tr>
<tr>
<td>Hermetic</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Twin screw</td>
<td>200-600</td>
<td>HFC and HFC</td>
<td>Sliding system, variable speed</td>
</tr>
<tr>
<td>Small</td>
<td>5-250</td>
<td>HFC and HFC</td>
<td></td>
</tr>
<tr>
<td>Reciprocating (single-stage)</td>
<td>2-4000</td>
<td>All types (-25°C to +10°C)</td>
<td>100% capacity control</td>
</tr>
<tr>
<td>Reciprocating (two-stage)</td>
<td>2-150</td>
<td>All types (-25°C to +10°C)</td>
<td>50/100% speed control</td>
</tr>
<tr>
<td>Centrifugal (multi-stage)</td>
<td>300-15000</td>
<td>HFC</td>
<td>Inlet guide varies (all cases)</td>
</tr>
<tr>
<td>Open-type reciprocating (2, 4, 6, 10 and 12 cylinders)</td>
<td>100-1000</td>
<td>HFC and HFC</td>
<td>Cylinder unitizing</td>
</tr>
<tr>
<td>Open-type screw</td>
<td>200-3000</td>
<td>HFC and ammonia</td>
<td>Sliding system, variable speed</td>
</tr>
</tbody>
</table>

Source: BSRIA Guide 8

Key:

- HFC = hydrofluoro carbon
- HFC = hydrofluorocarbon
Material Selection

Value Engineering!!!!
Material Selection

Stainless Steel, Mild Steel, Copper, Cast Iron, Plastics (Mepla & Speedfit), EPDM, phosphor Bronze, Brass, Aluminium.....

Electrolytic / Galvanic corrosion
Seals and washers
Lubricants and greases
Jointing compounds
Water treatment chemicals
Insulation products
Boiler selection
Peripheral equipment
Expansion vessels
Material Selection

Thanks to Paul Nolan for the bladder picture
4 WATER TREATMENT

CENTRAL HEATING
The Logic System range of boilers have an ALUMINIUM alloy heat exchanger.

IMPORTANT.
The application of any other treatment to this product may render the guarantee of Ideal Stelrad Group Invalid.

Ideal Stelrad Group recommend Water Treatment in accordance with the Benchmark Guidance Notes on Water Treatment in Central Heating Systems.

If water treatment is used Ideal Stelrad Group recommend only the use of Scalemaster Gold 100, FERNOX, MB-1, ADEY MC1 or SENTINEL-X100 inhibitors and associated water treatment products, which must be used in accordance with the manufacturers’ instructions.

Notes.
1. It is most important that the correct concentration of the water treatment products is maintained in accordance with the manufacturers’ instructions.
2. If the boiler is installed in an existing system any unsuitable additives MUST be removed by thorough cleansing. BS 7593:2006 details the steps necessary to clean a domestic heating system.
3. In hard water areas, treatment to prevent lime scale may be necessary - however the use of artificially softened water is NOT permitted.
4. Under no circumstances should the boiler be fired before the system has been thoroughly flushed.

For further information contact:
Fernox Cookson Electronics
Forsyth Road
Sheerwater
Woking
Surrey GU21 5RZ
+44 (0) 870 601 500

Sentinel Performanc
The Heath Business Runcomb
Cheshire WA7 4QX
Tel: 0800 369 4670
www.sentinel-solutic

Scalemaster Water ~
Emerald Way
Stone
Staffordshire ST 15 0
Tel: +44 (0) 1785 81 81

Calmag Ltd.
Unit 3-6, Crown Wor
Bradford Road
Sandbeds, Keighley
West Yorkshire BD21
Tel: +44 (0) 1535 21 __________

Adey Professional H
Gloucester Road,
Cheltenham GL51 8NR
Tel: +44 (0) 1242 546700
Design, Installation & Protection of Closed Loop Systems

Installation Process:

1. Know your Contractors!
2. Material Storage
3. Pre delivery testing of supplied products
4. Banned Products
Know your Contractors!

M&E Design Consultants
M&E Installers

- Past Projects
- Extents of Involvement
- Who was on the project & are they on your team
- What support is being provided
- References
- Members of Professional Bodies
- Approved Installers Scheme

- NOT the CHEAPEST Quote............
Material Storage
Pre-delivery testing???

Need testing to prove they work, but how does this affect them prior to use? You will never remove all the water from the items.
A shower that was regularly used in Healthcare had a blending chamber as part of the design that held about 180ml of water.

How much biofilm will form in this when it is waiting to be installed and first used? - Manufacturer designed out the issue.

Many smaller manufacturers don’t consider the testing regimes that they use.

Kohler Mira as an example, only tested with treated water and sampled the water to ensure the biocide treatment was working.

Ideal Standard only test with air, a % sample need to be water tested but never get sold to a customer.
Banned Products

Beware of the contents of the plumbers tool box.....

and what can be purchased from any plumbers merchant. Some items are legally allowed to be used, but can still cause problems if they are installed within a system. Some like Lead solder are obvious, but it can still be purchased and if used on potable system will lead to contamination. Some are banned by clients for good reasons, e.g. NHS, EPDM hoses, but Why?
Why to avoid EPDM.

Thanks to Prof Tom Makin for permission to use of the pictures
WiseMans EverFlux Large EF250 250ml

Everflux is a WRAS approved water soluble self-cleaning plumbers flux paste. Everflux’s unique smooth paste formulation goes much further than other fluxes. Manufactured in the UK for 30 years.

Features and Benefits:
- UK WRAS listed
- Contains a Corrosion Inhibitor built in
- Meets all worldwide plumbing code specifications
- Soluble in hot and cold water
- Proven self-Cleaning Formulation
- For use on Gas and Water Installations
- A non-alkali formula allows total joint slip
- Ideal for use with leaded and un-leaded solder

Technical Specification
Manufacturer Part Number EFL250
Protection of the System:

1. When do I put water into the system?
2. Products available
Water on Date and what next?

Where has the water come from?

Hydraulic pressure test before we seal up ceilings and walls

But how long before the system is needed?

What do you do with the system when installed?

Can’t be flushed if the system is not finished, can you fully drain down, do you use chemical treatment?

Biofilm formation and corrosion will be starting as soon as water enters the system.
New Oncology Wing
St James’s Hospital, Leeds
Basement Level 1 - Plantroom No 2
New Oncology Wing, St James's Hospital, Leeds
Basement Level 1 - Plantroom 2
A 30m riser shaft with a single 150mm pipe is 540kg of water.
• A district heating main with 2 miles of 6” main leaking at a rate of 1000l per day
• Inhibitor levels checked every quarter
• Is this a problem?
• A district heating main with 2 miles of 6” main leaking at a rate of 1000l per day
• Inhibitor levels checked every quarter
• Is this a problem?
• Main contains circa 57,600l of water
• So every 58 days the water is effectively replenished in the system
• But you are also adding air to the system and this will add to the corrosive effect of the water in the system.
• Fixing the leak is essential.
Intro to Commissioning course 18th May - learn about air and water systems plus get free guides

This popular course, now launching in Manchester, focuses on the importance of commissioning, a vital phase in the production of building services systems.

It covers detailed descriptions of the practical procedures for the commissioning of air and water systems, advice on commissionability issues and watch points for the inspection stages.


The course agenda:

**System commissionability:**
- valve/damper locations
- valve/damper options and selection
- flow measurement methods

**Pipework and ductwork installation considerations:**

Past delegates said:

“I found the whole course really interesting, especially the pipe systems” Mott MacDonald Ltd

“Good trainer/very well knowned” ENWA

Modern-type boilers are here to stay

Consultants, designers and installers must come to terms with the fact that system cleansing and water treatment is now very vital and necessary to the welfare and prolonged existence of the boiler/chiller plant, rather than something that ought to have been done but frequently was not. These rules should be observed and enforced.

1. Do install Microbubble Air & Dirt Separators with Magnets. The Magnent Range
2. Make sure the water system is De-aerated
3. Do install Chemical Dosing pots.
4. Do cleanse systems.
5. Do treat systems with good-quality corrosion inhibitors.
6. Do install adequate flushing points.
7. Do fill large-capacity systems (in very hard water areas) with softened or demineralised water.
8. Do monitor refill water volumes and investigate promptly if water replenishment is excessive.
9. Do not drain/refill systems unless absolutely necessary.
10. Do maintain water-treatment concentrations.
11. Do check and flush the dirt separators regularly (to drain), but most importantly during the first months of operation of new systems or those that have just been worked on.
What else is a bath room for?
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Thank you for inviting me to speak at your conference today, any questions?

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Les Bekesi
Executive Building Services Manager