



Managed Water Services
KEEPING WATER SAFE

Managed Water Services – Cooling Tower Pack Endoscope Inspection



Example Site
Example Site

Cooling Tower Endoscopic Inspection Report

Survey and report carried out by

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General Overview

The safe operation of evaporative cooling equipment is governed by the requirements of The HSE document :- Approved Code of Practice – HSG274 part 1 which gives practical guidance with respect to cooling tower Regulations.

When and how often should a cooling system be inspected?

1.83 Effective water treatment will slow the rate of fouling but will not completely eliminate it or prevent fouling caused by airborne contamination. It is therefore necessary to inspect parts of the cooling tower system regularly to determine the cleanliness, need for cleaning and type of cleaning process required. Provision should be made to allow access to these parts safely.

1.84 The frequency with which these inspections should be scheduled will vary depending on the fouling potential and should be determined by the history of previous cleans and an assessment of the likelihood of fouling, based on the water treatment history and the environment in which the cooling tower is operating. The following timescales, though not prescriptive, can be considered typical for different situations:

- at least every 3 months for a cooling system in a dirty environment (eg. a tower that is prone to process or environmental contamination);
- at least twice a year for an air conditioning comfort cooling system;
- at least every 12 months for a 'clean' industrial application and any others.

1.85 Paragraphs 1.114-1.129 provide guidance on the tests for monitoring water quality and water treatment analytical reports. The responsible person and their water treatment provider should review the results jointly and agree any necessary actions. In addition to the monthly water treatment reports, Table 1.2 illustrates how the history of the water analysis and other fouling factors might help decide how often to inspect and clean the system and predict the risk of an increase in fouling over a period.

Endoscopic analysis should be carried out to determine the pack conditions

How clean does the pack need to be?

1.91 The cooling tower pack can potentially become fouled with a wider range of deposits than the cooling tower base tank and other system sumps, and is a good indicator of the overall system cleanliness.

1.92 After a period of use, cooling tower pack is likely to become fouled and the extent and nature of the fouling will depend on a number of factors, including the chemical composition of the make-up water, the presence of process and environmental contaminants and the efficacy of the water treatment programme in place. Table 1.5 and Figures 1.5 and 1.6 suitably demonstrate the levels of organic and inorganic contamination that are acceptable and where to take action to improve cleanliness.

Table 1.5 Action levels for inorganic scale, dust and silt deposits, based on coverage and thickness on cooling tower pack

Surface coverage	Deposit thickness			
	Eggshell	Up to 1 mm	1–3 mm	> 3 mm
50%+	Acceptable	Caution	High risk	High risk
25–50%	Acceptable	Caution	High risk	High risk
10–25%	Acceptable	Acceptable	Caution	High risk
<10%	Acceptable	Acceptable	Caution	Caution
<p>Estimate the proportion of pack surface that is covered with deposits and its thickness. If the material appears to be non-biological, anything no thicker than an eggshell can be considered to be an insignificant stain and not a deposit. If the contaminating material appears to be microbial, ie biofilm, irrespective of thickness, the pack should be cleaned. Deposits may be unevenly distributed within the pack, but the dirtiest areas should be used for classification of the deposit thickness. Compare the extent of the deposits with previous inspections to determine whether fouling is increasing.</p>				

Endoscopic Cooling Tower Inspection

Good: Pack very clean – no action required



Staining and not a deposit

Acceptable: Light mineral deposits only – monitor for deterioration



Caution: Deposits more significant or may be biological – action required



Review scale control measures and monitor for deterioration



Review scale control measures and monitor for deterioration



Deposit may be biofouling. Further investigation is required

High risk: Heavy mineral or microbial deposits – urgent action required



Heavy scale



Silt



Algal growth

Endoscopic Cooling Tower Inspection

Good: Pack clean – no action required



Acceptable: Light mineral deposits only – monitor for deterioration



Caution: Deposits more significant or may be biological – action required



Deposit may be biofouling. Further investigation is required



Review scale control measures and monitor for deterioration



Review scale control measures and monitor for deterioration

High risk: Heavy mineral or microbial deposits – urgent action required



Endoscopic Cooling Tower Inspection

Equipment used was an MWS RBF700 inspection system with 5.5mm 2M long Hyperion Probe, producing high- resolution digital images of 5X magnification.



Access to the towers was made by fixed ladders at differing locations

The following endoscope images are chosen to provide a representative overview of the pack condition.

Each tower is divided into three cells, A, B & C (cell C being closest to the water treatment plant room door in each example).

Several photographs were taken from each cell at various heights and depths.

Representative photographs are shown in this report.

A	B	C
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Example Site Endoscope Inspection

Sufficient endoscope images were taken to provide a comprehensive view of internal condition of the cooling tower pack flutes

1. Breakage- none / minimal
2. Biofilms – none observed
3. Deposits – some light deposition on tower 3 cells A, B & C that will require further monitoring.

**Identification of these deposits would help to diagnose the cause/source. Their composition is mineral, possibly carbonate and/or phosphate compounds of Calcium and/or Magnesium. There is a possibility it could be process contamination This can only be confirmed by laboratory analysis*

Conclusions:

Pack on tower 3 was shown to have light deposition and will require further monitoring in six months. All other packs were found to be in a good condition.

Recommendations: As prescribed by the HSE ACoP L8 guidelines the pack must be kept free of deposits to avoid harbouring bacteria and providing a possible nutrient source.

Tower 3 should be inspected again at the next shutdown opportunity, using the endoscope method, to examine the condition of the pack for comparison with the images in this report and to ascertain whether any deterioration has occurred and whether a pack out clean is necessary at that time. Acid foam cleaning can prove effective in removing residual light mineral deposits.

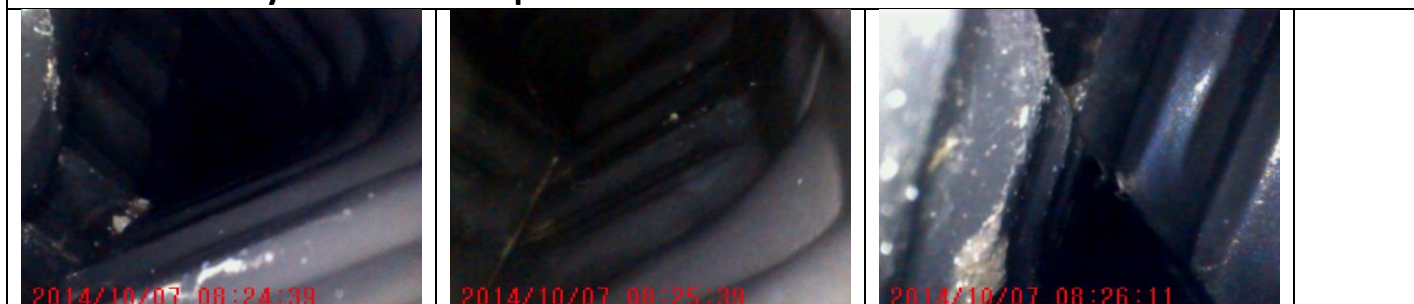
Preventive Measures: Please ensure that the operating conditions are periodically reviewed (including treatment programme, dosing and control measures and scope of testing and monitoring) to ensure that waterside conditions are optimized in the cooling system to maintain a clean, deposit free system.

Example Site Endoscope Inspection

TowerID

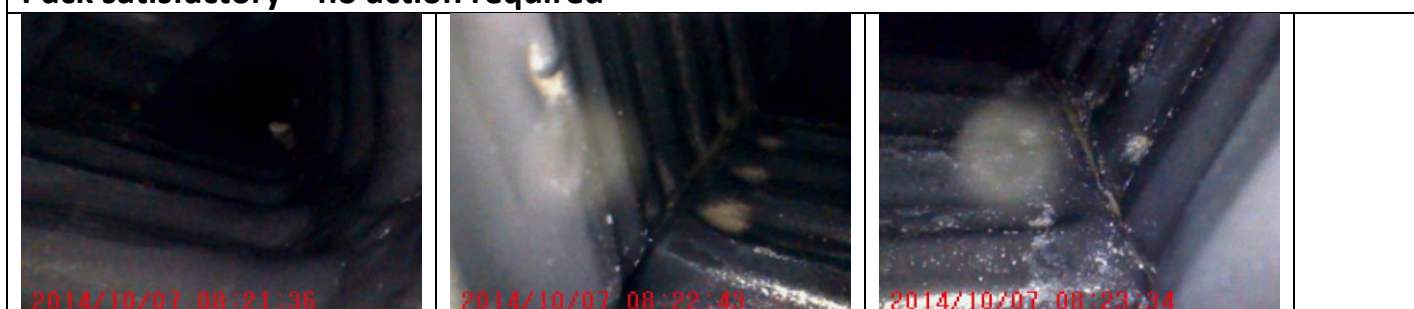
Tower 1 cell A

Pack satisfactory – no action required



Tower 1 cell B

Pack satisfactory – no action required



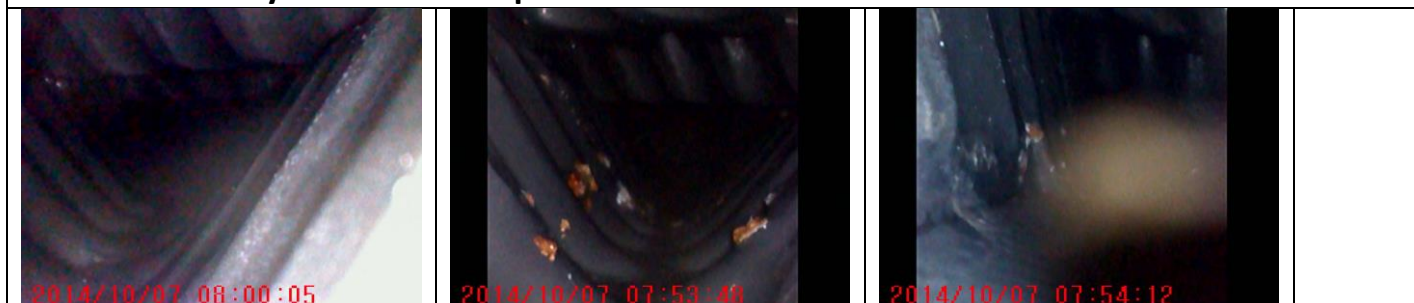
Tower 1 cell C

Light mineral deposition – monitor for deterioration



Tower 2 cell A

Pack satisfactory – no action required



Example Site 20 Canada Square, Canary Wharf

Endoscope Inspection

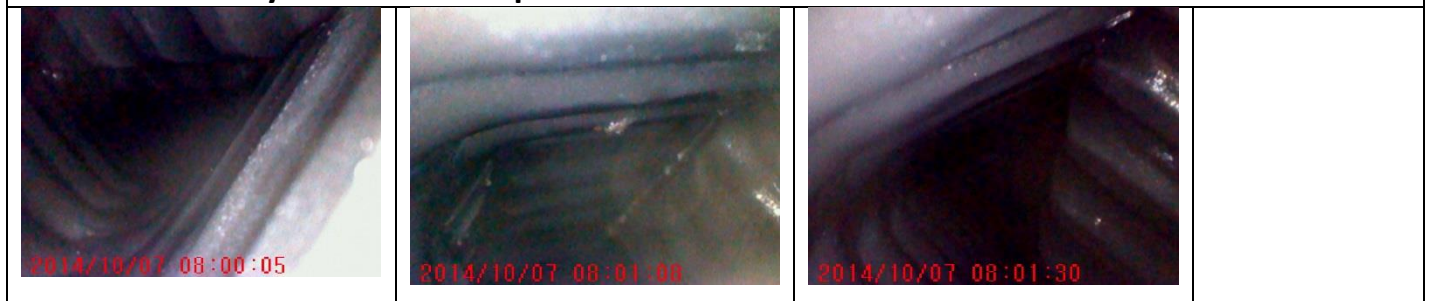
Tower 2 Cell B

Pack satisfactory – no action required



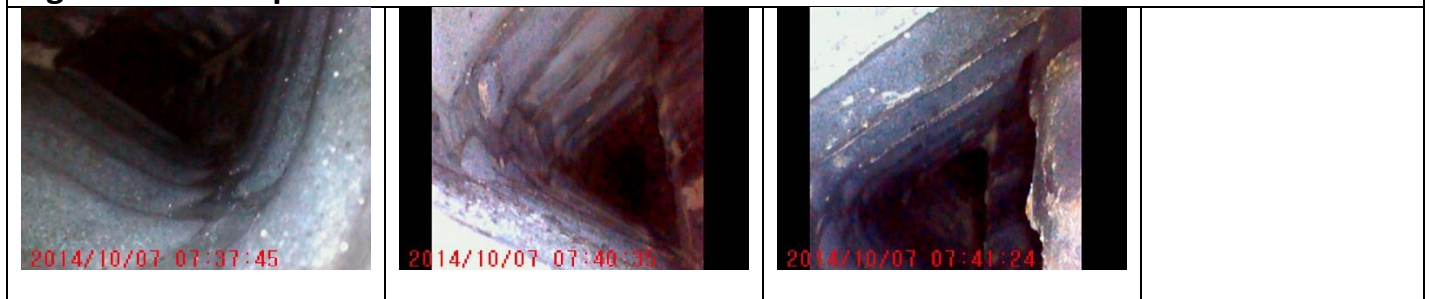
Tower 2 Cell C

Pack satisfactory – no action required



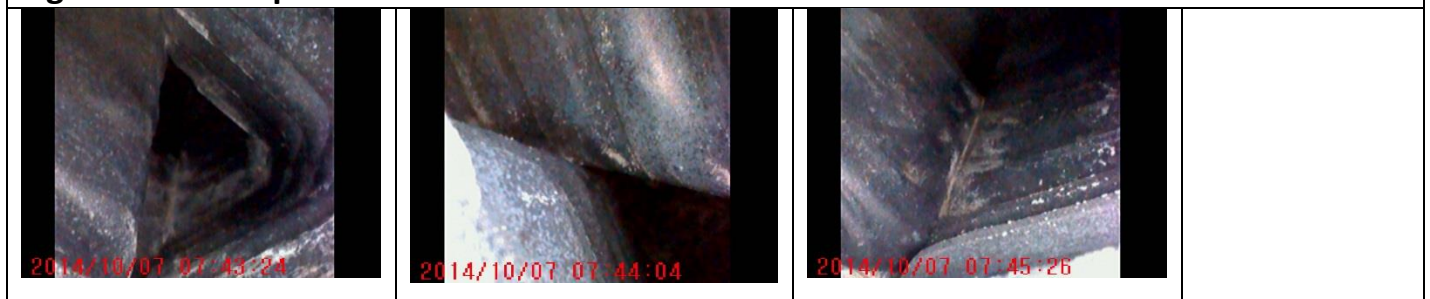
Tower 3 Cell A

Light mineral deposition – monitor for deterioration



Tower 3 Cell B

Light mineral deposition – monitor for deterioration



Example Site

Endoscope Inspection

Tower 3 Cell C

Light mineral deposition – monitor for deterioration



Tower 4 cell A

Pack satisfactory – no action required



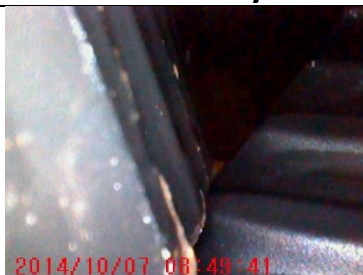
Tower 4 cell B

Pack satisfactory – no action required



Tower 4 cell C

Pack satisfactory – no action required



Tower 5 Cell A

Pack satisfactory – no action required



Tower 5 Cell B

Pack satisfactory – no action required



Tower 5 Cell C

Pack satisfactory – no action required



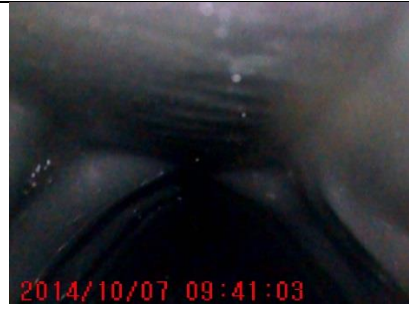
Tower 6 Cell A

Pack satisfactory – no action required



Tower 6 Cell B

Pack satisfactory – no action required



Tower 6 Cell C

Pack satisfactory – no action required



Engineers Signature & Print Name		Customers Signature & Print Name	