

Appendix 2: Risk assessment led approach to cooling tower fill pack removal

Factors to take into account in reaching an informed judgement whether or not to remove the fill pack for cleaning.

Legionellosis Risk

Does the initial legionellosis risk assessment identify the cleanliness of the fill pack as a significant risk factor?

What is the additional legionellosis risk (if any) to operators and others resulting from cleaning?

Safety & Practicability

What are the risks of the following when removing and reinstalling the fill pack?

- Slips, trips and falls
- Manual handling
- Working at heights
- Confined or restricted spaces
- Safe access
- Exposure to chemicals

Is there space to remove, clean and reinstall the fill pack?

How disruptive would removing and reinstalling the fill pack be to the business?

History and frequency

Does the initial legionellosis risk assessment advocate a frequency for fill pack removal?

What are the findings of the monthly to quarterly visual inspections advocated in L8?

Have there been changes in operation, treatment, control, contractors or the environment (e.g. nearby building or demolition works)?

How well has the system conformed to its performance targets for important parameters such as levels of hardness, inhibitor, dissolved solids, biocide, bacteria (including legionella) and contaminants?

Condition Appraisal in Advance of Scheduled Clean and Disinfection

How long will it take to make arrangements for fill pack removal and cleaning if it is deemed necessary?

What is the condition of the pack? Remove and inspect a representative sample, for example by:

Checking for mechanical damage and other dilapidation such as cracking, delamination, embrittlement and discoloration

Judging the drained weight and comparing it to the manufacturer's specification or to a similar component which is known to be clean

Agitating, distorting, knocking, washing through with a low pressure hose and examining any material dislodged

Examining the surfaces, peering between the component sheets, prying them apart or even breaking up a bale if necessary, wiping, scrubbing, scraping, washing etc.

Consider other information which may be useful in indicating that there may be deposits, for example:

Deposits on other surfaces

Accumulation of sediment in low water velocity zones such as distribution troughs and tower ponds (cold basins), drift eliminator supports etc.

Frequent hardness slip in the make up water
Frequent low scale inhibitor concentrations
Low calcium recovery figures
Reduction of heat rejection performance
Excessive fan operation or speed
Uneven flow through the pack
Recurring or persistent high bacteria levels

If the findings are that the pack has significant deposits, a cleanliness appraisal should be made of the heat exchanger. Consideration should also be given to a review of the water treatment regime. This might involve more frequent cleaning of the tower and/or the implementation of supplementary measures, such as side-stream filtration.

Pack scaled or fouled

If the fill pack is scaled or fouled and it is reasonably practicable to do so, remove it.

Reasonably practicable means, in essence, that you must do everything that can be done to reduce risk to its lowest possible level, *except that* you don't have to do something where its cost is clearly excessive compared to the size of the risk reduction.

For a cooling tower serving the air conditioning in a typical office block, removing and reinstalling the fill pack could amount to a day's work for two men and would cause some damage to the pack, probably requiring partial replacement. This on its own would not be deemed to constitute a prohibitive cost.

If the heat exchanger cannot be shown to be clean, it should also be cleaned.

Pack clean

If the pack is demonstrably clean, record its condition including evidence such as photographs, weights etc and leave it in place for cleaning.

Pack scaled or fouled but removal not practicable

If the fill pack is scaled or fouled and it is reasonably practicable to do so, remove it.

To reach the judgement that removing the pack is not reasonably practicable (rather than just inconvenient), there must be substantial and demonstrable disadvantages or costs which outweigh the advantages of removal and reinstallation.

The construction of the cooling tower may make pack removal difficult or even dangerous (although modifications can often make the task easier)

The location of the cooling tower may make pack removal difficult or even dangerous

The time taken may be greater than is available (although this can often be avoided by forward planning)

The construction of the fill pack may be such that removal does not make cleaning any easier or more effective than cleaning *in*

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The nature of the scale or fouling may be such that it can be effectively removed without removing the pack

If the heat exchanger cannot be shown to be clean, it should also be cleaned.

Pack cleaning, whole system cleaning, whole system disinfection

The guidance in L8 should be met or exceeded by site or system specific method statements. Risk assessments are required for all reasonably foreseeable hazards, suitable and sufficient precautions must be taken as necessary.