

# Removal of pack from cooling towers

## Summary

The maintenance of a water system in a clean state is an important part of managing the risk from legionella. The removal of pack from a cooling tower for assessment of cleanliness as part of a cleaning regime is an issue which causes confusion and conflict for cooling tower users, water treatment companies, other service providers and inspectors of health and safety.

This guidance note considers issues raised by the guidance given in the Approved Code of Practice and Guidance 'Legionnaires' disease – The control of legionella in water systems' L8 regarding the removal of pack from cooling towers for assessment of cleanliness and/or cleaning. It aims to clarify the guidance and promote a consistency of approach to the need for removal of pack by providing advice on the factors which may inform decisions on pack removal for cleaning and inspection.

## 1. Background

1.1 The pack is often the most inaccessible part of the cooling tower. Inspection of the pack to monitor its physical condition is often difficult. Yet the pack constitutes the majority of the wetted surface area within a cooling tower system and as such is one of the main areas where scale, debris and biofilm are likely to accumulate, and it can be the most difficult area to clean adequately. Experience has shown that contaminated, dirty packs have been the cause of significant outbreaks of Legionnaires' disease. It is worth noting that this has been the case for cooling towers where the pack has appeared to be clean superficially, but closer internal examination has identified extensive fouling and scale deposits. Proper, effective assessment of the cleanliness of the cooling tower pack is therefore a key component of the overall control strategy.

1.2 Ensuring that the pack remains in a clean state is an important part of any control strategy. Current figures suggest that probably only 50% of users of cooling towers regularly remove pack. Certificates of cleaning and disinfection of cooling towers are issued asserting that the towers have been cleaned and disinfected in accordance with L8. Close questioning reveals that this does not always include pack removal, even if it has been identified as a requirement in a risk assessment or in

cleaning procedures. Risk assessments often do not consider pack removal in sufficient detail to reach a considered conclusion on the need for it, nor the frequency.

1.3 Non-removal of the pack can make cleaning and inspection of the internal surfaces of the tower difficult.

## 2. Approved Code of Practice and L8

The Approved code of Practice and Guidance (ACOP) 'Legionnaires' disease – The control of legionella in water systems' L8 addresses the issue of cleaning the water system and removal of pack in a number of ways:

2.1 Assessing the risk from exposure to legionella.

The ACOP para 23 states that a suitable and sufficient assessment is required to identify and assess the risks of exposure to legionella, and any necessary precautionary measures.

2.2. Preventing or controlling the risk from exposure to legionella.

ACOP para 54(e) requires 'maintenance of the cleanliness of the system and the water in it' as part of the precautions to control the risk from exposure. This is clarified by Guidance paras 57(d) which states that the proliferation of legionella bacteria can be prevented by keeping the system clean to avoid the build up of sediments which may harbour bacteria, and 58(f) which details the need for cleaning and disinfection procedures to be included in a written scheme of how to use and carry out control measures.

2.3 Part 2 guidance on the control of legionella in water systems.

Guidance para 81(d) – contains guidance on the design and construction of cooling systems for cleaning and disinfection.' those parts of the tower which become wet should be accessible for cleaning: packs should be readily removable and easily dismantled'.

Guidance para 138 – contains guidance on manual cleaning operations '...with all accessible areas of the tower etc being adequately cleaned. Where practicable the packs should be removed at least once a year and preferably every 6 months. If this is not practicable it may be necessary to apply supplementary strategies....'

## 2.4. Responsibility of manufacturers, importers, suppliers and installers.

ACOP para 70(a) requires that water systems that may create a risk of exposure to legionella bacteria be designed and constructed so as to be safe and without risks to health when used at work,

Guidance para 74(d) states that water systems should be designed and constructed to 'aid cleaning and disinfection – for example, those parts of the system which need regular cleaning should be easily accessible, readily removable and easily dismantled'.

## 3. The Requirement for Removal of Pack for Cleaning and Inspection

3.1 Prevention or control of the risk from legionella by maintaining a clean system is a requirement of the ACOP in para 54(e). As part of the water system, the pack in a cooling tower must be maintained in a clean state. Para 138 gives the guidance on how the requirement in para 54 may be achieved, but other equally effective means may be used to maintain a clean system. The guidance given in para 138 of L8 is often mistaken as a mandatory requirement to remove the pack from a tower for cleaning, at least annually.

3.2 The expectation is that cooling towers users will follow the ACOP and Guidance. If they do not follow the ACOP and Guidance then any other measures that they put in place to prevent or control the risk from legionella must be equally as effective as those in the ACOP and Guidance.

3.3 There is often no informed decision on the need to remove pack for inspection and/or cleaning and the frequency with which this should occur. The system cleaning regime should be based on an ongoing risk assessment and considered judgement of all the physical parameters relating to the physical condition of the system; proximity to high risk groups and the quality of the water treatment regime in use and a risk based determination made of whether or not the pack needs to be removed for inspection and/or cleaning.

3.4 An effective water treatment programme as required by the ACOP will help to prevent corrosion, scaling, fouling and microbial activity in a water system, and hence help to keep the system, including the pack, clean. However, changing a water treatment programme will not in itself clean a

pack that is already fouled. Once a pack has been cleaned or replaced, the water treatment programme should be reviewed to ensure that it is effective in helping to prevent scaling and fouling in the pack.

3.5 Any risk assessment should consider the need for removal of pack as part of an overall cleaning regime. There will be many factors to consider in making a decision on pack removal including practicability. Useful guidance has been produced by the Water Management Society and the British Association of Chemical Specialities. The guidance has been reproduced with permission in the appendices.

3.6 If enhanced water treatment or supplementary measures (including for example filtration, increased monitoring, novel *in situ* cleaning methods) are in place, and it is claimed that these maintain the system, including the pack, in a clean state (i.e. no scale, deposits as rust or biofilm), **this must be demonstrable**. Photographs of the pack at inspection, endoscopy, or pack weights are examples of evidence that help to demonstrate that the pack is clean and has been maintained in a clean state. The evidence should be gathered by examining sufficient of the pack to represent the condition of the whole pack as any variation in water or airflow across the pack can result in marked variation in fouling throughout the pack. The condition of the pack will need to be monitored at frequent intervals to ensure that it remains in a clean state and the monitoring of its condition should inform the need for a review of the assessment, and the frequency of cleaning.

3.7 Where the pack is removed, the assessment of the risk from exposure to legionella should determine the frequency of pack removal based on the water treatment regime monitoring results and any local conditions, including proximity to high risk groups, which may affect the cleanliness of the system. The Guidance in L8 recommends that the pack be removed at least annually. Any variation from the guidance (i.e. extending the frequency beyond an annual clean), for example due to extra water treatment measures, must be demonstrably effective in keeping the pack and the rest of the water system clean and free from scale, sediment and biofilm. This means initially that the system and representative sections of the pack must be inspected (with photographs taken, endoscopy or pack weights for example) to record its condition (with the exception of a new tower or a new pack), and then inspected for cleanliness after a year (with the condition recorded) to justify any departure from an annual pack removal for cleaning. An informed judgement of the frequency of pack removal and inspection must then be made and recorded. The guidance in the appendices will assist in making the judgement.

3.8 Equally, there will be circumstances where cooling systems in certain locations will require more frequent inspection and cleaning than that recommended in the Guidance particularly if they are subject to heavy contamination (e.g. next to a foundry, demolition site or building site, or in a plastics factory), and these must also be reflected in the risk assessment.

3.9 In situations where pack removal for cleaning and inspection is required, an important feature of cleaning the tower and associated water system is the forward planning necessary to ensure that the tower and system can be released from duty and that the necessary equipment for safe access to the tower for cleaning is available at the appropriate time. The availability of a replacement pack to fit the tower can minimise down time and enable the removed pack to be cleaned later without time constraints and in a safe manner.

3.10 All aspects of the work involved in the removal, inspection and cleaning of pack (eg access, manual handling, falls from height, exposure to aerosols, confined space working) must be addressed in a risk assessment which takes account of the nature of the tasks, the configuration and other particular circumstances of the plant and site and the training and experience of the individuals carrying out the work. This assessment must be formally recorded in writing. This will include those situations where the pack can be cleaned *in situ* by removal of some segments of pack and carrying out the pack cleaning inside the tower by moving the remaining sections of the pack to clean all parts.

## 4. Cooling tower construction

### 4.1. New Towers

4.1.1 Sections 3 and 6 of the Health and Safety at Work etc Act 1974 place duties on manufacturers, importers, suppliers and installers regarding the design, manufacture, supply and installation of equipment for use at work.

4.1.2 Water systems, including cooling towers should be designed and constructed so as to be safe and without risks to health when used at work. Guidance is given in ACOP L8 on design and construction in paras 70-78.

4.1.3 New cooling towers should be designed so that the pack can be

removed easily for inspection and/or cleaning. Access hatches enable towers with sectional pack, or pack in baskets to be removed. Towers with hanging fill pack often have removable sides which permit some of the pack to be removed with the rest cleaned *in situ* as the sections can be spread easily. In each case it may be time consuming to remove the pack, but may not be impracticable.

4.1.4 Due consideration should also be given to the location of a cooling tower and the need for safe access to the tower for cleaning, inspection and maintenance.

## 4.2. Old Towers

4.2.1 The design and construction of older towers is extremely varied ranging from large wooden towers to small towers of solid construction. In many cases dismantling or partial dismantling of the tower will be necessary to enable the pack to be removed.

4.2.2 Access for pack removal can be a serious problem, due to both the size of a tower and its construction. Pack removal can be both difficult and time consuming. In many older towers where the pack has not been removed for a number of years or has never been removed there is always the risk of it disintegrating on removal or of it not fitting back into the tower afterwards.

4.2.3 The construction of the tower and the practicability of the pack removal should be considered in any risk assessment when reaching a decision on the means by which the water system is to be maintained in a clean state.

4.2.4 Consideration should be given where appropriate to modifying old towers to enable access to the pack for inspection and removal. The tower manufacturer may be able to assist in this matter.