

Managing the Risk of Legionnaires' Disease in Vehicle Wash Systems

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Water Management Society Working Party
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Management and control of Legionnaires' disease is described in the HSE Approved Code of Practice and Guidance Document 'Legionnaires' disease. The control of legionella bacteria in water systems' (L8). This document is divided into three main parts. These are:

The Approved Code of Practice,
Guidance on the control of legionella in cooling water systems, and
Guidance on the control of legionella in hot and cold water services.

L8 recognises that other types of water system can potentially harbour the *Legionella* bacteria that give rise to Legionnaires' disease. Some of these systems are listed in Appendix 1 of L8 as *Checklist 3: Other risk systems*. This Checklist gives brief guidance on controlling *Legionella* in the systems listed, This guidance is to be used in addition to L8 and does not replace the requirements therein. It is the duty holders' responsibility to ensure that risk assessments and control measures including management plans in the event of non-compliance are in place as detailed in L8.

If doubts exist regarding any aspect of the effective management, control, operation or maintenance of the system, then advice and assistance should be sought from an organisation with suitable competence/experience in this field

The document presented here is one of a series published by The Water Management Society. Each document in the series highlights a specific type of system in which it is recognised that there is a risk of Legionnaires' disease from the proliferation and dissemination of *Legionella*. The purpose of each document in the series is to highlight the issues that give rise to risk and to offer guidance on controlling this risk. It should be noted that, although this guidance is given in some detail, each system is unique and the approach adopted in controlling the risk must therefore be based on the risk assessment of each specific system.

It should be emphasised that the guidance offered here is the considered opinion of The Water Management Society.

All recommendations made in this guidance document should be taken into account by the individual system risk assessment and validated by the owner/operator for each system taking into account local factors such as design, use and environment.

Legionella will grow in any water system where:

- The temperature of the water is between 20 and 45°C in any part of that system
- There is sediment, sludge or other nutrients which will support microbial growth
- There are biofilms (or slimes) which may support the potential for legionella survival and growth
- There is scale and/or corrosion (iron is a growth factor for legionellae)

Where there is also the potential for aerosols to be formed there is an increased risk for causing Legionnaires disease.

Areas of no or low flow (stagnant areas) increase the risk of microbial growth.

Vehicle Wash Systems

Vehicle wash systems include car washes, e.g. those found at petrol service stations, lorry washes (often found at goods storage and distribution depots and at manufacturing plants), bus washes (often at transport depots), and train wash systems. (*see also document on Jet Washes*)

They fall into two categories with regard to water usage:

- Those in which wash water is collected and recycled, and
- Those in which water is used once through and discharged to drain

Those in which water is recycled may reclaim up to 95% of the water. (manufacturer's figure)

Types of vehicle washes

- Car washes can be either manual jet washes in which the vehicle is driven onto a pad and then manually jet washed with brushes and jet lances, or they can be of the automatic type in which the vehicle is driven onto a pad and is automatically washed by jet nozzles mounted on a moving frame that scans the length of the vehicle.
- Lorry and bus washes tend to be of the automatic type, but obviously larger to accommodate the size of the vehicle.
- In train wash systems, the jet nozzles are often stationary and the train is driven through the wash.

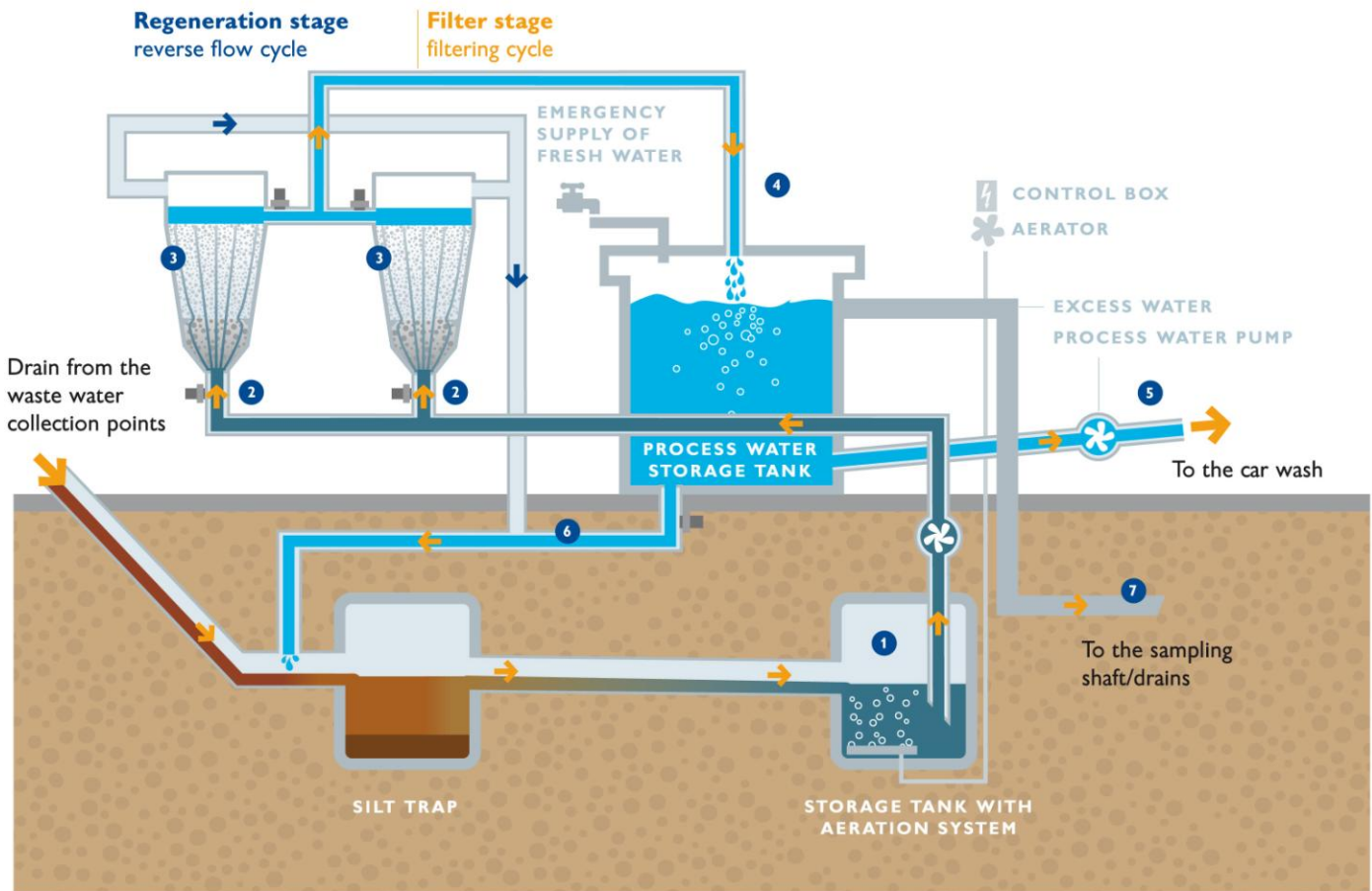
Vehicle wash systems may be in the open or (as often found at petrol service stations) enclosed to reduce nuisance e.g. noise and spray. The degree of enclosure can vary but will have little impact on the reduction of legionella risk.

The vehicle wash process generally involves an initial wash cycle with detergents. This might also include the use of wax. The next stage is the rinse cycle, and this might be followed by a warm air drying cycle.

In a typical unit where the water is recycled through collection / interceptor tanks (usually below ground under the vehicle wash pad), the cycle of operation is typically as follows.

The collected water, following vehicle washing, passes initially to an interceptor tank which separates floating coarse debris and settles silt/grit. The level of silt in this tank is usually monitored with a dip stick and emptied as required by a gully sucker. Oil absorbent pads/filters are employed to remove small quantities of oil normally present in vehicle wash operations. . A sump pump transfers water from the collection / interceptor tank through hydrocyclones to the first stage wash water tank, usually located above ground. The hydrocyclones act to remove some further fine solids which return with a little water back to the collection / interceptor tank. The first stage wash water still contains detergent not used during the last wash which is often used directly in the next wash, reducing detergent consumption.

When the vehicle wash is in the rinse cycle, the water flows from the wash tank to an intermediate tank where fresh make up water (usually softened) is added. The water is then cycled through activated carbon filters and into the rinse tank. The activated carbon filters remove detergents and other organics, any remaining solids and chlorine to produce water of suitable quality for rinsing.



Sample design of a vehicle wash system

Testing and Servicing

L8 Appendix 1, *Checklist 3* under the heading 'Car / bus washes' recommends that the filtration and treatment system is checked and that the systems are cleaned and disinfected at a frequency recommended by manufacturers. The owner/operator should validate that this frequency is sufficient for controlling the *Legionella* risk.

A Typical Maintenance Schedule

All systems will require maintenance and the schedule must be validated by the owner/operator for each system taking into account local factors such as design, use and environment.

A typical maintenance schedule for a vehicle wash system in which the water is recycled might be:

Daily – Ensure only vehicle wash water drains into the collection / interceptor tank. If fuel spillages or floor cleaners are allowed to enter, then this will create chemical contamination problems which will have to be addressed, but are outside the scope of this document.

Weekly – Check sludge levels in the collection / interceptor tanks. Clean the channel round the collection / interceptor tank and clean the tank mesh screens. Check that hydrocyclone underflow nozzles will pass water when the sump pump is running. If not, remove nozzles, clean, and replace. Switch duty / standby pumps to avoid water stagnation.

Monthly – Check oil absorbent sheets (if fitted). If saturated with oil, clean and re-use or replace. Remove coarse debris, clean oil and grease from the pump screen in the collection tank. Remove underflow nozzles from the hydrocyclones and clean and replace as necessary.

Other recommendations – Depending on manufacturers' guidelines and local risk assessment, system components should be cleaned and disinfected (especially the collection/interceptor tanks). All filters and strainers should be inspected, cleaned and/or replaced at frequent intervals to maintain their efficiency and to reduce the potential for biological growth.

Factors Affecting Legionella Risks Associated with Vehicle Wash Systems

The following factors need to be considered when assessing the risk of contracting Legionnaires' disease from vehicle wash systems.

Exposure to Aerosols – Vehicle wash systems generate aerosols at the spray nozzles and also during the warm air vehicle drying cycle. They vary in design, and the degree of protection offered by the system varies from one design to another. The design process should incorporate measures to minimise the risk to users and the public.

Water Quality – Water supplied to the unit might come directly from the Mains. However, on industrial sites it could come from a process water source. Industrial process waters are often pre-treated to make them suitable for their intended industrial purpose. Water qualities vary depending on pre-treatment.

Temperature and stagnation – *Legionellae* generally proliferate in the temperature range 20 – 46°C and growth rate is most rapid at a temperature of around 37°C. When assessing the risk in vehicle wash systems it is therefore important to assess the temperature of the water used and to consider seasonal variations including exposure of for example storage tanks and pipe work to thermal gain including direct sunlight. Infrequently used vehicle washes may have extended periods of stagnation which if combined with exposure to sunlight may increase the risk of *Legionella* growth. These may include weekends and bank holidays. A period of idleness for one type of vehicle wash, e.g., a factory lorry wash during a holiday period, might not be the same for another, e.g., the same holiday period might increase usage of petrol service station vehicle wash systems.

During drought periods, vehicle wash systems are amongst the first to be shut down to conserve water. There is an increased risk of proliferation of *Legionella* bacteria in the system during the shutdown period. In assessing the risk, it is important to consider the procedures in place to shut down and restart the system safely. These will normally include draining the system on shut down and cleaning and disinfection of the system before reuse.

Potential for Contamination – Vehicle wash systems have a potential for *Legionella* to proliferate owing to the presence of soaps, dirt, oils, and sediments, which provide nutrients to support microbial growth, including bacteria and protozoa. In certain conditions, these can support the rapid growth of *Legionella* within water systems. The potential *Legionella* growth will be greatly reduced if the temperature of the whole system remains below 20°C. Where the temperature of any part of the system is above 20°C then additional control measures must be employed to reduce the risk of *Legionella* growth. An assessment of water cleanliness and potential for contamination is important in risk assessing vehicle wash systems, particularly in those in which the water is recycled. The type of debris entering the system will vary from system to system. For example, a petrol service station vehicle wash system in a city is likely to become more contaminated with oil and grease picked up from the road and wash out of partially combusted fuels and dirt, whereas one in a rural area is likely to become more contaminated with agricultural debris. The silt/sludge builds up in the bottom of the collection / interceptor tanks. There are various factors which may impact on the potential sources for contamination which must be considered in the RA:

- The suitability and efficiency of the filtration and separation system employed
- suitability and efficiency of the chemicals and associated dosing equipment
- the maintenance and servicing schedule of the equipment,
- the frequency of silt removal (e.g., by gully sucker)

Maintenance, Cleaning, and Disinfection – The risk assessment should also consider the comprehensiveness of the maintenance schedule, the frequency of cleaning and disinfection, and the method used during cleaning and disinfection. Regular cleaning and disinfection is particularly important in recycled wash water systems, and especial attention must be given to the removal of sludge and to cleaning and disinfection of collection / interceptor tanks.

Management and Procedures – Management structure, definition of responsibilities, lines of communication, training, written procedures, record keeping, etc., are all important factors when assessing the risk. These issues are all covered in detail in L8.

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Water Supply – Water used in vehicle wash systems should preferably be of mains water quality. Mains water temperatures may be in excess of 20°C in the summer, which will increase the risk of *Legionella* growing in the system. The temperature of the water supply to the system should be monitored to assess whether other means of control are needed. If process water is used, then it should be of suitable quality, i.e., clean / filtered and pre-treated as required, e.g., with a suitable effective biocide.

Equipment Condition – It is important to keep equipment in good, clean condition, free from corrosion, hydrocarbons, and deposits to reduce the potential for bacterial proliferation. Chemical dosing equipment and filtration / separation equipment should be well maintained and kept in good working order. A routine maintenance schedule should be established and records kept of remedial work done, checks made, etc.

Microbial Control – It is important to keep chemicals topped up in dosing systems. It is most important to ensure that biocides are compatible with other system chemicals and that target levels for both are monitored and maintained. Regular checks of chemical consumption and bacteria levels should be scheduled and records kept.

Water Temperature – Wherever possible, water temperatures in the range 20 – 46°C should be avoided. All factors which may increase the temperature within the system should be assessed, monitored and managed e.g. frost protection heating, ambient temperature of enclosures, potential of heat gain from vehicles, plant rooms etc. It may be necessary to consider insulation and/or screening from sunlight, of pipework and tanks to achieve this. Temperature and temperature variations (including periods of idleness) should be considered when assessing the risk.

Inspection and Cleaning & Disinfection – L8 Appendix 1, *Checklist 3* recommends under the heading 'Car / bus washes' that systems are cleaned and disinfected at a frequency recommended by manufacturers. The frequency will depend on the rate at which the system becomes contaminated with debris from vehicles and should be validated for each individual system. Especial attention must be given to the frequency of emptying and the frequency of cleaning and disinfection of collection / interceptor tanks.

Exposure to Aerosols – Wherever possible, vehicle wash systems should be designed to avoid undue exposure of users and the public to aerosols. The risk assessment should take this risk of exposure into account and, if possible, make recommendations on steps that can be taken to reduce risk of exposure. These steps might include recommendations on design modification or steps to improve procedures to reduce risk.

Operating Procedures – Written operating procedures should be in place for routine use and cleaning and maintenance and should also take account of possible shutdown of the system and steps to be taken both during shutdown and subsequent start up. These procedures should include measures to reduce the risk of proliferation of bacteria including *Legionella* and should also consider means of protecting operators and the public from exposure to contaminated aerosols.

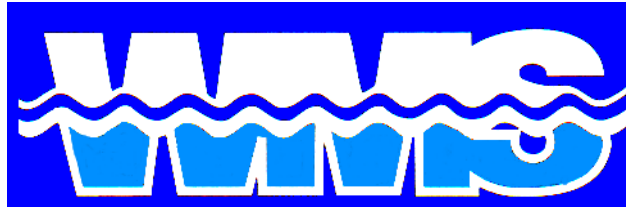
Sampling and Testing for Legionella – L8 makes no specific recommendations on sampling and testing for Legionella bacteria in vehicle wash systems. However, in view of the potential for contamination with oil, grit, soil, etc., and potential for stagnation during periods of non-use (e.g., periods of water usage restrictions), it is

recommended that Legionella sampling and testing is done initially to establish that control has been achieved and thereafter at a frequency determined by the risk assessment.

Record Keeping – Records should be kept as required in L8 and should include all written procedures.

Records should also be kept of

- routine maintenance such as cleaning and disinfection, filter backwash / cleaning, activated carbon filter medium replacement,
- chemical dosing system operational checks and top up of chemicals, *Legionella* testing,
- temperature checks (if made), collection / interceptor tank silt level monitoring, frequency of collection / interceptor tank silt removal (e.g., by gully sucker), etc.
- Any remedial works undertaken
- Training of operatives



Disclaimer: the Water Management Society has published this document as part of a series of guidance papers designed to give support in the control of legionellosis. Guidance in this document does not replace any legislative requirements and should be used in conjunction with any manufacturers' recommendations. The Water Management Society accepts no responsibility for misuse or misapplication of the guidance.

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