

Effluent Treatment

GRP Fabrications



Tel 0274-729361

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Our Ref: BDR/DLC



Federation of Civil Engineering Contractors

29 May 1985

Air Products Limited
Hersham Place
Molsley Road
Hersham
WALTON ON THAMES

OFFICE OF C. H. W. S. C.

Dear Sirs

RE: LEGIONAIRES DISEASE

We enclose for your information a note we have prepared on the very topical subject of Legionnaires Disease.

The object of the note is to allay some of the concerns which recent uninformed publicity may have produced and to indicate the necessary treatment which can effectively eliminate the problem.

If you require any further help please do not hesitate to contact us.

Yours faithfully
Davenport Engineering Co Ltd

B D Ripley
Marketing Manager

Encs

Davenport Engineering Co. Limited Harris Street, Bradford, West Yorkshire, BD1 5JD.

AP00036676

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**LEGIONAIRES DISEASE - THE CAUSE AND PREVENTION OF
LEGIONELLA PNEUMOPHILA IN WATER COOLING TOWERS**

Legionnaires disease is caused by the bacterial cell *Legionella Pneumophila*. It was first identified in 1977 as a result of research into the cause of the mysterious deaths of several ex legionnaires following the Philadelphia convention in 1976. A few cells of the bacteria were isolated in samples taken following the convention and were named after the convention outbreak. Subsequently, many other members of the *Legionella* genus have been identified as possible causes of the infection.

Although relatively new in name, Legionnaires disease will over the years have been responsible for the outbreak of many epidemics throughout the world. Symptoms of the disease manifest themselves within 2 to 10 days of exposure and include headache, high temperatures, muscle aches, coughing, vomiting and diarrhoea.

In a natural environment *Legionella* has been identified around the world in the muds found in rivers and lakes with the highest infestations being where soil and water contact each other. The risk of infection from natural sources in the UK is insignificant due to the very low concentrations and the adverse temperature and other conditions for the proliferation of the bacteria. The favourable environment for the growth of the bacteria found in certain man made water systems, such as cooling towers, humidifiers, hot and cold water piped water systems and shower heads can allow the development of high concentrations of bacteria, which greatly increase the risk of infection.

Growth of *Legionella* is favoured in neutral pH conditions and where temperatures are in the region of 20 Deg C to 70 Deg C, with temperatures in the mid range being most favourable, at lower temperatures the bacteria can exist in a dormant state in deposits of silt and other debris. Also essential for growth is a source of nutrients which include nitrogen, iron and the amino acid cysteine. In addition the evaporation of water vapour, which occurs in cooling towers causes the concentration of dissolved solids and biological organisms in the circulating water to be increased from 2 to 10 times that in the make-up water supplied to the cooling tower. Airborne spread of the bacteria through the inhalation of water droplets arising from the carry over from cooling towers and the spray from showers is a frequent cause of infection.

..../

Tests for the presence of the organism in the circulating water of cooling towers, in which the water quality is adequately controlled and treated have invariably proved negative. It is, however, occasionally identified where the water quality is inadequately managed. Although cooling water systems have previously been wrongly blamed as a major source of the infection, it has been confirmed that contaminated cooling water has been associated with outbreaks of the disease.

Good maintenance of the cooling water system ensures that conditions in the circulating water are not conducive to the growth of the organism.

Scale and corrosion cause the build up of deposits within heat exchangers, pipework, the cooling tower and its sump. These deposits provide a sheltered environment for the development of high concentrations of the organism. Dosing the waters with appropriate scale or corrosion inhibitors is essential. In addition its effect is to increase process efficiency and to decrease maintenance costs.

Organic materials can enter the cooling water through process contamination, contaminated make-up water derived from rivers etc or be carried into the cooling tower with the air. These organic materials provide a food source for the growth of micro organisms such as *Legionella pneumophila* as well as the more usual biological slimes, algae and fungi found in cooling towers.

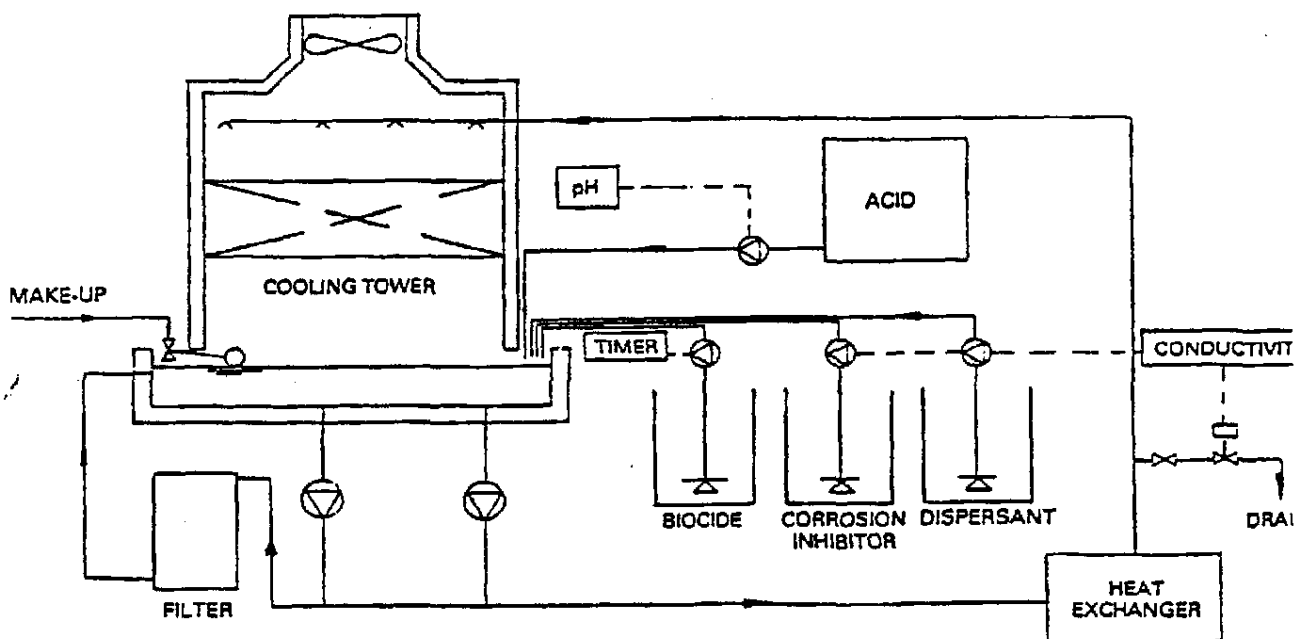
Chlorine and organic based biocides are added to the circulating water in slug doses to oxidise the organic matter and to sterilise living organisms. Chlorine based biocides such as gaseous chlorine, sodium hypochlorite and chlorine dioxide are very effective, but have short system lives as the residual chlorine is stripped from the water as it passes through the cooling tower. It is usually added at a rate of 1 to 5 ppm over a 30 minute period on a daily basis.

Organic biocides are available from water treatment chemical suppliers containing blends of active compounds and dispersants, being non volatile, extended contact periods are possible so exercising control in stagnant areas where chlorine would not have the opportunity to penetrate. Organic biocides are usually added in slug doses on a weekly basis often in association with daily chlorination. The dispersants present in the solutions help detach dead cellular material from the heat transfer surfaces and keep them in suspension for discharge from the system in the blow down.

The effectiveness of the biological control programme can be established through regular counts of micro biological population within the system with biocide dosage the rates being adjusted to maintain acceptable counts. These can be backed up by annual selective counts for *Legionella pneumophila*, the absence of the bacteria is not necessarily confirmed by a low count of the total population.

Silt deposits can build up very rapidly in water cooling systems where untreated river water is used as the make-up source or where there is a dusty environment. The basin of the cooling tower, distribution troughs and stagnant areas in process plants allow suspended solids to settle, so creating a suitable breeding environment for *Legionella pneumophila*. To minimise the effects of silt deposits dispersants can be added to the water to keep them in suspension or side stream filtration facilities can be provided to remove solids from the circulating water. The level of silt deposits in the cooling tower basin and cooling tower internals should be checked at least on an annual basis and arrangements made for cleaning.

The process line diagram shows a typical cooling water treatment system, which would effectively control the use of water and treatment chemicals associated with a medium to large scale cooling tower in a hard water area. When operated in a competent manner the system would ensure that all reasonable steps had been taken to prevent the development of *Legionella pneumophila* and the spread of Legionnaires disease.



TYPICAL ARRANGEMENT OF DAVENPORT SCHEME

PETROLEUM COKE DUST

AP00036681

Memorandum

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**AIR
PRODUCTS**

To: D. S. Zuck Dept.: IGD Specialty Gas - Long Beach
From: E. C. Crossland Dept./Ext.: IGD Technical Affairs/5589
Date: 9 July 1985
Subject: Long Beach Industrial Hygiene Survey

cc: E. H. Alkire (without attachment) N. R. John
J. A. DeSanto R. J. Lomicky
K. A. Eaton R. D. Wood (without attachment)

In response to the safety review conducted by R. Flaska on 5 March 1985, which noted potential worker exposures to emissions from neighboring plants, an industrial hygiene survey has been requested by IGD Technical Affairs. The results of this survey conducted by the Corporate Medical Department are attached. There were no exposure levels found above any regulated occupational exposure standards. However, Corporate Medical's report makes several suggestions which would reduce the potential for health impact from these releases. 

Below is a summary of the suggestions which can and should be implemented by you immediately on a local level. It is my understanding based on our recent conversation that most of these items have already been initiated. The suggestions include:

- Providing self-contained breathing apparatus (2 units) along the north fenceline for use as necessary.
- Supplementing the site's emergency procedures to include responses to H₂S releases.
- Providing dust masks (3M-8710 or equivalent) to employees working outdoors for extended periods of time or during excessively dusty periods.
- Discontinue sweeping of coke dust-contaminated areas and replace with wet or dry vacuuming procedures.

J. A. DeSanto will develop cost estimates for the recommendations requiring capital improvements. These are the installation of a multiple point H₂S monitor/alarm and the enclosure of the specialty gas building.

The periodic employee physical examinations and followup air monitoring also suggested in Corporate Medical's report will be initiated by Corporate Medical and Technical Affairs. If you should have any questions or are in need of any assistance in this matter, please do not hesitate to contact me at Extension 5589.

ECC/cn
Attachment

*Gene***AP00036682**

Memorandum

AIR
PRODUCTS

To: E. H. Alkire
From: R. D. Wood
Date: 26 June 1985
Subject: Industrial Hygiene Survey Long Beach, Specialty Gas

Dept: Technical Affairs
Dept. Ext.: Corporate Medical

cc: E. C. Crossland

Attached are the results of the industrial hygiene survey conducted April 15-17, 1985 at the Long Beach, California, Specialty Gas facility. The following comments are based on observations and measurements made during the survey. If you have any questions, please feel free to call.

Summary

1. Hydrogen Sulfide (H₂S)

A potential H₂S hazard exists for all Long Beach site personnel. The primary source of H₂S emissions is the sulfur extraction plant on the north side of the APCI site.

A multiple-point continuous H₂S monitor and alarm system should be installed. Employees working near the north fence line should have access to SCBA escape packs and site emergency procedures should be written.

2. Petroleum Coke Dust

Air monitoring was conducted both inside and outside the Spec Gas building. Analysis of the samples indicated elevated total particulate concentrations and the presence of polynuclear aromatics (PNA's).

The Spec Gas building should be enclosed to the greatest extent feasible.

A ventilation system having proper filtration capabilities should be installed in the building.

Employees working outside the building for extended periods of time should wear respirators.

Work areas should be vacuumed to minimize airborne dust generation caused by housekeeping activities.

AP00036683

Page Two

Periodic physical examinations should be offered to site personnel and periodic exposure monitoring should be conducted.

3. Arsine

Arsine exposure monitoring was conducted during the disposal of arsine through the dopant scrubber. Both personal and area arsine concentrations were well within acceptable limits.

Provisions should be made for securing dopant cylinders to the rack during the unloading procedure.

RDW:bmw
Att.

AP00036684