Legionella considerations for RUL's proposed acid plant

Operationally, the development of the proposed new acid plant by RUL needs to consider an unlikely but nonetheless important occupational health and safety issue which may arise. There have been a number of documented cases world wide of *Legionella*, a gram negative bacteria, being associated with cooling towers (or chemical industrial cooling systems) and air scrubbing mechanisms[1]. Both components, in different manifestations, are integral parts of the proposed new sulphuric acid production plant at RUL. [Note: preliminary discussions with the acid plant team have indicated that the design does not contain any scrubbers, but the principle is important here and not specific technology. Any pollution abatement technology where water and water containing aerosols are likely to accumulate, linger & be discharged may be problematic].

The *Legionella* bacterium includes the species (*L. pneumophila*) that causes Legionnaires' disease and is distributed via aerosols (the inhalation of mist droplets containing the bacteria). Person to person transmission of Legionella has not been demonstrated[3]. The potential for the development and distribution of this bacterium and the manifestation of the *L pneumophilia* species (causing Legionnaires' disease) in the cooling and "scrubbing" components of the RUL acid plant are the most important aspects to consider in the context of this EIA.

Secondarily, the occurrence and distribution of the bacterium via air conditioning systems at RUL, both existing and those proposed for the plant, must also be considered and obviated – this must be done as part of RULs ongoing operational health and safety management. It could be axiomatically argued that the probability of bacterium proliferation and inhalation will be doubled at the new acid plant because of the presence of the specific industrial components and the high (expected) use of air conditioning equipment. RUL's new acid plant's planned position is within the boundaries of the existing RUL operation. Its situation within the dry and arid environment will be beneficial in terms of the chances for proliferation of the organism to lessened with high evaporative rates favouring the neutralisation of the organism (should it occur).

It must be emphasised that the chances of this bacterium becoming problematic at RUL are low (other species of the genus are often present in water sources but these are not associated with disease epidemiology) especially given the fact that the plant will be built from new using best practice technology and that potentially problematic surfaces (such as heat exchange surfaces) will be designed to ensure non-favourable conditions for *Legionella spp* proliferation. However, a precautionary principle approach should be applied at RUL with respect to the operation of the new acid plant - particularly in the light of two important aspects of *L. pneumophila's* pathogenesis and epidemiology.

- Immuno-compromised individuals (such as those infected by HIV) are most at risk from Legionnaires' disease and it is in these conditions that the disease, if contracted, may be fatal[5]. RUL's workforce assigned to the acid plant and the organisation's workforce health programme must consider this when the plant starts up and becomes operational (see later discussions).

- As the bacterium is most potent when it is airborne, the movement of discharged aerosols from cooling towers and scrubbing stacks are important to consider. *Legionella* can travel distances in excess[4] of 6km and if specific wind conditions predominate, the nearby community of Arendis could be at risk if there was to be an outbreak. Individuals with low levels of immunity such as the elderly and those with compromised immune systems would be most at risk. This potential scenario should be identified as a clear risk for RUL and the management of both workforce and community health, albeit with a low to very low probability.

General recommendations around minimising the proliferation of *L. pneumophila* and associated risk of Legionaires' disease include:

- Minimizing water stagnation. This will be done as a matter of course at RUL because of water scarcity and efficient use of water in the acid plant will be a key design criteria

- Minimizing process leaks into the cooling system that may provide nutrients for bacteria development

- Maintaining overall system cleanliness is important. This will minimize the buildup of sediments that coiuld harbour or provide nutrients for bacteria and other organisms.

- Applying scale and corrosion inhibitors as appropriate and in terms of BATNEEC principles

- Use high-efficiency mist eliminators on cooling towers and emission stacks.

- Control of the overall microbiological population. This could be done by regular disinfection of appropriate components of the plant (either by use of halogenisation (chlorine), ozone or ionisation (see below))

Conflating the above considerations and the realistic Legionella risk described above, it is important to consider specific occupational interventions which can be targeted at the workforce – arguably the most sensitive receptor group in terms of Legionella contamination:

Personnel Protective Equipment

All staff in the acid plant should wear PPE as appropriate, specifically dust masks or respirators to minimise the risk of inhalation of contaminated droplets.

Medical Consideration

Work prioritisation should occur within the acid plant. Individuals who have cancer, smoke or are otherwise medically compromised will be most at risk. Individuals with chronic allergies and those that have a cold or flu (or are recovering) will also be at

risk. Some sort of protocol should be developed to consider this and factor it into the operation of the plant.

Start up/Shut down procedures

These periods of plant operation should parallel appropriate guidelines which consider topics such as drainage, decontamination and maintenance geared to obviating Legionella risk (http://www.ashrae.org/).

Longer Term Monitoring

It is recommended that monitoring for bacteria development and proliferation take place once a year (initially, after start up, samples should be taken after the first 3-6 months of operation). If bacteria development is deemed problematic (i.e there is a risk for infection and/or distribution of *L pneumophila*) simple long term treatments are available that do not require high maintenance. An example is the use of ion technologies where a small device with copper and/or silver anodes distributes small amounts of the metal – toxic to most of the *Legionella spp.* – into the appropriate water or water accumulation zones.

1. http://www.legionella.org/
2. ^ Swanson M, Hammer B (2000). "Legionella pneumophila pathogesesis: a fateful journey from amoebae to macrophages". *Annu Rev Microbiol* **54**: 567-613. PMID 11018138.
3. ^ Winn, W.C. Jr. (1996). *Legionella (In: Baron's Medical Microbiology, Baron, S. et al, eds.*, 4th Edition, University of Texas Medical Branch. ISBN 0-9631172-1-1.
4. Nguyen T, Ilef D, Jarraud S, Rouil L, Campese C, Che D, Haeghebaert S, Ganiayre F, Marcel F, Etienne J, Desenclos J (2006). "A community-wide outbreak of legionnaires disease linked to industrial cooling towers--how far can contaminated aerosols spread?". *J Infect Dis* **193** (1): 102-11. PMID 16323138.
5. Cooling Technology Institute (2000). *Legionellosis guideline: Best practices for control of Legionella*, CTI, USA.