

Aging Aircraft & Sustainability Conference
Thursday, 20th July 2017



**Aircraft Airworthiness
& Sustainment Conference**



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Water Quality

How it impacts on Airframe and Engine washing

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Topics

Water testing/sampling primer

Water Quality and Airframes

Water Quality and Engine Washing

Water Quality and OHS





Before we begin:

A glossary of common terms used in
water science

Abbreviations will be used during this
presentation





- pH = measure of acidity or alkalinity
- EC = Electrical Conductivity
- TDS = Total Dissolved Solids
- TSS = Total Suspended Solids
- TA = Total Alkalinity
- TH = Total Hardness
- CH = Calcium Hardness





LSI = Langeleir Saturation Index

BOD = Biological Oxygen Demand

COD = Chemical Oxygen Demand

HPC = Heterotrophic Plate Count

HCC = Heterotrophic Colony Count

CFU = Colony Forming Units





Bion Systems Water Parameter Requirements for Aircraft Washing. ASWW (Aircraft Standard Wash Water)

These parameters are based on a number of different standards to give a “best practise” scenario for the purposes of aircraft washing. The table takes into account military practises, aircraft manufacturers requirements, individual airframe requirements and OH&S demands.





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Parameter	Limits
pH	7.5 ± 0.1
Temperature	25°C – 30°C
Total Dissolved Solids (TDS)	< 500 mg/l
Total Suspended Solids (TSS)	< 5 mg/l
Chlorides	< 40 mg/l
Sulphate as SO ₄	<0.1 mg/l
Iron (as Fe)	<0.2 mg/l
Manganese	<0.2 mg/l
Total Hardness (CaCO ₃)	140 mg/l ± 5 mg/l
Total Alkalinity (CaCO ₃)	190 mg/l ± 10 mg/l
Biological Oxygen Demand (BOD)	< 3 mg/l
Chemical Oxygen Demand (COD)	< 3 mg/l
Total Petroleum Hydrocarbon (TPH)	< 5 mg/l
Langelier Saturation Index (LSI)	0.0 <-> +0.75





LSI – Langelier saturation Index

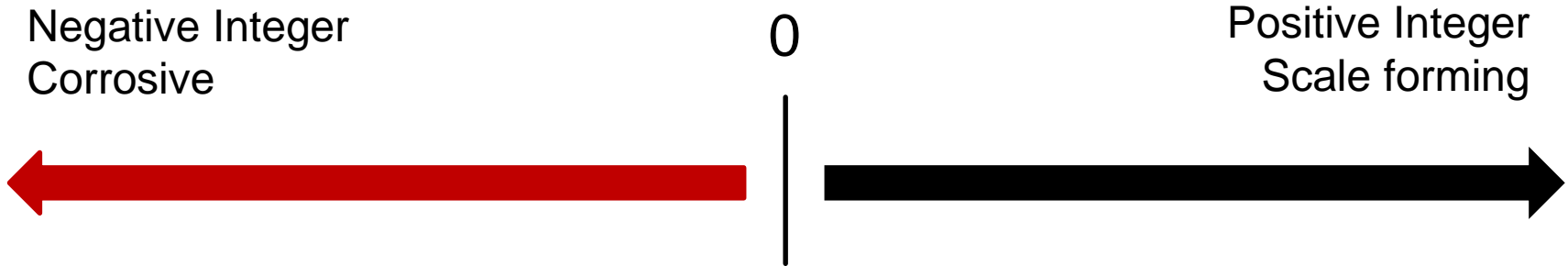
One of the most important tools in water chemistry

The measure of the corrosivity of water





LSI – Langelier saturation Index





LSI	Indication
LSI<0	Water is undersaturated with respect to calcium carbonate. Undersaturated water will scavenge metal ions from surfaces it comes in contact with.
LSI=0	Water is considered to be neutral. Neither scale-forming nor scale removing.
LSI>0	Water is supersaturated with respect to calcium carbonate (CaCO ₃) and scale forming will occur.

LSI	Indication
-2,0<-0,5	Serious corrosion
-0,5<0	Possible slight corrosion but non-scale forming
LSI = 0,0	Balanced but pitting corrosion possible
0,0<0,5	Slightly scale forming, corrosion possible
0,5<2	Scale forming but non corrosive





Corrosion is also caused by contaminants in the water

- Chlorides
- Sulphates
- Iron
- Bacteria





Summarising this section:

- Soft metals (aluminium, magnesium) are susceptible to corrosion by unbalanced water
- Soft metals are also susceptible to corrosion by materials suspended in the water. Eg: Chlorides, sulphates





Engine washing/rinsing

- The issues are usually the opposite to airframe washing.
- Meaning: Scaling on the inside of the engine is more likely than corrosion.

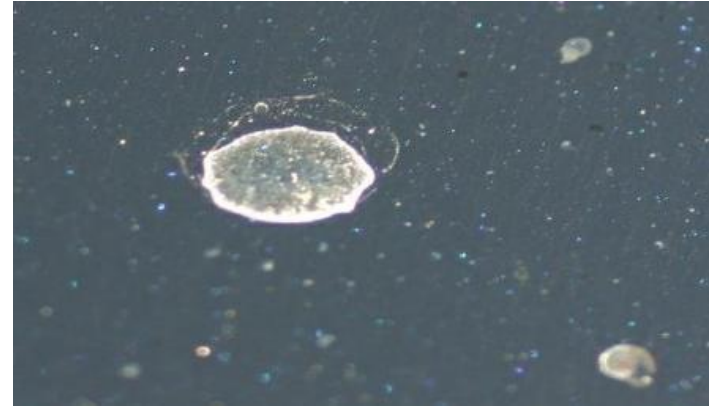




Deionised water should always be used for washing/rinsing turbines

Why?

Gives a better and more effective
rinse.



Spotting or calcium build up





OHS issues in regard to airframe and engine washing

An aircraft can be repaired easier than humans!

We are only looking at factors involving potable water.





Water chemistry is NOT an OHS issue with potable water

Microbiological activity is a **BIG** issue





Microorganisms of prime concern are:

➤ *Pseudomonas sp*

➤ *Legionella sp*





Why these organisms in particular?

- They are spread by aerosols
- They affect parts of the body that the aerosols contact





Why these organisms in particular?

These organisms attack

- The skin, eyes, ears
- Mucus membranes
- Respiratory tract





IMPORTANT!

- Pseudomonas also attacks the eyes, ears and skin through direct contact.
- Is identified in 25-30% urinary tract infections





IMPORTANT!

- Whilst it is generally considered that both *Legionella* and *Pseudomonas* attack immunosuppressed or otherwise unwell persons, both organisms DO attack healthy people.
- People who smoke, drink alcohol, take medication, recreational drug users, under stress are more susceptible.





Legionella sp

- General awareness of the organism
- Causes Legionnaires Disease, Pontiac Fever, non-specific flu, pneumonia like symptoms

Also has symptoms of:

- Headaches Night sweats Joint pain Nausea Vomiting
Diarrhea Cough - usually with blood Tiredness
Lack of concentration Altered Mental State





Pseudomonas sp

The dark horse.

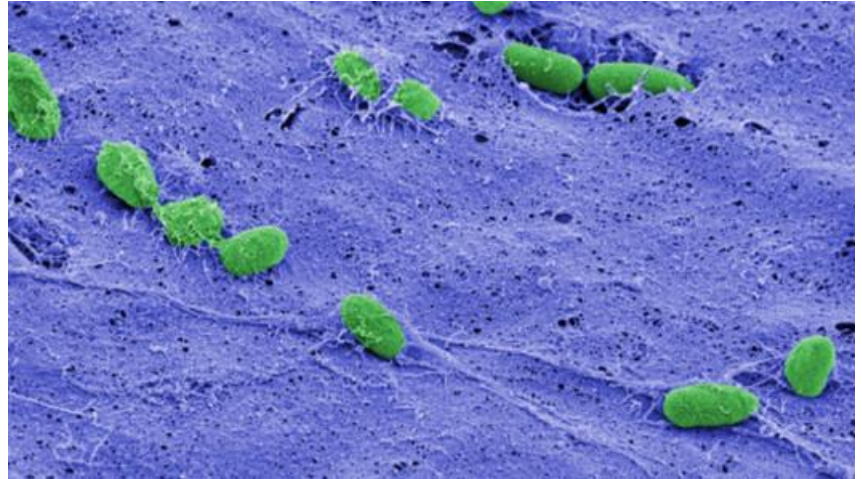
Often gets away without being recognised as the culprit.





Pseudomonas sp

- Swimmers ear
- Urinary Tract infections
- Eye infections
- Skin rashes/ulcers
- Blood infection
- Bone/joint infections
- Heart valve infection



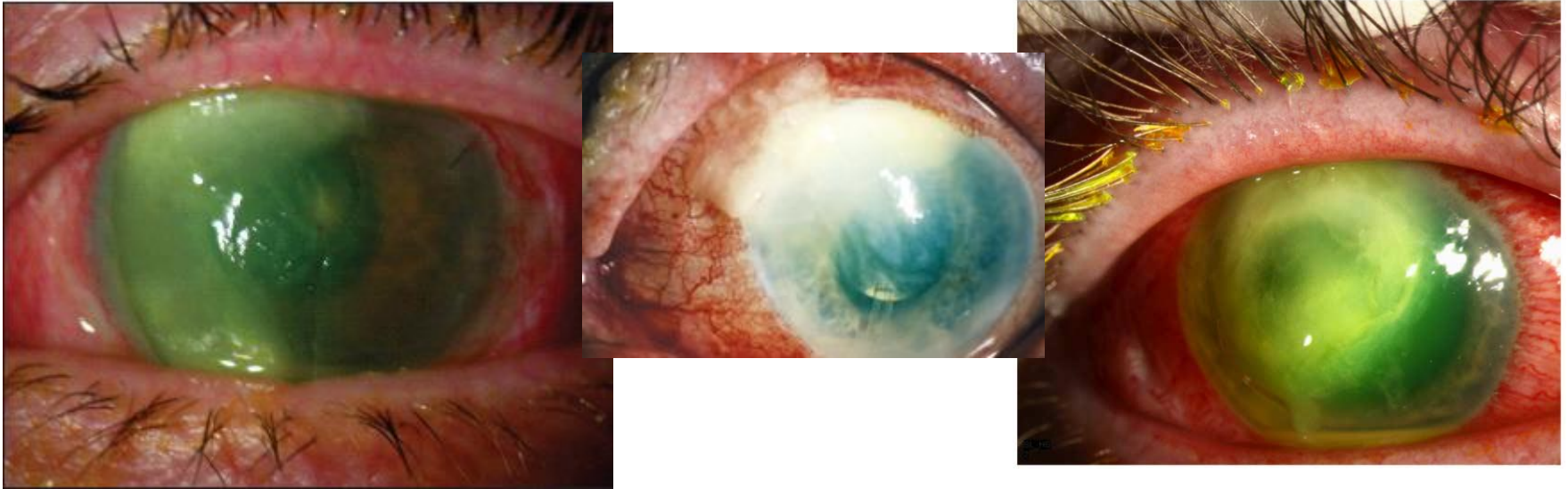


Commonly recognised Pseudomonas infections





Less commonly acknowledged Pseudomonas infections





Less commonly acknowledged Pseudomonas infections





Less commonly acknowledged Pseudomonas infections





In Closing

- **Pseudomonas and Legionella exist within water supplies connected to aircraft wash bays**
- **These organisms can be transmitted over long distances (Legionella has been detected 6+ kms from the source. Think: it will get over the fence, into public contact)**
- **Inevitable that persons will to come into contact with these organisms**





In Closing

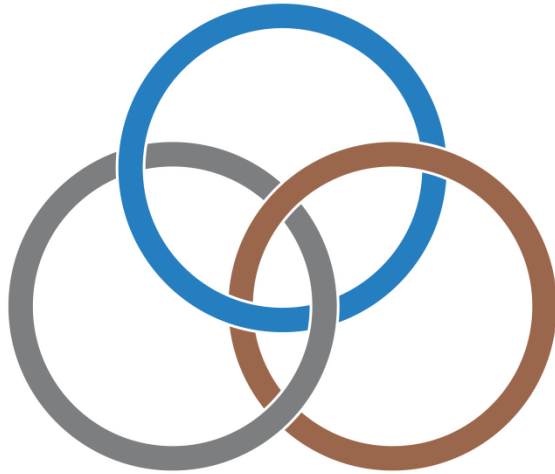
- **Emergency Showers and Eye wash stations are heavily infested with these microorganisms**
- **These facilities are used often when there is tissue damage and stress to the individual.**
- **Chances of a serious infection from an emergency wash station would be 99%**



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**Any
Questions?**

