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EFFECT OF TEMPERATURE ON THE RATE OF KILL OF ANTI-MICROBIALS FOR AVIATION FUEL

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Microbial contamination is a sporadic but costly problem in the distribution and use of distillate fuels. Where good housekeeping practices, primarily the control of the ingress and accumulation of water, fail to prevent microbial growth, treatment with anti-microbial chemicals (biocides) is usually prescribed. Where excessive growth occurs, treatment may need to be preceded by tank and system cleaning. The downtime required for treatment of aircraft fuel tanks has a serious logistical and economical impact on operations. Even without tank cleaning, biocide treatment may result in 1 – 4 days of aircraft downtime on account the prolonged soak time required for biocides to be effective. It is known that the kill rate of biocides can be highly temperature dependent. Some biocides are only effective against microbes which are metabolically active because the microbe has to absorb and metabolize the anti-microbial agent in order to realize its killing potential. At temperatures below 4°C most microbes will not be metabolically active, although many will survive in an inactive state at far lower temperatures. Conventional biocide kinetics suggest that many biocides will cease to be effective below 4°C. For this reason biocide treatment procedures for aircraft now stipulate that flight time (when fuel tank temperature is likely to fall considerably below 0°C) should not be included in the prescribed biocide soak time. In the field, biocides are usually applied to aircraft while they stand on the apron, at temperatures which may vary considerably, reflecting the diverse range of climates that aircraft operate within. One might expect that a treatment applied in sub-tropical conditions would be considerably faster acting than a similar treatment applied outdoors in winter in Europe or North America. Application of biocide fuel treatments within the hangar is often not a practical proposition. The benefit of biocide use outdoors at temperatures approaching 0°C has been questioned. Surprisingly little is known about the kinetics and mode of action of many fuel biocides and, to our knowledge, the effect of temperature has never been thoroughly investigated.

This study aimed to establish the effect of temperature on the kill rate of 3 commercially available fuel biocides (two of which currently have approvals for aircraft use) and also di-ethylene glycol mono-methyl ether (DiEGME) which has been used and marketed as an anti-microbial agent for aviation fuels.