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The Effect of an Anti Burglar Device on Electronic Equipment

Danish Technological Institute, Environmental Division has evaluated the effect on electronic equipment when a fog producing liquid is released from an anti burglar device.

The evaluation is based on the chemical composition of the fog producing liquid and an analysis of the amount of condensate on exposed printed circuit boards followed by a microscopic investigation.

The fog producing liquid is a mixture of a propylene glycol and water. The effect of the anti burglar device is that the fog producing liquid is evaporated by rapid heating. Because of the high boiling point of the glycol, the vapour will condense very rapidly when cooled in the air just outside the exhaust of the device. Therefore an aerosol of tiny droplets is formed resulting in a very dense fog.

Corrosive Effect
The propylene glycol used has no corrosive effect to metals. The water from the fog producing liquid may result in surface corrosion on unprotected parts of iron and steel as any water in contact with iron and steel surfaces. The effect is very short because the water will evaporate rapidly. The propylene glycol is soluble in water, so it is possible to rinse exposed surfaces efficiently by wet cleaning after release of the anti burglar device.

If no rinsing of the surface is done, the glycol will evaporate in a few hours or days depending on how much fog producing liquid is released. The liquid will not leave any permanent residues on the surfaces.

Condensation of Fog Producing Liquid
The idea of the anti burglar device is that the alarm caused by an intrusion will result in the evaporation of a mixture of a propylene glycol and water. The boiling point of the glycol is about 230 °C and water 100 °C. Because of the high boiling point of

the glycol it will condensate very rapidly to tiny droplets forming an opaque "smoke". The tiny droplets will slowly settle mainly on horizontal surfaces.

Analysis of Fog Producing Liquid on Printed Circuit Boards
The analysis of the amount of fog producing liquids on electronic equipment is carried out by exposure of three ram modules in a test chamber of 36 m^3 with 60 seconds fog. The ram modules were kept in the chamber for 60 minutes without any air exchange. After 60 minutes exposure they were stored in tight plastic bags and analysed in the laboratory at Danish Technological Institute. The first module was analysed immediately after opening of the plastic bag and the two others were kept for evaporation in room temperature for 24 hours and 7 days respectively. The amount of propylene glycol on the individual module was analysed together with a similar module, which had not been exposed to the fog producing liquid.

The result of the analysis was that only the module analysed immediately after removal from the plastic bag had very small amounts of glycol on the surface. Only 0.3-mg propylene glycol was found on the module having a surface of 150 cm^2. After evaporation for 24 hours or 7 days no detectable amount of glycol was found on the printed circuit board. The detection limit of the liquid is 0.1-mg propylene glycol.

Microscopic Examination for Corrosive Effect
The module not exposed to the fog producing liquid, and the module stored for evaporation for 7 days were examined in a microscope for comparative investigation of corrosion or chemical attack on the surface of the printed circuit board. The microscopy was carried out using magnification from 10 to 25 times. The investigation showed no sign of corrosion or attack on the materials of the printed circuit boards neither on the components, the plastic material of the board or on metal surfaces of copper or solder.

Conclusion
The evaluation of the effect of the fog producing liquid on electronic equipment is that no condensed fog producing liquid is detectable on surfaces after 24 hours of evaporation and no visible attack or corrosion on the printed circuit board can be found. The printed circuit boards were exposed directly into the fog producing liquid. In practice the printed circuit boards are inside cabinets so the amount of condensate on the board will be lower than at the actual test.

Kind regards
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