## METAL CORROSION INSIDE WOODEN CONTAINERS – ACID WOODS

The corrosive agent emitted by the wood is acetic acid, and the metals most susceptible are those readily attacked by it. The following list shows the degree of susceptibility to attack:

*Group 1 – Severe attack* Cadmium, Carbon steels, Low alloy steels, Lead and lead alloys, Magnesium and its alloys, Zinc and Zinc alloys
*Group 2 – Moderate attack* Copper and its alloys (but see section 5 below)
*Group 3 – Very slight attack* Aluminium and its low strength alloys; slightly greater for Al-Cu and Al-Zn alloys, Nickel
*Group 4 – Insignificant attack* Austenitic stainless steel, Chromium, Gold, Molybdenum, Silver, Tin, Titanium and its alloys

EFFECT OF HUMIDITY

The table below gives typical results of the corrosion in an enclosed vessel of four metals by a 1% acetic acid solution dissolved in various solutions chosen to maintain the relative humidity within the vessel at the levels stated. The vessels were kept at 30$^{o}$ C.

| Metal | | Corrosion, g/dm$^2$, after 40 days | | |
|---|---|---|---|---|
| | 72% RH | 85% RH | 96% RH | 100% RH |
| Cadmium | 0.12 | 1.4 | 1.6 | Very large |
| Zinc | 0.12 | 0.75 | 1.05 | Large |
| Steel | Trace | 0.9 | Very large | Very large |
| Copper | Trace | Trace | 0.65 | 1.0 |

These figures show the influence of relative humidity on vapour corrosion by acetic acid. Even steel, which is particularly heavily attacked at high humidities, is attacked only very slowly at 72% RH (and below). It is interesting that this threshold figure is the same as for the corrosion of steel by the sulphur dioxide in an industrial atmosphere. Copper, on the other hand, has a threshold above 85% RH, and a not too high rate of corrosion at 96% and 100% RH, hence its classification as a Group 2 metal in section 4.1. Some other evidence puts the threshold for magnesium alloy at 63% RH.

Although no figures are available, it is a reasonable assumption that water promotes the formation of acetic acid in wood. It then follows that high humidity has a twofold effect, in that it both promotes the formation of acid and the subsequent corrosion by that acid.

The woods causing greatest acetic acid attack are listed in sheet 42b