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AmericanAirFilter

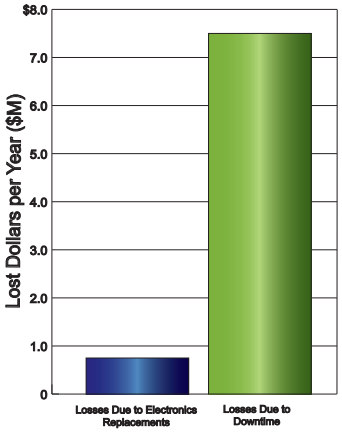
# SAAF™ TechNote:

## Effects of RoHS Compliant Electronics at Tire Manufacturers

Corrosion of electronics due to ambient air pollution has been documented for many years. Recent regulations have made once immune manufacturers, such as tire makers, susceptible to problems only seen at industrial sites such as pulp & paper mills, petrochemical refineries, and geothermal plants.

### *Cost of Downtime*

The cost of downtime is the most significant consequence of electronic equipment corrosion. In manufacturing arenas, corrosion of electronic control equipment can lead to shutdown of the process – lost production time. Some tire manufacturing facilities have estimated the losses due to replacing electronics at $750,000 per year and the losses due to manufacturing downtime to be ten times that amount.

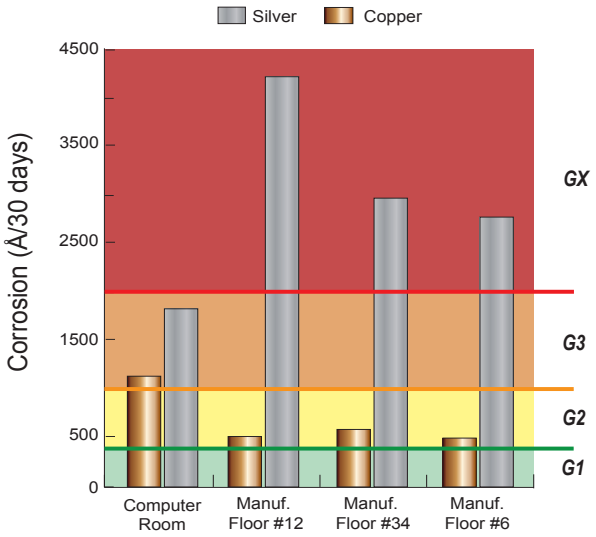



### *RoHS*

The requirements of the European Union Restriction of Hazardous Substances (RoHS) Directive restricts six substances – mercury, lead, hexavalent chromium, cadmium, polybrominated biphenyls, and polybrominated diphenyl ethers. Thus, the circuit board manufacturers had to remove lead based solder to comply with the directive. Immersion Silver (ImAg) was chosen by many manufacturers as the RoHS solution due to its ease of manufacturing and appealing costs. ImAg is more susceptible to gaseous corrosion than the former lead based solder.

### *How to Monitor for Corrosion*

Multiple companies have investigated environmental conditions at sites housing RoHS compliant circuit boards using copper and silver coupons. This type of monitoring is termed “reactivity monitoring.” Interestingly, the results show that corrosion of silver coupons significantly exceeds that of the copper coupons. For each set, the resulting silver corrosion is significantly higher than the copper corrosion. It is clear that silver coupons are serving as the indicator of corrosion and copper coupon corrosion rates alone do not indicate a safe environment.



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### Conclusion
Electronic control equipment complying with the European Union Restriction of Hazardous Substances Directive may fail quickly in industrial or mildly industrial environments due to gaseous corrosion. Industrial plants should use reactivity monitors to determine the air quality in control rooms and spaces. Control areas producing 300 angstroms or more per month on copper or silver coupons (or sensors) may incur costly failures and downtime if not protected from gaseous corrosion through methods such as gas-phase filtration.

*Figure 1*


*Figure 2*


*Above is an example of a new unexposed coupon (Fig. 1) compared to a coupon placed in a tire manufacturing plant (Fig. 2). The coupon placed at the tire manufacturer was exposed for 23 days and showed severe corrosion on silver (GX - 5,373 Å) while the copper coupon showed far less corrosion (G2 - 606 Å). The silver corrosion was largely caused by a sulfur contaminant.*

***Traditional Corrosion Control (ISA 71.04-1985)***
Protected Equipment: Non-RoHS compliant circuitry in control rooms, motor control centers, or other such areas.

| Class | Copper Å/ 30Days | Reliability Statement |
|---|---|---|
| G1 (Mild) | < 300 | Sufficiently controlled such that corrosion is not a factor |
| G2 (Moderate) | < 1000 | The effects of corrosion are measureable |
| G3 (Harsh) | < 2000 | There is a high probability that corrosive attack will occur |
| GX (Severe) | ≥ 2000 | Only specially designed and packaged equipment would be expected to survive |

***RoHS Compliant Corrosion Control (ISA 71.04-1985 Modified)***
Protected Equipment: RoHS compliant circuitry in control rooms, motor control centers, or other such areas.

| Class | Copper Å/ 30Days | Silver Å/ 30Days | Acceptability |
|---|---|---|---|
| G1 (Mild) | < 300 | < 300 | Acceptable |
| G2 (Moderate) | < 1000 | < 1000 | Not Acceptable - Corrosive Attack May Occur |
| G3 (Harsh) | < 2000 | < 2000 | |
| GX (Severe) | ≥ 2000 | ≥ 2000 | |

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