RoHS Compliance: THE END of Reliable Electronics?

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We replace most electronics not because they break or wear out, but because we want something:

- Smaller
- Faster
- Cheaper
- Lighter
- That runs the latest software
- That has more “bells & whistles”
Restriction on the Use of Certain Hazardous Substances in Electrical and Electronic Equipment (RoHS) Directive — Directive 2002/95/EC:

- Passed by the European Parliament in 2002
- Published in the Official Journal of the European Union on February 13, 2003
- Bans lead, mercury, cadmium, hexavalent chromium, polybrominated biphenyls (PBB’s), and polybrominated diphenyl ethers (PBDE’s) in electronics sold in Europe after July 1, 2006
- Hefty fines or jail terms for non-compliance
- Will cost $40,000,000,000 to $80,000,000,000
Lead:
- Affects the nervous system
- Can cause brain damage in infants and small children
Worldwide annual usage of lead is:

- 80% for batteries
- 5% for bullets
- 0.5% for electronic solders and platings
  (approximately 37 to 40% of typical electronic solder is lead.)
Over 45 different alloys have been investigated as lead-free electronic solders and platings:

- Sn(0.3-4.7)Ag(0.5-6)Cu (SAC) preferred for most Applications — Sn3.8Ag0.7Cu melts at 217°C
- Sn(0.7-3)Cu preferred for wave soldering — Sn0.7Cu melts at 227°C versus Sn37Pb melts at 183°C
Taking lead out of electronic solders and platings can lead to:

- Tin whiskers — short circuits
- Tin pest (tin plague, tin leprosy, tin disease) — open circuits
- Low-melting-point alloys (SnPbBi melts at 96°C) — solder joints that melt in normal use
- Electronics that can not be repaired (popcorning)
(page 5 of Galyon, George T., Plamer, Larry, "Tin Whisker Microstructural Analysis," IBM eSG.
http://thor.inemi.org/webdownload/newsroom/Galyon.pdf)
http://www.smartgroup.org/pdf/tinpest.pdf)
(Tin pest in tensile sample of lead-free solder
http://www.geocities.jp/jinyyy/Leadfree/Contents/Tinpest.htm)
My suggestions are:

- Do not buy any *new* electronics between January 2006 and July 2007
- Avoid “RoHS compliant” products if you can
- Get the longest Extended Warranty that you can for a “RoHS compliant” product, from a company that is big and rich enough that it is unlikely to go bankrupt during the warranty period
Resources: