

ADVANCES IN HANDHELD XRF DESIGNS AND CHALLENGES IN MEETING RoHS/WEEE DIRECTIVES

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The European Union has adopted the RoHS Directive due to health and environmental concerns originating from certain chemical substances common to consumer electronics manufacture and these products' subsequent end-of-life disposal. The directive has set maximum concentration values (MCV) for six substances, to be measured as weight % in homogeneous materials. Specific limits are 0.1% for lead (Pb), mercury (Hg), hexavalent chromium (Cr⁶⁺), polybrominated biphenyl (PBB), and polybrominated diphenyl ether (PBDE). A more stringent limit of 0.01% is applicable to cadmium (Cd). Following in the path of the EU, China and several US States have enacted their own version of restrictions on these same restricted substances and are contemplating restrictions on additional substances.

X-ray Fluorescence (XRF) technology is identified as a primary screening tool for nondestructive tests of compliance to the RoHS Directive. This has created a demand for XRF analyzers that can be efficiently utilized in electronics production environments. Handheld units, offering a great deal of mobility and flexibility, have immense potential. As a result, XRF manufacturers are offering RoHS solutions based on adapted XRF designs from previous applications or newly designed systems specific to RoHS compliance.

Desires to utilize XRF technology to meet all aspects of the RoHS Directive have produced a challenging set of expectations. Particular aspects include the inhomogeneous nature of most electrical components, assemblies of components (such as assembled printed circuit boards), correlating laboratory samples to actual components, and the statistical nature of acquiring XRF data. Some challenges result from unfamiliarity with fundamental XRF principles and others originate from a lack of a clear RoHS evaluation methodology. Technical solutions exist for some perceived problems, while others may require expectations to be adjusted to more realistically achievable levels.

Handheld XRF systems have become significantly more sophisticated and capable in recent years. The RoHS Directive has additionally provided an impetus in this development. This paper provides an overview of the challenges being experienced in the RoHS screening process, technical advances being made, and the desired future improvements.