



Background

EC Directive 2012/19 on waste electrical and electronic equipment (WEEE), indicates in Annex VII that mercury containing components such as switches or backlighting lamps, have to be removed from any separately collected WEEE. In addition to this, the Directive requires the mercury from gas discharge lamps be removed. The recycling of LCD panels poses a problem for electronic equipment recyclers as they have mercury containing components (such as the CCFL tubes providing backlight). Mercury is hazardous to health.

Mercury in LCDs

It is difficult to find precise data in relation to the amounts of mercury used in the backlights; research conducted on behalf of the European Commission found that a typical 32-inch LCD TV contains 45mg of mercury on average¹. A study run in 2011 resulted in a value of 1.33 to 2.63 mg of mercury per tube². In a different study (2010) it is mentioned that lamp manufacturers have declared an average amount of mercury per lamp as being 3.5 mg³, and the same study reports that both elemental mercury and compound mercury, bound to internal components, were found inside sampled CCFLs. Significant total amounts of mercury, up to 3.88mg per CCFL, were found.

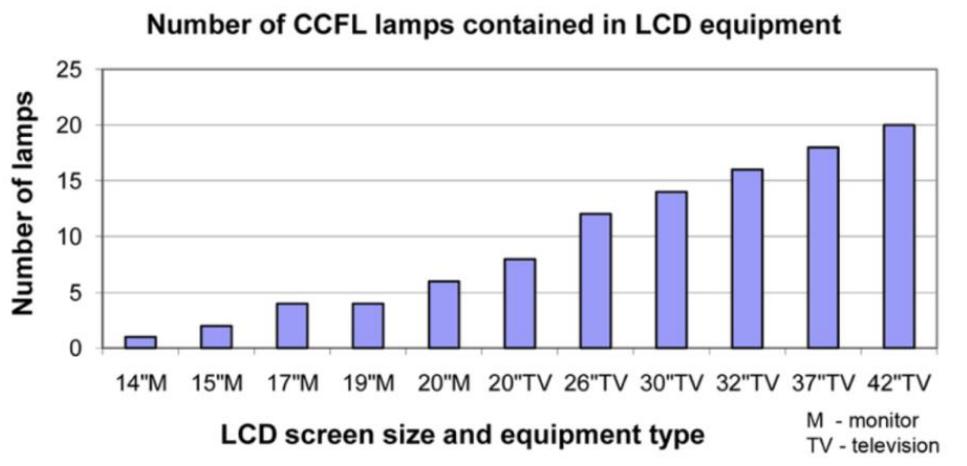


Figure 1. Number of CCFLs contained in LCDs by screen size and type (Source. WRAP©, 2010)

How are People Exposed?

LCD screens contain mercury within the CCFL backlights. Mercury is a heavy metal and its properties are a health concern to humans as it has toxic properties. When a lamp (contained within the LCD screen unit) is damaged it is possible for direct exposure to mercury vapour and mercury dust, which poses a high risk. The metal can vaporise at room temperature and employees who come into contact routinely are not always aware of the risks. It is easily absorbed through the lungs and can lead to severe respiratory tract damage with the symptoms of shortness of breath, muscle weakness, headache and fever. Ingestion can cause burning of the mouth, abdominal pain, vomiting and bloody diarrhoea. Skin contact with mercury may cause irritation and burning with symptoms of redness and pain. Contact with mercury may also result in skin sensitisation. Mercury eye contact may cause

¹ Demonstration of Flat Panel Display recycling technologies©. WRAP. 2010

² Disposal of Flat Panel Display Monitors in Switzerland. EMPA, SWICO Recycling. 2011

³ The location and character of mercury in waste LCD backlights©. WRAP. 2010



symptoms of redness, pain, blurred vision and in some cases permanent eye damage. It is for this reason that LCD screens have been classed as hazardous waste⁴.

Studies showed that manual disassembly of FPD screens to remove the backlights resulted in breakages of between 15% and 35%, putting the operative at risk of exposure to the mercury contained within⁵.

Occupational Limits

Indicative Occupational Exposure Limit Values (IOELV) are established by the Scientific Committee on Occupational Exposure Limits. IOELVs are health-based, non-binding values that determine threshold exposure levels below which exposure is not expected to lead to adverse effects. They have to be considered by the Member States when establishing their own national Occupational Exposure Limits⁶. Directive 2009/161/EU of 17 December 2009, establishes a value for a reference period of eight hours-time weighted average (TWA) for mercury:

“Mercury and divalent inorganic mercury compounds including mercuric oxide and mercuric chloride (measured as mercury) IOELV: 0.02 mg/m³ (milligrams per cubic metre of air at 20 °C and 101,3 KPa.) (...) During exposure monitoring for mercury and its divalent inorganic compounds, account should be taken of relevant biological monitoring techniques that complement the IOELV “

National legislation may apply further limits on blood and urine of workers as well as regular monitoring of such.

Protective Measures

A risk assessment determines the level of risk and suitable protective measures to be implemented at treatment facilities. Treatment operators shall observe and implement applicable treatment and health and safety legislation. In general, this includes the performance of a risk assessment and implementation of protective measures indicated by the risk assessment expert and legal requirements such as e.g.:

- Personal protective equipment for staff;
- staff training;
- monitoring of mercury exposure levels in the working areas and treatment output fractions;
- monitor staff through testing of blood and urine;
- have adequate mercury abatement systems in place;

More Information on ReVolV: <http://revolvproject.eu/>

Project coordinated by:



⁴ Collection and Handling of LCD screens©. WRAP.

⁵ Demonstration of Flat Panel Display recycling technologies©. WRAP.2010

⁶ https://oshwiki.eu/wiki/Occupational_exposure_limit_values

