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## **EVALUATION OF DIFFERENT STRATEGIES FOR END-OF-LIFE LIQUID CRYSTAL DISPLAYS (LCD) MANAGEMENT**

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### **Abstract**

End-of-life liquid crystal displays (LCD) represent a potential source of secondary raw materials for their relevant content of valuable materials, like plastics and metals. Furthermore, the combination of traditional and innovative recycling processes allows the recovery of indium, defined as critical raw material by European Commission. In this context, we have evaluated the environmental impacts of different management scenarios: incineration, the current recycling strategies and more innovative options addressed at indium recovery. Currently, end-of-life monitors are recycled through two different approaches: either manual dismantling, that allows the processing of homogeneous LCD flows, or mechanical treatment, where heterogeneous flows of monitor are processed, to guarantee the continuous operation of the high capacity plant. Such difference does not allow a direct comparison among the two current recycling approaches; however, the three scenarios (incineration vs. current recycling vs. innovative strategies) were assessed for each one of the two recycling approaches. The advantage of the materials recovery was confirmed in both the cases by a life cycle assessment, which showed a whole environmental credit in the range 60-130 kg CO<sub>2</sub>-equiv., mainly due to the avoided primary production of recovered fractions. Nevertheless, the low indium concentration and the impacts of its recovery make the innovative recycling disadvantageous, if compared to the traditional one. A metal upgrading in the panel, feasible through physical treatments, can overcome this criticality, in the case of manual dismantling. The present study confirmed the life cycle assessment as support tool for the definition of the best option of waste management.

*Key words:* End-of-life LCD, indium, life cycle assessment, management strategies, recycling

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