Industry comments on the JRC technical report:

Study for a method to assess the disassembly of electrical and electronic equipment

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The JRC study assesses disassembly time calculation methods for recycling. It also considers necessary characteristics for a standardised method to assess the ease of disassembly to then develop a calculation method and table for small electronic devices with a maximum weight of 4kg, which can be disassembled on a workbench.

While the assessment is based on end of life methods, the proposed methodology does not differentiate between recycling and repair. This is problematic in that, for disassembly for material recycling, time is critical whereas reversibility is not. For disassembly for repair, both reversibility and timing are critical.

Furthermore, we would question that a simple measure of overall disassembly time is sufficient to determine recyclability. Manual processing will also, for example, use cutting tools to dismantle products. There may be specific instances where screws are the focus, but not, for example for draining coolant gases from fridges, or removing phosphor coatings from inside CRTs. There are TVs taken apart very quickly using a circular saw.

For instance, a recent paper[1] based on research on 16 recycling plants in Portugal presents a mixed picture: Firstly, to increase the range of metals recovered from small WEEE, it advocates increased manual disassembly (by employing more workers not by making manual disassembly easier). Secondly, to increase recycling rate of these metals it advocates investment in mechanical processing (particularly for PCBs). Both manual and mechanical processing is required for effective WEEE recycling, and there is a limit to which manual disassembly is the optimal solution. Whether disassembly or manual treatment is needed depends upon the specific product and component, as well as the available post processing technology used for subsequent mechanical recovery.

Detailed comments

- Feasibility of the suggested method for small, portable and large electronic products has not been proven. The method has only been tested for comparably large computer displays,

1 Ford, P, Santos, E, et al (2016), Economics of End-of-Life Materials Recovery: A study of Small Appliances and Computer Devices in Portugal, in: Environmental Science & Technology, *50* (9), pp 4854–4862, http://pubs.acs.org/doi/abs/10.1021/acs.est.6b00237.

which are designed for a different use-case and therefor use different connections technologies than portable electronics. Therefore the methodology cannot be replicated to all types of product groups and be used as a basis of future horizontal discussions on standardisation/Ecodesign.

- Due to high size and reliability requirements, small & portable electronic products have to use joining technologies, including glue, which are not considered in the study. To cater for these we recommend to include all disassembly tasks (including wedge/pry and peel) mentioned in the Kroll method referenced in table 4 or add a statement that the method has not been tested for and might not be suitable for this product category.

- For reliability reasons it is essential that components within portable electronic products are connected without freedom of motion. We therefore recommend to amend the definition of fastener as follows:

  Connector/Fastener is a specialised component or part of a component used to mechanically ***or chemically*** *connect different components with* ***or without*** *a certain degree of freedom of motion.*

- **Time is a relevant parameter for recycling. For repair, other parameters are more important** (p.11): When a product is disassembled for repair, the recovered value is high so the disassembly time is less important (in terms of seconds) than in disassembly for recycling (where the recovered value is much lower). For disassembly for material recycling, time is critical, reversibility is not. For disassembly for repair, reversibility is critical. We strongly recommend considering to differentiate between disassembly for recycling and repair in the methodology.

- With regard to repair, data retrieved from a workbench situation cannot be transferred to real life (p 22): The service technician potentially has to work in a narrow space having an unergonomic stance in dim lighting. The idea of "slight variations in the basic motions" therefore is not applicable.

- **Practicability of the method** (p.37): The required documentation is extensive. We recommend making the methodology more practicable. We have concern on the statement "recyclers, repair centres and refurbishing operators gain a better insight into how to disassemble a product" (page 35), as we do believe that they do not. They would only get a theoretical value on how long it takes. Similarly, the assumption "or which key components are relevant for the market of reused or recyclable components", would not indicate to recyclers, repair centres and refurbishing operators, which are the key components. Moreover, their everyday practice is giving them more insights than theoretical values.

- **Allocation of time** (p.36): How is time allocated if a component is disassembled to get access to another component? E.g. the task is to remove the back cover, MLB and speaker of the product. It takes 10 s to remove the back cover, then 5 s to remove the MLB and 8 s to remove the speaker. Are the 10 s allocated to MLB and speaker equally? Is the eDim always for full disassembly? The methodology is currently very linear; it would however need better definitions and calculation rules for complex or partial disassembly.

- **Study relies on small electronic devices with a maximum weight of 4 kg** (pp.24 & 38): This method is not feasible for large products (production printer has > 6000 parts), which are typically produced at a low volume. Therefore, the scope should be clarified, i.e. for what type of product is this method (that aims to becoming a standard) appropriate? Currently the method is aimed at EEE (p.10).

- **Disassembly tasks** (p.23): The study presents six basic and relevant disassembly tasks of an average disassembly process: Tool change, identifying connectors, manipulation of the product, positioning, disconnection, removing. These tasks make sense and can be used in practice. However, when is something disassembled? What is the level of disassembly? The categories apply to each disassembly round. Do we need to go all the way to the component of a printed circuit board? Page 20 mentions disassembly for repair, refurbishing, component harvesting and recycling, these require different levels of dismantling. The level of disassembly should be differentiated, otherwise ease of disassembly cannot be compared between different products In addition, the definition of sub-assembly overlaps with that of a component (p.3). The PCB is given as example for a complex component but falls also under the definition of sub-assembly.

- **Suitable for setting up regulatory targets** (p.20): The method should give insights into the actual effort required to disassemble components in such a way that authorities can use the method both for verifying that a product design achieves a certain threshold and for rewarding "best-of-class" product designs. This study is meant to feed into the material efficiency standardisation, which is meant to support Ecodesign. Ecodesign is about market access by removing the worst performers. It is NOT about awarding best of class product design. The method should be used to remove the worst performers. The best performers are awarded by Ecolabels, etc. A more holistic approach is needed to award the best designs.
- Reference values (p. 38): A footnote or link referring to the publication of the reference values would have been appreciated.
- JRC studies (p.9): The chapter 1.3 lists JRC studies on material efficiency of products, without mentioning that they have been heavily criticised by industry. As an example, DIGITALEUROPE has been very critical in its comments on the study on enterprise servers (Talens, Pieró and Ardente, 2015) and has reiterated its comments in 2016. The chapter would really benefit from an examination of the comments from stakeholders. By no means it is acceptable to present the JRC studies as consensual research base to built on.

Conclusions

- The method may work best for end of life treatment, however, it is unrealistic that recyclers look at this parameter at all given the current recycling technologies and practices available.
- The standardisation request of EC is clearly distinguishing between repair and dismantling at EoL - so should the study. We would advise to not anticipate the outcomes of the standardisation work.
- Counting screws may be manageable for market surveillance authorities but does not deliver added value for any of the target groups.
- Complete disassembly cannot be the benchmark – if at all - a limited number of sub-assemblies may be addressed.

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