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DENMARK

Product passport as a tool for sustainable resource use

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Publication date:
2015

Product passport-A tool towards sustainable resource use

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The wind turbine industry is experiencing rapid growth. In 2014, the annual installation crossed the 50 GW mark for the first time as more than 51 GW was installed globally (Global Wind Energy Council, 2014). Wind turbines are designed to have a life time of 20 to 25 years. After this amount of time, the turbines are either repowered or decommissioned (Jensen, 2015).

Wind energy is in general perceived as a clean, environmentally conscious source of energy. The wind industry has interest in maintaining this image by minimizing the overall environmental impact of the wind turbines (Cherrington, et al., 2012) as well as bringing down the cost of energy (Kost, et al., 2013). With a weight of several hundred tons, the decommissioning of wind turbines includes numerous materials of different quality, complexity and value. Recent life cycle assessments (Siemens Wind Power, 2014) (Gamesa, 2015) show that the materials accounts for more than 75 percent of the total impact of the wind turbine, so closing the loop and conserving these materials is of key interest. At the end-of-use life cycle stage for a modern wind turbine, the average recyclability rate has been calculated to be 80% (by mass), excluding the foundations (Guezuraga, et al., 2012). This means that several tons of material does not enter the 'material loop' once again but instead is treated as waste either due to complexity of the material or lack of information.

Comparable and more mature industries like for instance the automotive, shipping and aviation industry have been facing similar challenges. The automotive industry is today regulated by the end-of-life-vehicles directive (Directive 2000/53/EC-a, 2000) and the shipping industry has adopted the Hong Kong Convention (International Maritime Organization, 2015) and the aircraft industry has created the Aircraft Fleet Recycling Association (AFRA) and launched the Process for Advanced Management of End of Life Aircraft (PAMELA) as instruments to increase the recycling quality and rates of the respective products.

This paper compares the development within the abovementioned industries with the wind turbine industry based on literature review and interviews to propose a 'product passport' as a tool to help increase the recycling rate of wind turbines at their end-of-life.

This paper further shows how the process of developing a product passport can increase internal knowledge regarding the products, as collaboration along the supply chain is of key concern. The product passport can increase the salvage value of the product, be used as an instrument for design changes to ease recyclability, be used to set requirements for recycled content in product design and be used to highlight the reusability of specific components of the product.

Keywords: Wind turbines, Recycling, Product passport, Closed material loop