

Potential for the circular economy in the deconstruction of wind turbines

The sustainable deconstruction of wind turbines is of great importance due to the growing of renewable energies and the limited availability of resources. Forecasts by the Ramboll Research Center show that the amount of waste from deconstruction will increase drastically in the coming years. A total of 5.5 million tons of waste concrete are forecast for 2038. Due to the large amounts, solutions must be found to address this issue. The sustainable non destructive deconstruction of wind turbines could be a solution. The aim of this study is to examine the nationwide distribution of the various types of tower construction in order to assess transportation and logistics aspects and to evaluate the potential for reusing reinforced concrete segments by means of material analyses. The findings will be used to measure economic factors and dependencies with regard to reuse potential.

The methodology includes material tests on wind turbines from the Teglingen and Lorup wind farms in Germany as well as a data analysis to document the distribution of the different tower construction types. Among other things, it was found that almost all of the towers examined achieved at least the original compressive strength class and in some cases even significantly exceeded it. In addition, very low carbonation depths and high concrete coverings result in very high depassivation times. The results of the site analysis show that reinforced concrete towers make up significant proportion of the wind turbines in operation (9.8 %) in terms of the amount of material used. The data analysis also showed that the distribution of different tower types corresponds to the overall distribution in Germany.

Further research, regarding economic and ecological aspects of the reuse and deconstruction of wind turbines will be conducted in order to develop sustainable, resource-saving strategies for the construction industry.

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