European Commission

Science for Environment Policy

Understanding aluminium scrap qualities can contribute to circular economy goals (Austria)

The potential of recycling aluminium scrap in Austria has been modelled in a new study. A surplus of mixed aluminium scrap is expected by 2045 if no advanced sorting technologies are applied. Increased demand for wrought aluminium alloys could mean this surplus occurs sooner. New methods to intensively sort aluminium could prevent this excess and contribute towards REACH[1] recycling and climate targets.

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Source: Buchner, H., Laner, D., Rechberger, H. & Fellner, J.(2017). Potential recycling constraints due to future supply and demand of wrought and cast Al scrap – A closed system perspective on Austria. *Resources, Conservation and Recycling*: 122: 135–142. DOI:10.1016/j.resconrec.2017.01.014

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Mining of primary metals can have serious impacts on the environment. Reusing secondary raw materials (especially metals) is, therefore, a priority in Europe. Metals are an important material for various industries and, in many cases, can be readily recycled; their comprehensive recycling and reintroduction into new lifecycles means they are essential aspects of resource efficiency and will help the EU in its efforts to move towards a circular economy.

Aluminium is a lightweight construction material used in industries such as transport and engineering, generally as an alloy. The alloy composition is important for the end use of aluminium as well as for the recycling of aluminium scrap. For example, cast alloys have been used more extensively within the transport sector whereas wrought alloys are used more frequently in buildings and infrastructure. In order to ensure optimal reuse of material a mixture between wrought and cast alloys during recycling should be avoided.

Material flows analysis (MFA) aims to quantify the flow and stocks of materials in complex systems. In this study, researchers used MFA to examine the aluminium available for recycling in Austria. The study covered the period 1964 to 2050 to see whether future aluminium scrap could satisfy demand. The researchers modelled a closed system in order to directly compare demand for aluminium with supply from the scrap market on a national scale, which is the ideal of a circular economy.

Demand was modelled for the six major sectors which use aluminium— transport, buildings and infrastructure, mechanical engineering, electrical engineering, consumer goods and packaging. Foreign trade and loss of stock (e.g. through inefficiencies in production and recycling) were also modelled to calculate the amount of scrap aluminium available for domestic recycling.

Future consumption of aluminium was modelled using a stock-driven approach for the transport, buildings and infrastructure and electrical engineering sectors. This approach considered aspects such as aluminium content within vehicles, size of houses and the expansion of the electrical grid. Currently scrap aluminium recycling in Austria only partly separates cast and aluminium alloys. The researchers therefore also modelled technologies that would increase the separation of cast and wrought alloys. In order to identify any potential limitations for future aluminium recycling, the researchers also considered aluminium quality through both historical and predicted data on wrought and cast alloy composition within different sectors.

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1. Regulation (EC) No 1907/2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH): http://ec.europa.eu/environment/chemicals/reach/reach_en.htm

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The results indicate that under current recycling practices there will be a surplus of mixed aluminium scrap by around 2045, meaning more mixed scrap will be generated than can be used domestically in Austria. If there is more intensive use of aluminium in the transport sector, then the surplus of mixed scrap is likely to occur around 2030. A more intensive use of aluminium in cars is likely to occur since aluminium is widely used as lightweight material (e.g. to reduce the weight of vehicles in order to reduce CO_2 emissions). Intensive sorting of aluminium from scrapped vehicles could prevent a surplus of mixed scrap, as improved methods of sorting aluminium scrap between wrought and cast alloys would allow for an improved recycling of aluminium scrap.

The researchers modelled a closed system to see if supply of scrap metal could satisfy demand in Austria. In reality, foreign trade of scrap metal has a key role to balance supply and demand of aluminium scrap in Austria. Scrap is largely imported from neighbouring countries, especially Germany (60% of total imports), which is also the main destination for scrap exports (almost 50%). On the one hand, this could be an outcome of close economic interaction between these two countries; on the other hand, it could also be an indicator that foreign trade is currently used to balance available scrap qualities.

The researchers say that current policy efforts to promote a circular economy do not always consider the material quality of metals, whereby material of superior alloy quality may be preferred from international sources. The quality of materials also becomes more important as recycling rates increase, in order to ensure all material can be used. The researchers say that the study demonstrates how understanding scrap usage on a regional scale is important for developing more resource-efficient systems.

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