

Circular economy in the ceramic industry

Position paper

With a new Circular Economy Action Plan adopted by the European Commission on 11 March 2020, the transition from a linear ‘produce, use, waste’ model to a circular model where resources and materials are reused, recycled or recovered has become a high priority on the European political agenda and a major element of the Green Deal. **The European ceramic industry, represented by Cerame-Unie, welcomes this Action Plan and highlights that circularity is one of the key drivers to achieve a carbon-neutral economy.** Cerame-Unie also underlines that this transition calls for new business models and encourages the development of innovative solutions in the industry. This position paper stresses how the ceramic industry contributes to the shift towards circular economy, through durability and resource efficiency of ceramic products (1) and ongoing research & innovation (2). However, the ceramic industry is still facing regulatory and technical obstacles (3) which hamper the uptake and development of circular practices.

1) Durability and resource efficiency of ceramic products

Resource efficiency is not only about ‘using less’, but about ‘using better’. Ceramic products and in particular ceramic construction products are resource efficient and have a high durability, requiring little or no maintenance. Studies show that a brick house can have an average life span of more than 150 years, as do clay pipes and buildings containing expanded clay. Research also show that clay pavers can have a lifetime of 125 years. Sanitaryware appliances and ceramic tiles for flooring and walls can have a life span of up to 50 years, which is very high in comparison to alternative materials. Cerame-Unie points out that **durability of products is a key factor for resource efficiency and circular economy.** Furthermore, it can only be appreciated with a **holistic approach** that takes into account the **complete life cycle of the product.**

Moreover, given the inert nature of fired clay, **ceramic products can be reused, recycled or recovered after the end-of-life stage**, meeting the concept of Cradle to Cradle. In this context, the ceramic industry has developed solutions with the aim of **minimising the raw material consumption and waste generation during the production process, and increased the reuse or recycling of products.** This has been done through the reuse of internal production residues (e. g. mass residues, dry broken ware, etc.), the reuse of waste from other industrial processes, the reuse of water used in the

manufacturing process, an optimized raw material selection or an optimisation of the product design, and supply chain cooperation in the case of recycling. However, it is important to note that the chemical transformation of clays to ceramics does not allow for a 100% closed loop recycling but rather provides a valuable input for an open loop one.

2) Research and innovation for materials efficiency

Research and Innovation in the ceramic industry has been deeply changing the manufacturing process and the use of raw materials, leading to an increased materials efficiency. These measures encompass the **saving of raw materials through innovative technologies and product developments, the substitution of primary raw materials with recycled materials, the direct internal reutilization or recycling of materials, as well as the substitution of conventional fuels.** In the last years, research has also been especially emphasized in the area of product design in several ceramic sectors. In this context, digitalisation also plays a key role. In the wall and floor tiles industry, some manufacturers have switched from rotary printing to digital printing: ceramic inks can be used instead of decorative pastes, so that only 20% of the raw material previously needed is used. Moreover, broken ware is minimised since the mechanical load on the tile is eliminated. Research on the future potential for the application of digital printing in the glazing process is performed. Advanced techniques also help to improve the mixture of raw materials: as an example, a recent project¹ aims at developing ceramic tiles made from over 70% recycled materials from urban and industrial wastes in substitution of natural raw materials. Research activities also focus on the optimisation of the drying and firing process of ceramic products which requires higher investments.

3) Regulatory and technical obstacles to circular practices in the industry

Although the ceramic industry is showing innovative solutions to add to the circular economy in Europe, regulatory and technical barriers still exist to scale up current initiatives or to start new ones.

Lack of a well-functioning European market for secondary raw materials

According to Eurostat, on average 12% of materials resources used in the European Union in 2016 came from recycled and recovered materials and saved extraction of primary raw materials. To significantly increase this percentage, **a well-functioning market or system for secondary raw materials is needed.** For the uptake of recycled ceramic aggregates, manufacturers need affordable prices and high-quality materials which are not contaminated with construction and demolition waste (e.g. mortar, plastic, gypsum) or with detrimental industrial process materials (e.g. slags and fluxes). Lack of trust in the quality and consistency of such materials is another obstacle. The **development of standards for**

¹ [Wincer](#) project co-funded by the Eco-Innovation Initiative of the European Union

secondary raw materials can be a step forward to improve their quality and traceability. In addition, due to the long lifespan of ceramic products and the fact that in some sectors over a third of the production is exported outside the European Union, the quantity of secondary material available after the end-of-life stage would anyway be globally insufficient. As a result, virgin material remains a requirement within the supply chain.

Different interpretations of end-of-waste and by-product status

The creation of a European market of secondary raw materials is also hampered by regulatory barriers related to end-of-waste and by-products status. Different **Member States have developed their own criteria with regard to by-products² and end-of-waste³ status**. As a consequence, a secondary raw material can have a certain value in one Member State and can be considered as waste in another. In some Member States, it is also difficult to recognise production residue that is not waste as a by-product, which would allow their use it in the industrial process. This ambiguity in current legislation involving waste and by-products creates a 'grey zone' which can lead to different interpretation between the manufacturers and local authorities. The use of waste derived from other industries as by-products, used as a raw material for further processing, which is considered as material recovery, is often not encouraged by local authorities. Companies have to start a long authorisation process to allow this waste to be transported and used in the production process. These different rules also lead to shipment issues of secondary raw materials across borders.

Collection and treatment of waste

Another regulatory obstacle faced by the industry is that waste may only be collected and treated if the company has the necessary permission by the competent authority in the respective country. In this respect, national regulations differ from each other. There are different competent authorities as well as different durations of proceedings which need to be considered. In addition, the proceedings differ in their complexity. **Harmonised procedures do not exist** which makes definition of processes and responsibilities difficult.

² According to article 5 of the Waste Framework Directive ([Directive 2008/98/EC](#)), a by-product is defined as a substance or object, resulting from a production process, the primary aim of which is not the production of that item only if the following conditions are met: further use of the substance or object is certain, the substance or object can be used directly without any further processing other than normal industrial practice, the substance or object is produced as an integral part of a production process, further use is lawful.

³ According to article 6 of the Waste Framework Directive, certain specified waste shall cease to be waste when it has undergone a recovery operation, including recycling, and complies with specific criteria.

Waste transport

Transport of waste between different Member States is a complex process and leads to administrative overburden. Transportation costs of end-of-life products and of secondary raw materials limit uptake and competitive advantage of recycling material. The material sources and the manufacturers are not always close to each other. Provisions to further harmonise the implementation of certain procedures and to reduce unnecessary regulatory and administrative burdens are welcome. Cerame-Unie calls on the European Commission to ensure the proper functioning of the European internal market for secondary raw materials. This will allow a smooth exchange of waste for reuse and recycling. Waste destined to valorisation must benefit from the principle of free movement of goods within the EU.

National legislations limiting the use of secondary raw materials

Some national legislations are limiting the use of secondary raw materials. As an example, Member States can determine limit values for eluates in recycled materials and industrial by-products. Because of the imposition of uniform limit values and the assessment of all industrial by-products and recycled materials on the basis of these limit values, many of these materials are excluded from further processing. **The European single market of secondary raw materials will not function properly if the limit values are not harmonised.** Optimum use of industrial by-products and recycled materials is made possible by taking account of the specific features of each material.

Chemicals legislation

Obstacles to the use of waste in the production process are linked to chemicals legislation. With more and more substances being classified as hazardous, **difficulties arise to use some residue or natural elements in the production process.** By way of example, Coal Tar Pitch, a residue produced during the production of coke, is used in the refractory industry for tap hole clay and slide gate plates. This substance, considered as hazardous, is subject to authorisation for use and as a consequence, the non-application for authorisation can result in heavy financial fines or legal punitive actions. ECHA is now challenging its use as an intermediate in slide gates plates while such a use eliminates it and generates significant environmental benefits for Steel Makers. A similar issue affects titanium dioxide (TiO₂), an element naturally present in the form of impurities in most of the mineral raw materials used in the manufacturing process of ceramic products. TiO₂ is also used as a raw material for the synthesis of coloured and white inorganic pigments for both industrial and consumer applications. Thus, the classification of TiO₂ as carcinogen will have a very negative impact on the ceramic industry. While it may continue to be used from a regulatory point of view, in practice we fear that its use will tend to diminish for consumer product applications (e.g tableware, sanitaryware, ceramic tiles). For the industry, this will lead to a significant disadvantage of European companies towards non-European competitors.

Need for an efficient system for collection, sorting and separation of waste

With regard to technical barriers, Cerame-Unie highlights the need for an efficient system for collection, sorting and separation of waste such as construction waste, dust and residues. By doing this, the quality and quantity of materials available for recycling will improve drastically. As an example, to reutilise residues of bricks from demolition works in our production processes, a good separation of the demolition fractions is essential, since high contents of sulphate or lime from other construction materials (e.g. cement) can make their reutilisation impossible. **Recycling is a relevant process for resource efficiency and thus should be properly addressed.**

Adaptation of technical requirements of installations

One of the main technical challenges to reuse and recycle ceramic products is the **adaptation of internal technical requirements of installations**. These requirements depend on the properties of the raw material used. To be able to reuse or recycle the final product, additional testing is required, necessitating further investments, sometimes at high costs, to improve the feeding and dosing equipment.

Thus, Cerame-Unie calls on the European Commission to lift regulatory inconsistencies in order to increase and further develop circular practices in the European industry. Cerame-Unie also highlights that creating such a recycling loop generates significant costs and will not happen at the required speed without proper incentives, similar to the ones implemented for renewable energy.

Key messages

- Clay, the basic component of many ceramic products, is a widely, endlessly available raw material.
- Ceramic products are resource efficient and stand out by their high durability thanks to their long lifespan.
- Ceramic products can be reused, recycled or recovered after their end-of-life.
- The ceramic industry has developed innovative solutions to minimise the raw material consumption, reduce waste of its production processes and increase the reuse and recycling of end-of-life products.
- The industry is still facing important regulatory barriers that hamper the development of the circular economy, such as various interpretations of end-of-waste and by-products status among Member States and the lack of a well-functioning European market for secondary raw materials.
- Technical barriers are also identified, such as the need for an efficient system for collection, sorting and separation of waste as well as the adaptation of technical requirements of installations.
- Creating such a recycling loop generates significant costs and will not happen at the required speed without proper incentives, similar to the ones implemented for renewable energy.

The European ceramic industry covers a wide range of products including bricks & roof tiles, clay pipes, wall & floor tiles, refractories, sanitaryware, table- & ornamental ware, technical ceramics. The industry generates over 200,000 direct jobs and a production value of €31 billion within the EU.

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