



Bodecker
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Consistently simple...

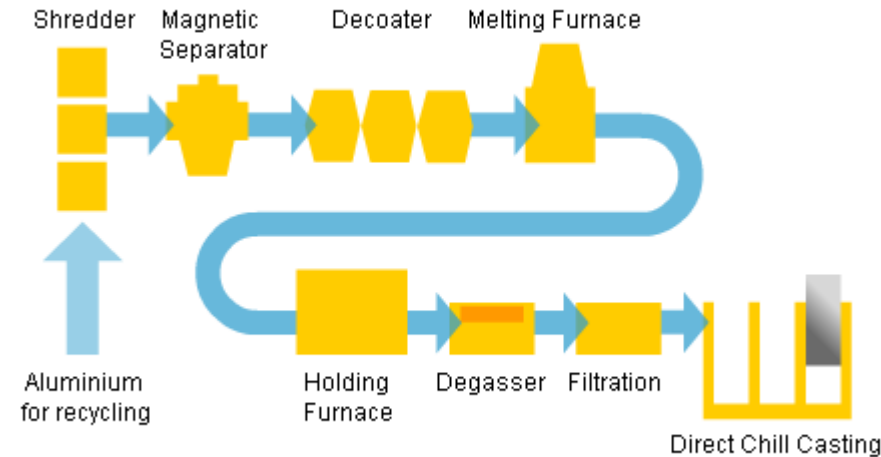
**CLOSING THE CYCLE:
THE ALUMINUM RECYCLING
PROCESS**

RECYCLING PROCESSES



- Aluminum has been recycled since the early twentieth century, and the process is considered part of the natural life-cycle of metal. The initial reasoning for recycling were commercial and environmental, since the 95% energy saving – (coupled with production of the metal through recycling) - is economically sound.
- With today's technology, aluminum and its alloys can be melted and re-casted indefinitely, producing metal with the same properties as primary aluminum. This is why recycled aluminum retains the highest value in the conventional recycle chain, which drives collection for further recycling. Virtually 100% of the scrap arising from the manufacture and production of aluminum products is recycled.

CLOSED-LOOP ALUMINUM RECYCLING



The industry recycles all the aluminum scrap it can obtain from end-of-life products and aluminum by-products. New scrap is collected almost in its entirety, as collection is in the hands of the aluminum industry. The collection of aluminum at end-of-life depends, however, on consumer initiative to collect aluminum for recycling, as well as the co-operation of industry, legislators and local communities to set up efficient collection systems.

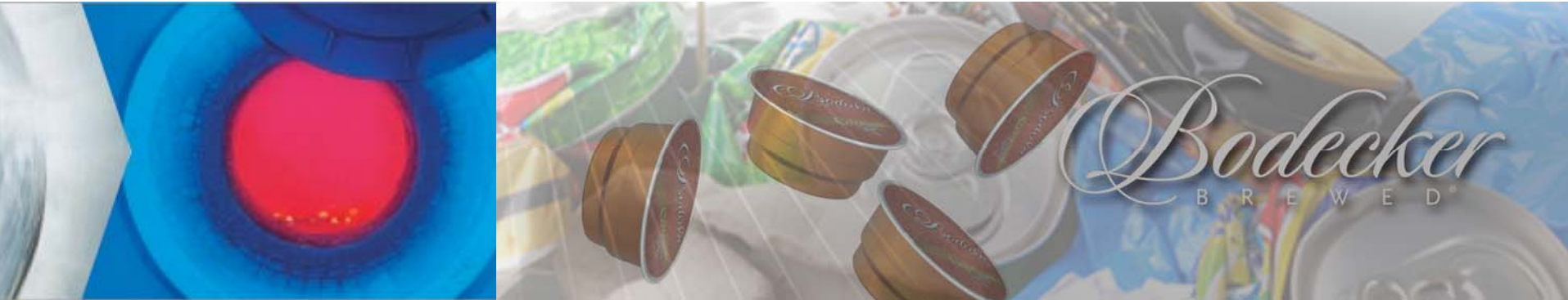
RECYCLING



The recycling of aluminum is a four stage process:

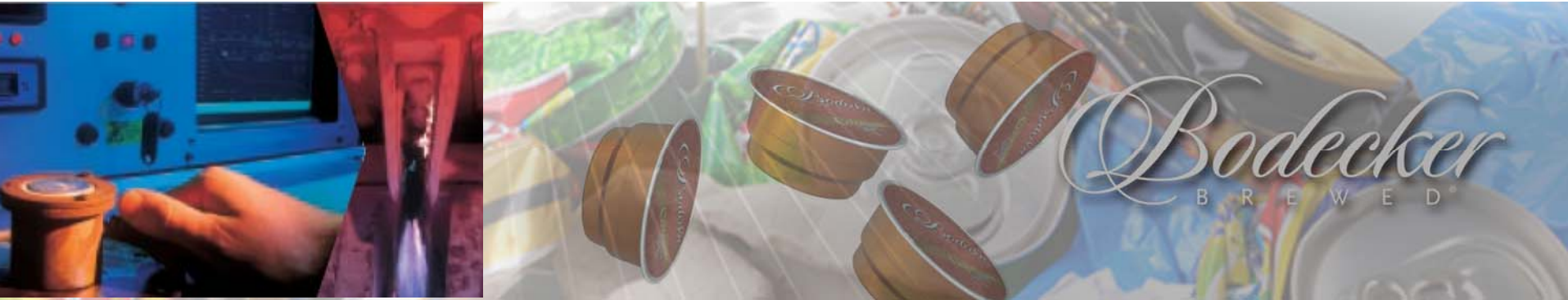
- 1. Shredding aluminum**
- 2. Decoating the lacquer on the aluminum**
- 3. Melting the aluminum**
- 4. Casting the ingots**

SHREDDING ALUMINUM



- Aluminum arrives either in bales or loose and flattened, and it's shredded into small particles in a 1000 horsepower shredder with a capacity of 15 tones per hour (based on recycling plants designed in 1990's). The shreds are then passed through a double magnetic drum separator to remove steel and other foreign materials (such as coffee), which are a contaminant to the process.

REMOVING FOREIGN MATERIALS FROM THE ALUMINUM



- Lacquer, coffee grounds and other foreign materials from the branded and decorated aluminum is removed by blowing hot air (around 500°C) through the shreds in a decoater, on a slowly-moving insulated conveyor. The hot exhaust from the de-coater is combusted in an after-burner, and the exhaust from the after-burner passes over a heat exchanger, which heats the fresh air going into the decoater. By recycling hot air in this way, the need for a separate fuel source for this part of the process is removed, maximizing energy efficiency.

MELTING THE ALUMINUM



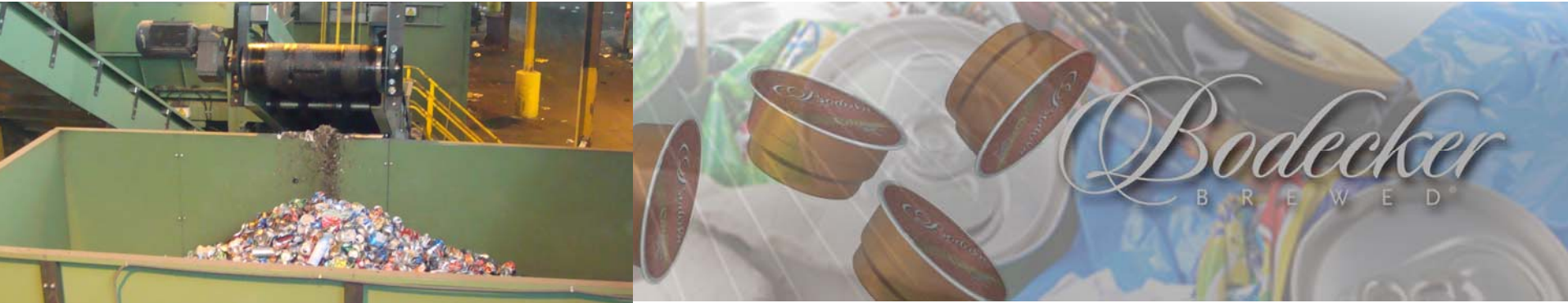
- The hot, shredded, decoated aluminum is fed into one of the two 90-tonne sidewall furnaces, which contain submerged stirrers that create a vortex in the pool of molten aluminum and drag the shreds quickly down into the melt. This process achieves rapid melting rates and high yields.
- The furnaces have state of the art regenerative burners and a burner management system to reduce the amount of energy used. The jet pump stirrers alternate between applying positive and negative pressures, blowing out and sucking in the metal to achieve rapid melt and even temperatures.
- Dross, which is a by-product of melting aluminum, is removed periodically from the furnaces, and cooled under a blanket of argon to prevent oxidation. This increases the amount of aluminum that can be recovered from the dross.
- The now-molten metal is transferred into the 90-tonne holding furnace, where accurate temperature control is achieved, the alloy composition is checked and the metal is treated to remove non-metallic particles before casting.

CASTING THE INGOTS



- Ingots are cast by tilting the holding furnace and pouring the molten metal - via a two-stage process to remove any remaining minute non-metallic particles and gases - into a vertical casting unit. Chemical composition and metal cleanliness are then tested on each cast.
- As the metal flows into the mould, it is chilled by jets of cool water being pumped around the mould, and a solidified outer shell is formed.
- The base of the mould begins to lower hydraulically, the metal continues to flow into the mould and the shell is now directly cooled by a secondary water curtain as the ingot grows to a length of up to 9m.
- The ingot solidifies gradually during the casting process, which takes approximately three hours. The ingots, are then shipped on to a mill for rolling into the sheet from which manufactures subsequently produce new products - and the whole process begins again.

HOW MUCH ENERGY IS SAVED BY ALUMINUM RECYCLING?



- The energy required to produce one tone of recycled aluminum ingots from **clean scrap can be as little as 5% of the energy needed to produce one tone of primary aluminum.** However, aluminum scrap is frequently mixed with other materials and additional energy may be required to separate the aluminum and protect the environment from the impact of these materials. Further energy needs relating to both the primary and recycled aluminum production chain are dependent on the technology applied and the geographical location, and therefore on local energy efficiency and transportation distances. Hence, it is not possible to calculate a universal value for energy savings.

WHAT HAPPENS TO THE RESIDUES GENERATED DURING THE RECYCLING PROCESS?



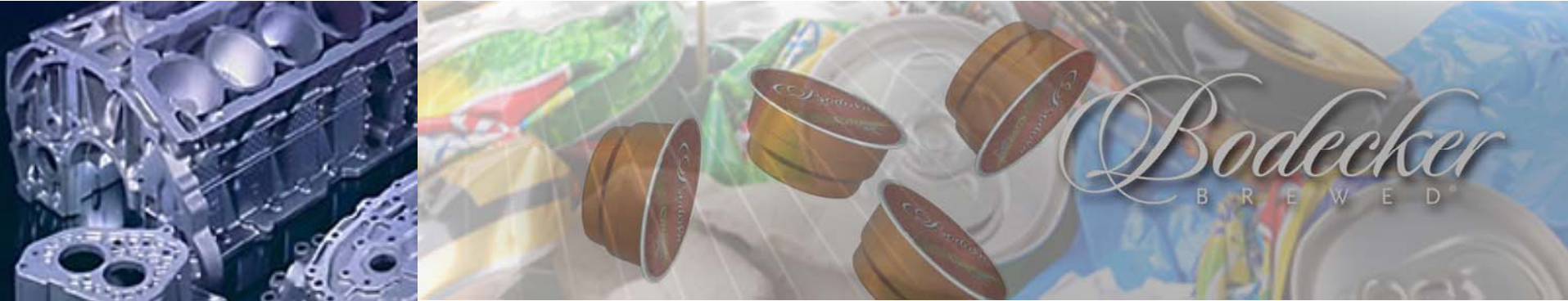
- Aluminum salt slag is a mixture of salts, aluminum oxide, metallic aluminum and impurities, extracted from aluminum scrap during melting. It is the typical residue left behind when aluminum scrap is melted in a rotary furnace. Rotary furnaces are commonly employed for aluminum scrap containing foreign materials. Depending on the kind of rotary furnace used and the type of scrap being melted, anything up to 500 kg of salt slag can be generated in the production of one tone of aluminum metal. Salt slag, which used to be land filled, is now recycled. The salt that is applied during melting can be completely recovered and used again for the same purpose by the refiner. The metallic aluminum is also recovered and utilized to produce aluminum alloys.

WHAT HAPPENS TO THE EMISSIONS GENERATED DURING PROCESS?



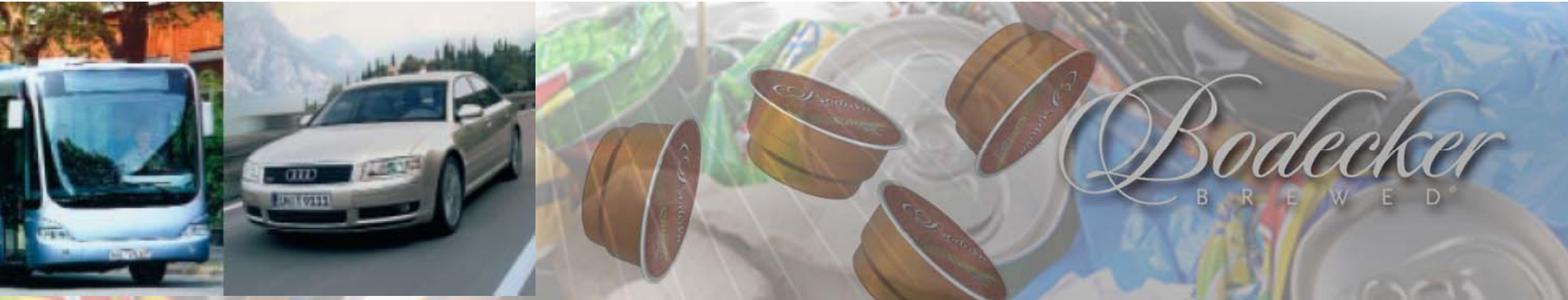
- The most significant emissions resulting from the aluminum recycling process are emissions released into the air. These include dust and smoke, metal compounds, organic materials, nitrogen oxides, sulphur dioxides and chlorides. State-of-the-art technology is used to extract fumes and other emissions and to reduce fugitive emissions. The limits for dioxin emissions are very strict, in the range of $<0.1 - 1 \text{ ng/Nm}^3$.
- North American and European refiners and remelters are equipped with state-of-the-art air filter equipment to clean exhaust gases of dust, acidic gases (HCl, HF, SO₂), volatile organic carbon, dioxins, and furans.

THE GLOBAL RECYCLING MESSAGES



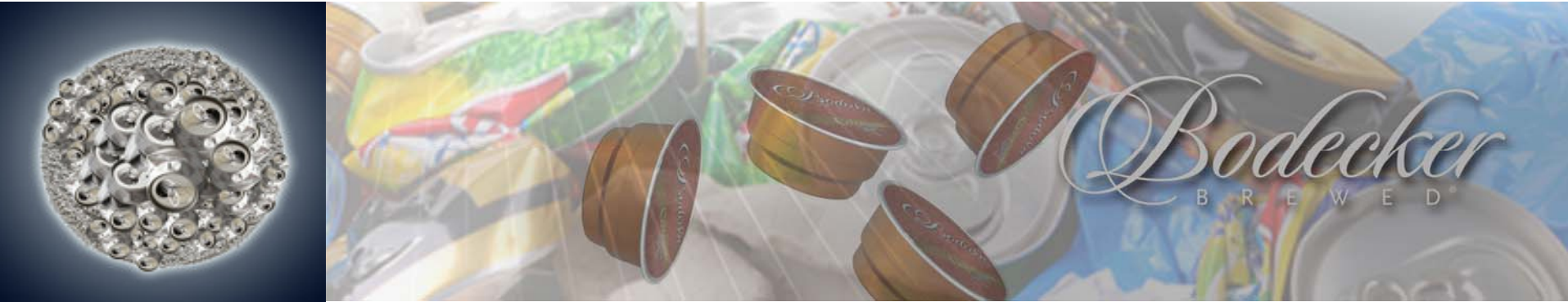
- Aluminum can be recycled over and over again without loss of properties. The high value of aluminum scrap is a key incentive and major economic impetus for recycling.
- Aluminum recycling benefits present and future generations by conserving energy and other natural resources. It saves up to 95% of the energy required for primary aluminum production, thereby avoiding corresponding emissions, including greenhouse gases.
- The growing markets for aluminum are supplied by both primary and recycled metal sources. Increasing demand for aluminum and the long lifetime of many products mean that, for the foreseeable future, the overall volume of primary metal produced from bauxite will continue to be substantially greater than the volume of available recycled metal.
- Industry continues to recycle, without subsidy do to the high value of used aluminum and production cost savins. However, with the help of appropriate authorities, local communities and society as a whole, the amount of aluminum collected could be increased further.
- Global aluminum recycling rates are high, approximately 90% for transport and construction applications and about 60% for beverage cans. Although recycling of flexible packaging presents a challenge, the unique barrier properties of aluminum foil are considered vital to the preservation of products (e.g. foodstuffs and medicines).

ALUMINUM TRACKING THROUGHOUT ITS LIFE CYCLE



- The aluminum industry, in collaboration with various universities, is currently designing a model to track aluminum throughout its life cycle from mining to use to recycling. More than 90 processes (including sub-processes) and 300 aluminum flows will be investigated. The main objective of the study is to quantify the aluminum collection rate, as well as the metal losses incurred during the treatment and melting of scrap. This will help the industry to understand more fully, and continue to improve, the diversity of processes required for recycled aluminum production. The model is not static but will be regularly updated to ensure that technological, market and legislative changes are incorporated as they arise. This represents yet another significant step by the aluminum industry in its drive for, and commitment to, continued progress.

THANK YOU FOR CHOOSING BODECKER



Bodecker is currently the only hot beverage cartridge made from a fully recyclable material...aluminum. We use a direct marketing program to minimize costs, these savings are passed on to our customer in the belief that you identify more with the environment than with a branded name.

The logic: save the planet.....save money

The result:

“Our products do not go to waste”

Bodecker – a product for socially conscious companies with a desire to save the environment.

