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Ministry of Science & Technology

## Cost-Effective & efficient technology for recycling Aluminium scraps developed



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A team of Scientists has developed a cost-effective technology to recycle aluminum scraps efficiently minimizing material losses in the process, which can be used by small and medium scale industries.

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Dr. C. Bhagyanathan, Associate Professor from **Sri Ramakrishna Engineering College**, Coimbatore along with Dr. P. Karuppuswamy, Professor Sri Ramakrishna Engineering College and Dr. M. Ravi, Sr. Principal Scientist, **CSIR-NIIST** Trivandrum developed a technology system that could combine value added / non-value added and hazardous / non-hazardous wastes, aluminium alloys and assorted scraps for industrial applications and recycle them efficiently. The technology was developed with support from the **Advanced Manufacturing Technologies** programme of the **Department of Science & Technology** (DST), Government of India aligned with the 'Make in India' initiative. The developed technology can be used in tiny & cottage Industries, Small Scale Industries and MSME Aluminium foundries and recycling industries.

Conventional aluminium recycling techniques require high investment in processing and generate dangerous residues in form of ferrous (Fe), tin (Sn), lead (Pb) and burning of Mg in the crucible red hot. The process also involves manual separation and sorting of magnesium alloys, ferrous alloys and high silicon alloys etc. Moreover the separated magnesium is hazardous to the environment. Melting of these alloys are in the form of graded aluminium scraps. These industries sell the ingots based on chemical composition of the melt.

The new technology increases the purity and quality of recycled aluminium melt. The technology involves washing the basic inputs -- assorted aluminium scraps (mixed), drying and preheating, removal of basic impurities in melting furnace, degassing in nitrogen atmosphere and addition of alloying elements in holding furnace, filtering (refining) and pouring the metal into the mold. Three problems are addressed during the process. Separation of iron and silicon materials, preventing the loss of magnesium and adding of other elements like chromium, strontium, zirconium and so on to improve the mechanical properties under the prescribed limits. The conversion rate in the existing technology is 54% and with the new technology developed, the conversion rate has been increased by 70% to 80% depending on various cases of scraps dealt with.

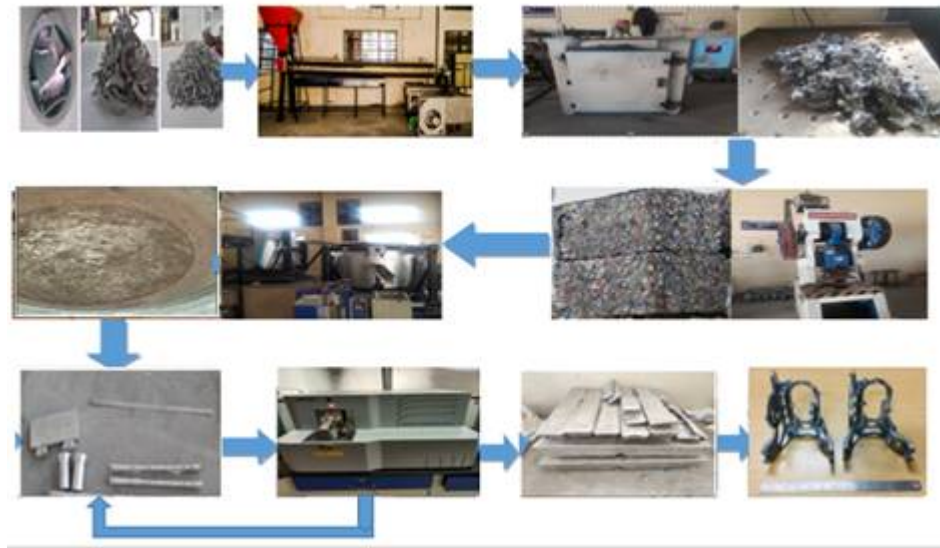
The technology is in 7<sup>th</sup> stage of Technology Readiness Level (TRL) and Dr. C. Bhagyanathan's team has collaborated with several industrial partners in Coimbatore like Roots Cast, Lakshmi Balaji DieCast, Enkey Engineering Works, Adhrash Line Accessories, Super Cast, Star Flow Tech, to cast various components like electrical housing bracket, automobile casings and valve components, motor housing

f bracket, motor impeller components etc., for further expansion. The team is also in processes of filing a patent for the technology and has also transferred it to Swayam Industries, Coimbatore, Servo Scientific Equipments, Coimbatore.

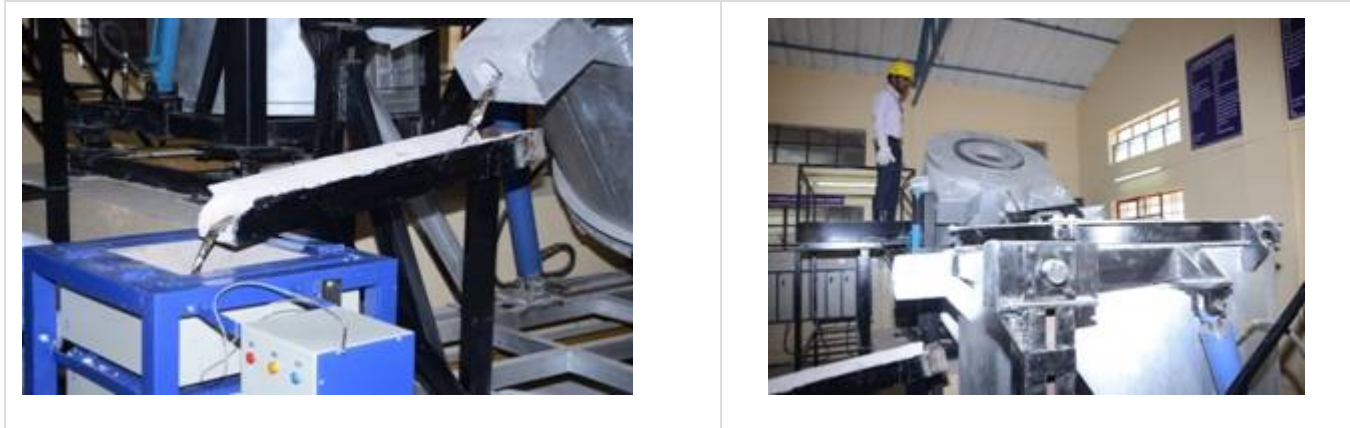
🐦 The technology is also equipped with advanced Aluminium Melting and Holding furnaces, a degassing unit, filtering setup, an industrial washing machine and Oven.

🗨️ Dr. C. Bhagyanathan's team is further working on recycling of aluminium to suit medium and large scale industries. They are in the process of mapping the results obtained with the small scale furnaces to the large scale furnace and conducting studies on purity post aluminium refining. This technology will be further upgraded with an advanced aluminium induction furnace capable of heat recovery could be successfully implemented in the small-scale industries.

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*Technology Work flow*



*Melting and refining of aluminum scraps*

For more details **Dr. C. Bhagyanathan** (9047026422, bhagyanathan@srec.ac.in) can be contacted.

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