CMI, Oddello Industries pursue recovery of rare-earth magnets from used hard drives

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Rare earth magnet assembly was recovered from a used hard drive. Credit: ORNL

A process developed at Oak Ridge National Laboratory for large-scale recovery of rare earth magnets from used computer hard drives will undergo industrial testing under a new agreement between Oddello Industries LLC and ORNL, as part of the Department of Energy's Critical Materials Institute. The effort was announced today at CMI's annual meeting at ORNL.

The world's most powerful magnets are manufactured using rare earth elements such as neodymium. These magnets are essential to the operation of everything from computer hard drives to electric and hybrid vehicles, electric bicycles, wind turbines, cell phones, air conditioners, and other appliances and industrial equipment.

Need for the element is rising as demand for consumer products and clean energy technologies grows. However, more than 95 percent of worldwide production of neodymium occurs outside the United States.

That's where recycling can create a new supply stream. Although the U.S. does not produce much neodymium, it does have vast sources of used consumer products from which to recover magnets made from rare earth elements. How to do so economically on a large scale is a question that researchers at DOE's Oak Ridge National Laboratory have studied and will now test on a production line under construction at an Oddello facility in Morristown, Tennessee.

The recycling method "can give you magnets that are already made, compared to digging up the ore and all the processing and expense required to get to the end product," said Tim McIntyre, program manager in ORNL's Electrical and Electronics Systems Research Division and the project lead.

McIntyre and other researchers developed a cost-effective method for recycling hard drives that employs a unique system to sort and align

them on a conveyer for processing. The method uses a mapping station with barcode scanning and a coordinate measuring machine to populate a database of each make of hard drive so they may be positioned for correct robotic disassembly.

The testing will explore two methods for magnet recovery: ultra-high-speed fastener removal and punching. The system will recover the magnets, their permalloy brackets, circuit boards, aluminum and steel, and also destroys data storage media to ensure security.

The process recovers the magnets intact, enabling their direct reuse by hard drive manufacturers or for use in motor assemblies, alternate uses through resizing or reshaping, or processing back to rare earth metal.

Some 115 million hard drives will reach the end of their first useful life in 2016 alone, McIntyre noted. Currently, about 60 percent of those are refurbished and sold into secondary markets, 5 percent end up in landfills, and 35 percent are shredded because of data security concerns. The process for recycling and recovery will target that 35 percent, with the potential of recovering some 1,000 metric tons of magnet material per year.

Oddello's experience designing and installing highly automated production lines made the firm an ideal partner to work with in employing the technology. The contract manufacturer operates several production lines in a 650,000-square-foot facility at its Morristown headquarters.

"We are always eager to work with organizations like the CMI and ORNL," said Oddello Chief Operating Officer Thomas Roberts. "Anything we can work on that involves a challenge of high volume and automation is intriguing to us." Roberts said the line is currently being installed with the help of ORNL and is expected to begin operating this

fall.

"This work will remove a major barrier to recycling critical magnet materials," said CMI Director Alex King. "It is going to make a big impact."

ORNL is hosting the institute's fourth annual meeting August 16-18, at which members and affiliates will hear the latest developments to ensure access to critical materials for US industry.

Provided by Oak Ridge National Laboratory