

Automatic Magnet Remover

A device for disassembling stator motors

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Introduction

With the subject of climate change dominating the global discourse, the topic of resource management became a fundamental issue as well. This involves sharing, leasing, reusing, repairing, and recycling. With the rise in automation across multiple industries, the need for environmentally conscious automation and frugality is a necessity.

An Automatic Magnet Remover (AMR), which purpose is to remove magnets from stepper motors seen in figure 1, was designed, constructed and evaluated. The previous process of removing the magnets, observed in figure 2, used manual labor which is both costly in time and safety. The project was developed in conjunction with the Bionics department at the company Össur Inc. Össur is one of the leading companies in the world in non-invasive orthopedics.



Figure 1 – The stepper motor

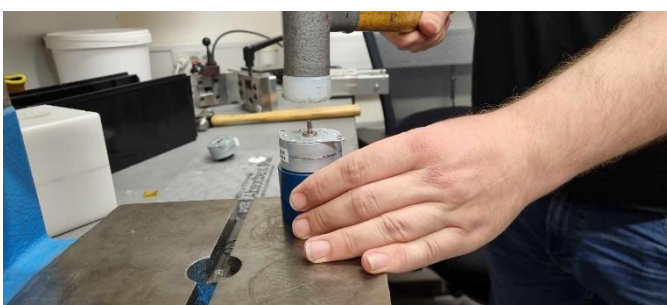


Figure 2 – The previous method of extraction

Design and construction

The machine consists of a programmable logic controller (PLC), a pneumatic system, sensors and was constructed out of aluminum profiles. The machine was encased in Plexi-glass for safety. The majority of components used in the AMR are recycled or repurposed parts from discontinued machines manufactured by the company. The machine can be observed in figure 3.



Figure 3 – The AMR

Testing and results

The results yielded favorable outcomes, as all pistons effectively impacted the motors at the designated point with precise force, facilitating the removal of the magnets. Notably, there were no observable signs of damage to the stators after the extraction. The entire process, encompassing motor loading into the magazine, magazine insertion into the AMR, and magnet removal, was accomplished in less than a minute. The extraction process itself, where every pneumatic cylinder was activated, took approximately 4 seconds. This is a significant improvement from the previous method of extraction, where one magnet was extracted every twenty seconds. A work instruction was created for the purpose of operating the machine. Future iterations of the machine entail assimilation into other machines or processes.