Nickel Powder Separation

Overview
Advantage Metal Powders wants to separate powdered nickel from a mixture of powdered iron, graphite, and lubricant. Nickel and iron are both magnetic, similar in density and in particle size. There currently are no commercially used separation methods for this application. If separated, the nickel powder would be significantly more valuable than it is in mixture.

Objectives
The objectives for this project were to determine if a separation method capable of meeting the requirements of Advantage Metal Powders exists, build a small-scale prototype, and give recommendations for full-scale equipment. The separation method must be able to process 5000 lbs of powder an hour, and produce two mixtures: one containing less than 0.5% nickel, and one containing greater than 30% nickel.

Approach
- We began by communicating with Advantage Metal Powders regarding the separation requirements.
- An AHP comparison chart was used to determine customer needs priority.
- Patents for existing products were examined.
- We researched the properties of nickel and iron, hoping to find some area where the two differed.
- We considered the use of sieves, fluidized beds, centrifuges, and eventually decided on an electrostatic separator.
- A small scale prototype was constructed.
- A detailed test procedure was created.

Outcomes
While the prototype was unable to separate the powders, the knowledge gained is still valuable. With modification, the prototype could be made to function as desired. The foundation is there for another team to build upon. If a successful separation method is implemented, Advantage Metal Powders could earn $1.5 million annually from the sale of nickel powder.