

Waterjet Abrasive Removal System (WARS)

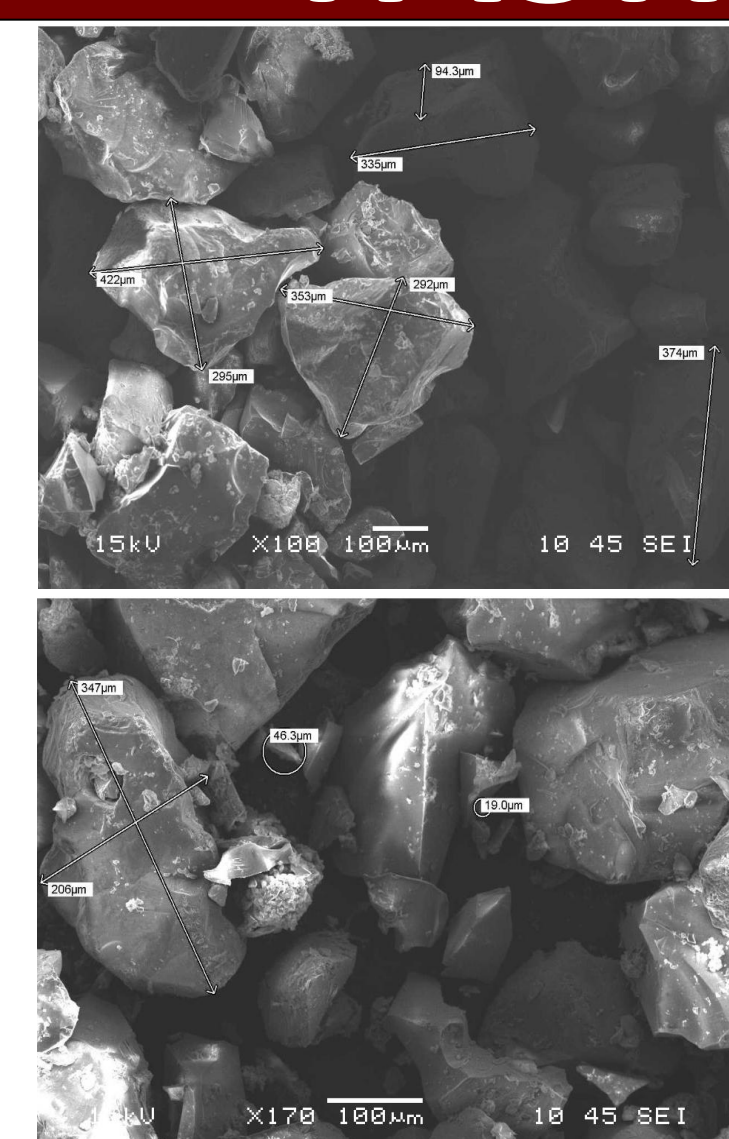
Gabriella Cadolino, Colin Foley, Luca Garratt, Caleb Koogler, Trevor Robbins,
Justin Sarnowski, & Kenneth Speth

Faculty Advisor: Dr. Chiradeep Sen and Dr. Anand B. Nellippallil, Dept. of Mechanical & Civil Engineering,
Florida Institute of Technology

PROJECT OBJECTIVE

The purpose of this project is to design and manufacture a system that removes abrasive garnet from the collection tank of a waterjet and separates any debris from the water. This project was developed for the L3Harris Student Design Center (L3HSDC) with the goal of minimizing the manual labor required for removal.

TASK CLARIFICATION



- Minimum particle size required for filtration was found to be 50-microns utilizing data from a Scanning Electron Microscope.

COLLECTIONS



Submerged Jets:

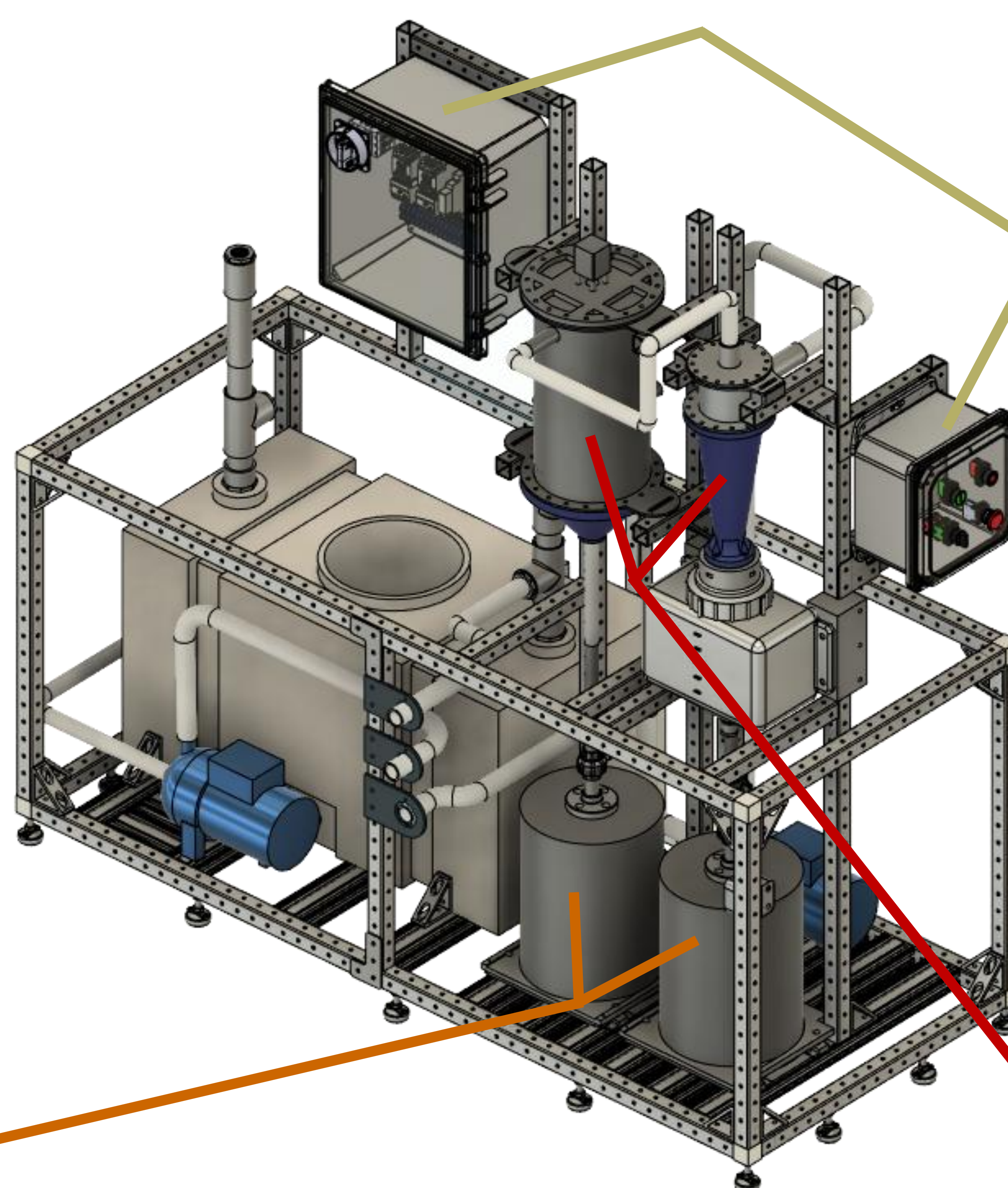
- PVC piping system that is fitted inside of the waterjet tank.
- The jets homogenize and guide the fluid mixture towards an inlet pipe connected to the separation system.

DISPOSAL

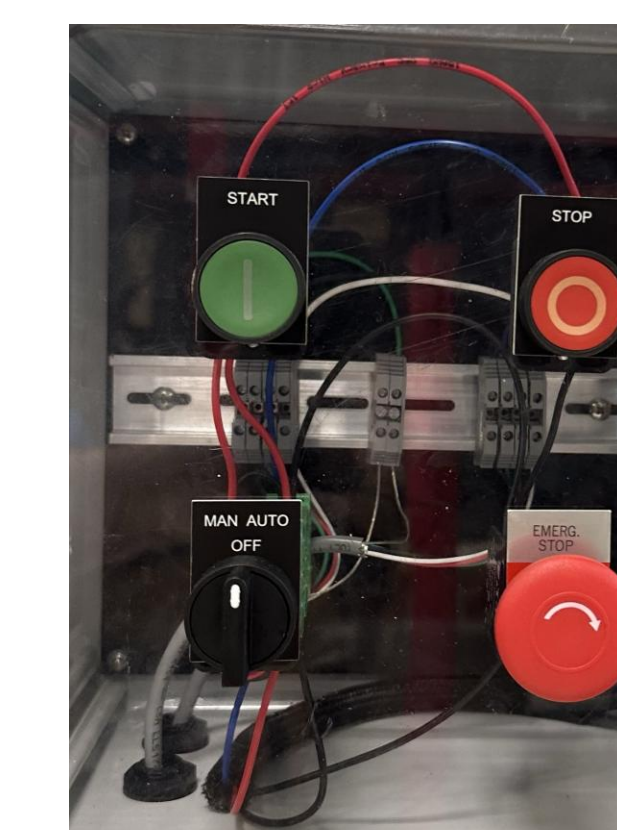
- The L3HSDC requires all removed abrasive garnet to be placed in buckets for drying and subsequent disposal.
- Light provides visual indicator to inform staff of disposal bucket capacity.



Abrasive Removal System Model



ELECTRONICS



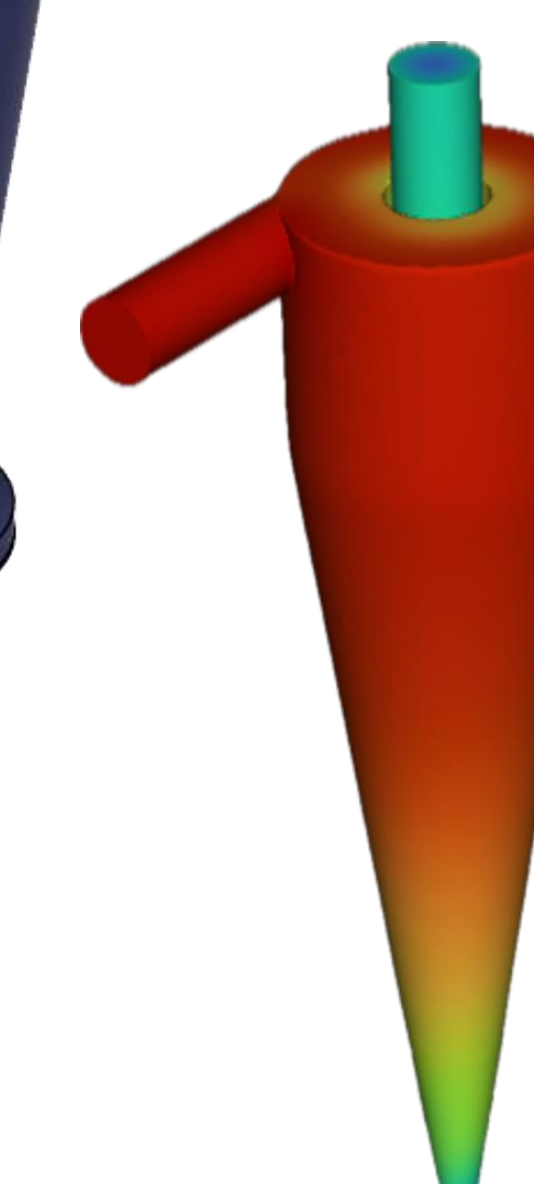
- Consists of electromagnetic contactors, overload relays, full load disconnect, start and stop push buttons, and two emergency stops.

SEPARATIONS



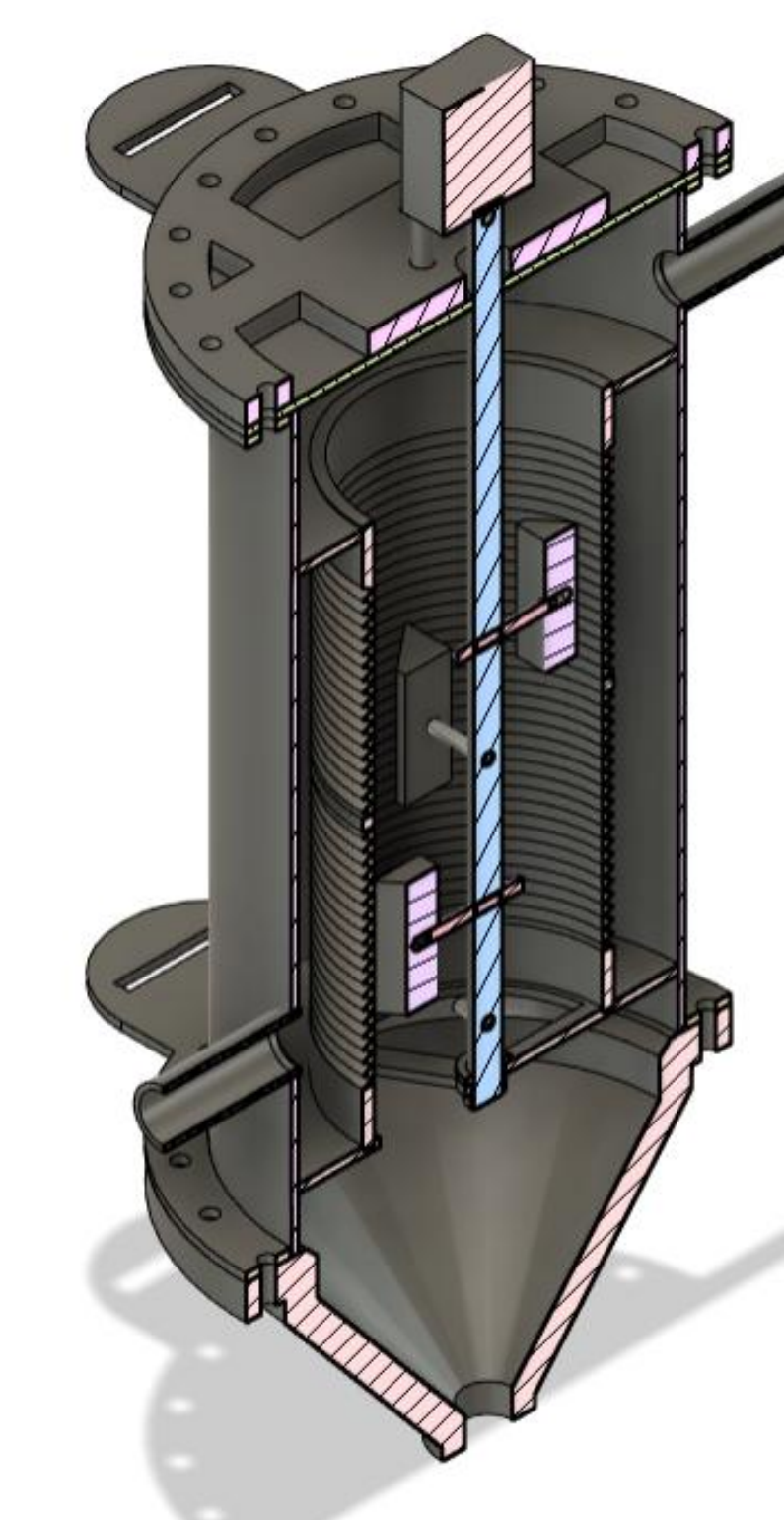
Cyclone Separator:

- A funnel device with a tangential inlet that creates a vortex flow to force abrasive particles downward while lower pressure forces fluid upward.



Self-Cleaning Filter:

- Remaining mixture flows into a 50-micron wedge wire filter mesh that filters the abrasive while the wiper blades scrape it down into the disposal buckets.



RESULTS



It was determined the system effectively removes particles up to 50-microns in size and can remove up to 20 pounds of abrasive per hour.

ACKNOWLEDGEMENTS

We would like to offer a special thanks to SAI Filters for their donation of the filter mesh, André Robidoux as our GSA, Zac Schardt, Rongxuan Ma, and the staff members of the L3HSDC, the Microscopy Lab, and the Florida Tech Machine Shop.