Carbon Particle Disperser
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ABSTRACT
The Carbon Particle Disperser is a lab-scale device that mixes air and carbon nanoparticles that absorb concentrated solar energy and are used to generate electricity in a Brayton Cycle.

PROJECT BACKGROUND
Modern solar power stations come in two varieties: Photovoltaic (PV) and Concentrated Solar Power (CSP). CSP stations use mirrors to concentrate solar radiation from a large area into a small beam that is then utilized by a solar receiver as a heat source for a conventional power plant. Figure 1 below shows a CSP station.

Although current CSP technology uses the Rankine cycle to generate power, new receivers are in development that make use of the more efficient Brayton Cycle. These receivers utilize carbon nanoparticles to absorb solar energy and transform it into useful thermal energy. The Carbon Particle Disperser (CPD) mixes air and prefabricated carbon nanoparticles, producing a continuous and consistent cloud for the receiver.

DESIGN
As seen below in Figure 2, the current design of the CPD is based off a jet mill, which uses compressed air fed through angled inlets to create a vortex effect. For this application, unlike a conventional jet mill that grinds particles, the CPD will only be responsible for mixing prefabricated particles with compressed air.

As shown below in Figure 3, the major design challenge in this project is creating a CPD that disperses a carbon cloud at up to 6 atm, and thus may operate up to 10 atm. A cross-sectional view of the CPD is pictured below in Figure 3.

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FUTURE WORK
• Testing the density of the carbon black cloud
• Development of a carbon feeding system
• Designing an automatic control system

REFERENCES