The project is to design a power supply that will drive a piezoelectric device. The requirements for this power supply include: 1-20 Watts output power, 120VAC input voltage, reach piezoelectric device’s resonant frequency and be impedance matched. Furthermore, the power supply circuit should be simple, compact and light weight. The team has been requested by the sponsor to analyze a preexisting device that runs a piezoelectric material. The device that we analyzed was the Black and Decker Ultrasonic Buzz Stain Remover. The Buzz device controls a small piezoelectric material which vibrates and removes stains from materials. The Buzz device however does not do everything that the sponsor wants and yet is also does more than what he wants. The project is to analyze and reverse engineer the Buzz device, remove the extraneous components and add the desired features.

This project is sponsored by Mark Leiby; entrepreneur and mechanical engineer from Penn State. Mark owns and runs the company Aerokinetic Systems. The purpose of the piezoelectric device has not been given, however Mark explained what he wants to get out of this investment. He wants to learn how driving a piezoelectric device can be accomplished and how it can be done cost efficiently. Eventually he wants to develop a marketable product using the information we have found.

A considerable part of the project has been to analyze the circuit and determine the function of each component on the board. Steadily, components that were not needed have been removed from the device. A smaller and more concise circuit has been completed for the final presentation.

The prototype that has been completed for the final presentation is a reverse engineered version of the Ultrasonic Buzz Stain Remove. The deliverables agreed upon that the team met include producing a simpler, lighter and working prototype, schematics of the original and simplified circuits, all of the input/output values of the AC/DC adapter, audio amplifier, voltage regulator, transformer, MCU controller and piezoelectric device, and a written analysis of the circuit. The team did not increase the power output to the circuit but information on how to accomplish this is provided in this report.

This circuit has the potential to output up to 20 watts and can drive piezoelectric devices. Since it is cheaper than similar power supplies, it will be more profitable to use this circuit in the sponsor’s product. Moreover, with the new simplified schematic, it is easier to design a phase lock loop to track the changing resonance frequency of the piezoelectric device.