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Optimum Stack Position Within a Bottle-shaped Thermoacoustic Engine[1] ELWIN BASSETT, BONNIE ANDERSEN, UVU — Thermoacoustics involves turning heat energy into acoustic energy, or using sound to pump heat. A thermoacoustic engine with a transducer could be used, for example, to convert solar energy incident on a satellite into sound and then into electricity. This research focused on the optimization of stack placement within a bottle-shaped 1.4 kHz engine to achieve maximum acoustic pressure. The prime mover consisted of two connected cylinders: the bottle neck, 5 cm long and 1 cm in radius, and a cavity, 10 cm long and 2 cm in radius, with the stack located within the middle of the neck. Sound intensity is a function of both pressure and velocity; therefore, maximum intensity should be found in between their nodes. However, a phase shift is introduced for the velocity due to the thermoacoustic effect and the optimum position will not be exactly between the nodes. Therefore, 9 different stack positions within the neck were tested to determine the optimum location. The optimum was found to be 39% away from the closed end of the neck, which improved acoustic pressure by 50%. Further testing is planned, to verify the results and test different configurations.

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