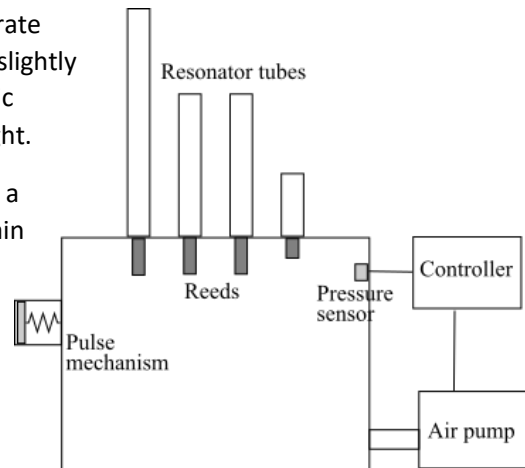


Senior design project proposal – contact Dr. Marek if interested <marek_ka@mercer.edu>

Purpose: The client wishes to have a device with which to calibrate bagpipe drone reeds to sound at the same pressure, which is a slightly lower pressure than the chanter reed sounding pressure. A basic schematic of what the device might look like is shown to the right.

Objective: Build a pressure chamber “box” which is supplied by a user-controllable pressure, at flow rates from zero up to a certain value. The pressure should be sustained with minimal pulsation. Additionally, there must be a method of creating a single pressure pulse (adjustable in amplitude) which is used to start the drones playing. Measurements and adjustments may be either automatic or read/implemented manually.

Group composition: At least one mechanical and probably one electrical/computer student should be in the group.



Requirements:

- Construct a chamber into which 3 drones and 1 chanter reed can be mounted. The chamber interior must be accessible without too much hassle, and it must be large enough to allow for bagpipe moisture and flow control treatments to be inserted into the chamber (with proper mounting points). The chamber should have interior tubes covering the reeds, to which moisture/flow control apparatus can be mounted. Blowstick treatments should be mountable to the port coming from the air source.
- Include a “primer” button or device to start up reeds by applying a single pressure pulse
- The chamber must be able to maintain a small pressure differential from atmosphere, slightly greater than the maximum pressure blown by a bagpipe player. The air source (pump or blower) must be able to maintain this pressure at the rate at which air is used by the reeds, plus any leakage from the system. (Students should determine what these values are). The ideal control of pressure within the chamber will be within 0.2” H₂O.
- The chamber will have resonator tubes over the reed outlets to represent the drone pipes and chanter. The reeds should be mounted directly into the tubes, which then attach to the exterior of the chamber, with the reeds fitting through ports cut into the chamber at the mounting points. Mounts may be sealed using hemp twine (traditional method) or another suitable method.
- A safety pressure valve may be necessary, depending on the pump/blower capabilities.
- Some method of reading the instantaneous pressure in the box must be present. Some method of controlling the air source to produce the desired pressure must be present. It must be possible to change the set pressure while the apparatus is in operation.

Additional “stretch” goals:

- Measure total air flow rate through the device.
- Sound tubes over reed outlets are tunable (adjustable length or end aperture).
- Develop a method of introducing, measuring, and controlling moisture in the air.
- Develop a method of controlling air temperature.