



DESIGN OF A QUIETER HAIR DRYER

TEAM 6

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AIM: OPTIMIZE CENTRIFUGAL FAN DESIGN TO REDUCE NOISE



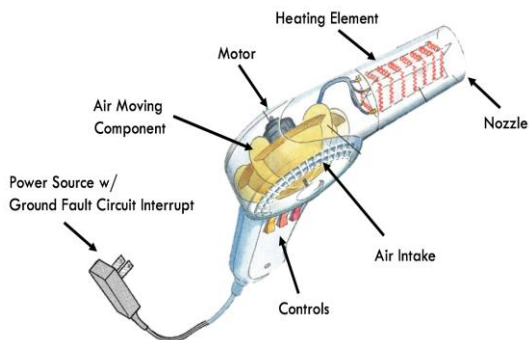
WHAT IS THE PROBLEM?

Hairdryers can be very loud and can cause noise disturbances in peaceful areas such as salons, pet grooming shops, and our very own households bathrooms.

OUR PROJECT SCOPE

Our project scope is to identify the primary source of noise within a centrifugal type hand-held hair dryer, then make repeatable and measurable noise reduction improvements through modifications via design aspects, while maintaining its overall flow performance.

STANDARD COMPONENTS OF A HAIRDRYER



OBSERVED "QUIET" MODELS

Centrix Q-Zone



Whisper Light



EXPERIMENTAL SETUP

Temperature:

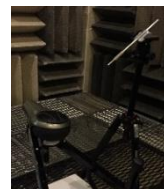
- Infrared Thermometer
- Duct Tape

Velocity and Pressure:

- Pitot Tube
- Digital Manometer
- Mechanical Traverse
- Labview and Matlab

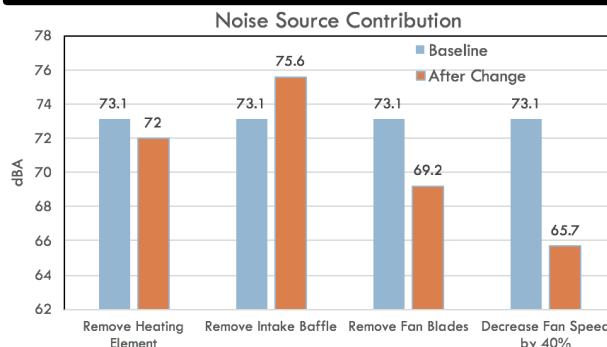
Noise:

- Anechoic Chamber
- Free Field 1/4" Microphone
- Hairdryer Stand
- Duct Tape
- Labview and Matlab



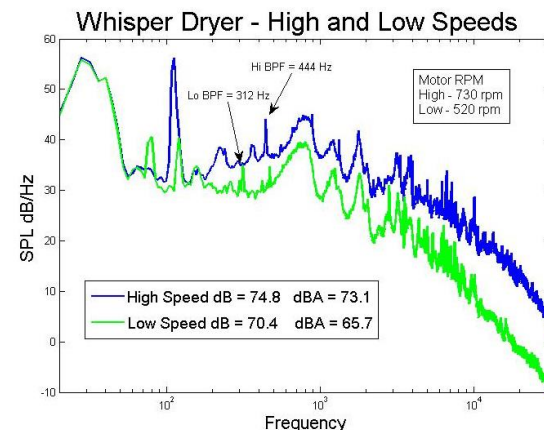
A requirement of any design modification made to the hair dryer is that the performance must not suffer! The performance of the hair dryer is determined as the rate of heat carried from the volume flow rate of the air. Using the pitot tube to measure velocity and the thermometer to measure the temperature change, the heat rate can be easily determined.

ANALYSES OF NOISE CONTRIBUTION



Fan speed plays a significant role!

FAN SPEED



- The maximum noise reduction would come from reducing the fan speed.
- Optimize fan system to ensure sufficient flow
- Shift the noise to lower frequencies where human hearing is less sensitive.
- Lower the *blade pass frequency* in order to take advantage of an *A-weighted filter*

FAN MODIFICATION PLANS

- Reduce the number of fan blades
- Increase size of fan and area of blades
- Add saw-tooth serrations to trailing edges of each blade
- Reduce the diameter of fan



FUTURE PLANS

- 3-D print modified fan blade systems
- Test each one and measure the resulting noise produced
- Flow simulations to optimize fan design and of see flow paths of the assembled dryer