

'Nulls' in Helmholtz Resonators (i.e., the stack silencer)

- 'Nulls' are specific frequency ranges where silencers are not very effective in reducing noise.
- One of the homeschooling parents in Oakland is the sound engineer for Netflix's "13 Reasons Why." He specializes in reducing low frequency noise for on-location films. He explained nulls to us, and we got a demonstration of nulls in a helmholtz resonator using a plastic organ pipe. We were showed that every configuration has its own set of nulls.
- The paragraph below, from Ray, E. 2015. "Reactive Silencers", Industrial Noise, B & W Universal, describes 'nulls' with a simple graph. Transmission loss (TL) is the reduction in noise by the silencer.

"Figure 2 shows an analysis of a large combination, three-chambered silencer. Note the dips at 40 and 50 Hz; these are called nulls where either the transmission loss (TL) or insertion loss (IL) makes a dip. All reactive silencers have these dips or nulls, and they can be most pronounced. A null is like a "short circuit" allowing the acoustic energy to be transmitted through the silencer. In this application, this silencer cannot be used on an engine that has a significant engine order or firing frequency near 40 or 50 Hz; otherwise silencer performance would be most disappointing"

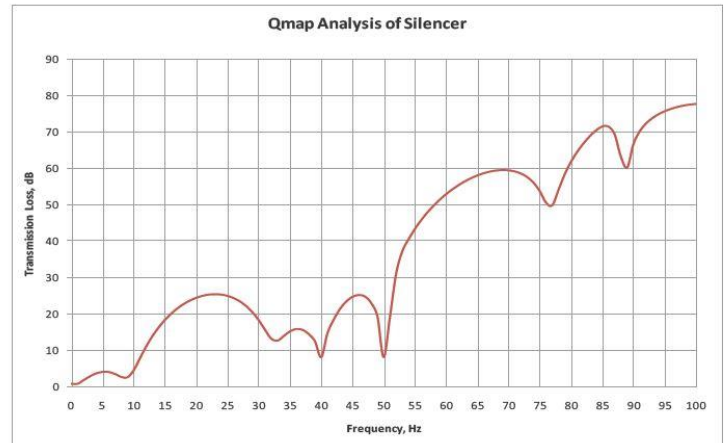
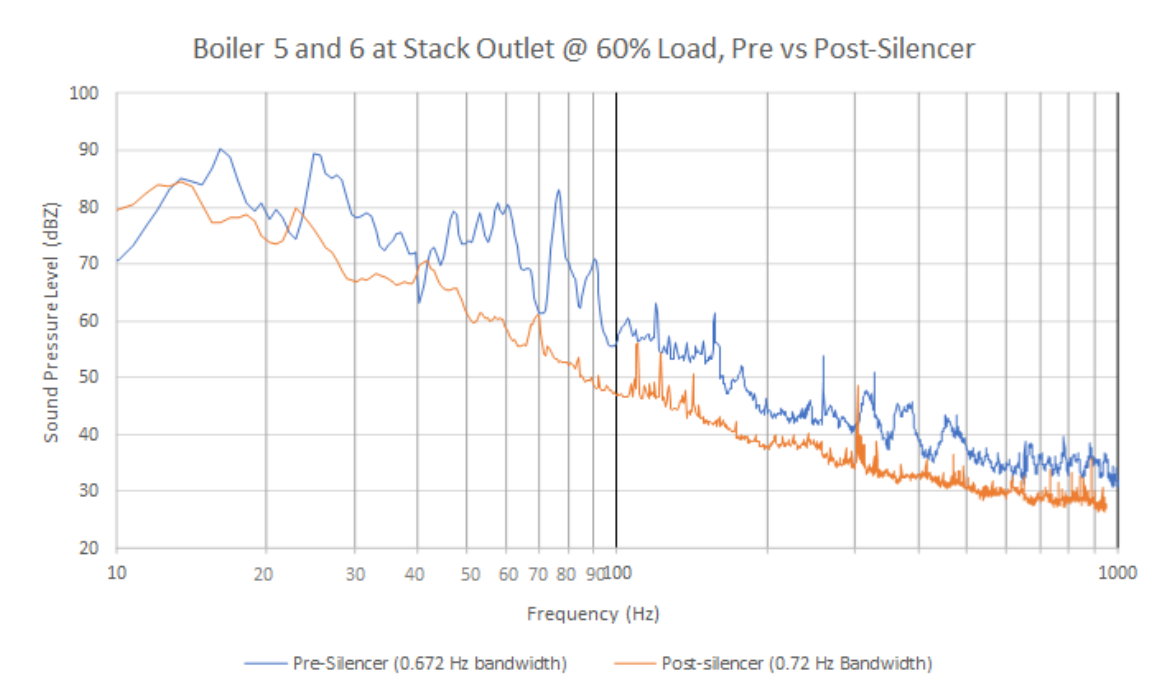


Figure 2 – Analysis of a Three-Chamber Reactive Silencer

'Nulls' in UVMCC's stack silencer

- The plot below is at 60% load, where Boiler 5 produces less noise. Nulls would be more easily identified at 100% load, but unfortunately pre-silencer measurements were not taken at 100% load.
- Locations where the two curves meet below may correspond to nulls, where the stack silencer does not give much noise reduction. The curve in Figure 2 above represents the difference between curves like the two below.



A version of the plot with less smoothing of the post-silencer data. The biggest difference from the previous is circled.

