

Dynamometer is Centerpiece of Roush NVH Services

Roush Industries of Livonia, MI, is a leading supplier of noise and vibration control engineering and consulting services to the auto industry, offering field and laboratory testing as well as acoustic dynamometer testing of vehicles, engines, transmissions, brakes and components. Through its combination of NVH experts, equipment, and facilities, Roush is uniquely qualified to provide the highly specialized design, analysis, testing, and engineering services necessary to solve complex noise and vibration issues.



Figure 1. Roush's new hemi-anechoic chamber was designed and installed by Eckel Industries and provides a controlled acoustic environment for NVH services.

The Chassis Rolls Dynamometer is the centerpiece of its vehicle NVH development services. It is available as a stand-alone tool or in conjunction with measurement equipment, mechanical, and engineering support. It provides OEM and tier customers an independent facility, allowing them to use their own staff and equipment to perform tests, or to direct a Roush team in developing their vehicle systems. Additionally, customers can expect accurate, unbiased results with the security of knowing Roush will protect customer privacy and confidentiality.

Roush's new high-performance hemi-anechoic chamber (Figure 1) was designed and installed by Eckel Industries, Cambridge, MA, and provides a controlled acoustic environment for NVH consulting services. The 4WD chassis rolls with Schenck Pegasus dynamometers and controls incorporates independent dynamometers for front and rear axles to allow 2WD and 4WD operations. The chamber provides Roush with the precision testing environment it needs to make critical measurements for its OEM and tier customers and for developing vehicle systems.

The chamber utilizes Eckel's EMW, high-transparency, 52%-open-area, perforated metallic anechoic wedge lining. The chamber's performance exceeds the design criteria low-frequency, cut-off of 100 Hz by a significant margin. This allows Roush engineers to make precision measurements to below 80 Hz at the low end of the spectrum to 20,000 Hz at the high end. Qualification of the chamber was done in accordance with ISO 3745. The "inverse-square law" performance of the chamber (variance from 6 dB per doubling of distance) for frequencies from 80

Hz to 20 KHz is shown in Figure 2. The chamber achieved a background ambient noise level of NC 14 with 7,000 CFM of ventilation and dyno pumps running.

The interior dimension (free field) of the chamber is 40 × 23 × 14 ft. The chamber walls and ceiling were constructed of concrete and rest on a 12-in.-thick, steel-reinforced, isolated floor. Integrated into the chamber floor is a Schenck Pegasus four-wheel, road wheel dynamometer.

The metallic wedge uses classic "Harvard design," with two 12-in. peaks on a 24-in. square base frame with an overall depth of treatment of 34 in. Incorporated into the wedge construction is a 'white' acoustically transparent matting between the perforated facing and acoustic fill for positive fiber containment along with uniform color and appearance. The wedge units are factory finished in white enamel and were mounted to the walls and ceiling using a unique track mounting system.

For vehicle access to the chamber, two in-swinging wedge "cage doors" and two out-swinging sound doors were provided with a clear opening of 10 × 10 ft. The "cage doors" incorporate curved-radius wedges at their leading edges that mate when the doors are closed, providing full depth of treatment coverage across the entire entry way.

Roush and Eckel engineers designed several unique features into the system; they include a telescoping dynamometer shaft silencer that completely encloses the dyno shaft as the road wheel was adjusted for different wheel bases. Plus, wall surfaces of the dyno pit were lined with functional sound-absorbing panels to eliminate reverberation.

Roush has one goal – improving the noise and vibration quality of customers' products, and these new facilities provide the platform.

Additional information about Roush Industries' testing services can be obtained from: rewent@roushind.com.

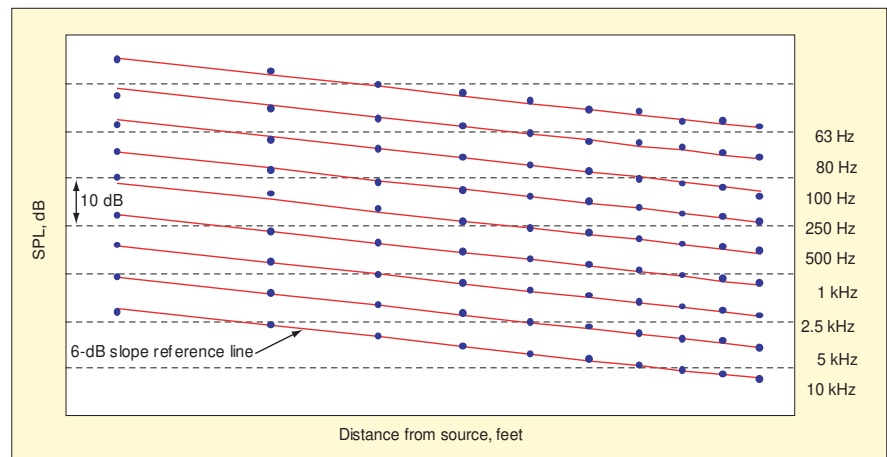


Figure 2. "Inverse-square law" performance of the chamber (variance from 6 dB per doubling of distance) for frequencies from 80 Hz to 20 kHz.