EZSLAM

Application Notes:
EZSlam in Door Closing Sound Quality

A New Twist on Sound Quality

The sound that the door generates when closing is widely accepted as a perception of quality of a vehicle. Many studies have been published on this topic as well as many trade secrets have been developed within organizations. In this application note our experts will explain how EZSlam technology has assisted user in understanding and optimizing door closing sound.

“Characterize the physical constraints, mechanics and kinematics.”

Complementary Information

EZSlam has been contributing to this field in a unique way. Several hardware and software systems are available on the market that are dedicated to recording and analyzing sound waves. These systems are often found in specialized rooms and NVH test environments.

EZSlam is not competing with these systems but provides complementary data for the study. EZSlam results will fill the often undocumented void between sound propagation and the door kinematics.

Macro Perspective

Studies and tools exist to map out frequency response of the tiniest component of the door assembly. This wide perspective certainly adds to the understanding and contributes to improved sound quality. However, studies and conclusions have a whole new perspective when looking at the macro aspect of the closure. EZSlam comes into the picture to understanding the mechanics and dynamics involved to move and slow down the door.

Operation

Prior to the sound study, EZSlam can be installed on the car and a standard series of test can be recorded. These tests include door slams, static closing etc. All force, speed, pressure, angle, and position data that EZSlam collects is transmitted to the software for analysis. This full acquisition cycle would take less than 25 minutes.

The software compiles the data into a set of metrics that will enable to characterize the door and its components. This includes critical aspects such as striker alignment, speed profile, seal compression, cabin air evacuation, hinge friction, check operation, and weight. All this essential information is then used to benchmark a group of samples, adjust a test vehicle to nominal or other characterization of the samples.

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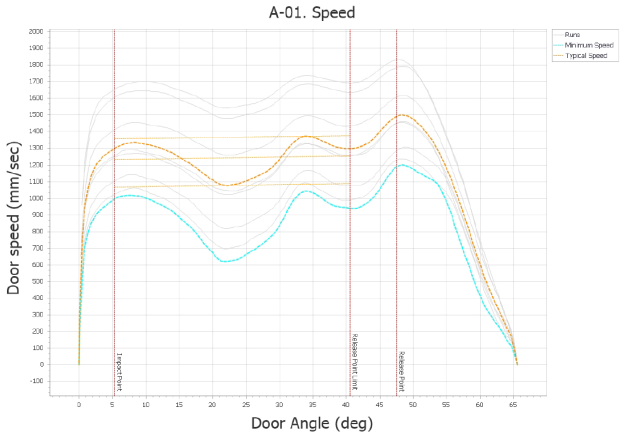
A First Example: Door Speed Curve

In line with intuition, it has been proven that if a closure enjoys a smooth damping, or a gradual slowing down to zero, the impact is softened. Therefore, the excitation of any components is limited, and the amplitude of the resonance or intensity of high pitch sound will be reduced. In the opposite case when the door is subject to abrupt deceleration, this sudden hard impact will significantly increase the chances of the resonances.

"Slow down gently, avoid the impact."



A Second Example: Cabin Pressure Wave

Another critical example of this macro concept of a closing event is the pressure wave in the cabin. This pressure wave is not to be confused with the sound pressure wave but the low frequency pressure propagation as the door approaches its final position. This air trap serves as a damper and can contribute significantly to the deceleration of the door.

Keep an eye on Closing Efforts

On the other end of the spectrum, EZSlam will also document the characteristics of closing efforts. A door system that meets all the sound criteria but is hard to close is not necessarily a solution. The door is by design a compromise between easy to close, proper sealing and a solid sound. This compromise can only be controlled if all aspects are measured throughout the manipulations.

"The door is a balance between easy to close, correct sealing and a solid sound."

Control the Contributions

This final approach of the door and impact can be controlled by many components of the system such as the seal compression curve, the air extraction in the cabin, the air extraction from the seals, the striker alignment, the weight of the door, the door check profile and more. All these parameters can and should be included in any correlation or benchmarking study. The understanding of their respective influence will contribute to the quest of a solid sound of the latching door.

Tolerancing

With the component's contribution documented and understood, a limited additional study can be conducted to understand the influence of manufacturing tolerances on the effect of closing sound. As EZSlam measures the components, a controlled and documented modification can be associated with a change in sound characteristics.

For more details, please visit our **EZSlam** product group page at www.ezmetrology.com.

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