

On the use of transmissibility to estimate vibro-acoustic responses in operational conditions

Miguel Neves, Hugo Policarpo, Nuno Maia, Dmitri Tcherniak

Abstract: This work briefly reviews the concepts of displacement transmissibility, acoustic transmissibility as well as vibro-acoustic transmissibility used to relate excitations from some parts with their counterpart. One application where the concept appears naturally is the operational transfer path analysis (OTPA). It is based solely on operational measurements (conducted when the machine is in operation), not requiring any FRFs, thus significantly reducing the complexity of the measurement campaign and reducing the measurement time. The OTPA method has advantages depending on the conditions of the problem. Here, the authors are concerned with the influence of the stiffness values of the vibration source (excitation) mounts on the response inside the structurally connected acoustic cavity. In this article, the authors conclude that if the stiffness of the mounts approaches zero, the OTPA contributions coincide with the baseline ones independently of having cross talk or not. If the mount stiffness approaches infinity, the contributions coincide with the OTPA contributions obtained when the indicator signals are measured on the passive side of the mount. Therefore, placing the indicator accelerometers on the active side of the mounts are advantageous as this will produce a lesser error than when they are placed on the passive side of the mounts. Placing the indicator accelerometers on the both sides of the mount produces no cross-talk error. These results illustrate in which conditions the contributions from classical TPA and OTPA compare.

¹⁾ Miguel Neves, Ph.D.: Instituto Superior Técnico, Av. Rovisco Pais 1049-001, Lisbon, Portugal (PT), miguel.matos.neves@tecnico.ulisboa.pt.

²⁾ Hugo Policarpo, Ph.D.: Universidade Nova de Lisboa, Caparica 2829-516, Portugal (PT), hugo.policarpo@tecnico.ulisboa.pt.

³⁾ Nuno Maia, Associate Professor: Instituto Superior Técnico, Av. Rovisco Pais, 1049-001 Lisbon, Portugal (PT), nuno.manuel.maia@tecnico.ulisboa.pt.

⁴⁾ Dmitri Tcherniak, Ph.D.: Brüel & Kjaer Sound and Vibration Measurement A/S, Skodsborgvej 307, DK 2850 Naerum, Denmark (DK), dmitri.tcherniak@bksv.com.