

# Reverse Engineering Based Trunk Lid Torsion Bar Design Method

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This study reports the development of a new automotive trunk lid torsion bar (TLTB) design method to determine a free shape that meets a target closed shape with a specified torque. A TLTB is utilized to help elevate and hold open the trunk lid. A TLTB supplier obtains bend points and torque at a closed trunk position as specification from a car maker. The free TLTB shape is conventionally determined by rotating the given bend points around a hinge axis to satisfy the specified torque. In most cases, a deformed TLTB shape in the closed position designed in the conventional method is different from the specified shape given by a car maker (target). Hence, this sometimes causes interference issues with surrounding components. Therefore an FEA based reverse engineering method is developed. The free TLTB shape is designed as follows: Using the results from the conventional method, the difference between FEA closed shape and target closed shape is determined. A new free shape is automatically created by adding/subtracting the difference to/from the initial free shape with some modification for torque. This process is repeated until the difference becomes less than an acceptable tolerance. Validity of the method is proven in this paper.

**Keywords :** Trunk Lid Torsion Bar, Reverse Engineering, FEA Design, Validity of the Method

## 1. INTRODUCTION

Today's main types of trunk lid opening and closing support system for sedan vehicles are damper types and torsion bar types. This paper proposes a new design method for the latter type; often called Trunk Lid Torsion Bar (TLTB). Two TLTBs are typically mounted symmetrically around trunk hinge axis as shown in

Fig.1. This figure is flipped upside down for visual clarity. One end is fixed to a vehicle structure. The other end is mounted to the hinge arm to open and close the trunk. In this arrangement, the restoring torque of the TLTB partially cancels the mass of the trunk lid (TL), so that users can easily open and close the TL. When the TL is unlocked, the TL should typically stop when