Chapter 5

Designing of a Twin Tube Shock Absorber: A Study in Reverse Engineering

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ABSTRACT

Reverse engineering has become the one of the most relevant concepts in modern design doctrines. Advances in technology demand shorter lead time in the overall product development stage, especially in the automobile sector. Hence as a study in reverse engineering, the author has reverse engineered a twin tube shock absorber. The process involved the obtaining of subassemblies of the damper mechanism to generate a 3D CAD model of the damper in PTC CREO 2.0. The model was used to conduct static structural and CFD analysis of the same using ANSYS 15.0 Workbench. The data obtained was used as the datum for the design modifications and performance enhancement of the part. It was seen that the design of the piston valve was optimum hence modifications to the base valve were done. Following the generation of the datum, similar analyses were conducted on the modified assemblies. The results were compared to the datum for the selection of the most appropriate design. Four designs are analyzed and compared with the datum and the set with four orifices in the valve disk was found to be optimum.

INTRODUCTION

With ever shortening lead times and the demand for accuracy of designs and manufacture, the path of least resistance for the redesign of a product is that of reverse engineering. As innocuous as it may seem, the term reverse engineering in itself encompasses multiple fields and specializations. It involves the reproduction of anything based on extracted information (Chikofsky & Cross, 1990; Eilam & Eldad, 2005). It has proved to be one of the best methods for data acquisition for the purpose of redesigning any product. It has come to be considered one of the technologies that have been able to provide business benefits by enabling a shorter product development cycle (Raja, 2008).

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The demand for higher quality standards in the automotive industry has created the need for higher performance of shock absorbers. Noise reduction and vibration damping have become the thrust areas for designs.

Figures 1(a) and 1(b) show the designs of modern shock absorbers.

The function of the shock absorber is often misconstrued to be the absorption of vibrations in the system. However that job is done by the spring. The shock absorber provides the damping force necessary to dissipate the energy absorbed by the spring while neutralizing the original shock.

**BRIEF BACKGROUND**

The design, manufacture, assembly and maintenance of products, systems or both, is the essence of the engineering process. In the pursuit of these goals, who paths are generally available to engineers: forward engineering and reverse engineering. The progression from high level abstractions and logical designs to the physical implementation of the system is termed as forward engineering. However, in certain scenarios, the physical product/system may be available readily, albeit without the accompanying technical details such as design specifications, drawings, etc. The reproduction of the part or system in such cases, in the absence of technical specifications is known as reverse engineering. The process of obtaining a geometric CAD model from 3-D points acquired by scanning or digitizing the extant system can also be called Reverse Engineering (RE).