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Editors: *Dr Slavko Arsovski*, full professor
Faculty of Engineering, Kragujevac
Dr Miodrag Lazic, full professor
Faculty of Engineering, Kragujevac
Dr Miladin Stefanovic, associate professor
Faculty of Engineering, Kragujevac

Technical Editor: *Snezana Nestic*
Faculty of Engineering, Kragujevac

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*Sincerely yours,
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7th IQC
**QUALITY
RESEARCH**

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WHY MANAGEMENT SYSTEM FAILS719

Jasna Glisovic¹⁾
Jovanka Lukic¹⁾
Danijela Miloradovic¹⁾
Dobrivoje Catic¹⁾

1) University of
Kragujevac, Faculty of
Engineering, Serbia
jaca@kg.ac.rs

RESEARCH OF THE JUSTIFICATION FOR THE HIGH WARRANTY COSTS DUE TO DISC BRAKE NOISE

Abstract: Development of the braking system includes optimization of many aspects of its performance, including the propensity to generate noise, in order to meet the demands of customers. Modern vehicles, with a generally high share of the front (disc) with regard to rear (drum) brakes during braking process and with small wheels, require from disc brakes even greater braking torque, leading to a higher frequency of occurrence of noise and vibration. This, with significant driver's subjective perception of the problem, related to the general quality increase in other aspects of vehicle design, has led to large-scale reclamation costs within the warranty periods that could no longer be ignored. In addition, brake noise is unpleasant, on the one hand, for passengers, as well as those in the immediate vicinity - it can also become a problem and a kind of environment "pollution". It is understandable the existence of great interest, and money invested in resolution of these issues.

Keywords: Disc Brakes, Brake Noise, Quality, Warranty Costs

1. INTRODUCTION

Vehicle NVH (Noise, Vibration and Harshness) characteristics not only contribute to the luxury level of the car, they also have an impact on customer satisfaction, warranty cost, brand image and company's efforts to gain a competitive edge in the automotive market.

There are many sources and causes of noise and vibration in a vehicle (Figure 1)-engine, driveline, tires, brakes, wind and electrical drives. While some NVH characteristics are actually admired in certain cases (such as the characteristic noise of a certain brand's engine or even the sound of the door when slammed), most noise and vibration in the vehicle must be minimised in order to ensure a

totally comfortable driving experience. Brake system is another important source of noise and vibration [1].

Brake noise is currently a high priority topic in vehicle noise prevention. Brake noises can be classified into three categories based on the frequencies at which they occur: 1) brake groan at below 100 Hz, 2) brake moan in 100-1000 Hz range, and 3) brake squeal at above 1000 Hz. Brake squeal can be described as an irritating sound with a main frequency between 1 and 20 kHz, generated by the brake components. It is predominantly generated at low speeds (below 30 km/h) and at low brake pressures (brake line pressures below 20 bar). Typical squeal situations are stopping at a red light or in a parking spot. The similarities between brakes and stringed instruments are

