

Application for Measurement & Analysis of Automobile Door & Window Seal Pressures

This brief highlights how the I-Scan system can be used to detect design flaws in soft rubber seals.

Water leaks, wind noise and ease of opening and closing doors is a major concern for automobile manufacturers and door seal designers.

The I-Scan system provides the diagnostic tools necessary to evaluate, view, and measure the pressures acting on an automobile door seal (*Fig. 1*). The I-Scan system has helped many companies validate the effectiveness of a design and also detect weak spots in a seal.

In the study below, two separate recordings were taken using an I-Scan sensor with a 1.3" by 10.4" measuring area on two different door seals. The output from these recordings are shown as 3-dimensional graphical displays (*Fig. 2 and Fig. 3*). Following along the 3-D wire-frame display of Sensor A (*Fig. 2*) you will notice a void or color change indicating the weak spot of this seal. This represents a potential leak path for both air and water. The weakness of the seal is even more apparent when compared to the second seal, Sensor B (*Fig. 2*). Notice that Sensor B has a lower, more even pressure distribution, and does not contain a void in the seal, thus making this a more appropriate contact seal.



Figure 1. The I-Scan sensor placed between the vehicle door and the rubber door seal.

I-Scan calculates pressure data such as average seal pressure, force, contact area and seal profile width. The high spatial resolution pressure data obtained from the system can be used in finite element models to improve seal designs. Tests can also be performed to measure and profile the entire door seal perimeter under different conditions. For example, one could profile the door seal statically, or dynamically during closure or while driving the vehicle at different velocities. This data can then be used to improve seal designs, thereby reducing noise and eliminating leaks.

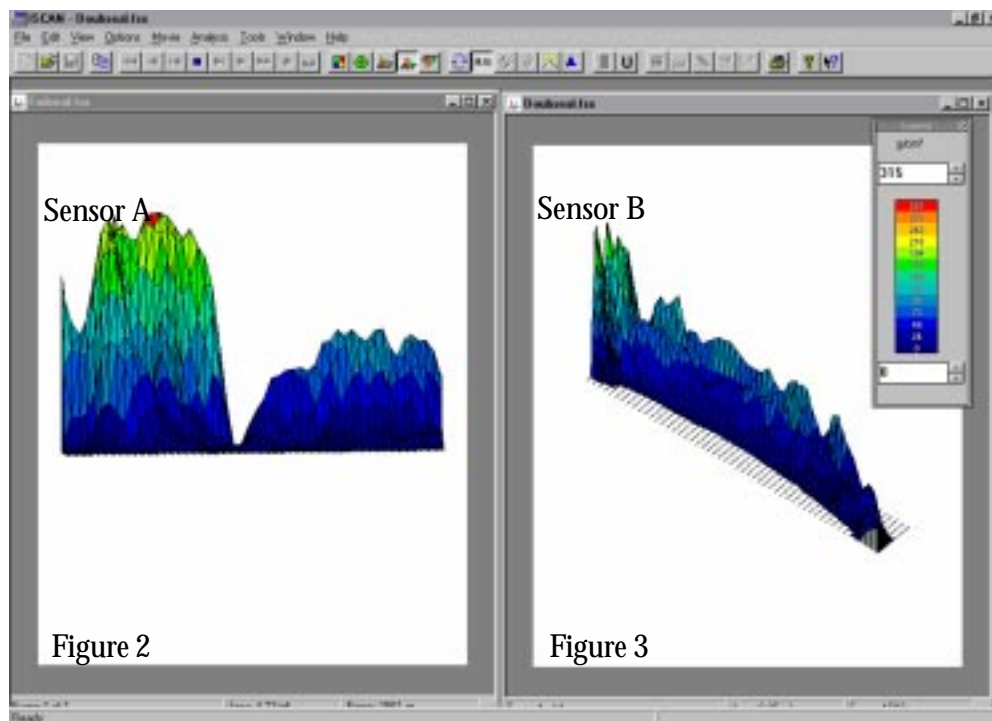


Figure 2. 3-D displays compare door seal weakness.