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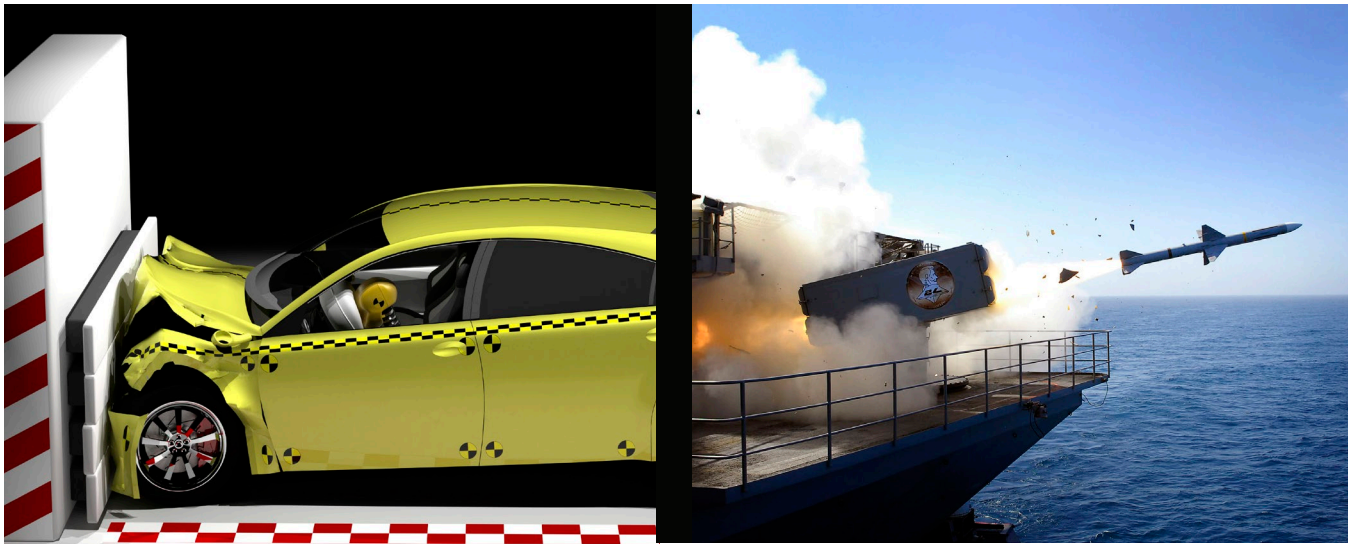


Case Study

Endevco Piezoresistive Pressure Sensors Offer Low Acceleration Sensitivity

Endevco Model 8507C

IUSTI-CNRS 7343 laboratory of Aix-Marseille University

ENDEVCO 8507C – CASE STUDY
Endevco pressure sensors have low sensitivity to acceleration input.

Philippe de CORDEMOY – February 2023

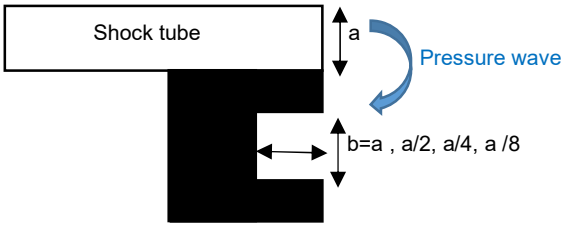
Technical background.

When performing pressure measurements in harsh environments your sensor might be exposed to non-pressure stimuli that could impact the output signal. Events such as temperature transient, photo flash, vibration or shock can influence your output, yielding unexpected and inaccurate results. Endevco pressure transducers are, by design, highly insensitive to acceleration inputs. The reaction of the pressure transducer diaphragm to applied acceleration is a function of its stiffness, mass, diaphragm thickness and diameter.

Several design features of Endevco pressure transducers protect them against response to acceleration, including the stress concentration at the gage location, the mechanical isolation of the sensing element from the case, and the high stiffness of the low-mass diaphragm. On a miniature 8507C, even in the case of an acceleration applied in the sensitive axis off the diaphragm, the sensitivity is as low as 0.002 psi/g. Sensitivity to cross acceleration is generally 1/5 of that in the sensitive direction.

Case study.

In this example, researchers at **the IUSTI-CNRS 7343 laboratory of Aix-Marseille University** used a shock tube to generate a pressure wave above a structure with a recessed cavity. The goal of the experiment was to study the behavior of the pressure wave inside the cavity.



Square cavity

Shock tube on top of the structure

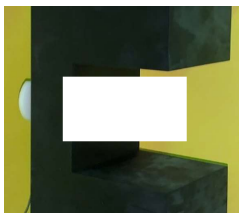
Structures with different sizes of square cavity
(a , a/2, a/4, a /8)

The researchers complained that the output signal of their piezoelectric pressure sensor (brand name intentionally omitted) was showing "strange behavior." They believed that this was related to vibration of the structure rather than the pressure fluctuation inside the cavity that they'd hoped to measure. As a result, they had no confidence in the pressure measurement made.

Endevco's solution.

Due to space constraints and anticipated pressure range, model 8507C was recommended. The sensor was mounted through the structure and flush to the cavity.

Endevco pressure sensor model 8507C-15

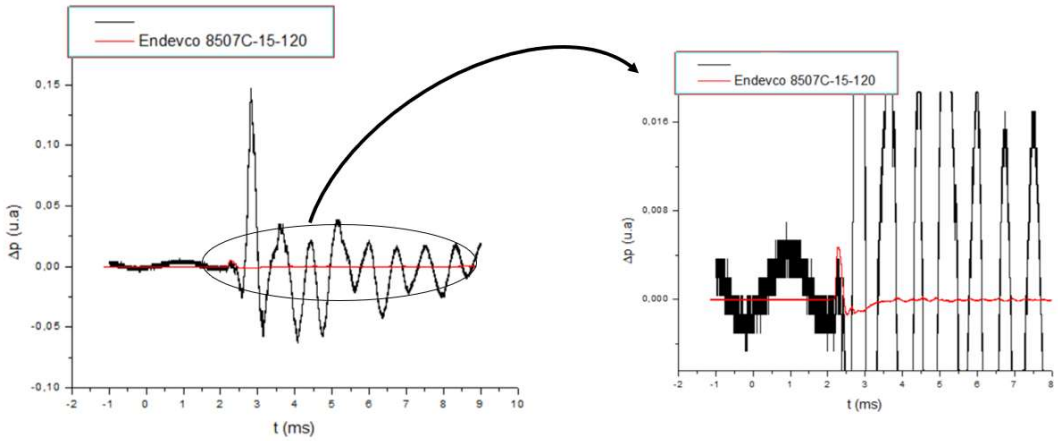


8507C flush mounted

New pressure waves were generated to study their behavior inside the cavity.

Pressure wave propagation inside the cavity.

Results.



The results clearly demonstrate that the Endevco pressure sensor is less sensitive to the vibration than the previously used piezoelectric pressure sensor. Those results also illustrate that the 8507C signal is less noisy. The zoom (picture on the right) clearly shows that the other pressure sensor was picking up signal before the pressure wave.

The researchers confirmed they were very pleased with the results and ordered three more units for future experiments.

Conclusion.

This case illustrates Endevco pressure sensors' low sensitivity to vibration, acceleration and shock. This characteristic, combined with their small dimensions, make Endevco pressure sensors ideal for harsh applications such as blast and impact testing, shock wave studies, and airbag testing.

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