

Composite Cylinder Instrumentation for On-board Monitoring

Objectives

- ❖ Development of an on-board monitoring system to verify the health of composite high pressure vessels for H₂
- ❖ Selection of the best on-board sensor system for continuous monitoring of the structural health of high pressure vessels

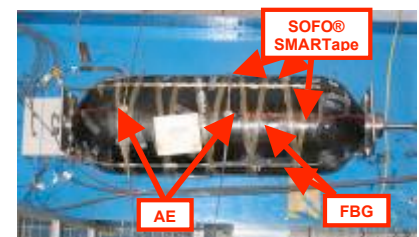
Achievements

Process developed:

- ❖ The first step of testing was to verify different kinds of sensor applications (acoustic, magnetic and especially optical ones) for vessels monitoring. The results showed that only optical fibre sensors could meet the specifications.
- ❖ The second goal of the investigations was to compare different optical sensor systems (the first one based on Fibre Bragg Gratings and the second one based on SOFO® sensors) for detection of defects.
- ❖ In the next steps, different types of optical fibre sensors were tested on the real objects. Cyclic and burst tests were performed. Tests of vessels with defined defects were realized and an on-board monitoring concept for high-pressure vessels was proposed.



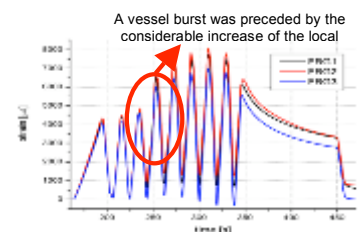
Hydraulic set-up for cyclic tests



Vessel with various sensors (FBG, SOFO® and AE)

Advantages of using the optical fibre sensors for vessel monitoring:

- ❖ Possibility of embedding the sensor in composite material without changing the strength parameters
- ❖ High sensitivity
- ❖ No sparking
- ❖ Insensitiveness to the external electromagnetic field
- ❖ Rugged condition resistance
- ❖ Small dimensions and light weight



Local vessel deformations during cycling test at the instant of the failure

Status & Future Perspectives

- ❖ Comparison of the optical sensor types
- ❖ Concept of an on-board monitoring system for automotive applications
- ❖ Prototype of high pressure vessels with integrated sensors and a lab-scale on-board monitoring system

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