

June 2019

COMMENTS ON DOCUMENTS

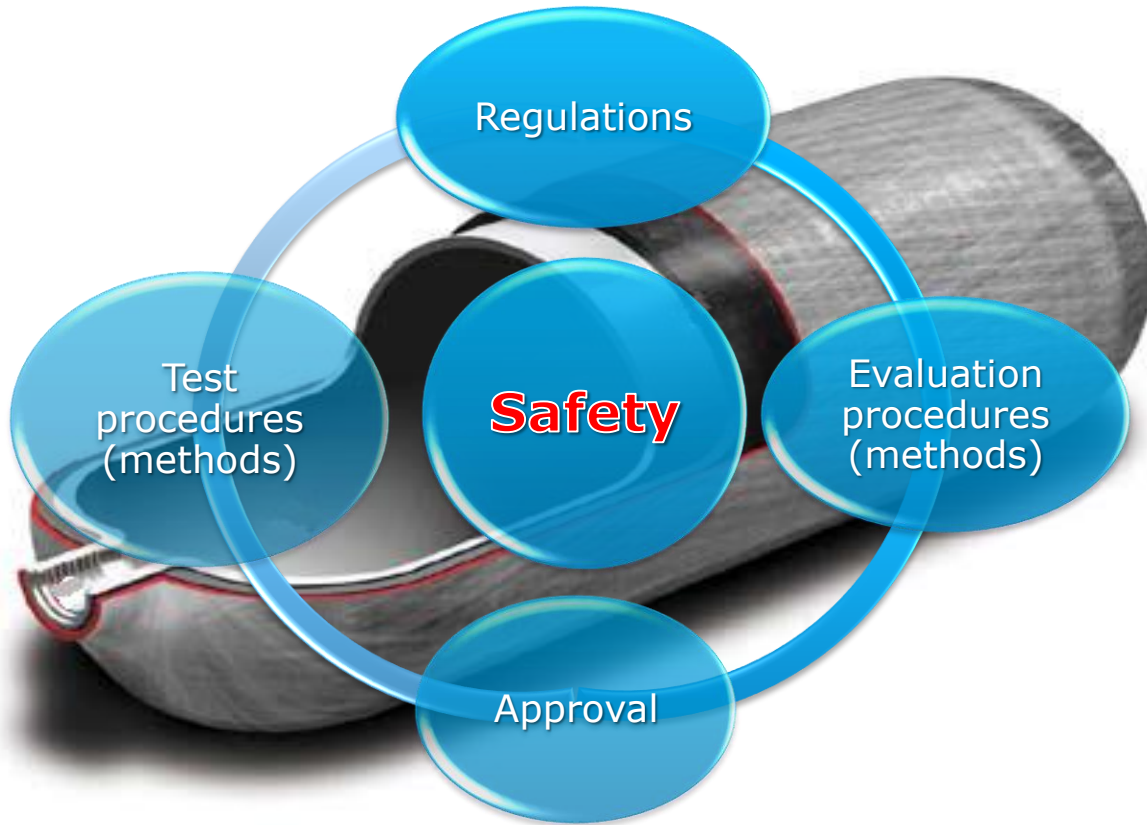
Bin Wang, Georg W. Mair

GTR 13 Phase 2 WG - 6th Meeting, Tianjing/China

The benchmark for acceptance of a standard or of technical requirements in a regulation is its power to ensure **safety of all products meeting the minimum requirements of a regulation or standard;**

- despite of the experience of potential manufacturers.**

Four aspects of safety in gas storage



Probabilistic Safety Assessment

The status of safety is achieved when an undesirable event does not occur more frequently than is accepted.

-
- 1. The current discussion about right-turning lorries killing bicycle riders in Europe shows:
The acceptance of fatalities not being passengers is much lower than of death passengers.**

 - 2. It is not worth to discuss details on incidents expected with a frequency lower than the accepted failure rate.**

Determination of safety level

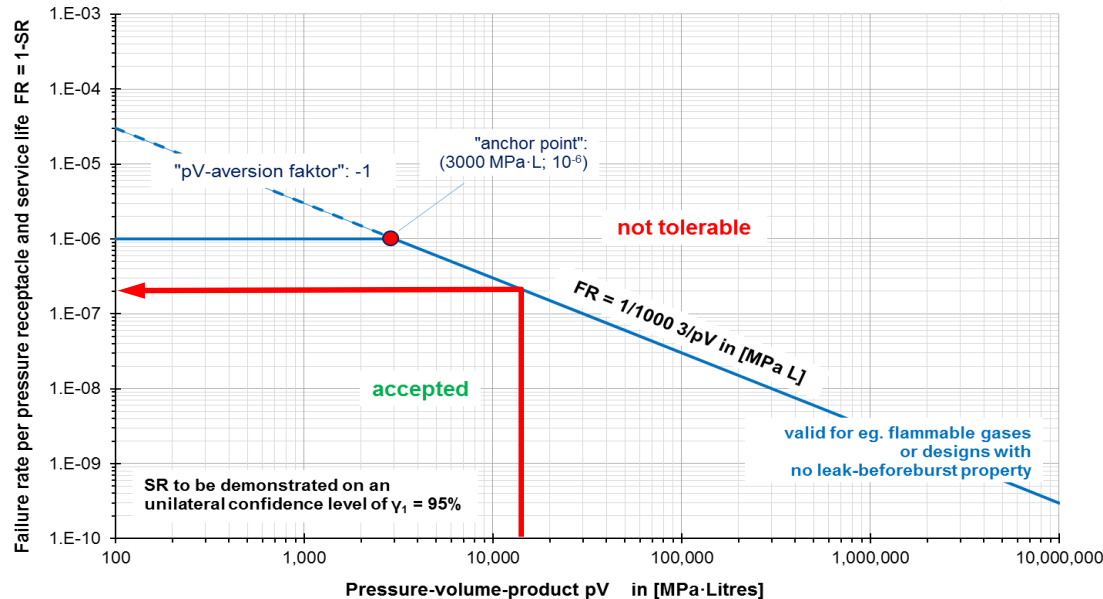
Based on German requirements for the transport of dangerous goods

Minimum requirements for CGH₂ storage in type IV-CPVs

Curve of failure rate FR vs. pressure-volume-product pV



TAHYA
TANK HYDROGEN AUTOMOTIVE



Source: BAM-GGR 021

This EU-project decided in 2018 to address a maximum failure rate of 2 of 10 Mio CPVs during life time up to a pV of about **150 litres@875 bars**


Comments on the documents

supplementary comments on GTR13-5-03

-
- We do not share the recommendations for widening the temperature ranges during test. This is contradictory to the approach of determining means strength and defining a accepted scatter range.
 - It is not correct to propose outdoor tests: burst tests and drop tests should take place indoor as hydraulic cycle tests and sustained load tests do.
 - A burst test running for just a few minutes shows too high strength values.
 - What does an individual test value as outcome of a very sophisticated test procedure mean? For validation of degradation the end-of-life scatter must be determined, too.

Comments on the documents

GTR13-5-12 and GTR13-6-13

-
- BAM was partner in the HyComp-project and uses the definition of safety factors as shown on slide 16 (GTR13-5-12). Define the probability of overfilling before defining the maximum service pressure! 
 - We do not support a further reduction of burst ratio without adequate measures with respect to production scatter and in-service degradation.
 - As indicated on slide 18, the influence of time for reduction of burst strength on cylinders is different than on flat probes.
 - The development of NDT for QM etc. is important. Operated evaluation procedures of test results have to be traceable, reproducible able and transparent to all experts.

Comments on the documents

GTR13-5-13 and GTR13-6-12

-
- Interesting test results
 - Keep the test procedure as reproducible as possible. The influence of wind or other factors has to be limited to the minimum.
 - We propose to introduce a “reference test vessel” that allows to calibrate the heat flux of the source into this reference for relevant equipment.

Comments on the documents

GTR13-5-14

-
- Define the probability of getting HFCVs exposed to fire!
 - What is the likelihood for getting a HFCV exposed to fire in a garage?
 - If this is below 1 of 1 Mio it is not worth to consider this combination of conditions. If it his higher, it is to consider regulations which valid for garages.
 - We accept limited gas release through the walls, especially as a kind of redundancy. But we do not support measures that are in contradiction to the important purpose of a blow-off line. No support of proposed chances.

