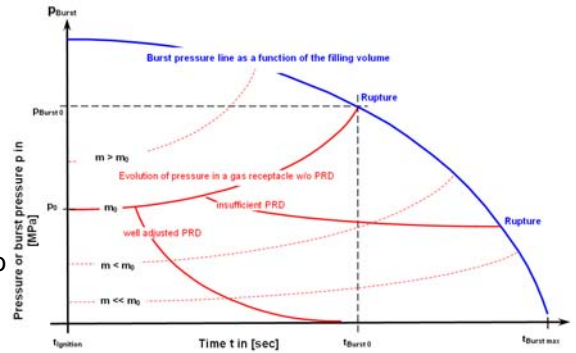


### Safety Assessment: Modular Fire Engulfment Test

#### Objectives

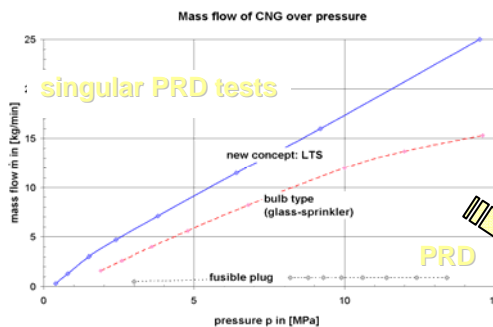
Vehicle burning can be caused by a technical failure or e.g. in conjunction with a crash. Without appropriate countermeasures pressure storage containers would burst within 3 to 15 minutes. With respect to the consequence of such a failure, appropriate measures have to be taken to avoid this reliably:

- ❖ Due to the short period to burst, fire brigades can rarely intervene successfully.
- ❖ The most efficient method for avoiding a fire initiated burst is to equip the system with a pressure relieve device (PRD).
- ❖ For dimensioning, the interaction of PRD and cylinder (principle see right) has to be taken into account.



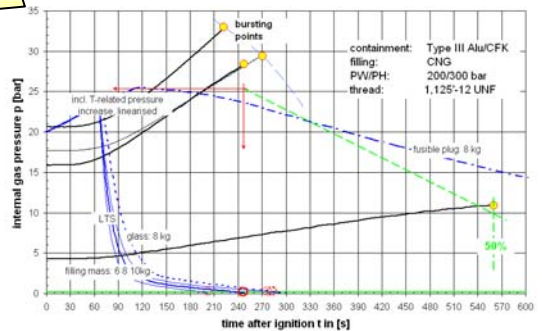
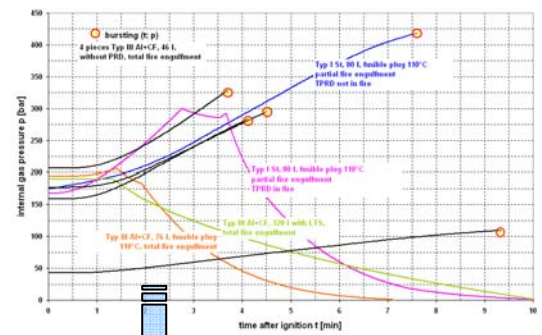
#### Test Results

The assessment of activation pressure, mass flow and release reliability of PRDs at the maximum pressure is not sufficient; some properties scatter significantly. Additionally the so called bonfire test of the container is currently only a PRD-test without a gain in knowledge on the composite container. In consequence of these deficits, a modular test concept has been developed. There the PRD properties and the fire resistance properties of the storage containers can be assessed separately in two parts:



- ❖ Part 1: Fire resistance test of the container without a PRD including measuring of time to burst and the development of gas pressure.
- ❖ Part 2: Functionality test of the PRD in fire including measuring the gas mass flow as a function of the gas pressure.

Based on the measured properties of PRD and container / cylinder, the interaction of both can be calculated and the safety of the combination can be assessed as final step.



#### Future Perspectives

- ❖ It is recommended to test some samples per PRD design connected with a buffer, the mass and pressure of which has to be measured continuously.
- ❖ The containment has to be tested separately. It has to be filled to different filling ratios (100% and e. g. 20% of nominal filling gas mass NFGM = mass at nominal working pressure @15°C) and closed. During the fire engulfment test, the period to burst, the pressure and the temperature have to be monitored.

Partner



Website

[www.storhy.net](http://www.storhy.net)



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