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Directive References: Annex I se 2.2.1

Subject: ESR Design – Decomposition of unstable fluids

Question: The last indent of section 2.2.1 of Annex I states that the decomposition of unstable fluids shall be taken into account for the loadings to be considered for the design of pressure equipment. Is this aiming at the explosive decomposition of unstable fluids?

Answer: No, this is aiming at the slow decomposition of unstable fluids occurring without ignition source and resulting in a slow increase in pressure.
Examples for gases which slowly decompose are Diborane (CAS No. 19287-45-7, UN No. 1911) and Germane (CAS No. 7782-65-2, UN No. 2192). Such gases also have specific requirements with regard to the test pressure according to the dangerous goods regulations.

Reason: The slow decomposition of unstable fluids results – over time - inevitably in an increase in pressure. It therefore has to be considered when designing pressure equipment for such fluids. On the other hand, an explosive decomposition of an unstable fluid will occur only when an effective ignition source is present inside the pressure equipment*. This generally would not be the case under normal operating conditions. Please refer also to Guideline A-56 (CLAP X057).

*: A heat source outside the pressure equipment may eventually initiate the decomposition of an unstable fluid inside the pressure equipment. However, this can happen only if the inside of the pressure equipment is heated to such a temperature that the decomposition temperature of the unstable fluid is exceeded and therefore actually is also an "inside" ignition source.

NOTE: For unstable gases in the sense of Annex II, Tables 1 & 6 see Guideline B-21 (CLAP X225).