# Minimizing Halon emissions & improve MRO of aircraft fire extinguishers by acoustic emission technology

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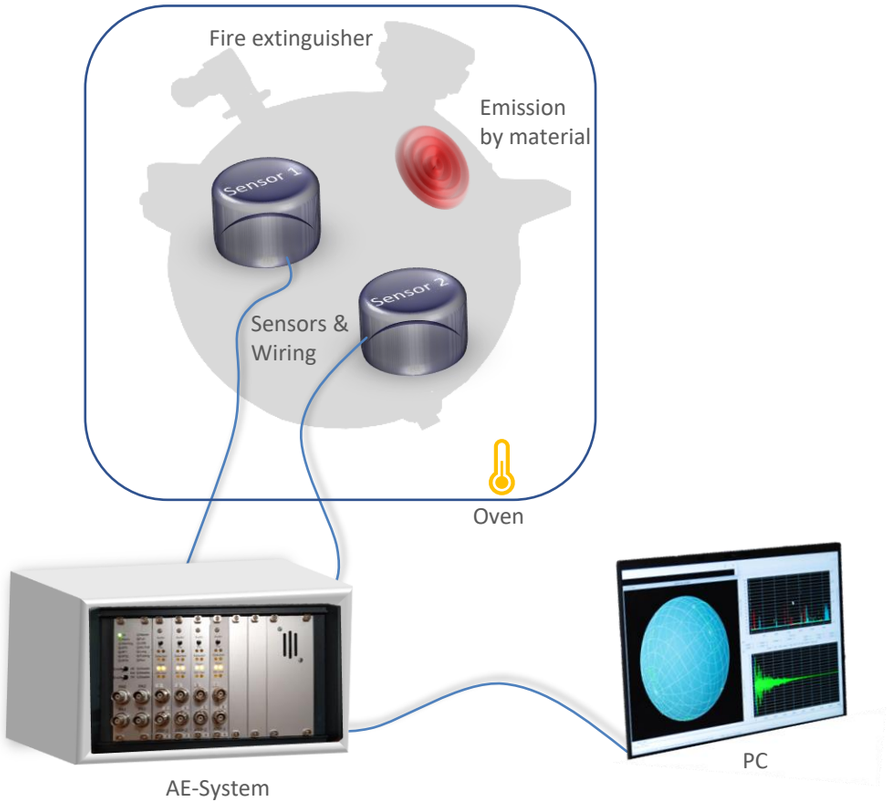
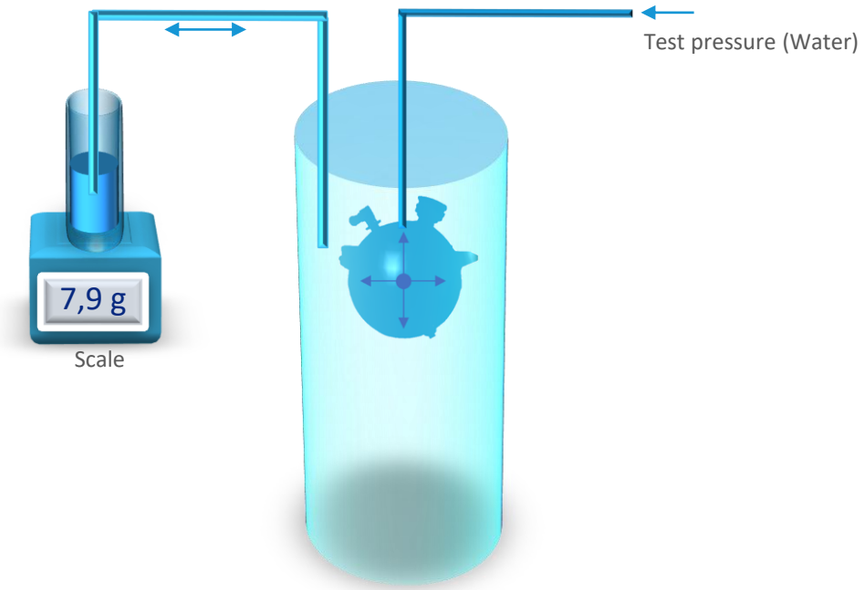
# Testing fire extinguisher structure - Test setups

## Acoustic emission (AE)




## Hydrostatic test (HST)



# Key properties: AE vs. HST

| | | Acoustic emission (AE) | Hydrostatic test (HST) |
|---|---|---|---|
| **Test method & requirements** | Test principle | Acoustic emission when load is applied | Expansion with test load applied |
| | Test medium | Agent | Water |
| | DOT requirements | DOT accepted alternative - DOT-SP 11850 | CFR 49 PART 180 Subpart C (§180.205) (Expansion methods) |
| **Sensitivity flaw detection** | Undetected defects | Low risk | Moderate risk, many small flaws are undetectable |
| | Scrap-rate* | approximately 1-2 % | less than 0.1 % |
| **Test process** | Risks | Fully automated process,<br>less potential damaging activities | Auxiliary processes - machining, welding (thermal load, material limits) |
| | Test load | Elastic deformation | Permanent plastic deformation - possible weakening of structure discussed |

* Rate of fire extinguishers that do not pass testing

# Key properties: AE vs. HST (continued)

| | | Acoustic emission (AE) | Hydrostatic test (HST) |
|---|---|---|---|
| **Specific conditions** | Leakages | Leakproof for many years in operation (Weight check) | Risk of newly introduced leakages |
| | Corrosion detection | Highly sensitive | Visual inspection |
| | Corrosion risk | Very low corrosion risk | Higher corrosion risk due to risk for traces of water / moisture |
| **Emission / Losses** | Emissions / Agent loss | Zero emission - no discharge, no losses | 10 - 35 % (High GWP / harmful agents) |
| | Halon 1301 obsolescence | Minimized consumption, mainly fire suppression on board of aircraft | Significant consumption by MRO activities |
| | Agent exposition staff | No exposition | Depending on safety measures |
| **Economic / Quality** | Maintenance cost | 30 - 70 % (depending on reference) | 100 % (reference) |
| | Turn-around-time | Fast (reduced process steps) | Reference |
| | Structure Quality / Safety | Improved | Reference |

# Future agents (Halon replacement) and research

**AE-applicability for future halon replacement agents**

- Studies support AE-technology is applicable for replacement agents, further studies planned
- Improved working safety for replacement agents with lower acceptable MAC (maximum allowable concentrations)
- Addressing possible environmental regulations

# Questions?