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C2Po2B-10: Best Safety Practices in Liquid Hydrogen Infrastructure and Fueling

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Liquid Hydrogen (LH₂) infrastructure systems are widely installed in industry where more than 200 systems convert the low pressure LH₂ to high pressure gaseous hydrogen (GH₂) which is stored in pressure vessels (ground storage tanks) and distributed via a high-pressure manifold as needed, to multiple fueling stations which refuel the onboard H₂ tanks of the H₂ vehicles (cars, buses, trucks) or hydrogen power industrial trucks (HPITs). The LH₂ infrastructure consists of various subsystems with different design and operating pressure and temperature ranges. It is critical to implement test methods which will test each subsystem/component under its worst case scenario. For instance, the worst-case scenario for the ground storage tank, is the maximum operating temperature/pressure case for strength consideration. The worst-case scenario for the tank valve, is the maximum operating pressure and minimum operating temperature for seal material embrittlement consideration. Several examples are presented where the worst-case scenarios are different, for the various components of the subsystem. It is also critical to develop intelligent systems which can utilize the output signal of the various sensors to determine subsystem malfunctioning, and take action that will result in safer and more efficient operation. Several examples are presented, where intelligent controls predict subsystem failure and take immediate action to avoid a dangerous condition.

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