

Industrial perspective of Hydrogen Storage, Service, and Safety

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There are many international accords on global warming, and the Paris accord goal is to limit global warming to well below 2°C and achieve Net Zero. To reach Net Zero, emission from home, transport, agriculture, and industry need to be cut. The green Hydrogen could be a critical enabler of the global transition to sustainable energy and net zero emission economies. The time is right to tap into hydrogen's potential to play a key role in managing critical energy challenges. Many countries are venturing into hydrogen fuel usage in transport and heavy engineering industries. Green Hydrogen can supply 25 % of the world energy need by 2050. India has the platform to meet the major share of the above. The Indian Startups and major industries essentially need to focus on Green Hydrogen.

To achieve the above goal, the startups and industries must follow the necessary safety standards on Hydrogen storage and servicing. Hydrogen is so hazardous (Group III), and exposure to cryo Hydrogen vapor can cause asphyxiation, exposure of the skin to liquid cause frostbite. The storage materials are subjected to embrittlement failures. The storage of hydrogen has to be as per STEC/AMCR regulations. The design of cryogenic Hydrogen storage vessel needs special construction in which double wall structure insulated with evacuated Multi Layer Insulation with liquid nitrogen shield. The transfer lines have to be provided with super insulation. The field storage of hydrogen needs special type of lightning protection and earthing schemes. The particle contamination level for fluid servicing circuit is maintained as per "NAS 1638 Class VI" in Aerospace applications. The cryo hydrogen servicing involves media substitution, chilling and filling of tanks and level correction. Hydrogen loading has to be done remotely with safety interlocks through pressure feedback or pump transfer mode. One has to ensure that the gas detection systems are calibrated periodically.

Principle of safety factors has to be adhered for new facilities. The relevant safety standards for industrial processes such as handling of gaseous and cryo Hydrogen are to be followed. The systems and the processes are to be designed for safety. The hazard risks associated with processes, operation with the facility, failure modes of components/systems, leakage of gas, instrument and control devices, control software, and hardware have to follow the safety standards. The layout, fire protection systems, gas detection system, etc need to be used are to be approved by PESO (Petroleum and Explosive Safety Organisation). The safety training for facility personal are essential part of the entire process.