Together we create the technology of the future

Safety of H2 installations from a practical point of view

ASE Technology Group – Functional Structure

400+
ENGINEERS

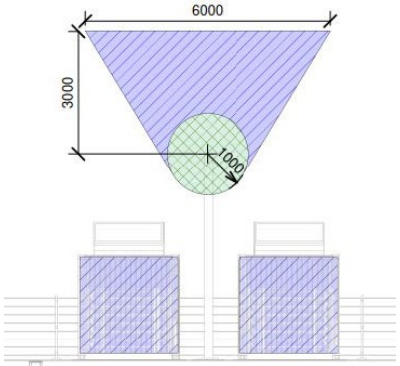
ENGINEERING DESIGN EPC	BIPRORAF · PROJMORS · CAMINO PROJECT · PROJMORS INDIA
EXPERT TRAININGS HR	EKO-KONSULT · LKK / CNK
INTEGRATOR	ASE ATEX · ASE OFFSHORE · SQUADRON
PRODUCER	ELMECH-ASE
EXPORT	MIEP · ASE BALTIC · ASE EAST AFRICA

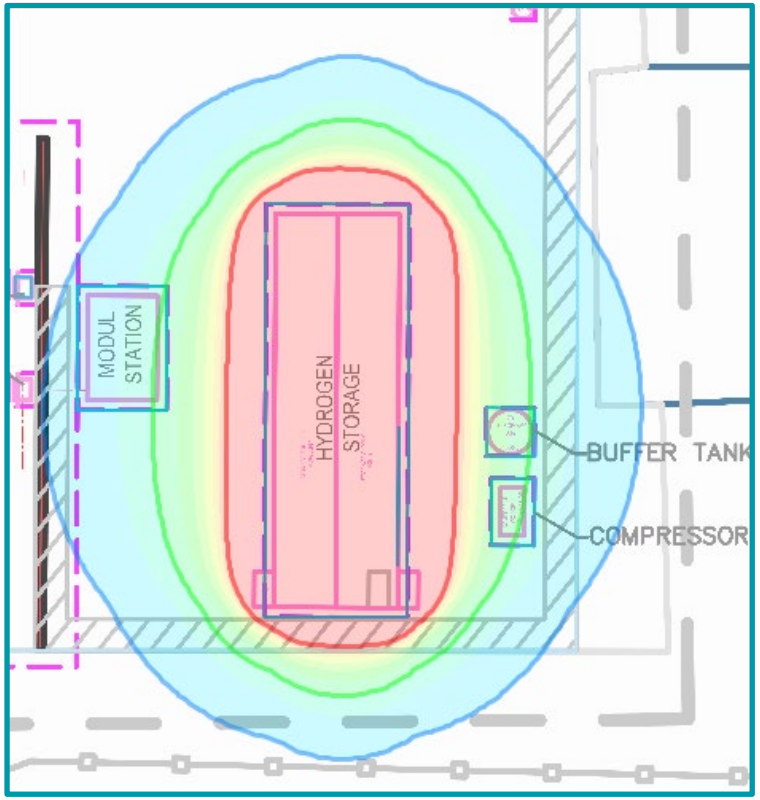
H2 Installations – Selected safety standards

ISO/TR 15916	Basic considerations for the safety of H2 systems
ISO 19880-1	Gaseous H2 - Fueling stations - Part 1: General requirements
ISO 16110-1	H2 generators using fuel processing technologies - Part 1: Safety
IEC 62282-3-100	Fuel cell technologies. Stationary fuel cell power systems. Safety
ISO/TS 19883	Safety of pressure swing adsorption systems for H2 separation and purification
ISO 22734	H2 generators using water electrolysis - Industrial, commercial, and residential applications
NFPA 2	H2 technologies code
CGA G-5.5	Standard for H2 vent system

H2 Installations – Safety distances acc. to ISO 19880-1

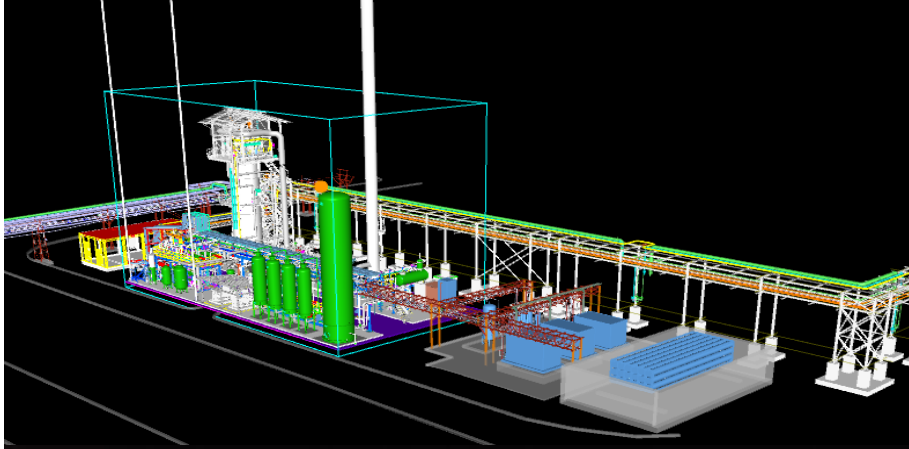
- ✓ For standard equipment and events, safety distances may be defined by in **national regulations** and/or may be determined on the basis of a **quantitative risk analysis (QRA)** and **consequence modelling.**
- ✓ In various regulations and industry practices, the term 'safe distance' often encompasses many types of distance, such as:
- ✓ restriction distances;
- ✓ clearance distances;
- ✓ installation layout distances;
- ✓ protection distances;
- ✓ external risk zone.





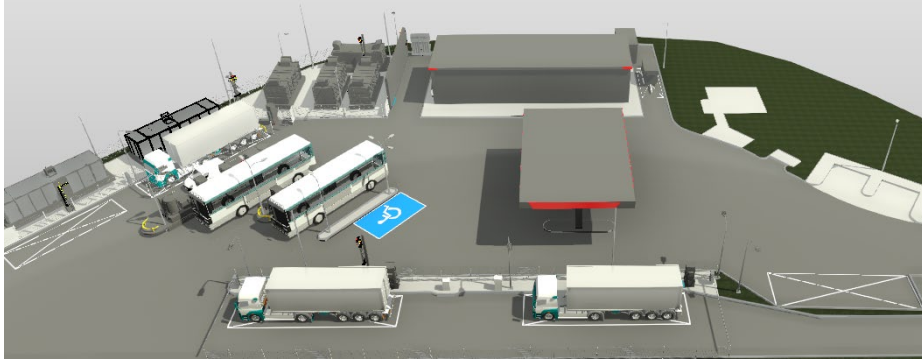
H2 Installations – Turnkey (EPC) Projects

- H2 & PSA+ PLANT- TRZEBINIA
- EPC installation for propylene glycol production along with auxiliary facilities such as Glycerin Purification Plant, Hydrogen Plant, Wastewater Treatment Plant for ORLEN Południe S.A. – Trzebinia



H2 Installations – Turnkey (EPC) Projects

- HRS POZNAN
- HRS KATOWICE
- For buses and cars
- ≈ 1T of H2/24h Poznań
  ≈ 0,6T of H2/24h Katowice



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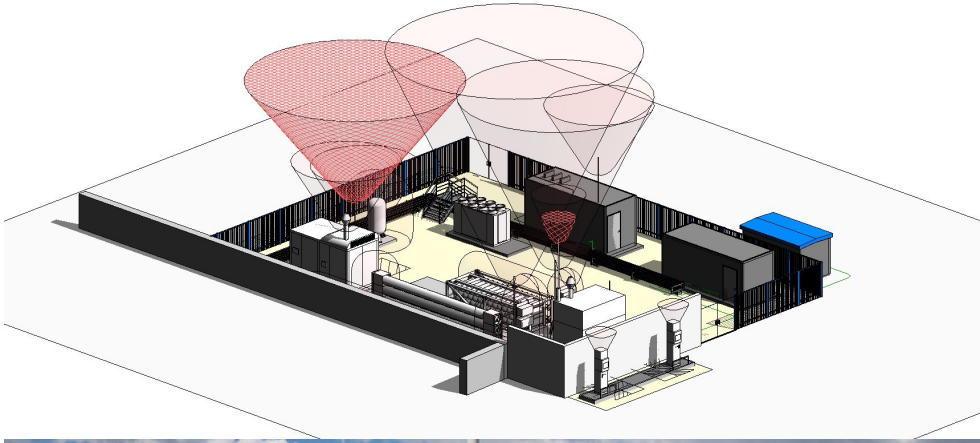
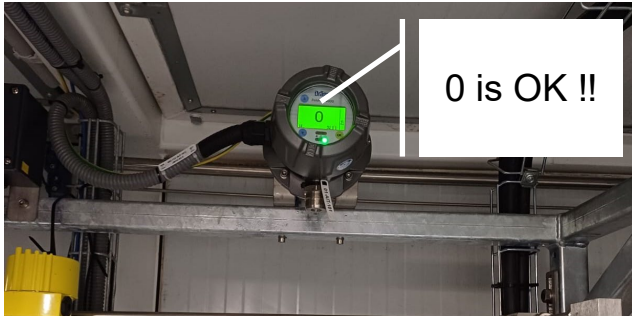
H2 Installations – Turnkey (EPC) Projects

- SOLBET
- GREEN HYDROGEN PLANT
- Electrolysis technology, compression, storage and distribution (passenger cars and forklifts)



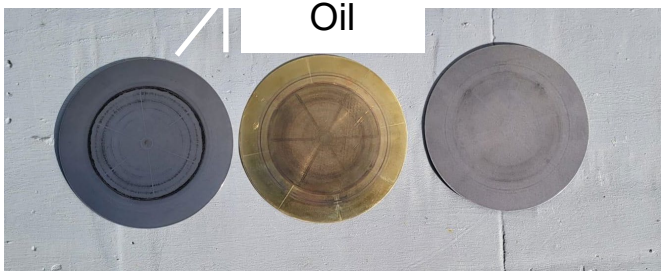
H2 Installations – Risks during the implementation and operation

- Inadequate insulation on pipelines in the H2 cooling system
- Internal leakage of solenoid valve (portable Ex ultrasonic camera)
- Effective H2 concentration monitoring in the electrolyser container, risk of H2 explosive atmosphere (gas detectors and correct ventilation)



H2 Installations – Risks during the implementation and operation

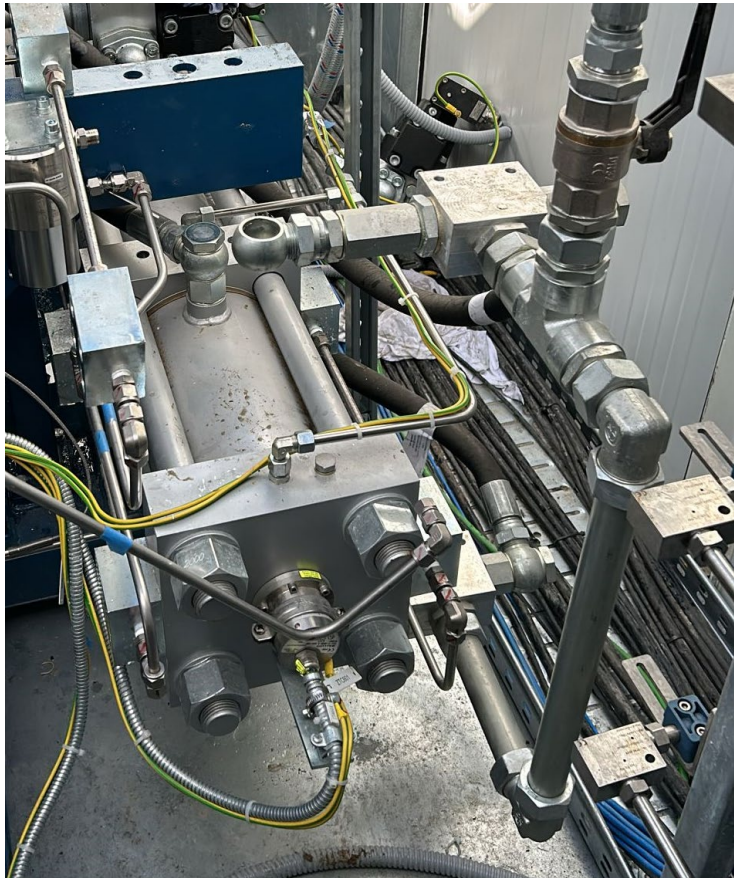
- Oil in hydrogen compressors
- Effective H2 flame monitoring in the HRS area (H2 flame in daylight is invisible, direct exposure to hydrogen flames causes immediate burns)



Micropack Biproraf, Ekokonsult

H2 Installations – Risks during the implementation and operation

- Hydrogen compressor leaking oil
- Inadequate sealing



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H2 Installations
– Risks during the implementation and operation

- Mechanical damage of the cabinet by vehicle
- Impact protection not properly installed
- Unfolded 'paws' to prevent the vehicle from rolling

H2 Installations – Safety distances acc. to ISO 19880-1

H2 explosion at a refuelling station in Sandvika (Norway)

- ✓ In June 2019, from the reservoir at the station at the Uno-X station in Sandvika near Oslo, H2 gas leaked and exploded.
- ✓ The incident left 3 people unharmed when the pressure wave triggered the airbags in their cars nearby.
- ✓ The cause of the explosion at the hydrogen refuelling station **was an incorrectly fitted cap on the hydrogen tank** in the high-pressure storage tank.

Source: https://www.nrk.no/norge/eksplosjon-ved-hydrogenstasjon-1.14582914

Hydrogen Academy - course is focusing on technological and safety aspects of H2 technologies

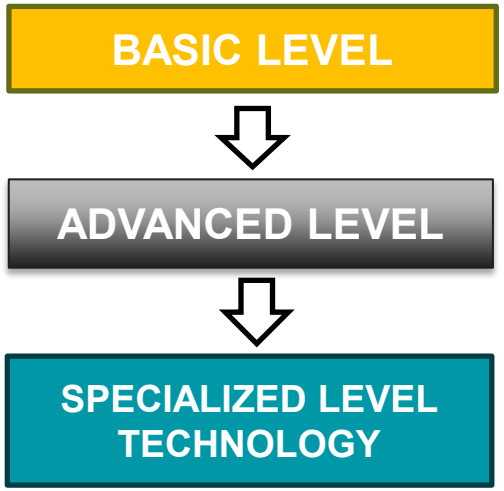
- ✓ Hydrogen technology
- ✓ Electrolyser
- ✓ Fuel cell

- ✓ Safety rules for hydrogen systems
- ✓ Health and safety

- ✓ Management of H2 projects
- ✓ Process safety management on hydrogen plants
- ✓ Hydrogen detection systems
- ✓ Selection and installation of equipment in H2 atmospheres

H2 Academy contact: trainings@ase.com.pl

STRUCTURE OF H2 TRAININGS



H2 Installations – Summary

Risks during the implementation and operation	
TURNKEY (EPC)	OPERATION
EPC Contractor/Integrator – Experienced	HRS operator training
Component producers, instalator for HP – Verified	H2 trailer/car operator training
H2 Leaks and flames detection systems – Effective	Awareness of risks during fueling and refueling

Battery energy storage system - ENERGATE

Energy storage

- Storing excess energy from PV installations for use during times of higher purchase prices
- Cost optimization of energy consumption: drawing energy during off-peak hours and selling it during peak hours
- Reduction of charges for ordered power – minimizing consumed power
- Power supply during periods of production absence
- Function of supplying power during grid failures
- Collective UPS function

Energy management module

- Improvement of electric power quality
- Reactive power compensation

BIPRORAF

TECHNOLOGY GROUP

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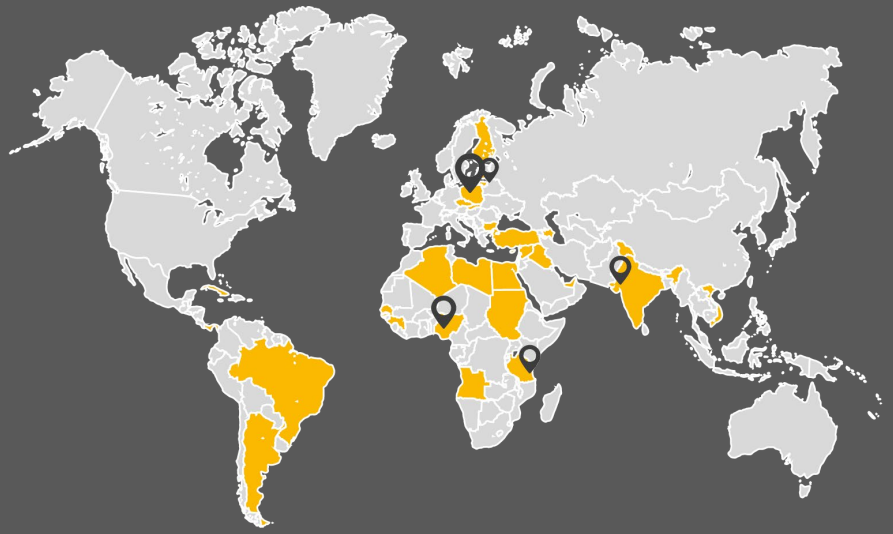

TOGETHER WE CREATE FUTURE