

- Background: mechanical engineering en process automation
- Started as process automation programmer and engineer
- Worked in de oil & gas industry (midstream and upstream) for 30 years (automation, instrumentation, gas chromatography, management and sales)
- Hanze University for over 5 years, managing/engineering:
 - HEAT House (testing facility for domestic heating systems)
 - WING (hydrogen testing grid 200 barg => 30 mbarg)
 - HydroHub (250 kW AWE and 250 kW PEM electrolyzers)
 - ReMo-Lab (laboratory for renewable molecules with the focus on biogas and hydrogen)



EnTranCe Hanze University of Applied Science

Experiments/tests/research with:

- Students
- Companies
- NGO's
- Cooperations
- Local governments
- Etc.



Hydrogen: part of the energy mix

- WING: hydrogen grid with 200 barg storage and 8 barg distribution
- Research on alternative fuels/gases
- Which role can hydrogen play in the present and future energy mix?
- Can hydrogen be retrieved from waste such as swill or manure?
- It is 'applied' so we try it
- Safety!!!

HydroHub MegaWatt Test Centre (HHMWTC)

- Large consortium with partners such as:
 - ISPT
 - Nobian/HyCC
 - Gasunie
 - Shell
 - TNO
 - University Groningen
 - Yara
 - Yokogawa
 - Groningen Seaports



- Alkaline Water Electrolysis (AWE):
 - 250 kW
 - Manufacturer PERIC (China)
 - Main objectives: finance and flexibility
- Proton Exchange Membrane (PEM):
 - 250 kW
 - Manufacturer TNO
 - Main objectives: higher pressures (up to 50 barg) stack testing
- Utilities:
 - 700 kW grid connection
 - 250 kW cooling
 - Ultra Pure Water system
 - Nitrogen
 - Instrument air
 - Fire/gas detection
 - Emergency Shutdown System

Challenges

- Safety first!!!
- Technical standards are not yet fully ready for hydrogen
- Hydrogen in domestic areas?
- NL: governmental attitude changes => rules change during the 'play'
- Grid entry
- Transport
- SHARING KNOWLEDGE
- And many more