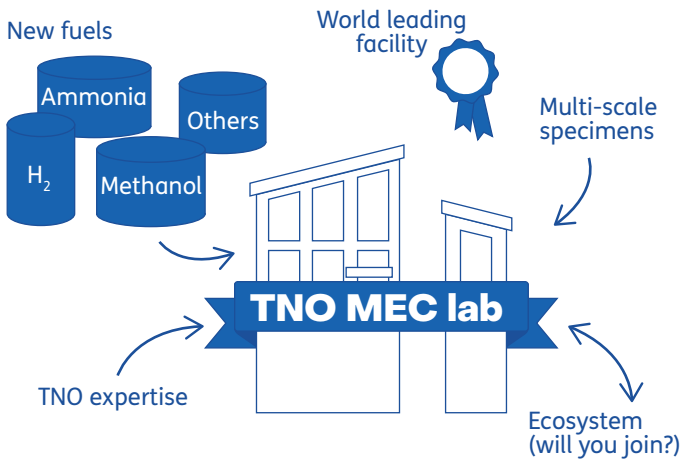


MEC lab



Testing materials and components in extreme conditions: e.g. cryogenic/corrosive/high temperature/hydrogen

TNO plans to develop a world leading facility for material, coupon and component (qualification) tests to accelerate the safe transition to renewable fuels. Will you join?

Problem and solution

The transition to a zero emission society requires a transition to renewable fuels. These fuels, such as hydrogen, ammonia, methanol, are corrosive, flammable, explosive, and stored and used under extreme conditions. This raises questions related to the safety of systems and components. However, test capacity to develop and qualify these systems and components is scattered and scarce. Tests are not all standardised, indicating the need for a facility that combines applied scientific research and development with experiments: the MEC lab.

With the MEC lab TNO assists clients as an independent partner specialised in design, execution and interpretation of non-standard tests. The output ranges from material models to digital twins of complete systems to manage associated risks.

What will we test?

The lab provides evidence for qualification of metals, rubbers/seals, composites. Ranging from coupon scale to (subsize) components and full systems (such as storage tanks, valves, pipeline systems). Examples of topics are hydrogen embrittlement of pipelines and corrosion of storage tanks upon transporting ammonia or methanol.

Types of tests, e.g.:

- Material tests: material characterization, exposure tests
- Mechanical tests: monotonic (slow strain rate), fatigue, corrosion, impact
- Qualification tests: burst tests, flow performance, deterioration, leakage, permeation

Conditions, e.g.:

- Substances: gaseous and liquid H₂, ammonia, LNG, CO₂, molten salt and various additives (O₂, H₂O vapor, N₂, H₂S)
- Temperatures: cryogenic to high temperatures (700 °C)
- Pressures: near-vacuum to 500 barg



Flammable



Compressed Gas



Corrosive



Toxic



Explosive



Cryogenic



Examples of test specimens that are tested in the lab. Left to right: cryogenic hoses, transport pipelines, (pressurized/cryogenic) storage tanks, small scale material coupon specimens.

What's in it for you?

The path towards lower emissions is currently full of obstacles, both in terms of available knowledge, lack of qualification standards and (outdated) regulatory frameworks. Independent applied scientific research (with associated MEC lab) fills this gap and accelerates the transition. Collaboration with class societies enables rapid approval of new concepts. The lab is not domain specific and is intended to, amongst others, cover the following domains:

- Pipelines: reuse of infrastructure for gCO₂ or gH₂ transport
- Transport: renewable fuels and ICEs for road/water/air
- Storage and bunkering: fuel/storage tanks, transfer and offloading systems, CCS, bunkering, tube trailer transport
- (Renewable) energy production: OWT, floating solar, nuclear (corrosion/high temperature)

Why TNO?

TNO performs various tests in extreme conditions related to alternative fuels today. Examples are dynamic tests in high pressure hydrogen, an operational CO₂ flow loop, tests of



TNO test facility for small scale coupon tests in pressurized hydrogen gas

cryogenic LNG hoses, venting tests of methanol and various (ammonia and hydrogen) exposure tests.

TNO has the ambition to expand this to a large-scale facility. With the availability of in-depth specialists on materials science, structural analysis, test setup design we have the knowledge available to cope with current and future challenges in the market. With a MEC lab, we are structuring and funnelling the research into alternative fuels, assisting you from coupon tests to qualification. TNO integrates scientific findings to independently develop test protocols and acceptance criteria.

Strategic considerations

- Publicly available specialized test capacity.
- Flexibility in test setups and substances for a future proof lab.
- Make use of, strengthen and expand existing TNO facilities; an increase of both scale and capacity increases the innovation power of the Netherlands and Europe.

Call to action

What are your testing needs? Please contact us and help to tailor the lab facilities to connect with industry needs.

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