

# SGS Measurement & Calibration across the Hydrogen rainbow'

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# Scope of SGS Measurement & Calibration Services



- **Four core strands of activity:**

1. On-site testing of process gases (bulk, high purity, tankers)
2. Calibration, Validation, Maintenance, Inspection of Measurement Instrumentation and associated systems
3. Project Instrumentation Solutions
4. Specialist Laboratory Analytical Services (particular competencies in Gases, Pharma, Semicon, H2 fuel & beverage grade CO2)

- **Sectors addressed:**

1. Pharma & Medical sectors
2. Beverage (Distilling, Brewing & Soft Drinks) & Food (Processing & Abattoirs)
3. Manufacturing & processing Semi Conductor
4. Energy - Renewables - Measurement & Calibration
5. Environmental Buildings
6. TODAY we are focusing on ENERGY and the challenges facing our transition to HYDROGEN



# 1. SGS/GAS role in sampling of hydrogen fuel electrolysers and refuellers.

<b>Gas Testing</b>	On-site analysis of hydrogen and Ammonia	Laboratory Analysis of Hydrogen from industrial grade to fuel gas as per ISO14687 to UHP grade	Periodic testing of Hydrogen generators, storage and fuelling stations	On site qualification of hydrogen generation, purification and filtration systems
<b>Instrumentation</b>	Local distributor for Servomex, AGC & Peak Laboratories	Design & build of sampling systems for diverse fuel cell applications	Maintenance of gas analysers for hydrogen, ammonia, oxygen and water	Service and calibration of gas analysers
<b>Knowledge &amp; Expertise</b>	Member of ISO GTSC TC11 gas quality - NSAI gas standard technical committee	20+ years experience in gas testing	Accredited laboratory by INAB to ISO 17025	Experience with multiple generation and storage solutions

# GAS Specialists in hydrogen quality

## Gas Testing

On-site analysis of hydrogen products up to Grade 8.0+ & analysis of particulates in hydrogen

Laboratory Analysis of Hydrogen from Industrial grade to fuel gas as per ISO14687 to UHP grade

Periodic testing of Hydrogen generators, storage and fuelling stations

On site qualification of hydrogen generation, purification and filtration systems

## Instrumentation

Local distributor for Servomex, AGC & Peak Laboratories

Design & build of sampling systems for diverse hydrogen applications

Periodic & corrective maintenance of gas analysers on Hydrogen service

In house service facility for service and calibration of gas analysers

## Knowledge & Expertise

Member of ISO GTSC TC11 gas quality - NSAI gas standard technical committee

20+ years experience in hydrogen testing and hydrogen analysis

Accredited laboratory by INAB to ISO 17025

Experience with multiple generation and storage solutions

## 2. Measurement challenges & strategies in high pressure hydrogen refueling.

### Safety is paramount

Rapid technology development means Standards are always 'catching up'

Sampling strategies & interfaces are unregulated & confusing

Collection of representative samples takes time

Transportation of samples can be a bottleneck

Sampling equipment must be rated for 700 barg

ISO 14687:2019 Grade D is a challenging and expensive analysis that takes time

What may be achievable in a lab may not be in the field

Customers want  
prompt support  
and reliable data  
at a fair price

## Laboratory & On-site H2 Analysis Capabilities



UHP mobile carts for ultra trace H<sub>2</sub>O, O<sub>2</sub>, H<sub>2</sub>, N<sub>2</sub>, Ar, CO, CH<sub>4</sub>, CO<sub>2</sub> & NMHC and particles counters down to 0.01 micron size

Gas Chromatography (GC):

GC-TCD Thermal Conductivity Detector

GC-FID Flame Ionization Detector and GC-Methaniser-FID

GC-SCD Sulfur Chemiluminescence Detector

GC-PDHID Pulse Discharge Helium Ionisation Detector

GC-HeDID Helium Discharge Ionisation Detector

GC-ECD Electron Capture Detector

GC-RCP Reducing Compound Photometer

Full array of Gas Reference Standards and calibrated permeation and dilution blenders

Hydra8 Moisture calibrator

Portable ppm Oxygen & Moisture analyser

High pressure sampling systems for sample collection in compliance with ASTM Methods

# Investing in equipment and skill sets



## **Examples of periodic testing**

Monitor quality of storage systems overtime for build up of impurities

Monitor performance of generation equipment such as electrolysers and steam methane reforming plants

Confirm compliance to product specification

Monitor quality of transfilling operations  
Confirm performance of purification and filtration systems

## **Benefits of periodic testing:**

Reduce need for on site instrumentation

Trending data overtime enables early detection of issues

Increased confidence in product quality

Providing industry  
with reliable data



## **GAS activities include;**

Site survey by our experienced engineers including review of venting points and their hazardous classifications

Design & build a sampling apparatus for customer H2 dispenser

Collection of high-pressure gas samples from the dispenser for laboratory analysis

GAS analysed the Hydrogen samples to ISO 14687:2019

Reported results within agreed turn around time

# Adding value to the transition



## Summary

We design, build, install, maintain & service Hydrogen analytical systems

We test hydrogen quality in our laboratory and on your site

We have been working with Hydrogen for 20+ years

We work closely with Standards and related committees to ensure we are working to best practices

We assist our customers along with the development of hydrogen installations of all purities and grades

# Adding value to the transition

### 3. Emerging energy transition strategies.

Wider implementation of hydrogen in energy trade is hampered by its costly and energy-intensive storage coupled with safety concerns associated with its high flammability

To achieve the necessary volumes of hydrogen production will require improvements in scale, efficiency & cost reduction

Scaling up production of brown hydrogen with SMR means the transition to hydrogen will be far from green for many years

Implementing renewable sources of energy is key to cost reduction

Consideration is being given to alternative energy vectors to kick start the transition to greener Hydrogen

Ammonia is a prime candidate for achieving this

Making  
Green hydrogen  
cheaper  
than  
Blue hydrogen

# Ammonia's role in transitioning to Green

- Hydrogen as an energy carrier has to be compressed or liquified at 700 barg or  $\sim -260\text{ C}$
- The cost of containment and transport is very expensive.
- Enabling a new H2 supply chain will take time we don't have
- By contrast, Ammonia (NH3) is a fuel and very easy to liquify, store & transport at 10 barg or  $-10\text{C}$  @ atmospheric pressure.
- The NH3 Supply chain is global and much less expensive to operate.
- NH3 like H2 can be used directly as a fuel and burnt in ICE & Gas turbines with minimal CO2 emissions.
- The world needs more fertilizer and NH3 can be traded as feedstock for making fertilizer, or used as fuel to generate electricity, or Hydrogen on demand to help balance energy demand.



# Considerations



- Moving to a hydrogen economy requires significant cost reduction and scaling up of volumes and efficiencies of hydrogen production.
- Science will improve scale and efficiency but until it does so lobbyists for big Energy have a vested interest in transitioning through the 'rainbow' to get there
- Europe's 'hydrogen economy' will be powered by hydrogen made from polluting fossil fuels rather than from renewable electricity.
- David Bunch (Shell UK CEO) stated at the All Energy conference in Glasgow that 'Natural gas is an indispensable transition fuel'.
- However, Transition Zero (analysts) suggest that cost of renewables is a far less expensive route given recent geopolitical events. <https://www.transitionzero.org/>

# Considerations



- Utilising new energy vectors like ammonia whilst science finds ways through the GHG rainbow may be unpalatable, but necessary.
- Ammonia has a significant role to play in long-term energy storage due to its most advantageous feature – high volumetric energy density.
- Heavy equipment manufacturers may use direct hydrogen combustion
- Shipping may be first to adopt ammonia as a replacement fuel
- Every sector will generate new emissions monitoring challenges and Standards
- **With over 2,500 sites and 100,000 employees SGS is positioned to play its part**

# 5. Reference materials.



- **A Roadmap to the Ammonia Economy**
  - [https://www.cell.com/joule/pdf/S2542-4351\(20\)30173-2.pdf](https://www.cell.com/joule/pdf/S2542-4351(20)30173-2.pdf)
  
- **H2 and NH3 – the Perfect Marriage**
  - <https://www.thechemicalengineer.com/features/h2-and-nh3-the-perfect-marriage-in-a-carbon-free-society/>
  
- **One-stop' offshore wind platform for green hydrogen and ammonia**
  - <https://www.rechargenews.com/wind/one-stop-offshore-wind-platform-for-green-hydrogen-and-ammonia-planned/2-1-918127>
  
- **EU Hydrogen Strategy**
  - [https://corporateeurope.org/sites/default/files/2020-12/hydrogen-report-web-final\\_0.pdf](https://corporateeurope.org/sites/default/files/2020-12/hydrogen-report-web-final_0.pdf)
  - [https://ec.europa.eu/commission/presscorner/detail/en/FS\\_20\\_1296](https://ec.europa.eu/commission/presscorner/detail/en/FS_20_1296)
  
- **Transitionzero Report**
  - <https://www.transitionzero.org/reports>
  - <https://www.transitionzero.org/blog/russia-divestment-eu-energy-transition>
  - <https://www.transitionzero.org/blog/including-gas-in-eu-taxonomy>
  
- **Video on IRENA Report**
  - [https://www.youtube.com/watch?v=\\_PJB5CIES6w](https://www.youtube.com/watch?v=_PJB5CIES6w)



Thank you for  
your time.

Any questions?

