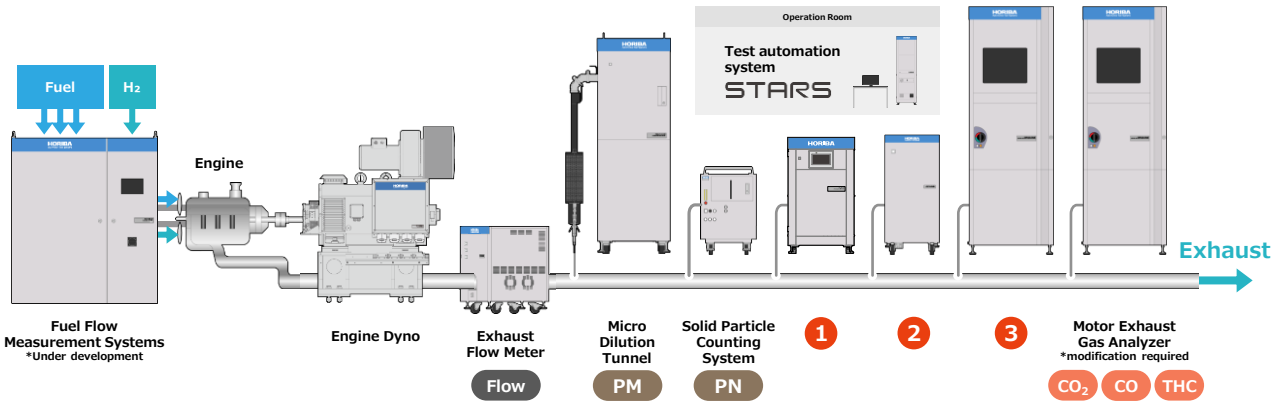
Hydrogen ICE Application Challenges & Solutions

EMISSIONS
ELECTRIFICATION
CAV
DATA

Please find details of the above points on the back side of this page



1 Hydrogen Gas Analyzer Hy-EVO

H2

Correctly measure H_2 in exhaust gas containing high moisture with Wet

Accurate determination of combustion efficiency from unburned hydrogen

- Highly accurate wet measurement eliminates error factors due to dry-wet conversion
- High-speed response enables transient hydrogen gas concentration measurement
- Safety design considering hydrogen characteristics

2 Laser Spectroscopic Motor Exhaust Gas Analyzer MEXA-ONE IRLAM

NO
NO2
NH3
N2O

Correctly measuring combustion conditions to reduce NH_3 IRLAM by HORIBA

Supports exhaust gas reduction by correctly evaluating NH_3 generated during SCR reduction

- Unparalleled response to stoichiometric and lean combustion changes
- Wide range to accurately evaluate the peak during stoichiometric and lean combustion
- Sampling technology to correctly measure NH_3 is also proposed (patent registered)

3 FTIR Exhaust Gas Analyzer FTX-ONE series

H2O
NO
NO2
NH3
N2O
CO2
etc.

Simultaneous multi-component measurement
to correctly measure combustion conditions and aftertreatment performance

Simultaneous measurement of H_2O and $NO_x/NH_3/N_2O$ with a single unit

- Unparalleled response to stoichiometric and lean combustion changes
- Low flow sampling to minimize turbulence in the measurement field
- Measurement of up to 28 components, including high-concentration moisture

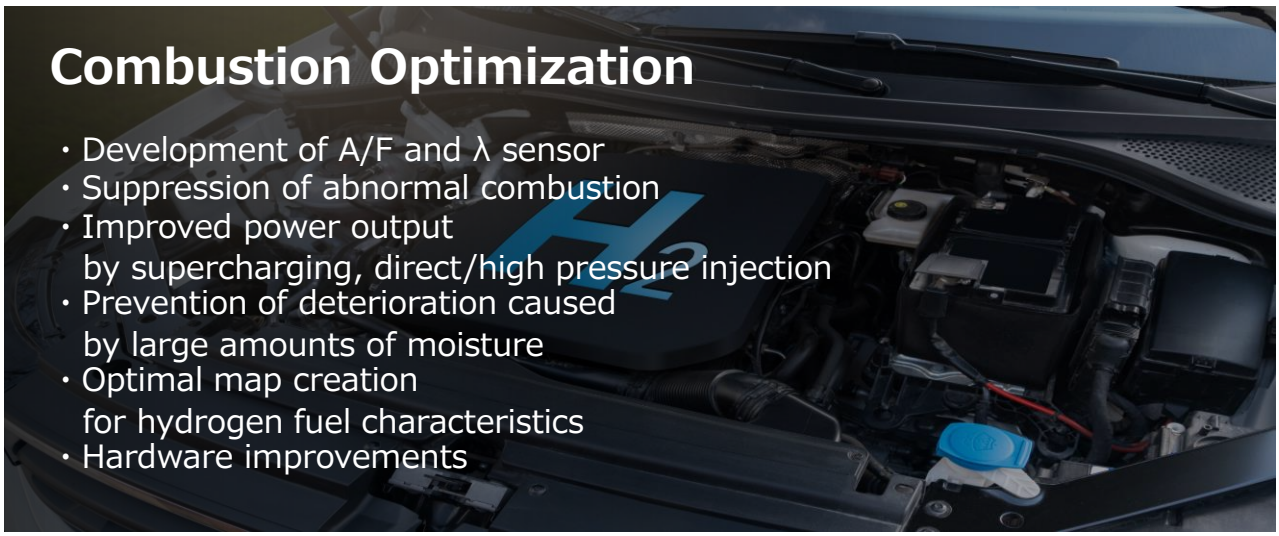
HORIBA Automotive

https://www.horiba.com/en_en/automotive/

TN-0012

Development Challenges for Hydrogen Engines

Combustion Optimization

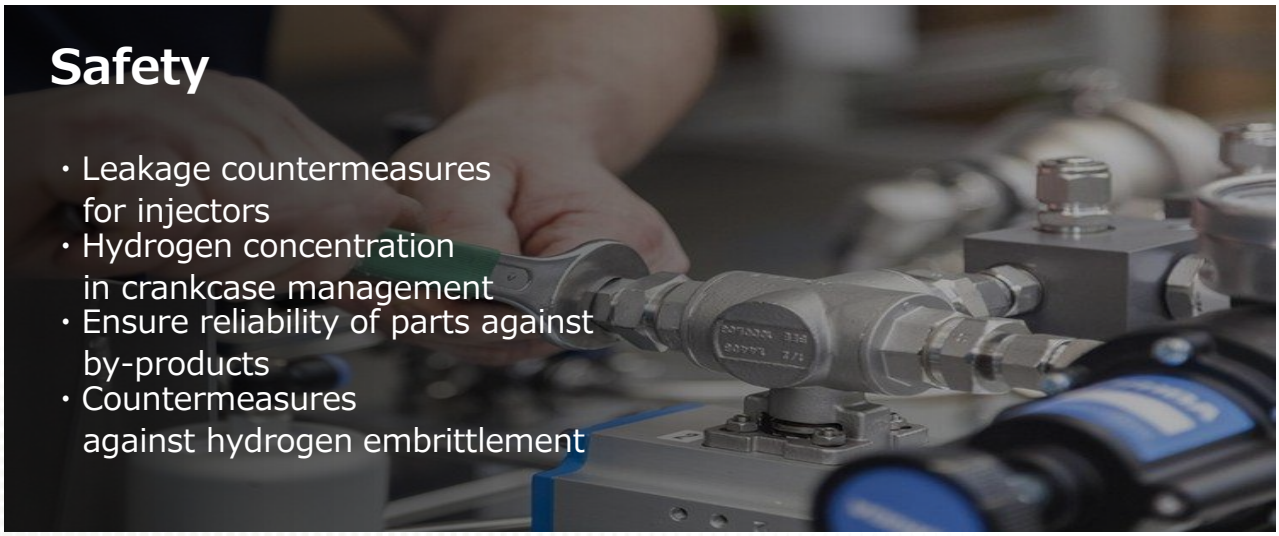


- Development of A/F and λ sensor
- Suppression of abnormal combustion
- Improved power output
  by supercharging, direct/high pressure injection
- Prevention of deterioration caused
  by large amounts of moisture
- Optimal map creation
  for hydrogen fuel characteristics
- Hardware improvements

Aftertreatment Development

- NOx reduction using catalysts
  (TWC /SCR /DOC, etc.) and EGR
- Suppression of NH_3 formation
  by H_2/NOx reaction in TWC
- Reduction of NH_3 slip from Urea SCR
- Suppression of N_2O generation in ASC
- Inhibition of CO_2 generation
  from Urea and engine oil
- Inhibition of PM/PN from blow-by gas
- Get the latest regulatory trends

Safety



- Leakage countermeasures
  for injectors
- Hydrogen concentration
  in crankcase management
- Ensure reliability of parts against
  by-products
- Countermeasures
  against hydrogen embrittlement