

Gas sampling procedures

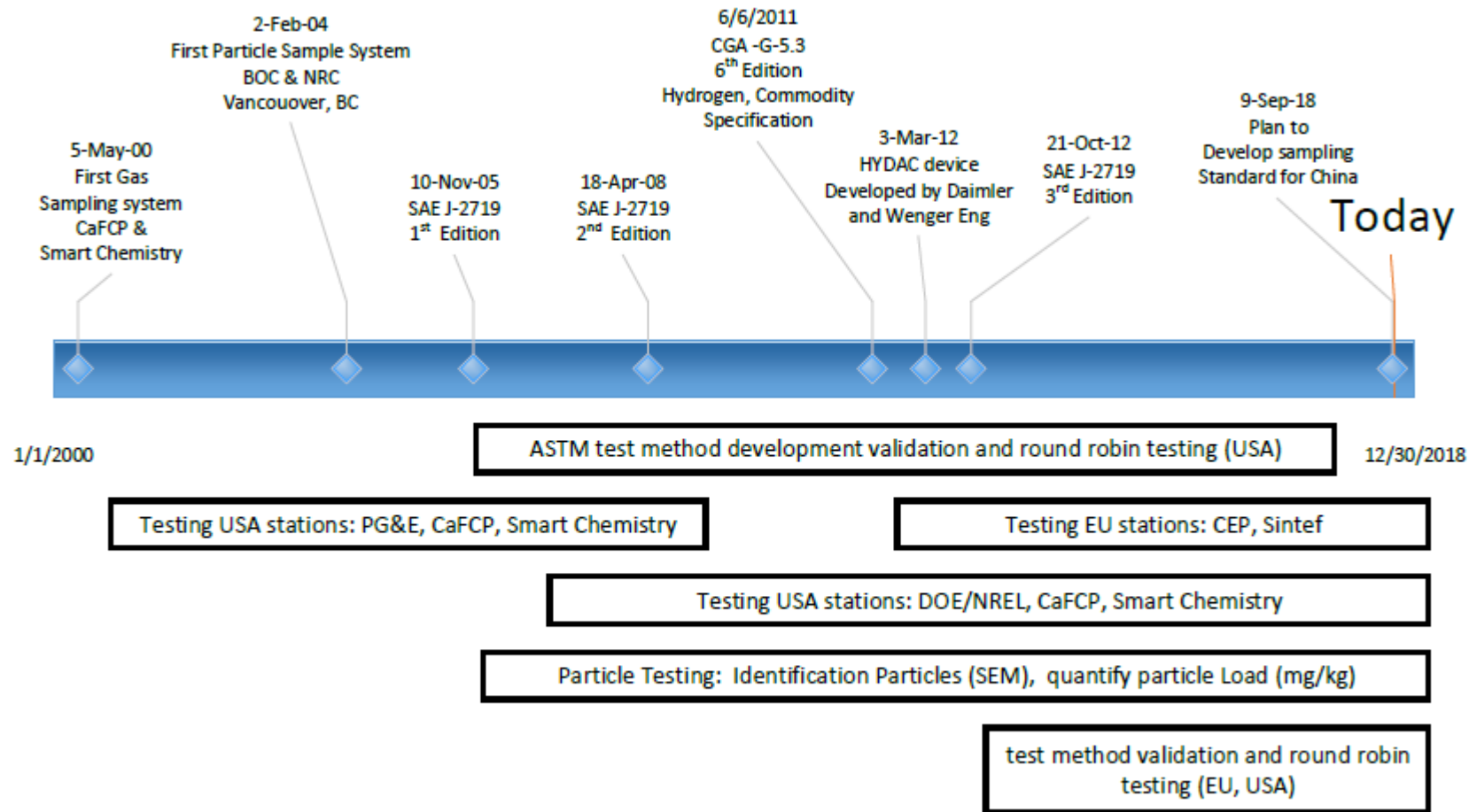
Thor Anders Aarhaug

MetroHyVe / HYDRAITE workshop
2019-09-12

Overview

- Different gas sampling strategies
 - Parallel
 - Serial
 - Direct
- Particulate sampling
- Sample cylinders

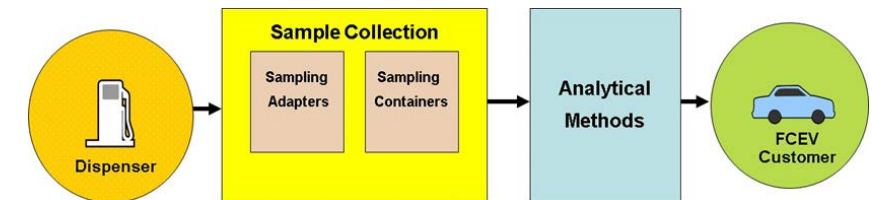
Hydrogen Sampling timeline



Sampling strategies

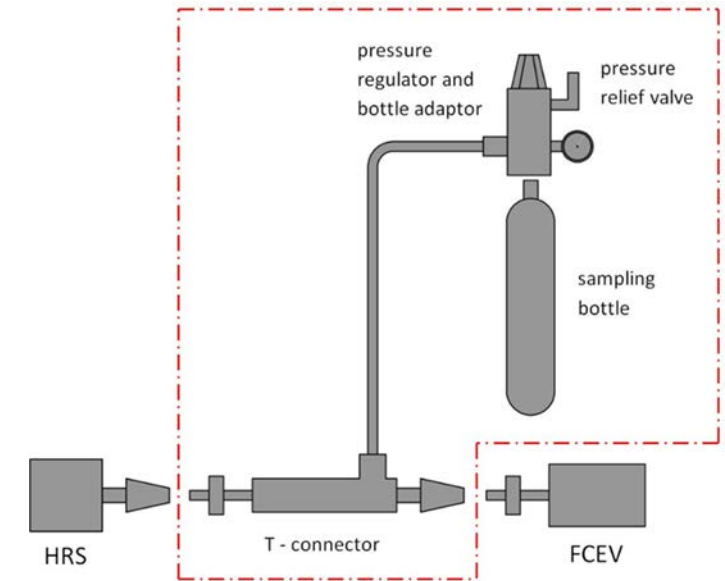
ISO 19880-1 Annex K: Sampling procedures and hardware for hydrogen fuel quality analysis

Method	Sampling time	HRS fueling override	Sink	Sample Cylinder volume (example)	Reference Sample pressure
Gas Parallel	~ 3 min	No*	FCEV or test CHSS	≤ 10 L	< 16 MPa
Gas Serial	< 1 min / cylinder	Yes	Vent system	≤ 2 L	< 7 MPa
Gas Direct	<10 min	Yes	Vent system	47 L	< 12 MPa
Particulate Direct	~ 3 min	Yes	Vent system	not applicable	APRR according to SAE J 2601**
Particulate series	~ 3 min	No *	FCEV or test CHSS	No applicable	APRR according to SAE J 2601**



Gas parallel sampling

- Linde Qualitizer 70 MPa adapter
- FCEV used as sink
- No IrDA
- Normal HRS operation while sampling
- Bleed valve depressurization



LOGY for
GEN VEHICLES



Gas parallel sampling



Gas parallel sampling

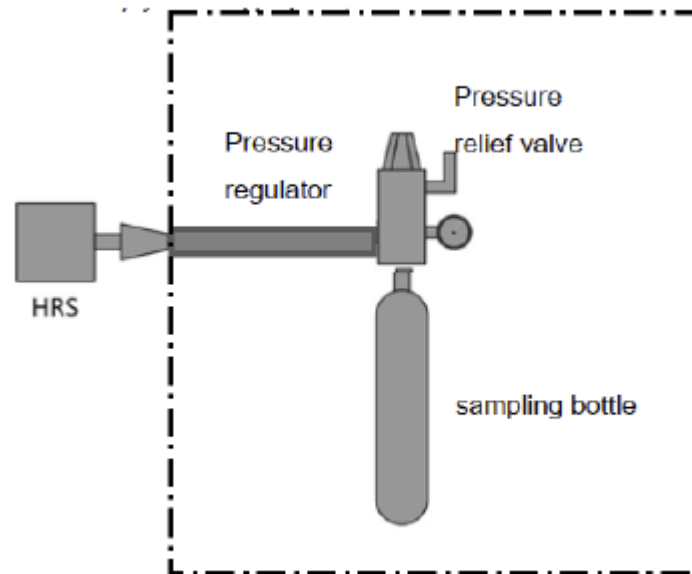


Purging

- No procedure from Linde on manual purging
 - Possible to abort refuelling within 15 seconds and then purge through bleed valve
 - Optionally initiate sequence without connecting to FCHEV (not tested)
- Small internal volume, check and quick connect valves retain hydrogen in system.
- SINTEF first time use:
 - Pressurized to 6 MPa manually
- Subsequent use without purging

Gas sampling direct method

- Japanese approach
- Large volume, low pressure cylinder (FeMn)
- P, T monitoring
- Purging on-site
- HRS override



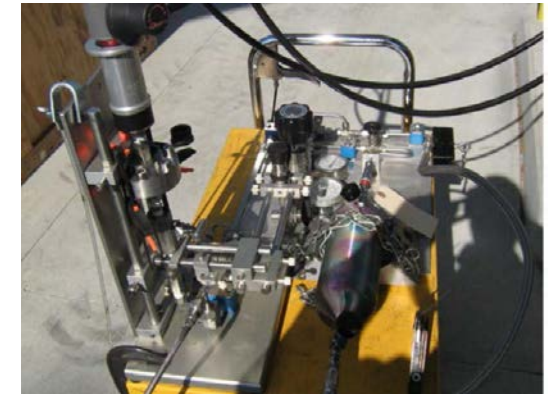
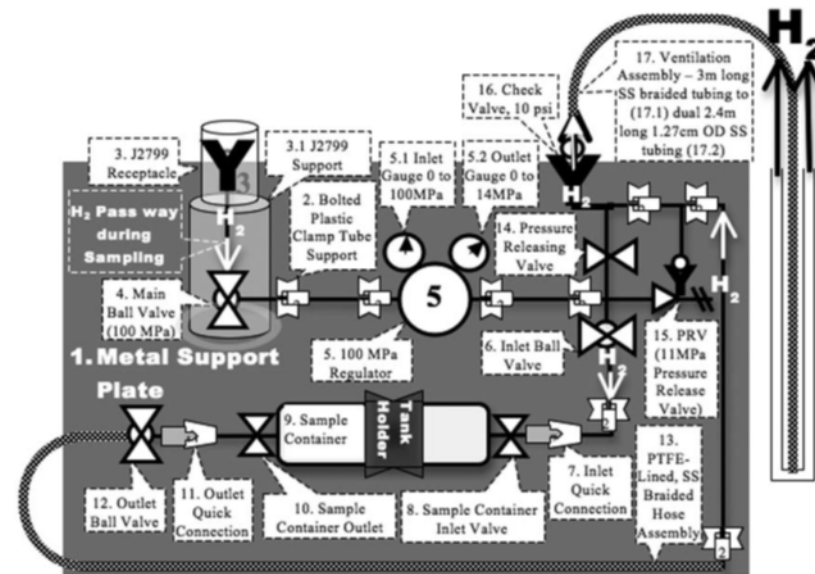
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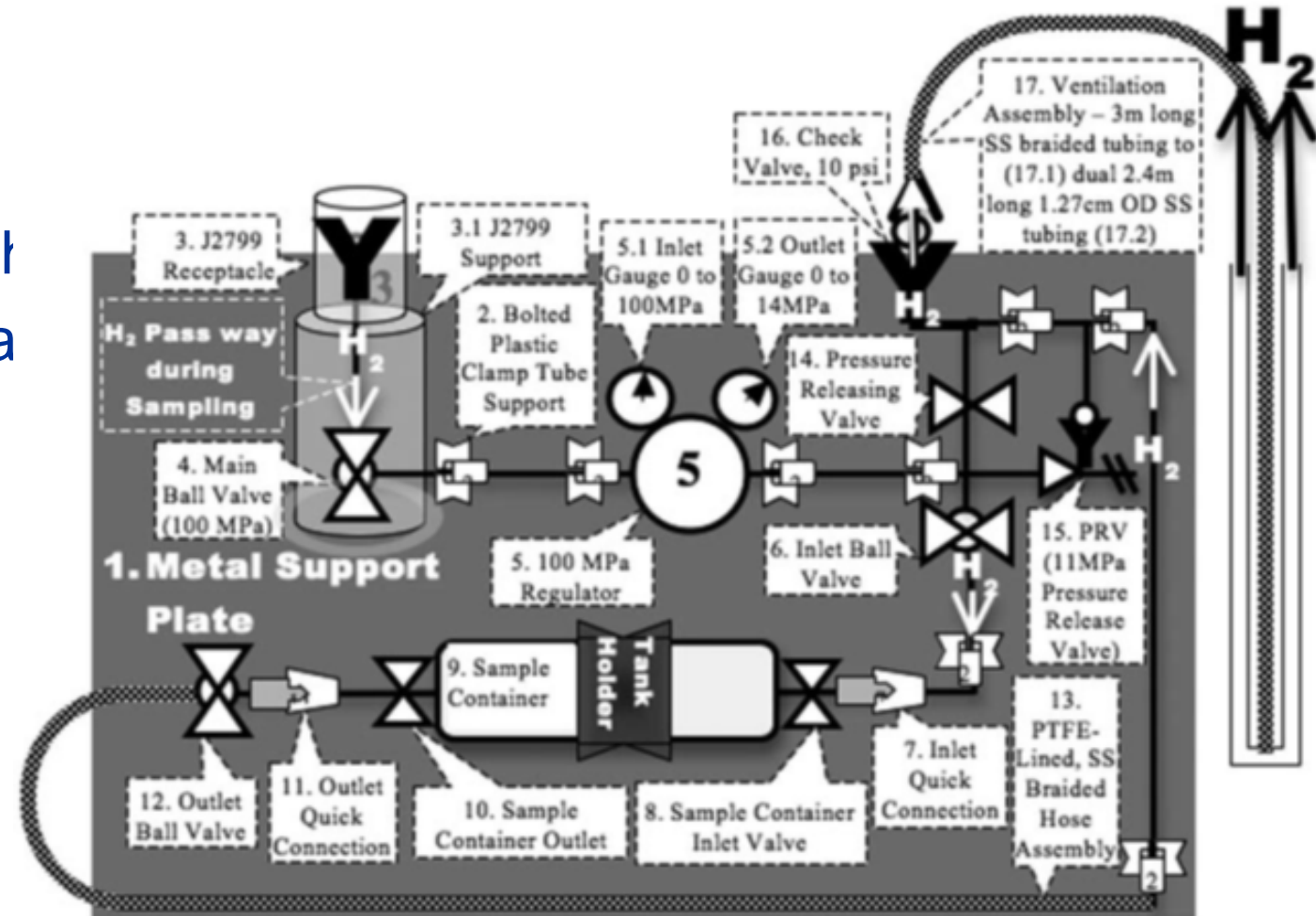
Gas serial sampling

- ASTM D7606-17
- Sample cylinder purge-through
- Sample collected at ca. 7 MPa
- Venting of large volume of H_2
- HRS override



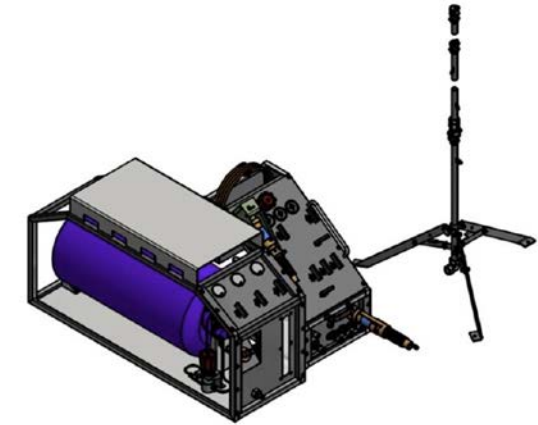
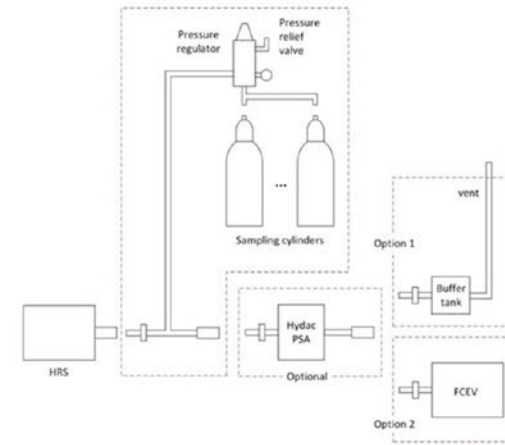
Gas serial sampling

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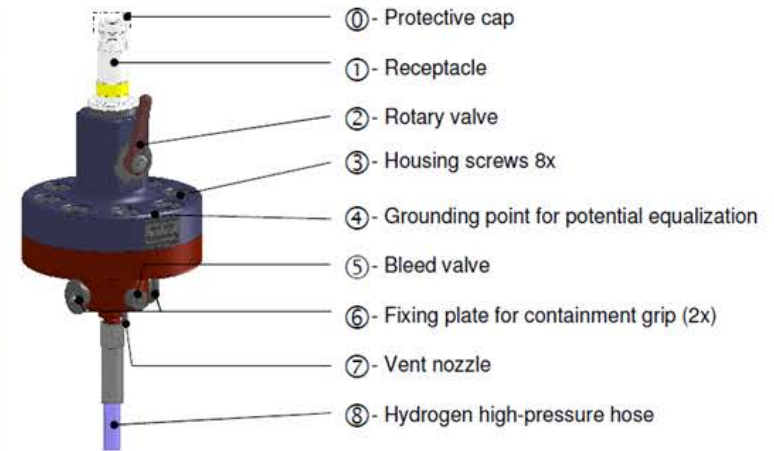
New gas sampling methods

- Air Liquide "serial" sampling
- HySAM
To be tested in 2nd half of HYDRAITE
- HyStEP



Particulate sampling

- HYDAC PSA-70
- 70 Mpa sampling
- No IrDA
- Vent valve



HYDRAITE



Sample cylinders

Parallel	Serial	Direct
10 L aluminum	0.5-2L steel	50L
Spectra-seal	Double ended	Maganese steel
SS valve	Sulfinert passivation	No passivation
	Passivated valves	



Items not standardized

- Cylinder selection
- Cylinder preparation
- Sampling adapter purging
- Sample cylinder transference
- Sample stability
- Sample cylinder service life

[Acknowledgements...]

THANK YOU



metrohyve.eu



hydraite.eu

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