ISO/TC 197
Hydrogen technologies

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TC 197 ISO 19880-1 Plenary Planning for TR-IS v 2015 V 30f

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Background:	Here is the presentation that was made by WG 24 at the 2015 Plenary Meeting in California.
Committee URL:	http://isotc.iso.org/livelink/livelink/open/tc197

ISO TC 197, WG 24
Gaseous H2 Fueling Stations - General Requirements

Jesse Schneider, BMW

Guy Dang-Nhu, Air Liquide

Nick Hart, ITM Power

Status update WG 24

- New Structure WG 24
- Positive Vote for ISO DTR 19880-1
- W24 Fueling Risk Assessment-Wrap-up
- Proposal for Designation Change from TR to TS
- New Subteam: H2 Fueling Validation
- Planning for the IS
- NWIP H2 Quality Sampling (US/ Norway

ISO TC 197 WG 24
Team Structure with subteams

WG 24 Management

Schneider (US), Dang-Nhu (FR)
Hart (UK)

Hydrogen Station Acceptance

Elliger (DE), TBC (US),

Safety Distance Methodology

Flynn (FR), Groth (US)

NWIP Proposed: Hydrogen Quality Sampling

Dr. Aarhaug (NO), Dr. Hsu (US)

H2 Fueling Site Validation

Karzel (DE), Xie, (US)

H2 Fueling Process Risk Assessment

Zimmermann (DE)

Positive Vote for ISO DTR 19880-1

- In October 2015, ISO TC 197 Management informed WG 24 that the ISO DTR 19880-1 has passed ballot for publication.
- A final draft has been distributed to the WG 24 and editing is underway for publishing.
- December 2015 : Finished DTR(S) 19880-1 (sent to ISO Management)

ISO WG 24 Risk Assessment
All Main Items Closed

RISK ASSESSMENT: RESULTS SUMMARY (CLOSED ITEMS)

Risk reduced to a minimum of 10^(-5)/year/station/scenario

	Scenario	Proposed Mitigation
1	Wear of valves	Install mechanical flow restriction (needs confirmation if technically feasible and needs to be tested) Action: Verify maximum possible flow due to cv values.
2	Over pressure of CHSS	- PRV at 125% or 138% NWP - SIL 2 high pressure trip (independent PLC)
4	Too low temperature in CHSS due to multiple causes	- SIL 3 (SIL 2 if more tank data on low temperature sce temperature trip (e.g. -60°C) (independent PLC) - Independent SIL 1 equivalent abort signal on too low Alternatively re-consider material of construction (EQU.

Recommendation only. Other equivalent solutions possible (e.g. improve the co initial event frequency

RISK ASSESSMENT: RESULTS SUMMARY (OPEN ITEMS)

Risk reduced to a minimum of 10^(-5)/year/station/scenario

#	Scenario	Proposed Mitigation	Information needed
3A (Too warm H2 – upstream failure)	Over temperature in CHSS	- SIL 2 high temperature trip (independent PLC) - Independent SIL1 equivalent abort IrDA signal on over temperature	- With the data provided by JARI, this indicates that the critical Type 4 tank is above 150C Material Temperature. The Wenger simulations show a peak of 100C (TBC) gas temperature. With the information from the Opel a 40C Delta between a shell and peak gas fueling temperature. Therefore the highest liner temperature is approximately 60C, which is not a burst or leak scenario for today's CHSS. - Prove that IrDA signal has a minimum - Is there a warning if the sensor is not working? - Is there any reliability data on the stop signal at 85°C and beyond
3B (false ambient T reading)		- SIL 2 independent safety PLC. This may be achieved by a 1oo3 temperature sensor with automatic trip (permissive) - Independent SIL1 equivalent abort IrDA signal for over temperature	- Same as above
3C (Control Loop Failure)		- Independent SIL3 ramp rate corridor verification (NOT POSSIBLE) - Independent SIL 1 equivalent abort signal on over temperature (EQUIVALENCY TO BE PROVEN)	- J2579, F.1.2 Material Qualification Test is greater than 100C material T. (not GTR) - With the data provided by JARI, this indicates that the critical Type 4 tank is above 150C Material Temperature. The Wenger simulations show a peak of 140C gas temperature. With the information from the Opel a 40C Delta between a shell and peak gas fueling temperature. Therefore the highest liner temperature is approximately 110C, which is not a burst or leak scenario for the CHSS. - Since SIL3 ramp rate corridor verification is not achievable, the information on the consequence shown to date is able to achieve ALARP

W24 Fueling Risk Assessment-Wrap up

- Create White paper Risk Assessment Summary including mitigation measure for specific (Shell) methodology
- Review severity levels & corresponding mitigation measures
- Suggest minimum safety requirements for IS standard

Withdrawal of ISO TS 20100

Suggestion from WG 24:

- “Withdraw ISO TS 20100” (cancel) regardless of TR or TS designation.
- Moving instead of TR to a TS
- “Same Designation” Replacement of TS 20100 with TS 19880-1

ISO TS 19880-1 Statement

- If the ISO TC 197 agrees, we can publish the first document as ISO TS 19880-1 (supersede ISO TS 20100).

- This may assist especially in Europe the adoption of hydrogen stations (and not be confused by another ISO TS 20100).

- This does **not** change in any way the planning to create an International Standard (IS) ISO 19880-1, allowing for further expert and P-Member comments.

Proposal: Change Designation TR-to-TS 19880-1

- Suggestion to change designation: TR 19880-1 → TS 19880-1 Advantages:
  - No change for the content from original TR: No Requirements
  - Same Target for International Standard at end of 2016 (content change possible until then)
  - TS 19880-1 would help avoid confusion: direct replacement TS 20100
  - 19880-1 Current Content in line with the TS Definition
  - European level: help national Legislative bodies to reference a recognized document→ Nov 2016.

Address Concerns from WG 24 Team regarding TS Content:

- At least one member wants to gain feedback from mirror committee by January also due to insufficient lead.
- Concern with EC adopting the TS 19880-1 and not IS 19880-1

ISO TS & TR
Designation Definition

3.1.4
Technical Specification
TS
document published by ISO or IEC for which there is the future possibility of agreement on an International Standard, but for which at present

- the required support for approval as an International Standard cannot be obtained,
- there is doubt on whether consensus has been achieved,
- the subject matter is still under technical development, or
- there is another reason precluding immediate publication as an International Standard

Note 1 to entry: The content of a Technical Specification, including its annexes, may include requirements.

Note 2 to entry: A Technical Specification is not allowed to conflict with an existing International Standard.

Note 3 to entry: Competing Technical Specifications on the same subject are permitted.

Note 4 to entry: Prior to mid-1999, Technical Specifications were designated as Technical Reports of type 1 or 2.

3.1.5
Technical Report
TR
document published by ISO or IEC containing collected data of a different kind from that normally published as an International Standard or Technical Specification

Note 1 to entry: Such data may include, for example, data obtained from a survey carried out among the national bodies, data on work in other international organizations or data on the "state of the art" in relation to standards of national bodies on a particular subject.

Note 2 to entry: Prior to mid-1999, Technical Reports were designated as Technical Reports of type 3.

2015 ISO 19880-1 F.A.T. vs. S.A.T. Fueling Tests

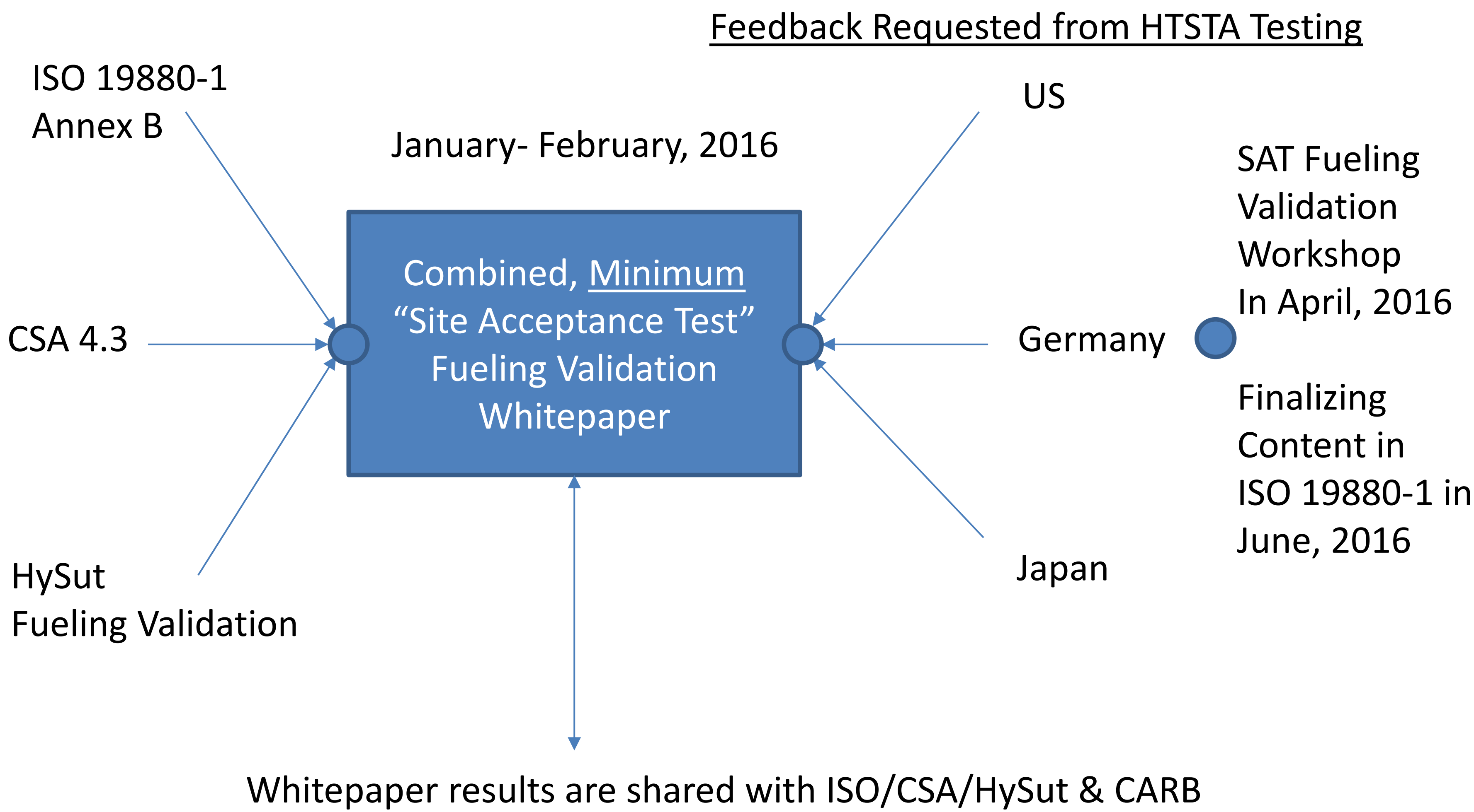
Table B.1: Dispenser function tests

Dispenser function Tests	F.A.T.	S.A.T
Confirmation that tables are correctly programmed into PLC through software means.	Yes	No *
15 Fault Simulation Testing (see table B.2). However Abort Signal to also be tested in both F.A.T. and S.A.T.s	Yes	No *
9 Site Acceptance Tests including 1-2 top off from low start pressure (see table B.3.3.4). Verification that Measured Fueling performance Parameter are within limits Gas Temperature Window, Flow Rate and Pressure targets are within bounds of Fueling protocol	No	Yes

Table B.3: Global Acceptance criteria for all hydrogen fueling testing to SAE J2601 (both SAT and FAT)

Criteria	Fueling Limits	SAE J2601 Clause Reference
Ambient temperature of operation Ambient temperature sensor (simulated signal)	-40 ºC < Tamb < +50 ºC	7.2.2
Vehicle tank starting pressure monitoring (simulated signal via IrDA receptacle) Dispenser pressure sensor (simulated signal, for instance by increasing 0,5 MPa to 5 MPa for a 2 MPa start pressure) (Text needs refining)	<0,5 MPa < P_0< NWP	7.3.1
Maximum Flow Rate Dispenser flow sensor (simulated signal)	Flow Rate ≤ 60 g/s	7.42
Fuel Delivery Temperature Dispenser temperature sensor (simulated signal)	-40 ºC < Tfuel	6.6
Vehicle CHSS Gas Temperature (simulated signal via IrDA receptacle)	-40 ºC < Tvehicle ≤85 ºC	6.6
Maximum Mass of Hydrogen Allowed during Start-up (not to be exceeded during the defined Site Acceptance Tests)	Total H2 mass prior to start of fueling < 200 g (measured at HSTA, flow meter, etc)	7.4.3
CHSS Capacity* (simulated signal via IrDA receptacle – out-of-bounds. , and each applicable CHSS volume category) (simulated signal of combined dispenser pressure and flow meter, including simulated volume outside those permitted) (correct CHSS volume category to be verified during the defined Site Acceptance Tests for different volumes as per HSTA capability, such as 2 kg to 4 kg, 4 kg to 7 kg categories)	2 kg to 4 kg, 4 kg to 7 kg, 7 kg to 10 kg CHSS volume categories as applicable 85 % CHSS Cap Actual <CHSS Cap Measured< 115 % CHSS Cap Actual (To be refined)	9.2
Fuel Delivery Temperature at Start-up Dispenser temperature sensor (simulated signal during simulated or HSTA fueling event)	Tfuel category min < Tfuel within 35 s (30 s +5 s tolerance) after the start of fueling	9.1.2
Fuel Delivery Temperature Tolerance* Dispenser temperature sensor (simulated signal during simulated or HSTA fueling event)	Tfuel category min< Tfuel <Tfuel category max (1 fallback allowed if available)	9.1.2.2

ISO WG 24, S.A.T. Whitepaper Concept: Workshop Discussion

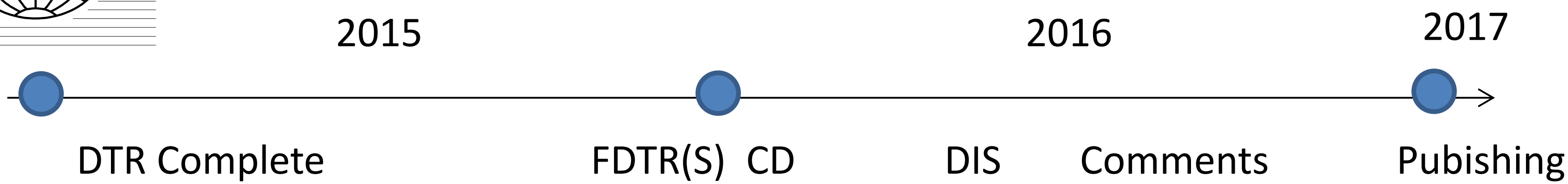


Source: Jesse Schneider, WG24 H2 Fueling Workshop

Feedback from Kickoff H2 Fueling Workshop

- Scope: Create S.A.T. Whitepaper based on SAE J2601-2014 requirements (not specific customer). F.A.T. need to be completed first (on-site also possible).
- Differentiate between F.A.T. and S.A.T
- Prioritize and Identify Safety for Acceptance Tests vs. Performance Requirements
- Define Minimum S.A.T. Test with the goal of reducing complexity / cost of S.A.T. (best practice with devices or FCEV)
- Target: Maximum of 3 Days for S.A.T. testing

TR(S) to IS Milestone Timeline



- December 2015 : Finished DTR(S) 19880-1 (sent to ISO Management)
- **January 2016: WG 24 CD IS 19880-1 released for expert comments & CEN Alignment discussion**
- **End Feb / Start March 2016 (CW 9-10) HyTReC**
  - 23-25.2.16 WG 24 Fukuoka, Japan
- **March Release of CD Ballot**
- **April 2016: California (CaFCP/ CARB/ ARB -TBC)**
  - WG24, California (venue TBC), US. April 21-23 (TBD WG 28, April 18-19)
- **June 2016**
  - WG24, Face-to-face meeting: Munich (venue TBC), Germany.
- **July 2016: DIS to be released for translation and ballot**
- **Nov / Dec 2016**
  - WG24, Face-to-face meeting: .
- **December 2016: IS to be submitted for publication**

Backup Slides

WG 24
Risk Assessment: Next Steps

NEXT STEPS FOR ISO WG 24 RISK ASSESSMENT

- Update Rankings for SIL based on severity (consequence)
- Summarize Data received from ISO WG 24
  - Opel Fueling Data showing shell vs. gas temperature
  - HyTransfer (when complete) showing shell vs. gas temperature
  - BMW Showing extreme fueling for SAE J2601
  - Air Liquide: over temperature testing based on higher ramp rates
  - Daimler: Composite of greater than10000 fuelings with J2601 within bounds of pressure and temperature
  - JARI: Extreme Temperature CHSS tests in a controlled temperature chamber environment to failure
  - Air Products: Composite data from fueling stations showing peak temperatures vs. starting pressure
- Draft Risk Assessment Report in February
- Review of Draft Risk Assessment Report in April
- Workshop Agreement Publishing (Jim)
- Publish Whitepaper from ISO WG 24 to be published in the public domain.