Introduction

The Condor H2 project was invited to attend the CESNI/PT/FC working group to provide industry insights. The working group under WP4 within the consortium is used to discuss the requirements that are drafted for the next release of the ES-TRIN. Since it is only possible to provide input on the documents as a member state, all the communication with the Secretariat flows through a representative of the ministry of I&W. All the discussed items will also undergo a first check in this step.

Process:

- WP4 working group is invited to deliver input on ES-TRIN requirements.
- Documents are created by Condor H2
- These are discussed with the Dutch delegation representative
- After acceptance by Dutch delegation representative, the document is submitted to the Secretariat of CESNI/PT/FC
- The Secretariat distributes the document among member states.
- Member states can react with a new document
- Document is discussed in the next PT/FC working group (quarterly)

Besides this process, the core-team of Condor H2 is also invited to attend the CESNI/PT/FC working group meetings. This document will be updated when new communications are made within the WP4 working group.

After the description of the goal of this process, the two communications that were created with the WP4 working group are described:

- CESNI/PT/FC 23 (34)
- CESNI/PT/FC 23 (30)

Goal

The goal of Condor H2 is to make sure that the following phasing of the tank pool is possible:

Phase 1 – creation of the pool: The first tanktainers for the pool are manufactured and the first ships are made ready for the tanktainers:

- Tanktainer side
    - Designed to fulfill Condor H2 tanktainer specifications
    - Design will undergo Risk Based Analysis with class once
    - Manufactured in series, class will check tanks
    - Ship is surrounding black box with in/outputs on interfaces
- Ship side
    - Ship location designed to fulfil Condor H2 ship specifications
    - Design will undergo Risk Based Analysis with class
    - Tanktainer is black box with in/outputs on interfaces

Phase 2 – scaling of the pool: the next tainktainers will be manufactured for the pool where we foresee two scenarios:

- Scenario 1: The demand for the tanktainers is growing and the manufacturer wants to build another 50 (identical to the 30 tanktainers) to submit to the pool.
    - Tanktainer side:
      Class will check if the new tanktainers are manufactured according the previously approved design.
    - Ship side:
      no action required
- Scenario 2: A tank manufacturer has constructed 30 tanks and submitted them in the pool. However, a new technology has been invented and the manufacturer wants to update its design and submit the new set of tanktainers to the pool
    - Tanktainer side:
      Identical to Phase 1
    - Ship side:
      no action required

Phase 3 – scaling of the pool: The pool is consisting of 300 tanktainers (scaled up further in line with phase 3) and 50 ships are successfully sailing with the tanks. Now a new tank manufacturer is entering the market and wants to include/sell (this does not matter for the technical example) their newly designed tanks in the existing tank pool.

- Tanktainer side:
  Identical to Phase 1
- Ship side:
  no action required

Phase 3 – Scaling of the number of ships using the tankpool: A new ship wants to make use of the existing tanktainer pool

- Tanktainer side:
  No action required
- Ship side:
  Identical to Phase 1

CESNI/PT/FC 23 (34)

In this document we proposed the following:

> *"2.3.5.6 If the safety concept of the swappable tank matches the safety concept on board of the vessel, it is possible to swap the type approved tank over vessels that are compatible with the same type approved tank. The tanks must clearly display their type approval."*

This was not accepted for two reasons. First of all the term 'safety concept' is not defined in ES-TRIN and secondly the type approval should be defined. For this; the Secretariat, the Chair and the Dutch delegation representative will have a set of meetings with a member of the Condor H2 core team to discuss this and produce a new proposal for the next PT/FC meeting in June.

In the minutes of the PT/FC meeting the following was concluded:

> 2.3.5.6: Mr VUIJK presents the vision of a tank pool as developed by the Condor project (see **Annexe 2**). In light of the Dutch and German delegations' comments, the GROUP expresses its strong support for the development of a tank pool solution recognising its economic benefits. The draft requirements explicitly foresee using swappable tanks and address compatibility of vessel and tank. In particular, the risk evaluation must address the vessel (including the swappable tank) as one system. At this stage, the information provided is insufficient to legally ground a type-approval in ES-TRIN. *The Dutch delegation commits to prepare a revised proposal regarding type-approval of swappable tanks (e.g. table to show in detail how the condor standard can be one mean to demonstrate compliance with the tank requirements in ES-TRIN).*

CESNI/PT (22) 24 rev.6		Dutch Delegation	CESNI/PT (22) 24 rev.7		German Delegation	Conclusions during PT/FC February meeting
Item	**Draft text**	**Notes**	**Item**	**Draft text**	**Understanding, conclusions**	
2.3.1.2	GH_2 fuel tanks shall be located as close as possible to the longitudinal centreline of the craft.	This might be interpreted as a limitation to installing MEGCs on-deck, on a side-by-side configuration – which is one of the more viable solutions.	2.3.1.1.6	No change	This requirement is identical with requirement 2.1.1.2 for LNG tanks. The wording “as close as possible to” instead of “on” was sufficient to allow multiple configurations. Of course, the intended interpretation allows also the more viable side-by-side configurations. No need to change the wording.	No change to text. Side by side configuration is still possible with this requirement.
2.3.1.5	The GH_2 containment system shall be provided with a secondary barrier. No secondary barrier isrequired for containment systems where the probability for structural failures and leakages through the primary barrier is extremely low and can be neglected.	Also on open deck? What are the secondary barrier requirements?	2 .3.1.1.1	No change	The definition for secondary barrier[1] is probably sufficient to explain expected design requirements. No need to change the wording.	It was confirmed that Type IV cylinders qualify for the ‘Leakages through the primary barrier is extremely low and can be neglected.’ Statement, therefore no secondary barrier is required.

[1] ES-TRIN Annex 1.1.16 Secondary barrier: the enclosure surrounding of the elements containing fuel (or the fuel cell components), designed to prevent fuel from escaping into the surrounding areas in the case of a leaking component (primary barrier).

2.3.1.8	Each GH2 fuel tank shall be protected against tank rupture by overpressure. This requirement is deemed fulfilled when the GH2 fuel tank is fit-ted with at least one PRV andone TPRD. If a GH2 fuel tank consists of several gas cylinders, the requirement appliesto each cylinder. The inspection body may allow alternative measures to prevent tank rupture, based on the risk assessment according to Article30.04.	It is important to clarify: TPRDs only work in a fire-type situation. For overpressure above the MWP (Max. Working Pressure) the system must be equipped with a Safety Pressure Valve (or Overpressure Relief Valve). TPRDs should be considered at the perimeter of the MEGC, as burst by fire protection, but demanding or forbidding TPRDs per cylinder will close a lot of design possibilities. Having TPRDs for all cylinders also creates an additional challenge for the venting solution of several TPRDS. The possibility that an arrangement of TPRDs for each cylinder might result in undesirable H_2 release must be considered: when TPRDs are too close, the release of one might	2 .3.1.3.1	Each GH2 fuel tank shall be protected against tank rupture by overpressure. This requirement is deemed fulfilled when the GH2 fuel tank is fitted with one or more pressure relief devices (PRV and/or TPRD). The type of pressure relief devices shall be determined by the risk assessment according to Article 30.04 considering the tank type and the configuration of the whole system. If a GH2 fuel tank consists of several gas cylinders, the requirement applies to each cylinder. To reduce the number of connections, the cylinders may be connected in groups, including the shut-off and relief capabilities. The total amount of gas that can be released in an incident shall be considered when conducting the risk assessment according to Article 30.04. The inspection body may allow alternative	The new proposal from GERC seems to address the concerns. Anyhow, it may needs to be clarified whether “To reduce the number of connections, the cylinders may be connected in groups, including the shut-off and relief capabilities” implies the possibility to install one TPRD for multiple cylinders.	New wording: Each GH2 fuel tank shall be protected against tank rupture by overpressure. This requirement is deemed fulfilled when the GH2 fuel tank is fitted with one or more pressure relief devices (PRV and/or TPRD). The number and type of pressure relief devices shall be verified by the risk assessment according to Article 30.04 considering the number and type (I, II, III, IV) of tanks as well as the configuration of the GH_2 containment system (including the discharge capabilities). If a GH_2 fuel tank consists of several gas cylinders, the requirement applies to each cylinder. To reduce the number of connections, the cylinders may be connected in groups,

		deploy theothers.		measures to prevent tank rupture, based on the risk assessment according to Article 30.04.		including the shut-off and relief capabilities
2.3.1.11	(…) Pressure relief vent pipes are not to be combined with vent pipes of other relief valves unless proven by a back-pressure calculation. (…)	Including TPRDs? This would lead to morethan 40 venting pipes for a single 20ft MEGC.	2.3.1.3.4	No change	It is permitted to combine the vent pipes, including those for TPRDs if a back-pressure calculation proves no negative effects on the venting. No need to change the wording.	As per comment of German delegation. Combination of vent lines is possible.
2.3.1.12	It shall be possible to safely empty the GH_2 fuel tanks, even if the hydrogen system is shut down.	Type 4 cylinders are not supposed to remain empty. Their design requires a minimum pressure to keep the liner's functional integrity. The MEGC is designed so that the minimum pressure switch can be bypassed, and consequently empty the system, but cylinders exposed to atmospheric pressure require an assessment to stay in service.	2.3.1.4.1	No change	This requirement is identical with requirement 2.1.1.4 for LNG tanks and is a requirement not e.g. maintenance, but for safety in critical situations. In these cases, it is not the primary goal to keep the cylinders alive but to ensure safety. The described design feature fulfills the requirement. No need to change the wording.	New wording: "It shall be possible to safely discharge the GH_2 from fuel tanks, even if the hydrogen system is shut down."

2.3.2.4	Low temperature GH_2 piping shall be thermally isolated from the adjacent hull structure, where necessary. Protection against accidental contact shall be provided.	What is exactly low temperature? MEGCs, according to ADR, have a design rangeof -20°C to 50°C.	2.3.2.4	No change	This requirement is identical with requirement 2.1.1.5 for vessels using LNG as fuel. Assuming that this requirement applies only to piping for LH_2, deletion of this sentence is suggested.	Is removed from text.
2.3.4.5	Ventilation systems required to avoid any explosive atmosphere shall have at least two ventilators with independent power supply, each of sufficient capacity.	For MEGCs installed on the deck, stacked or not, and with natural ventilation (openings on the bottom and top) this should not be required – that exemption must be clearly stated.	2.3.4.5	No change	This requirement is identical with 2.2.9.5 (without the last sentence) and reworded from an earlier requirement for ventilation systems for vessels using LNG as fuel. In the discussion of the Working Group CESNI/PT/FC, there was never an understanding that this requirement would apply to instances, where natural ventilation is sufficient. However, whether natural ventilation for MEGCs installed on deck provides sufficient ventilation to avoid any explosive atmosphere depends among others on the design of the individual vessel. Therefore, it is not possible to state that for MEGCs installed on deck generally no ventilators are necessary. No need to change the wording.	Ventilation systems are only required when there is a possibility of having an explosive atmosphere due to hydrogen buildup. Open tanktainers on deck do not have the possibility for hydrogen buildup.

2.3.6.5	Hoses used for the bunkering of GH2 shall be designed for a bursting pressure not less than five times the maximum pressure they can be subjected to during bunkering.	Five times the maximum pressure would result in a hose's design value of more than 3500 bar to 5000 bar!	2.3.6.5	No change	See new communication CESNI/PT/FC (24) 6 from Germany.	New wording: Hoses used for the bunkering of GH_2 shall be designed for a bursting pressure in accordance with the European Standard EN ISO 16964:2020.
2.3.9.3.1	Smoke detectors alone shall be deemed insufficient for rapid detection of a fire. Suit- able flame detectors (UV or IR) for the early detection of hydrogen fires shall be provided for a) all rooms and spaces of the hydrogen system and b) open decks where hydrogen fires cannotbe excluded.	H2 detection on open decks is challenging, considering the H2 buoyancy, the open volumeto be measured, exposure to wind, etc. A more precise, prescriptive measure must be written to avoid having unreliable safety measures.	2.3.9.3.1	No change	Could the Dutch delegation provide a proposal for the wished for more precise, prescriptive measure based on the experience with vessels certified in the Netherlands?	We have to write a new proposal for this.
2.3.9.5.1	A water spray system shall beinstalled for cooling and fire prevention to cover exposed parts of GH fuel tank(s) located on open deck.	Water on high-temperature flames vaporizes and bursts, propagating flames wider. It may also reduce TPRDs efficiency due to their localized cooling down, which does not translate to the surrounding	2.3.9.5.1	No change	The German experts agree, that cooling down the tanks may result in not properly working TPRDs. Moreover, cooling down tank is mainly a feature for cryogenic tanks to prevent heating rapidly up the liquid. Tanks for GH2 are protected against heat ingress by TPRDs. Further discussion is necessary, together with the examination of	We have to write a new proposal for this.

		temperature.			the GERC's proposal on TPRD/PRV.[2]	
2.3.10.2	Without prejudice to Article 30.07, upon failure in systems essential for the safety and upon fault conditions which may develop too fast formanual intervention, the GH2 safety system shall shut down the fuel supply system automatically.	This requirement is too vague – what is the shutdown triggering condition?	2.3.10.2	No change	This requirement is identical with requirement 2.2.13.1.2 for vessels using methanol as fuel. It was discussed in the Working Group CESNI/PT/FC and adopted by the Working Group CESNI/PT. Therefore, and as long as there is no concrete proposal for an amendment addressing the concerns raised here, the German delegation suggests keeping the current text.	No change was made as the triggering condition is 'failure in systems essential for the safety and upon fault condition that develop too fast for manual intervention.' This is already covered.

[2] Awaiting GERC's input. To be examined by the Group, together with the discussion on TPRD (2.3.1.3)] (CESNI/PT (22) 24 rev.7, CESNI/PT/FC (23) 33)