Conference Series on European Hyperloop Technology with a focus session on The Development of Large-Scale Research Infrastructure

Q&A:

Industry aspects on Hyperloop System Engineering

Mars Geuze - Hardt Hyperloop

1. Q: Which estimated maximal Speed will Hyperloop reach eventually?

   A: The most important first notion is that hyperloop is not just about speed, but about a combination of 1) infrastructure that is easier to integrate into the environment, 2) lower total cost of ownership, 3) lower energy usage and emissions, 4) higher capacity for transporting passengers and freight and on top of that 5) that it is also able to travel at high speeds. The maximum design speed is currently 1,000 km/h, but for most of the European network, a cruise speed of 700 km/h is sufficient and desirable due to costs, and for many shorter links the speed will likely be well below that.

2. Q: How do you feel about Virgin Hyperloop adapting to your levitation/suspension approach?

   A: As Hardt we will not make any conclusions on the type of solutions other parties are using, but in principle we support standardization, and believe that there should be a single interoperable hyperloop standard, so any convergence of technologies is applauded.

3. Q: Is there any serious LCA study on the energy consumption of hyperloop, and if yes, what does it say about the comparison of it with rail, road and aircraft?

   A: Yes, as part of the study with Royal Schiphol Group, a proper LCA has been performed, also including the emissions of the construction of the infrastructure. Hyperloop substantially outperforms aviation, although the difference becomes smaller if aviation is able to deliver on their roadmap to reduce carbon emissions over the coming decennia. The emissions of hyperloop at very high-speeds are comparable to the emissions of high-speed rail at comparatively much lower speeds.

4. Q: What is the maximal Speed you can test at Groningen?

   A: The ambition is to be able to test at up to 700 km/h, although this requires booster motors that have accelerations well above what would be implemented in realistic settings. The test facility will be implemented in a phased approach, where 700 km/h will likely not be attainable in the first phase.

5. Q: Which scale does the Groningen Tube represent?

   A: The scale in Groningen represents a full-scale system for a hyperloop application for cargo and is approximately 2 meters in diameter.

6. Q: Where do you believe the necessary un-interrupted stretches of land for building the tube can be found outside the test sites?

A: In our search for test sites, plenty of locations were found which could be suitable for a test location. The land does not need to be uninterrupted as hyperloop is relatively easy to integrate into the environment.

7. Q: Do you really think that these roomy looking interior renders of the Hyperloop capsule are feasible considering the very small tubes that are necessary to keep the costs low?

   A: The most common renders that are shown use a vehicle diameter of 2.7m, which is of similar size as common short-haul distance airplanes, except with 3 chairs per row instead of 4, and with luggage under the passengers rather than in overhead compartments. This provides much more space for the passengers while still having a small diameter tube.

8. Q: Will the European Union support your work on the Hyperloop Development Center?

   A: There's periodic meetings with the European Commission and all hyperloop companies in which the establishment of a regulatory framework for hyperloop, policy, and potential support from the European Commissions is discussed. At this point no concrete answer can be given.

9. Q: Any discussion on an Atlantic or Asian connection? I'm curious on construction in extreme environments.

   A: Although there is contact with American and Asian counterparts to work on future interoperability, actual connections are currently not in scope of the studies or discussions.

10. Q: For a Europe-wide freight network, do you see the infrastructure being underground or over-ground?

    A: Hyperloop can be implemented both underground and above ground. The costs of underground construction are often higher, but above ground construction is more difficult to implement. However, up to 70% of aligned can be done next to existing highways and railroads, greatly decreasing environmental disruption and decreasing costs.

11. Q: Has a total cost of ownership per transported passenger analysis been made for a full Hyperloop system compared with conventional rail and high-speed rail systems? For instance, it would be very interesting to see how Hyperloop lifecycle costs stack up against future maglev systems being built.

    A: By virtue of the smaller infrastructure, lower energy consumption and complete avoidance of moving components in the infrastructure, a hyperloop will always outperform traditional high-speed rail or maglev on isolated cases if the same speed is assumed (i.e. not taking into account interoperability with existing rail networks). Then there can always be a trade-off whether going at higher speeds (and consequently increasing costs due to more stringent infrastructure tolerances) is worth the extra costs.

12. Q: Do you see more interest from the railway industry and incumbent operators or from the airlines?

    A: Absolutely, for example multiple railway operators have already invested in hyperloop companies. Airports are also big supporters because it can increase their connectivity without requiring more space on airstrips, which is a very scarce commodity.