

CARGOTUBE: NEXT GENERATION SUSTAINABLE TRANSPORTATION BY HYPERLOOP TECHNOLOGIES

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CargoTube is a new form of low-infrastructure low-pressure tube transport (LPTT) that uses existing technology and can be implemented quickly. This makes it an interesting alternative to developments such as conventional hyperloop, because it is quicker and less costly to deploy, and raises fewer safety and infrastructure challenges. At the same time, it is complementary to and compatible with emerging hyperloop standards and technology. The benefits are zero direct emission while still providing high-speed movement of goods with great potential for sustainably linking urban areas, economic regions, and production facilities.

Especially in high-speed transportation, the air resistance make up for the by far biggest energy contribution, i.e. next train generation at 400 km/h results in more than 83% energy losses. These losses scale with the velocity cubed due to aero- and thermodynamics and cannot be recuperated by any means. Substantially minimizing the high impact energy consumption due to air friction is therefore the key parameter for sustainability. The vision for 2050 is a zero-emission multimodal cargo transport network, with CargoTube offering high speed (but sustainable) connection options, seamlessly integrated with other green modes such as electric barges, green railways, zero emission ships and electric delivery vehicles.

CargoTube's most important long-term impact will be the provision of zero emission low-energy high-speed freight transport, thus making a major contribution the required outcome of a transition to a net greenhouse gas neutral EU economy by 2050 (Tiseo, 2021). Additionally, societal benefits such as reduction of other transport emissions and pollution, e.g. aerosols, particulates and noise; better quality of life, and helping to tackle the ongoing shortage of workers in the European logistics industry; and reduction of congestion in urban areas and the European TEN-T network are also addressed.

LPTT is estimated to use up to 90% less energy than high speed rail, and 97% less energy than air transport. Furthermore, the remaining 3-10% energy required can be supplied by electricity, for which there are an increasing range of zero emission sources (the lower energy demand making it more achievable to meet this requirement). This is supported by previous hyperloop research which shows for example that routes could be up to 10 times more energy efficient than electric cars and 50-60 times more than air transport (Expatica, 2021)

Additionally, the use of advanced logistics optimisation algorithms ensures that the network is used more efficiently, further reducing energy use. There are many other positive societal impacts, which are described below.

A major problem with decarbonising freight transport is the requirement for fast movement of goods. Currently high speed usually means high energy, which is challenging to supply without the use of fossil fuels or other unfavourable sources.

References

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