Proposal 6

Title: The future of technical installations in tunnels: safe, predictable, adaptable

Theme: Sustainable use of underground structures
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Modern installations in tunnels need to be much more flexible and adaptable than they used to. The users and operators have bigger demands on functionality of installations. Tunnels need to offer a higher safety level. Nowadays we want traffic participants to experience no differences between driving on a road, or driving in a tunnel. The tunnels are important connection points, and any closures for maintenance or changes will result in big traffic congestions. On a more macro level the society also request installations to be circular and energy neutral.

The life-time of a tunnel is much longer than the life-time of installations. As a result update of installations will have to be realized to guarantee the minimal functionality. Together with the need to add functionality this means that many installations in tunnels will be changed the coming years. We need to be able to adapt installations in tunnels without decreasing the integral safety level, and without traffic disruption.

The challenge will be to change the current installations without traffic disruptions, and to implement new installations in a way that future changes can be done without tunnel closures. In the future we actually require adaptive systems, which without human intervention make sure a tunnel remains safe and can adapt their behaviour to the changing circumstances. Tunnels will have their own artificial intelligence, be 100% circular and will be energy neutral.

In the Netherlands we have many tunnels that have to be adapted in the coming years to comply with legislation, and because some installations become more and more difficult to maintain. A few tunnels have already be upgraded with a long tunnel closure, but for some tunnels it is not economical feasible to close them longer than a few days so new tactics have to be used for upgrades.

In our paper we discuss how to upgrade systems in tunnels without long closure times, and how to design systems in a way that tunnels in the future can be upgraded without tunnel closures. We included a roadmap how to get to artificial intelligent tunnels.