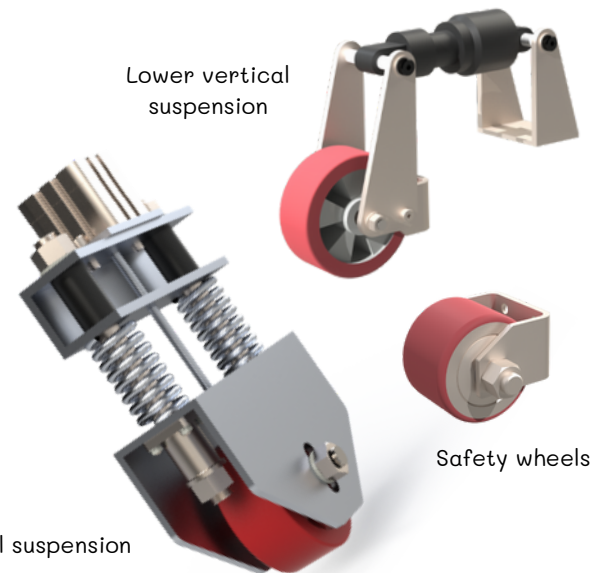


Dynamics Team

The dynamics team acts as the cornerstones of Hyperloop's safety. Participating thoroughly in the design process of the mechanical subsystems, their priority is to construct a failsafe transportation system. Additionally, the team also strives to optimise the efficiency of the pod, while making sure that the designs are well-engineered, highly sustainable and feasible for a full-scale Hyperloop system.

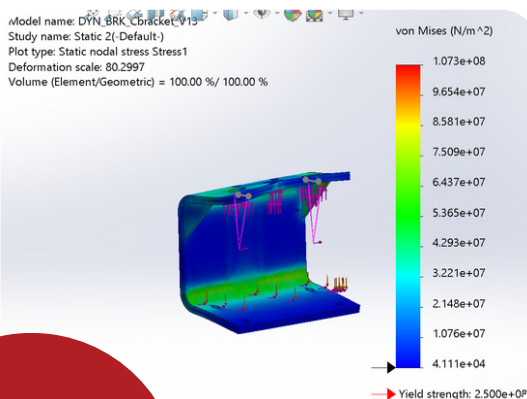


INTRO

The main goal of the Dynamics sub-team is to design and implement mechanical subsystems which can operate safely under any condition. To achieve this goal, the team continuously work on the following aspects:

1. Mechanical suspension - operates when there is no power to the electromagnetic suspension
2. Brakes - stop the pod in event of an electrical or pneumatic failure
3. Pneumatics system - controls the mechanical components.

It is worth noting that, unlike most transportation systems which brake using that wheels, what's unique about Hyperloop dynamics, in addition to the fact that no wheels are used, is that the pod is designed to be able to complete both levitating and non-levitating runs. Thus, the brakes need to be able to function during both configurations and the mechanical suspension must be able to come out of contact with the track (when we desire it to be!)



Example of a static simulation -
Brakes C-bracket

BRAKES

The friction brakes are part of the emergency braking system for the pod. Currently the Linear Induction Machine (LIM) is used as the primary braking system, but will no longer be able to act as a brake properly in cases of loss of power. Thus, an emergency friction brakes system which can stop the pod by mechanical friction alone is necessary. The mechanism used by the system clamps high-friction brake pad material onto either side of the track. It is both electrically and pneumatically failsafe, as the brakes clamp onto the track in the original position.

SUSPENSION

Regarding the mechanical suspension of the Hyperloop, the team works on two main suspension projects:

- The lower vertical suspension system, located on the underside of the track, is responsible for supporting the upward forces exerted by the magnets during a non-levitating run and to counteract forces created by other subsystems. The system is also constitutes of safety wheels which are located above the track to support the pod's weight in case the vertical suspension demagnetises.
- The lateral suspension system, on the other hand, keeps the pod centred on the track. It mitigates the impact of track misalignments by constraining the lateral motion of the pod using compression springs. The system also retracts to reduce friction and acts as a hard stop to protect other subsystems.

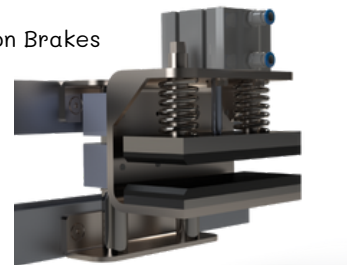
In general, the collaboration with other teams is crucial, to ensure that the different subsystems fit together as expected, so that HYPED can obtain the required level of control on each system.

PNEUMATICS SYSTEM

The pneumatics system consists of compressors, a reservoir, actuators and a range of safety components. By controlling the actuators, the system is responsible for retracting the brakes and the lateral suspension wheels, while providing additional braking force.

To meet Hyperloop's vision of sustainability, all subsystems must be efficient enough to save manufacturing time, upfront cost, and the use of resources. Thus, a high-pressure region is included in the circuit of the system to reduce the size of the reservoir required, thus reducing space and weight.

Friction Brakes



Dynamics Team

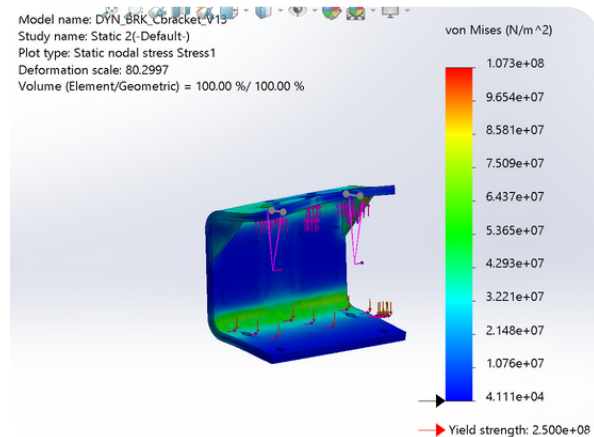
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