Modeling of an Electric Axle Drive with Modelica: A Study of Electric Active Dynamics

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This paper focuses on modeling of the electric axle drive system (eAxle) [Figure 1] used for improving vehicle stability and handling performance by means of a torque vectoring (TV) feature as well as improving vehicle traction and reducing CO2 emissions by means of an electric traction feature. The function, construction and benefits of the eAxle will be explained within these contexts. An overview of the modeling of the eAxle in Dymola® will be shown. Several simulation cases are conducted to verify the effectiveness of the system for reducing fuel consumption and improving longitudinal and lateral dynamics. A co-simulation was developed between Dymola® and Abaqus® to simulate the power loss and ascertain the temperature behavior on the housing of the eAxle . Finally, the eAxle with a vehicle model was driven over a special realistic handling course using an open source software called Blender®. The dynamic behavior of the whole vehicle model (with eAxle) will be validated by means of an optical measurement process or what so called Object-Tracking.
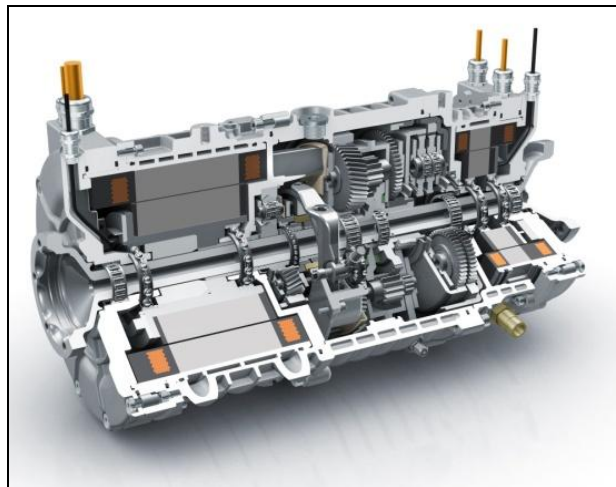
Figure 1:High voltage electric axle drive

References

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