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PREMAGNETISATION OF AN ELECTRIC DRIVE WITH DECOUPLING

Axel Unger
Bertrandt Ingenieurbüro GmbH

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PREMAGNETISATION OF AN ELECTRIC DRIVE WITH DECOUPLING

Initial situation:

The PPE51 will have an asynchronous machine with a decoupler on the front axle. This means that a clutch decouples the drive train and no longer creates friction. The primary drive is via the rear axle. If traction is needed on the front axle, a clutch on the front axle is closed.

Disadvantage:

The electric drive on the front axle must be brought up to the appropriate speed before the clutch can close. It is crucial that this happens quickly. Especially if the vehicle wants to recuperate, because the braking process is over quickly. An asynchronous machine has the disadvantage that before it can provide a torque, the iron circuit must be magnetised. This takes about 35ms. Only then can it start to build up a torque.

Solution:

In driving conditions where it is expected that the front axle is likely to be needed in a moment, it is premagnetised and can engage quickly if it is needed.

Advantages:

- Front axle can engage 35-50ms faster.
- more recuperation
- Faster traction

Technical implementation:

In driving conditions in which it is expected that the front axle will probably be needed in a moment, it is pre-magnetised and can engage quickly if it is needed.

As soon as the situation is over, the pre-magnetisation is cancelled again (energy saving).

Such conditions are e.g. brake pedal applied, wheel slip, collision assistant detects approaching vehicle, overtaking process, navigation data, etc.

The bias current I_0 is provided by the power electronics. This is done automatically when the drive is commanded into torque control mode.

In normal uncoupled operation, the drive is operated in freewheeling mode. There is no premagnetisation. If the condition occurs that a coupling is likely, the drive is commanded into torque mode with 0Nm. If no coupling is necessary, the drive is commanded back into freewheel mode. The magnetising current is approx. 5A. For reasons of efficiency, it does not make sense to pre-magnetise constantly.