

Developing the state-space flux linkage model

1. Develop d-, q- axis currents as function of λ 's and mutual fluxes λ_{AD} and λ_{AQ} .
 - Step 1a: d-axis currents
 - Step 1b: q-axis currents
 - Step 1c: Put them together
2. Develop state equations for λ 's by substituting current expressions (from step 1) into voltage equations (see Section 4.12.1)
 - a. Start from a preliminary form of the voltage equation
 - b. Substitute for the currents using 4.124, and do some algebra
3. Develop the torque equation in terms of flux linkages.
4. Approximate the effects of saturation.

SATURATION DEFINITIONS

- Magnetization current: $i_M = (i_d + i_F + i_D) \rightarrow \lambda_{AD} = L_{AD} i_M$
- Maximum per-unit flux linkage without saturation: λ_{ADT}
- i_{M0} : current that would produce λ_{AD} if no saturation effects
- i_{MS} : current that produces λ_{AD} with saturation effects
- λ' : Flux linkage resulting from i_{MS} if no saturation effects
- L_{AD0} : inductance corresponding to air-gap line; inductance when i_M is small, i.e., the non-saturated inductance. $\lambda_{AD} = L_{AD0} i_M$

