Dymola Hands-on

"Electrical Transformer Design using Dymola" is a comprehensive process that involves using Dymola, a modeling and simulation software, to design and analyze the performance of electrical transformers. Here are some descriptive notes on the various aspects of this process:

Introduction:

The design of electrical transformers aims to transfer electrical energy efficiently and safely between different voltage levels.

Dymola, a multi-domain modeling and simulation tool, provides a platform to simulate the behavior of transformers and optimize their design.

Transformer Modeling:

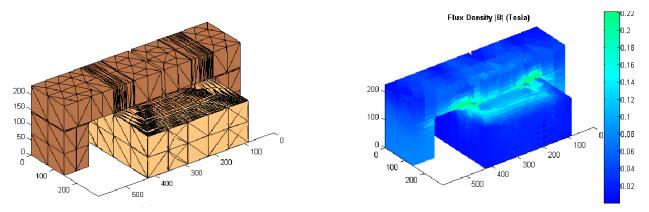
Dymola enables the creation of mathematical models that represent the electrical, magnetic, and thermal characteristics of transformers.

The models consider parameters such as the transformer's geometry, core material properties, winding configurations, and electrical losses.

Core Design:

Dymola allows for the analysis and optimization of transformer cores, which play a crucial role in magnetic flux induction and minimizing losses.

Core design involves determining the appropriate core material, core shape, and size to achieve efficient magnetic coupling and reduce hysteresis and eddy current losses.



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Transformer Input Parameters			Mixed Integer Programming Output Results
Rated power (kVA) Internal coil material External coil material Low voltage (V) High voltage (V) Internal coil connection External coil connection Internal coil type External coil type Frequency (Hz) Magnetic core material	400 Copper V 400 20000 Y V Sheet V	Conductors cross-section calculation Thermal Short Circuit Test Method Current Density Method a. Constant current density LV coil (A/mm ²) Method: a HV coil (A/mm ²) Current Density Coll (A/mm ²) Current Density Current Density C	Internal coll turns 19 Width of the core leg (mm) 258 Height of the core window (mm) 346 Magnetic induction (Gauss) 13237 L∨ coll current density (A/mm ²) 1 H∨ coll current density (A/mm ²) 1 Transformer design cost (€) 6364.13 Transformer Uk based on FEM (%) 1 Convergence history Graph Transformer performance Graph Active part design Graph Transformer design Graph
	VVire 💉 50 💉 HiB 👻	User Load loss (W) 3250 No-load loss (W) 520	
ariables for optimization Mixed Integer Programmin Direct transformer da Internal coil turns Width of the core leg (mi Height of the core windo Magnetic induction (Gau: LV coil current density (HV coil current density (esign inf m) [ow (mm) [ss) [A/mm ²] [tial value lower bound upper bound 12 10 20 ♥ Integer 200 200 500 Integer 200 200 500 Integer 2000 12000 18000 Integer 0 Default values	Transformer efficiency Transformer losses Graph TDO Transformer Design Optimiza

Winding Design:

Dymola facilitates the modeling and analysis of transformer windings, including primary and secondary coils.

The winding design involves determining the appropriate wire size, insulation materials, and turn configurations to achieve the desired voltage transformation ratio and minimize resistive losses.

Electrical Performance Analysis:

Dymola enables the simulation of the electrical performance of transformers under various operating conditions, such as different load levels and voltage inputs.

The software can assess important performance parameters, including voltage regulation, efficiency, and short-circuit behavior, to ensure the transformer meets design requirements.

Thermal Analysis:

Dymola allows for thermal analysis to assess the temperature distribution within the transformer under different load conditions.

The software considers factors such as core and winding losses, cooling mechanisms, and ambient temperature to ensure the transformer operates within safe temperature limits.

Optimization:

Dymola's simulation capabilities support optimization techniques to refine transformer designs.

Parameters such as core dimensions, winding configurations, and cooling systems can be adjusted and optimized to improve efficiency, reduce losses, and meet specific design constraints.

Documentation and Reporting:

Throughout the transformer design process using Dymola, it is essential to document the modeling assumptions, simulation results, and design iterations.

Dymola provides tools to generate reports and visualizations, including graphs, diagrams, and tables, to effectively communicate the design outcomes.