

# Aerothermal Characterization of the Cooling Flow in Hydro Generators

Aerothermale Charakterisierung der Kühlluftströmung in Wasserkraft-Generatoren

Mechanical Engineering

Master-Thesis (MTh)

**VOITH**

Ausgeschrieben am

**23.02.2024**

## Background

One of the main components of hydropower plants is the electrical generator converting mechanical to electrical energy. Despite the very high efficiency, dissipation occurs due to electromagnetic losses and must be removed from the system. For this purpose, a thermodynamic cycle is realized providing the required cooling air to the critical devices. A model of a hydro generator is currently in the design process, that will enable a detailed experimental analysis of the cooling flow.

Subject of the present thesis is the numerical prediction and the characterization of the cooling flow inside the conceptualized model generator. Focus is on the sensitivity analysis of the flow in between the magnetic poles towards variations of the rotor geometry. The simulation of the fluid flow is performed in 3D using SIEMENS STARCCM+©. A detailed aerothermal analysis shall be performed during the post processing using Java programming language. Based on the results of the fluid flow simulations design improvements are supposed to be derived directly contributing to the improvement of the current model generator design.

The master thesis is performed in cooperation with Voith Hydro Holding GmbH & Co KG. Voith will be happy to directly contribute with its expertise in the field of electric machinery.

Betreuer/in

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Schwerpunkt

x	analytisch
	konstruktiv
	experimentell
x	numerisch

## Keywords

- Sensitivity analysis
- Aerothermal management of electric devices
- Electrical turbomachinery
- Simulation technology (CFD)
- Programming in Java

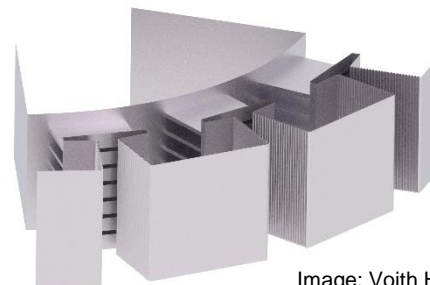


Image: Voith Hydro Holding GmbH & Co KG.

# Master Thesis: Aerothermal Characterization of the Cooling Flow in Hydro Generators

**Topic:** Characterization and sensitivity analysis of the fluid flow inside the pole gap of a hydropower generator

**Keywords:** Numerics, Sensitivity analysis, Aerothermal management of electric devices, Electrical turbomachinery, Simulation technology, Programming in Java

**Description:** One of the main components of hydropower plants is the electrical generator converting mechanical to electrical energy. Despite the very high efficiency, dissipation occurs due to electromagnetic losses and must be removed from the system. For this purpose, a thermodynamic cycle is realized providing the required cooling air to the critical devices. A model of a hydro generator is currently in the design process, that will enable a detailed experimental analysis of the cooling flow.

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