

**Announced on January 5, 2026**

Bachelor Thesis

## Mathematical Modeling of Charging Concepts for Electrified Terminal Trucks

Am Institut für Maritime Logistik

### Background

The maritime logistics industry is under significant pressure to drastically reduce greenhouse gas (GHG) emissions while handling continuously increasing container volumes. A central lever for the decarbonization of container terminals is the electrification of horizontal transport equipment. Unlike conventional diesel-powered terminal trucks, battery-electric vehicles (eTTs) require precise coordination between operational transport tasks and charging events to maintain terminal productivity and avoid bottlenecks.

### Objective

The objective of this thesis is to develop a mathematical description of the energy consumption and charging processes of electrified terminal trucks. This involves a systematic analysis of specific operational duty cycles (e.g., laden/unladen trips, idling at the crane, quay-to-stack movements). Based on this analysis, mathematical models will be developed to represent the State of Charge (SoC) over time and to evaluate the feasibility of different charging strategies.

### Tasks

1. **Process Analysis:** Systematically examine the operational workflows of terminal trucks and adapt them to the requirements of electrified equipment.
2. **Model Development:** Formulate a mathematical model to represent charging and discharging cycles based on current scientific literature.
3. **Concept Comparison:** Mathematically describe and compare different charging strategies (e.g., **Opportunity Charging** during idle times vs. **Depot Charging** during shift breaks).
4. **Visualization:** Graphically represent energy profiles and sensitivity analyses (e.g., the impact of charging power or battery capacity on vehicle availability).

### Qualifications

In addition to good academic performance, a systematic and sound scientific approach and basic knowledge in the field of maritime logistics are expected.

**Processing is possible as of now!**

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**Please send your application with CV and current grades to:**

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