

Master's Thesis Assignment

Development and Evaluation of an Energy Harvesting System for the Autonomous Power Supply of Open-Source-Based Sensors for Use on Trawl Nets

The open-source prototyping platform *OpenAquaSense* enables the development of modular sensor system prototypes for underwater applications that can be flexibly adapted to specific use cases. In the future, the platform is also intended to support sensor systems that are mounted directly on trawl nets in order to record relevant environmental parameters during towing operations. Such deployments typically involve numerous trawling operations over several weeks, resulting in particularly high requirements for robustness, reliability, and autonomy of the sensors.

One major challenge arises from the limited accessibility of the sensors during operation. In addition, cable-based connections are problematic in this dynamic application, as they may be subjected to mechanical stress and potential malfunctions during deployment and retrieval of the net. Therefore, the sensor systems are to be supplemented with a suitable energy harvesting system that enables autonomous power supply during towing operations and eliminates the need for cable-based operation.

The objective of this master's thesis is the development and evaluation of a functional prototype of an energy harvesting system that reliably supplies the *OpenAquaSense* sensors with energy during their deployment on trawl nets. The focus lies on identifying suitable energy harvesting approaches, the prototypical implementation of a robust power supply concept, and experimental validation under laboratory conditions.

The following aspects are to be addressed in detail:

- Research on energy harvesting methods for dynamic maritime applications and assessment of their suitability for use on trawl nets
- Derivation of functional and technical requirements for an autonomous power supply for the intended application
- Development of a concept for energy generation and storage while considering the identified requirements
- Design and prototypical implementation of a suitable energy harvesting system and its integration into a sensor system of the *OpenAquaSense* platform
- Experimental evaluation of the prototype with regard to performance, reliability, and practical applicability in the context of repeated trawling operations

The written thesis must be submitted before the end of the processing period. The results of the work are to be presented in a colloquium in the form of a presentation of approximately 20 minutes, followed by a discussion.

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