# Internship Proposal – MAEVA Project – Optimization of a SWAC Installation Coupled with an OTEC System

## *Context*

Ocean Thermal Energy utilization is based on exploiting the thermal gradient between the surface and the deep ocean. Currently, two complementary technologies are considered: **SWAC (Sea Water Air Conditioning)** and **OTEC (Ocean Thermal Energy Conversion)**.

- **SWAC** is a cooling technology that uses cold water pumped from ocean depths (typically between 600 and 1000 meters, where the temperature is around 5°C).
    - **Principle:** The cold water passes through a heat exchanger to cool a freshwater circuit (or heat transfer fluid), which is then distributed to the building air-conditioning network.
    - **Application:** Air-conditioning for large complexes or coastal districts with access to deep ocean waters.
    - **Advantage:** Significant reduction in electricity consumption compared to conventional air-conditioning systems (up to 90% energy savings) and elimination of harmful refrigerants.
- **OTEC** aims to **generate electricity** by exploiting the temperature difference between warm surface seawater (heated by the sun) and cold deep seawater.
    - **Principle:** It operates as a **heat engine** based on a thermodynamic cycle. A temperature difference of about **20°C** is required. Warm surface water vaporizes a working fluid (such as ammonia), which drives a turbine to generate electricity, then cold deep water condenses the fluid to restart the cycle.
    - **Application:** Continuous electricity production in tropical and subtropical regions.
    - **Advantages:** Renewable electricity generation 24/7 and potential **co-production** of potable water through desalination (open cycle).

In summary, **SWAC** is an **energy efficiency** solution for cooling, while **OTEC** is a **renewable electricity** production technology, both leveraging the thermal resource of **deep ocean waters**.

The Femto-ST laboratory, in partnership with the University of Polynesia, the University of La Réunion, and Aix-Marseille University, is developing optimization strategies for these technologies within an ANR project called **MAEVA (Multidisciplinary Approach for deep seawater Energy VAlorization)**.

## *Internship Description*

The goal of the internship is to provide a simulation framework for SWAC and OTEC processes and enable coupling of these two technologies. Several architectures are possible: SWAC then OTEC, OTEC then SWAC, or parallel operation.

After a literature review, the intern will develop a model using **TESPY (Thermal Engineering Systems in Python)** to evaluate the performance of different architectures. This model will be partially validated using data from our partners (e.g., the Papeete hospital operates a SWAC system). The intern will collect information from partners to list all constraints:

- Technical constraints such as maximum flow rates, pumping depths, or thermal loads imposed by buildings.
- Ecological constraints, including discharge temperature considerations.
- Economi/c aspects, discussed in detail with Aix-Marseille University.

## *Internship Details*

The internship is funded for 6 months and will take place in Belfort, with possible short missions to Marseille and videoconferences with Tahiti and La Réunion. Conducted within the FEMTO-ST laboratory, the intern will be required to produce a report in English. The internship is remunerated at €500/month.

## *Required Skills*

Knowledge in thermodynamics and Python programming is essential to tackle this complex subject. Strong synthesis and writing skills are expected so that the final report can be turned into a scientific article.

## *Application*

To apply, please send your CV and a cover letter, along with any supporting documents, to:

- Philippe Baucour: philippe.baucour@umlp.fr
- François Lanzetta: francois.lanzetta@umlp.fr

The internship will take place in a secure-access laboratory. Once selected by the scientific team, the candidate must complete the administrative procedure for lab access.

# DEAD LINE : Friday 19th December 2026