REQUIREMENTS AND AVAILABLE TECHNOLOGIES FOR TEMPERATURE AND SALINITY CALIBRATION APPLIED TO CTDs – RAIA OCEANOGRAPHIC CALIBRATION LABORATORY

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RAIA project is developing a cross-border oceanographic observatory in the NW of the Iberian Peninsula. To strengthen the observational network and to satisfy its present and future needs, a calibration laboratory is being implemented. In this poster an overview of the temperature and salinity calibration methodology and instrumentation selection is exposed.

WHY IMPLEMENT A CALIBRATION LABORATORY?

1. To assure high quality observational marine data.
2. To achieve the best performance of instrumentation used in oceanographic surveys and moorings.
3. To ensure that sensors are measuring accurately, truly and precisely in order to obtain reliable and comparable data.
4. To counteract he absence of regional and national infrastructures in which oceanographic probes calibration can be performed.

OUR OBJECTIVES

RAIA LABORATORY	
Conductivity	**Temperature**
± 0.002	**± 0.002 °C**

These objectives are in accordance with other reference calibration laboratories, institutions and instrumentation manufacturers' ones.

REFERENCE DOCUMENTS AND INTERNATIONAL STANDARDS

As there is not an international established standard for oceanographic instrumentation, choosing our reference documents has been one of the critical decisions to make. After a thorough search, the requirements chosen are the settled by Saunders in *Standards and Laboratory Calibration* (WHP Operations and Methods – July 1991).

These requirements are the most restrictive among many other reference documents (such as *Manual of Quality control procedures for validation of oceanographic data,* UNESCO Manual and Guides 26).

The highest quality standards for testing and calibration laboratories (ISO 9001 and ISO/IEC 17025) have been also considering during the instrumentation selection process.

As we describe below, both the selection of the best methodology and the appropriate instrumentation is a key factor to achieve all these quality aims.

ACHIEVING OUR GOALS…

TEMPERATURE REQUIREMENTS

Temperature measurement and calibration are critical because all the other quantities are calculated or referred to a certain reference value.

There is a wide range of available technologies:

- Thermocouples: inexpensive and solid but not accurate.
- Thermistors: short response time and accurate but non linear.
- SPRT: accurate and linear, long response time.

To achieve the best results in calibration conditions, the most appropriate instrumentation is a Pt25 SPRT probe connected to a super-thermometer bridge. Temperature-fixed points (TPW cell and Gallium melting point) and an external resistance complement the instrumentation to increase accuracy to fulfill especial needs.

Figure 1. Temperature bath

CONDUCTIVITY REQUIREMENTS

Conductivity is the quantity measured to calculate salinity of a sample. Due to the high amount of ions which is present in seawater, for this conductivity specific measurement range there are only few available instruments to perform accurate analysis of sea water samples properly. Amongst them, GuildLine Autosal is the one of which specifications better fulfill our requirements.

Because of the strong dependence of conductivity on temperature, samples must reach the thermal equilibrium before gauging them. In addition, the instrument must be perfectly thermally stabilized and calibrated before each measurement is performed.

Figure 2. Guildline Autosal

CONDUCTIVITY CALIBRATION:
TEMPERATURE VS SALINITY CHANGE

There are two different approaches to conductivity calibration: changing the temperature or changing the salinity of the bath in which the calibration is taking place. Both of them are equally valid, and the choice between them is more a strategic decision than a scientific one.

Temperature change	Conductivity change
•Equipment: - Temperature controlled seawater bath.	•Equipment: - Seawater tanks of various salinities.
•Vantages: - Less economic investment. - Less personal.	•Vantages: - Quicker. - Allows to perform several calibrations at the same time.
•Disadvantages: - Slower. - One instrument at a time.	•Disadvantages: - More expensive. - Difficult to maintain.

Figure 3. Comparative table of the two methodologies

CONTROLLING CALIBRATION CONDITIONS

Controlling environmental conditions during the calibration process is important for avoiding undesirable effects on it. Likewise, having an stable and uniform bath is essential.

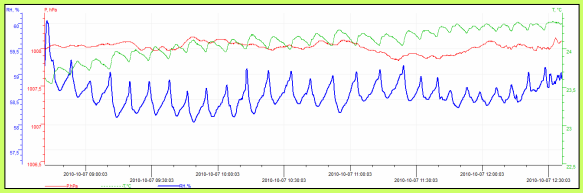

Figure 4. Laboratory environmental data are monitored in real time

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FUTURE LINES OF WORK

UTMAR'S main aim is to give technical and logistic support for design and integration of marine observation and monitoring technology, opening our facilities to our partners and other institutions .

In this moments, the Oceanographic Calibration Laboratory is developing new methods to include the calibration of other type of sensors (pressure, pH, oxygen, turbidity and fluorescence ones) in its services.

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