- **My summer internship experience :**

IFREMER presentation :

I did my 6 weeks first-year internship from June the 6th to July the 15th in IFREMER « centre mediterranée » located in La Seyne/Mer in VAR. It's an EPIC firm dedicated to the french oceanographic fleet (FOF) that is to say a public establishment of an industrial and commercial nature managing public service activity and based on private law. It's under the control of different ministries : the one of agriculture and food, the one of ecology, energy and sea sustainable development and finally the one of higher education and research. This firm is a single case in Europe concerning its public management and its socio-economical activity. Its various missions are :

- Climate study with ecosystem predictions
- Marine biotechnologies development
- Assessing and developing ocean resources and enabling their sustainable exploitation
- Improving methods for monitoring, forecasting, evolution, protection and enhancement of the marine and coastal environmental
- Foster the maritime economic development

At the end of the day, IFREMER is a huge structure based in France but also all over the world. The use of submarine vehicles like ROV (remoted operational vehicle), HOV (human occupied vehicle) or AUV (autonomaus underwater vehicle) is part of a will of ecological care, sciences and sustainable maritime economy. The most famous ones are the Nautile which is the only HOV in Europe able to reach a 6000m depth and the ARIANE and the VICTOR 6000 which are both ROV. Concretely, an exemple of typical IFREMER mission : samples and measures of marine fauna through the use of ROV. Indeed, from a ship of the fleet and thanks to wires and winches the crew launches and pilots the ROV and its ballast which allows the communication between the ROV and the ship.

Concerning the organisational chart I evolved in the DFO (direction de la flotte océanographique), SM unit (système sous-marins), IIDM service (ingénierie d'intervention en développement mécanique). My tutor was the chief of the service Ewen RAUGEL but I truly worked with Jibril DIFALLAH and Corentin RIVIERE who are hydraulic technician and engineer.

My activities :

The first day of my arrival, I have been introduced to all the crew of technicians and engineers and overall I have been explained all systems functionment such as the one of an hydraulic central, or how to understand an hydraulic schema or the role of each components and also the role of each lab and technical rooms.

Then, I have been placed on a project on which I was supposed to work alone. It dealed with an oil cooling system to develop for the hydraulic central of VICTOR 6000. Indeed, the ROV has an hydraulic central (working with oil as fluid) composed of a motor, pumps, pressure limiters and sensors, filters and pipes. A ROV needs such a system because it allows to transform electrical energy in hydraulical energy which is way more effective when you need to move huge objects under water. In fact, oil is circulating in the system thanks to the two pumps powered by the motor powered by eletricity. Its circulation is determined and regulated according to the operator's willings and allows the movements of hydraulic cylinders which then permit to move the hydraulic arms necessary to all kind of work underwater. A consequence of the circulation of this oil under high pressure (around 150-200 bars) is that the oil temperature is quickly increasing and when it reachs 65-70°C it becomes annoying so I had to think to a way to cool it, but I was never alone in my researches of information and I could ask questions to who I wanted in order to help me in my work.

Finally, I did some reports (and overall researches on all kind of exchangers listing pros and cons) and I had to do a little presentation to the engineers of the different solutions possible to discuss with them on which was the best one and we decided to not add a third pump for an exchanger because it would truly affect the productivity of the central but rather replace the material of the hydraulic central by a new one with a higher thermal conductivity and with added exchange surfaces thanks to 3D printing to facilitate thermal losses. So I had to find a new material and the best compromise between thermal conductivity and corrosion resistance because we work in submarine salted water. Moreover, I had to calculate the minimal needed surface to evacuate the heat by conduction and convection by using new formulas and finding extremely specific coefficients but it was quite hard and they told me to give this up and to see what it really happens during concrete essays because it was time to begin them.

Indeed, the electronical and hydraulic squads began the essays by checking the good functionment and behaviour of the central under high pressure (no leaks, good efficiency, …). More precisely, we put the central in an hyperbaric chamber which recreates the exact pressure conditions of surrounding water (625 bars) when the ROV is at 6000m of depth. I participated to the preparation by wiring electro plugs, screwing, … then I reported the figures of pressure efficiencies and related oil temperatures in an excel document to make graphics et conclude on the thermal power at stake.

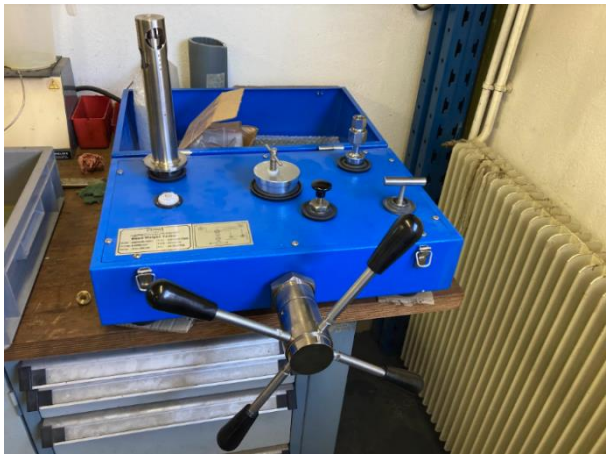
Moreover, I also translated an english manual to use a pressure balance on which I learnt to calibrate pressure gauges thanks to weights. I have created a report to modify the functionment of an old hydraulic central too.

Feelings and impressions :

At the end of the day, I directly felt that I had learnt thousands things since the first day and that it will continue during all the internship. I couldn't specify more my activities here and I skipped many essential subtilities I discovered there but I wanted in this report to show how I discovered the engineering and the professional world, how I saw concrete systems for the first time and how I had to assimilate quickly the functionment of everything. Indeed, I also witnessed some meetings between engineers and I understood how much communicating skills are essential to give properly the entire and consistent information. That experience was incredibly useful and it was also the chance to see some vehicles, I let you with some photos…

Photos :

The hydraulic central I had to modify.



The pressure balance

ROV Ariane

Me, playing with the telemanipulated hydraulic arm.

The hydraulic central of ROV Victor 6000 we put in hyperbaric chamber and on which I had to add a thermal exchanger.