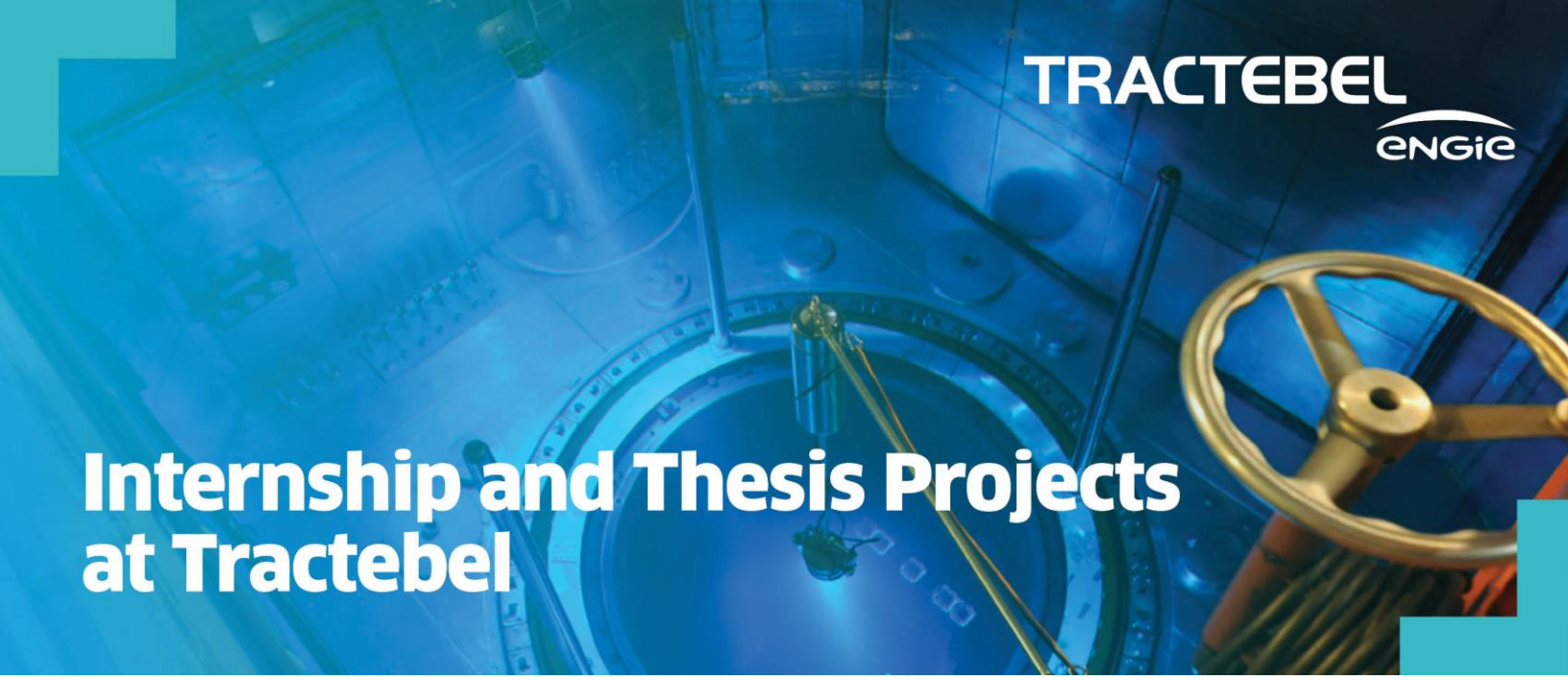

Optimization of fuel container loading sequences

Internship Summary

Business line: Nuclear – Nuclear Engineering Department – Core and Fuel Studies

Duration: ≈ 4 months

Period: -

Site: Brussels Engie Tower

Who is Tractebel?

Tractebel, part of the Engie group, has over 150 years of experience and is one of the world's largest engineering company. Tractebel offers its customers multidisciplinary solutions in the fields of energy, nuclear, hydraulic and infrastructure. Our teams are involved in all phases of a project, from feasibility studies to implementation.

With whom will you be working with?

You will work with the Core and Fuel team. The group performs calculations that span the entire spectrum of nuclear fuel applications, i.e. the core reload design, the in-core thermal-hydraulics, the spent fuel pools, spent fuel containers...

The studies in these domains require a large set of codes and tools, together with a validation database. To remain competitive and to diversify its competencies to the new generation of reactors, Tractebel continuously follows the evolutions of different other codes used in the domain, whilst upgrading the existing validation database.

What will you be working on?

We are looking for a motivated intern to develop and apply optimization techniques in the frame of spent fuel pools unloading.

The type of problems that must be solved in this context consists in finding for a given set of spent fuel assemblies a loading date and a position in spent fuel container that respect a series of constraints such as limits on heat load or dose around the fuel container.

While this type of problems can be solved ‘by hand” for scenarios involving a limited number of assemblies, this approach becomes quickly impractical for the more challenging problems which are currently encountered in the frame of the post operational phase of the units, during which entire spent fuel pools must be emptied (hundreds of assemblies). To efficiently solve the latter scenarios, mathematical optimization methods must be deployed.

For this internship, it is proposed to test two different optimization modelling paradigms: linear programing and constraint programming. One of the internship objectives will be to benchmark and compare the performances of these two paradigms on different fuel cask loading scenarios with increasing complexity.

To summarize:

- You will develop competences in the two distinct fields: spent fuel characterisation and mathematical optimization.
- You’ll become proficient at using scientific computation software such like Origen (isotopic evolution) and optimization toolkits (CPLEX)
- You will write a summary report.

Who are we looking for?

- You are a studying physics, mathematics, or engineering.
- You have a basic knowledge of linear programming.
- Knowledge of Linux, Bash, Python, … is strongly recommended.
- You are fluent in English.
- You are curious and have an initiative mindset.

- You appreciate teamwork.
- You are well organized and possess a strong team spirit.
- You are eligible for a nuclear security permit delivered by FANC as you'll be working with nuclear data.

What do we offer?

- An interesting internship in a multilingual environment, with a good work-life balance.
- The opportunity to meet industry experts and work in a team of experienced professionals.
- Familiarity with an environment that allows you to strengthen your professional and technical skills.
- An opportunity to experience the ways of working in a design office.

How to apply?

Do you think Tractebel is the ideal solution for your internship?

Contact your teacher and send an e-mail to MAXIME.HAEDENS@TRACTEBEL.ENGIE.COM with your CV and a concise motivation message.

We hope to see you soon!