Harnessing data to advance life cycle assessment of emerging technologies

Supervisor (primary) Imperial College London: Dr. Rupert J. Myers

Applications are invited to fill a PhD position funded through internal or external scholarships, or from a student's own funding.

This PhD project will create and use an improved inventory analysis database of unit processes and their inputs and outputs by harnessing massive quantities of openly accessible information in the literature, such as peer reviewed journal papers and technical reports. The goal will be to have these unit process datasets defined in a relatively generic manner, using known process relationships (e.g. the Bond-Work index for grinding), so they can represent processes in many industries. This new dataset will be used to create industrial scale process flowsheets from laboratory and pilot scale data for emerging technologies (to be decided during the project). These emerging technologies will then be analysed (at industrial scale) through ex ante life cycle assessment.

The PhD will be based in the Materials Section of the Department of Civil and Environmental Engineering (Skempton Building, South Kensington Campus). On a day-to-day basis they will work alongside ~30 PhD students and ~10 postdoctoral research associates in the Materials Section, including ~10 in their research group, led by Dr. Myers.

This PhD project offers excellent training and development opportunities in a highly stimulating environment, as well as access to a network of internationally leading academics, industrial partners, and research facilities.

Project details

Life cycle assessment is important methodology to quantify and evaluate the environmental performance of products and services that is today used by a huge number of people. Historically, life cycle assessment has been used to evaluate the environmental performance of established technologies (ex post) rather than emerging technologies (ex ante). This is partly because there is an inherent lack of directly measured industrial scale data for emerging technologies. Industrial scale data are needed to obtain reliable results and insights for technologies since this is the scale that they are implemented commercially.

Recent advancements in life cycle assessment methodology have shown how industrial scale data can be modelled or estimated such that they can be used for reliable evaluation of emerging technologies. Methods to obtain appropriate data include using process modelling, unit process data for similar ('proxy') industrial scale technologies, and relationships obtained from data for existing emerging or similar technologies at different scales. This project aims to use these approaches and 'rules of thumb', e.g. the Bond-Work index and other similar rules in the process engineering literature, to develop industrial scale unit process datasets, to create and then use them in an improved unit process dataset for life cycle assessment of emerging technologies.

Since there is a huge number of emerging technologies, the selection of which to model using the improved unit process dataset will be done during the PhD project. However, the selection of technologies chosen will be based on an evaluation of their genuine potential to

reduce environmental impacts and/or technoeconomic prospects, and also their relevance and complementarity to other research ongoing in Dr. Myers' research group.

This PhD project will have a heavy modelling focus, although a background in experimental engineering or science or industrial practice is important. They will have access to life cycle assessment software and tools, expertise and support of other PhD students and researchers working on life cycle assessment in Dr. Myers' group, and the wider opportunities and resources available in the College (Imperial Life Cycle Network, Grantham Institute, School of Convergence Science: Climate, Energy and Sustainability, etc.)

Academic requirements and experience

Required

- A good first class degree (or international equivalent) in a STEM subject, e.g., Chemical Engineering, Chemistry, Metallurgy, Physics, Materials Science, Environmental Science, Geology.
- Laboratory or industrial experience.
- Strong interest in sustainability and research.
- Excellent English communication skills.

How to apply

Applicants wishing to be considered for this opportunity should send the following application documents to Dr. Rupert J. Myers (r.myers@imperial.ac.uk):

1. Current CV including degree result and, if possible, class ranking

Application via the Imperial College Registry is not necessary at this stage.

Applications will be regularly reviewed until the position is filled.

Funding notes

Applicants interested in this project and seeking funding via scholarship schemes (see here: https://www.imperial.ac.uk/study/pg/fees-and-funding/scholarships/) or can self fund are welcome to apply.