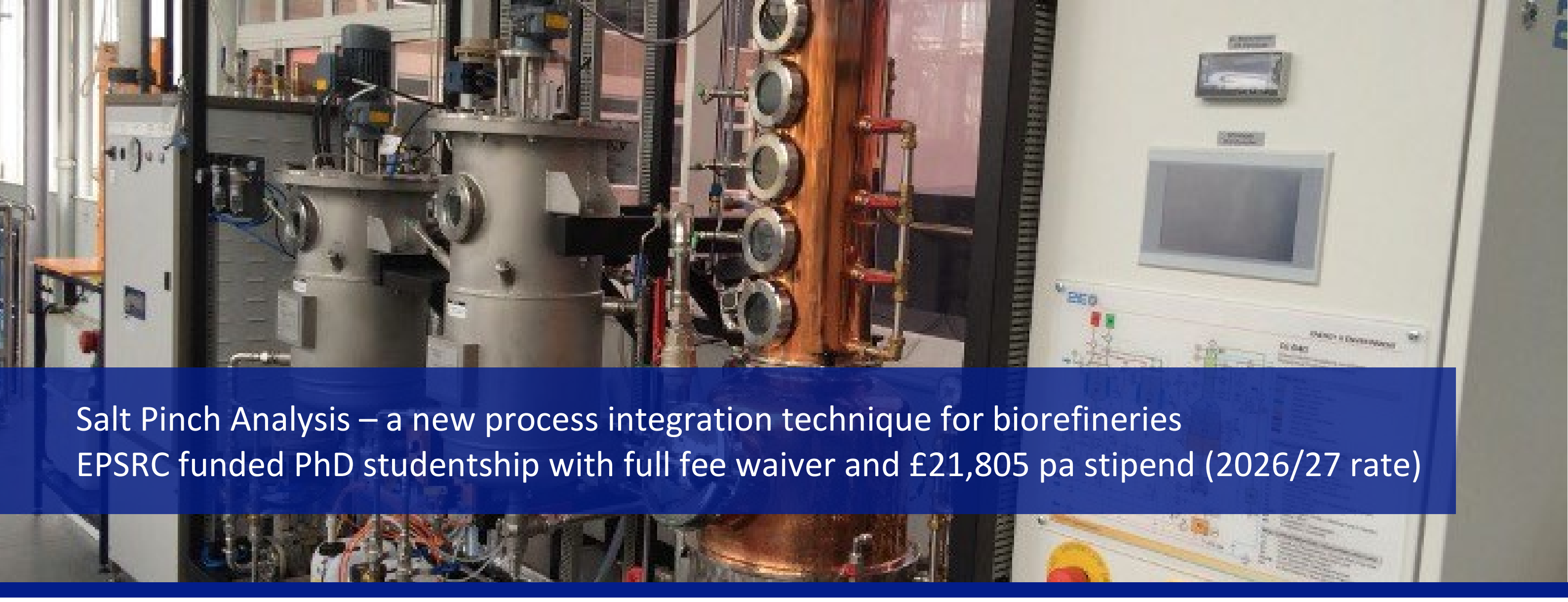


Salt Pinch Analysis – a new process integration technique for biorefineries

EPSRC funded PhD studentship with full fee waiver and £21,805 pa stipend (2026/27 rate)

Project Code: DLA_DTP_2026_02

Main Supervisor: Professor Grant Campbell

Co-Supervisor: Dr Athanasios Angelis-Dimakis, Dr Mohammad Alyassin

Project Introduction

The project will develop a novel process integration technique to minimise the production of unwanted salt arising from neutralisation of acid and alkalis used in extraction operations in biorefineries. Acid and alkaline extraction are key operations in biorefineries for recovery of high value phytochemicals and biopolymers, but the high volumes of acid and alkali must be neutralised, entailing further purchase costs of acid and alkali, and disposal costs of the large quantities of salt produced. Salt pinch analysis will apply process integration approaches to systematically match acid and alkali streams to minimise their usage and the creation of unwanted salt.

Project Details

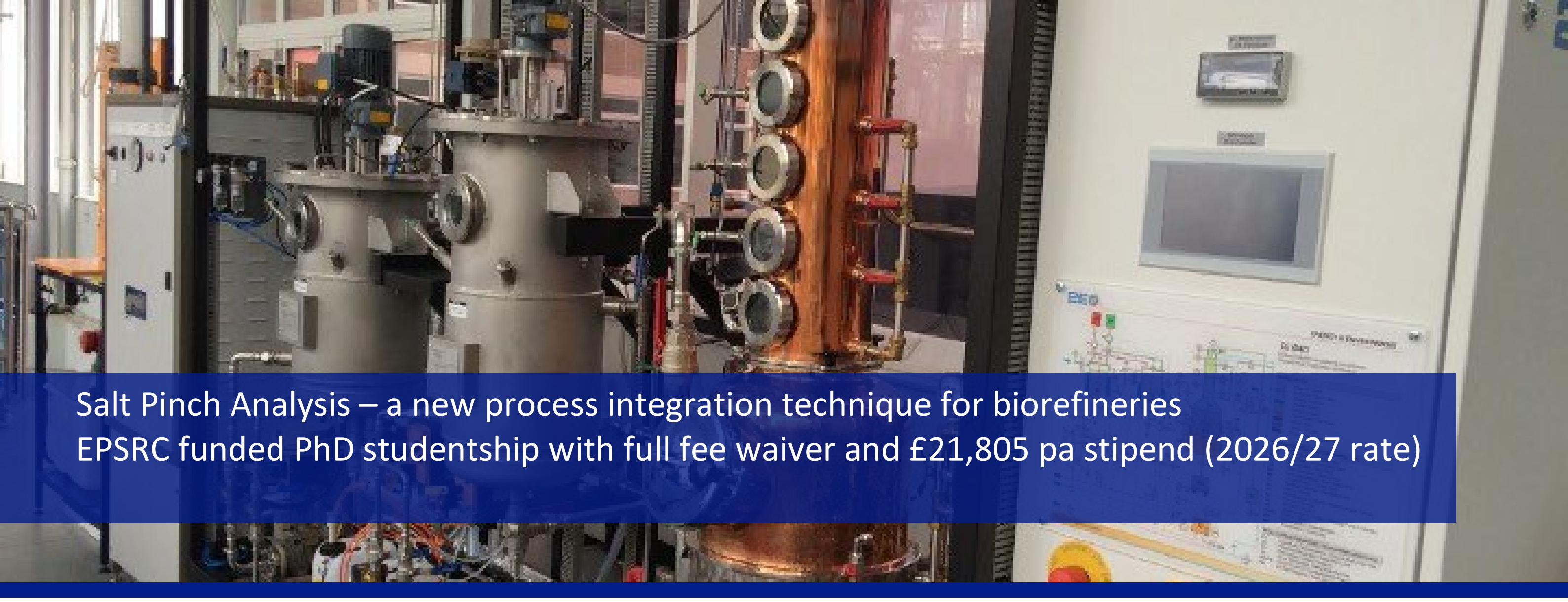
It is proposed to develop a novel process integration technique arising from the particular challenges of biorefineries regarding salt production arising from extraction operations.

Process integration is a branch of chemical engineering that optimally exploits interactions within processes to minimise resource usage and maximise energy and materials efficiency. Process integration (PI, also called Pinch Analysis) started with heat integration, demonstrating how thermodynamically feasible heat recovery targets could be calculated unambiguously, and heat exchanger networks designed to minimise utility usage (e.g. steam, cooling water), through optimal matching of hot and cold streams. PI techniques were extended to mass integration (including water and hydrogen pinch analysis) and have been deployed extensively across numerous industries, particularly oil and gas, saving energy and materials costs and enhancing the efficiency and economic performance of those industries.

Biorefineries have emerged in recent decades in response to urgent global needs to alleviate oil demand and combat climate change. In trying to sustain commercial viability and deliver their unique and urgent benefits, biorefineries suffer a double disadvantage relative to their competition with oil refineries, that the latter have not just of a cheaper and more easily processed feedstock, but also the efficiency benefits of extensive deployment of PI. ***In order to compete with oil refineries and make their distinctive contributions to circular economies and alleviation of climate change, biorefineries must adopt and adapt the PI techniques and approaches currently used in the oil refining industries.***

The supervisor, Campbell, with his colleagues, introduced Bioethanol Pinch Analysis[1-3], the first process integration technique arising from the specific requirements of biorefineries[4-6]. The current project proposes to create the second process integration technique arising from the specific requirements of biorefineries, Salt Pinch Analysis.

Extraction is a key operation in biorefineries, in which biomass components of desirable functionality are extracted and purified as high value co-products. Extraction frequently takes place under highly acidic or alkaline conditions, after which the acid or alkali must be neutralised, producing large quantities of unwanted waste salt, and entailing additional purchasing costs of the neutralising acid/alkali. The concept of Salt Pinch Analysis is to employ PI approaches to systematically match acid and alkali streams to neutralise each other, minimising costs of additional acid and alkali for neutralisation, and minimising salt production and its disposal costs. This technique will address a prominent biorefinery problem (with relevance to other industries employing neutralisation), enhancing their environmental benefits and their economic viability.



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Project-specific entry requirements

The ideal candidate would have a good first degree in chemical engineering and an aptitude for conceptual process design combined with sound experimental skills to generate data to support the implementation of the new PI tool.

Further Information

This call is open to **UK Applicants only**.

Applicants should be of outstanding quality and exceptionally motivated.

The studentships are funded for 3 years (subject to satisfactory annual performance and progression review) and will provide for tuition fees and a tax-free stipend paid monthly.

Please note that there are more projects than funded studentships available and therefore this is a competitive application process which will include an interview. Shortlisted candidates will be contacted for an interview in person or via Teams. After interview the most outstanding applicants will be offered a studentship.

Queries about the application process are welcome and should be emailed to pgrscholarships@hud.ac.uk.

Informal enquiries about this project should be directed to Professor Grant Campbell.

Type of Award: Doctor of Philosophy (PhD).

Eligibility: UK applicants only. First Class or Upper Second-Class Honours degree or equivalent in a relevant subject area, please refer to the entry requirements on the specific projects being advertised.

Location: Huddersfield.

Funding: 3 years full time research covering tuition fees and a tax-free bursary (stipend) starting at £21,805 for 2026/27 and increasing in line with the EPSRC guidelines for the subsequent years. Funded via the Engineering and Physical Sciences Research Council Doctoral Training Programme.

Duration: 3 years full-time plus 12 months writing up (please note that no funding is available for the writing up period).

Closing date: 28th April 2026

Start date: 1st October 2026

Application details

- Go to the EPSRC webpage and download the Expression of Interest Form 2026.
- Provide copies of transcripts and certificates of all relevant academic and/or any professional qualifications.
- Provide references from two individuals – please contact your referees and ask them to send them directly to pgrscholarships@hud.ac.uk from their email address.
- Proof of eligibility – e.g. scan of passport photo page
- Completed forms, including all relevant documents should be submitted via-email to pgrscholarships@hud.ac.uk.

Please note: if you do not attach all the relevant documentation prior to the closing date your application will not be considered.