

SUMMER RESEARCH 2024/25

PROJECT ABSTRACT



THE UNIVERSITY OF
WAIKATO
Te Whare Wānanga o Waikato

PROJECT # 36

SUPERVISOR/S:	Dr Ray Hudd
PROJECT TITLE:	Use of forestry waster biochar as an additive in New Zealand concrete mixes
FIELD:	Construction/materials
DIVISION/SCHOOL:	HECS - Te Kura Mata Ao School of Engineering
PROJECT LOCATION:	Hamilton

PROJECT ABSTRACT:

International research has identified the potential to use biochar (charcoal) made by pyrolysis of agricultural wastes such as rice and other cereal husks. New Zealand doesn't have significant agricultural waste of this type; however, the forestry industry produces a substantial amount of waste. This waste can be pyrolysed to produce biochar. Preliminary laboratory tests indicate that pine biochar can improve the performance of cement-based materials. This project aims to evaluate the effects of different methods of processing this waste to determine what effect the method of processing has. The project will involve making samples and testing the performance of cement mortar using biochar produced under different conditions.

STUDENT SKILLS:

- Proficient and thorough lab skills including mixing, sample preparation, testing and accurately recording data.
- Data analysis: ability to collate and review data and determine optimum performance from accumulated data.
- Ability to present test data concisely and accurately

PROJECT TASKS:

1. Evaluate different methods (exposure time and temperature) to produce different biochar materials. Task may be undertaken working with SCION, alternatively SCION will provide samples.
2. Data Collection:
3. Use the biochar produced as a partial cement replacement in mortar mixes. Determine the plastic and hardened behaviour of these mortar mixes and compare to control mixes prepared without cement replacement. These tests will include workability measurements using a flow table, setting times, compressive and flexural strength performance and drying shrinkage.
4. Data Analysis:
5. Review the data from the tests and identify which type of biochar gives the optimum mortar performance.
6. Prepare a poster summarising the results and outcomes of the tests.

EXPECTED OUTCOMES:

- Student's Research Poster (as per clause 6 of the [Scholarship regulations](#))
- Identification of preferred biochar preparation technique(s)
- Identify the optimum replacement level of the preferred biochar(s)

