# Stepping towards sustainable colour

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Designing colouration processes that lower the chemical and energy use during the wool dyeing process

-Rebekah Harman

**Project objective:**

Due to growing awareness about the negative environmental impact of the textile dyeing industry, this design research shows the development of a new process for colouring wool yarn for carpet.

The new process aims to **reduce energy and chemical use** as strategies to **lower carbon emissions** and **decrease chemicals** entering wastewater streams while also producing desirable carpet with aesthetically vibrant colour and texture.

Thanks to: Carpets and Rugs of New Zealand (CRONZ), Ministry for Science and Innovation, Massey University, AgResearch, Chemcolour New Zealand, Radford Yarns

Image credit: Amber Griffin

The stages of dye uptake are shown over the following slides, for a very dark navy blue.

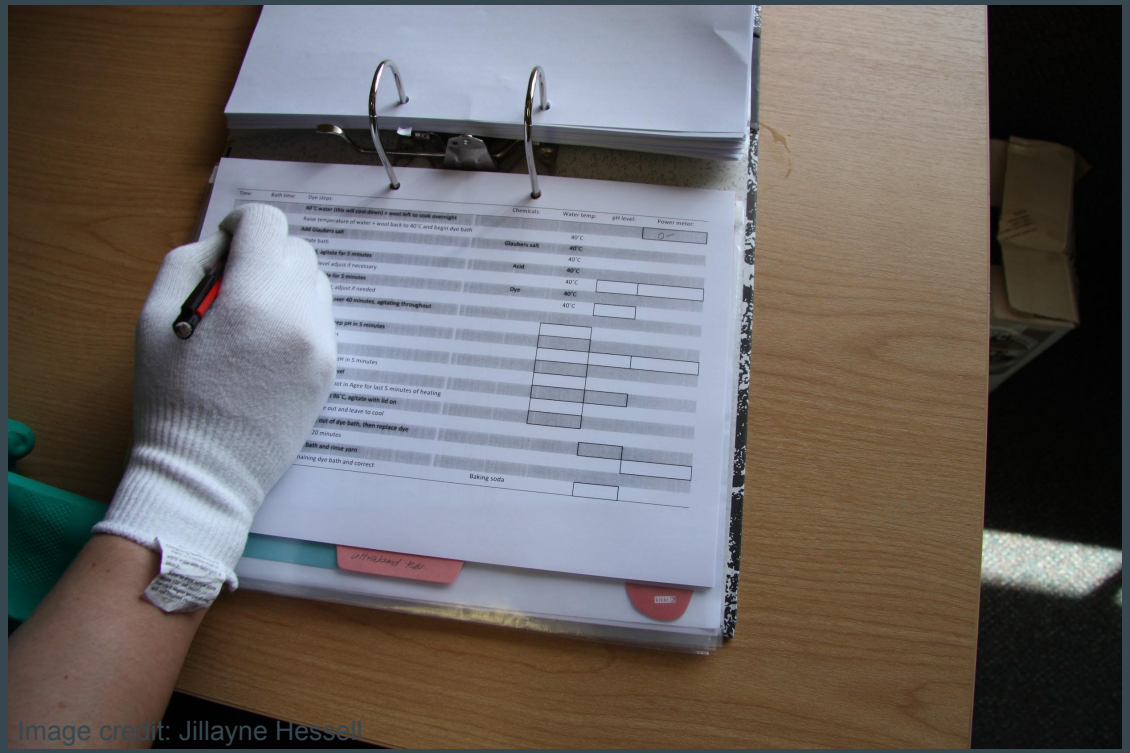


Image credit: Jillayne Hessell

Documentation of the full process is tracked, including measuring energy and chemical use, as it is an easy (and often forgotten) first step for businesses understand where high energy and chemical use occurs.


Equipment for the dyeing process is set out as above. A bain-marie type system is used to heat and control the temperature of the dye bath.

Image credits: Jillayne Hessell

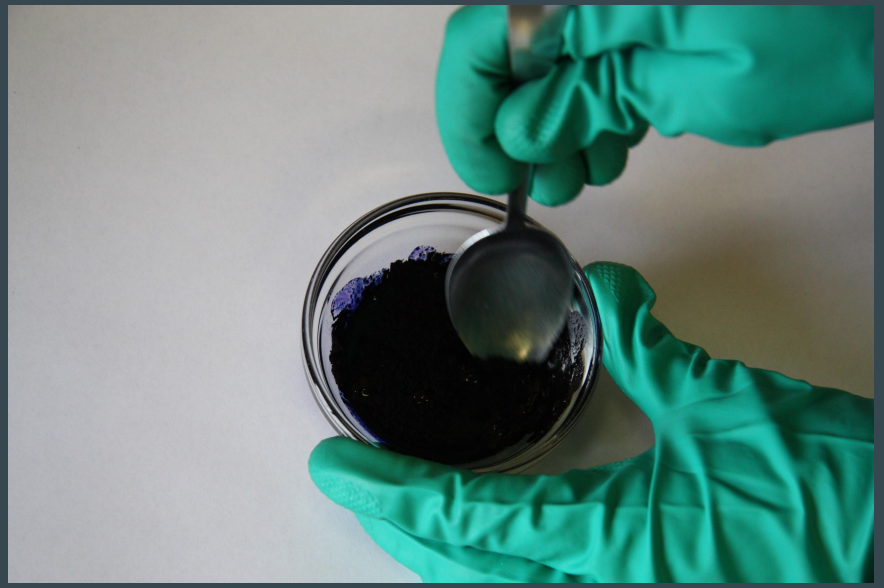
Energy use is tracked per dye bath, this enables comparisons to be made. 100% New Zealand wool year is weighed out, covered with water and left to soak overnight. By soaking the yarn before dyeing it the yarn is able to uptake the dye easier, eliminating the need for Lyogen (a chemical used to help yarn absorb dye).


To avoid unnecessary energy loss the outside of the bain-marie is wrapped in a wool rug. New research suggests colouration factories continue looking at ways to insulate and contain heat already produced.


The yarn and water are then heated to 40 degrees Celsius.

Glaubers salt is added to the dye bath.

Image credits: Jillayne Hessell



Acetic acid is then added to the dye bath.

Eco-friendly Clariant Optilan® MF dye powder is then weighed out and mixed to create the desired colour.


The dye colour is added to the dye bath.

Consistent agitation of the dye bath liquid is used as a technique to make sure the colour was applied evenly to the yarn, thus allowing for the elimination of the chemical Lyogen.



The dye bath is then gradually heated up while continuing to agitate the liquid.

Once the dye bath reached 96 degrees Celsius this temperature is held for between 30 and 45 minutes, with lighter colours taking a shorter period of time.


A successful process results in clear water, with the dye having been fully taken up by the yarn.

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