Move to modern construction

Imagine an Aotearoa New Zealand where the building consent process is streamlined, houses are built in half the time, quality is higher and vastly less waste is produced. That's the world of modern manufacturing and construction, and the first parts of it are being delivered right now.

BY DAVID HINDLEY, FREELANCE TECHNICAL WRITER

THE CONSTRUCTION INDUSTRY is being transformed from the moment a log arrives in a sawmill to the point where keys for a new house are handed over to the homeowners. Consider some examples:

- Woodspan, part of Taranakipine, has a computer-controlled machine that can process a parallel laminated timber floor panel from start to finish in 6 minutes.
- Concision, part of the Spanbuild Group, builds prefabricated bathrooms, from basic to luxury models and including tiles, flooring and fittings, that can be fully installed in apartments or retirement village units in just 1 day.
- Fletcher Building's $15 million, 8,500 m^2 off-site construction facility at Wiri produces closed wall panels and midfloor and roof cassettes that are assembled on site by their specialist teams. Total build time depending on typology can be reduced by 50–60%.

Big investments in new processes and machines

Big investments are being made in state-of-the-art processes and machines. Red Stag invested $50 million in its new CLT (cross-laminated timber) plant in Rotorua. State-of-the-art technology is being imported from Switzerland (in Hector Egger NZ's new facility in Cromwell), Denmark (the Optimizer crosscut saw in Prolam's Nelson plant) and Germany (in Concision's plant in Rolleston and in the Fletcher plant).

Off-site construction is thriving

If you design or build houses, you're probably already involved in the off-site construction world, even if you don't realise it. Over 90% of new house builds today use wall framing panels and roof trusses produced by frame and truss (F&T) manufacturers, and the F&T industry is part of the off-site construction sector.

'The off-site industry is extremely broad, from F&T and tilt slab companies through to modular bathrooms and complete buildings,' says Prefab NZ CEO Scott Fisher. 'We are seeing more and more the off-site industry meeting the on-site industry in a hybrid model.

'Houses don't have to be either/or, they can include both.' The same techniques are being used for medium-density housing, apartments and retirement villages as well as stand-alone houses.

There is plenty of activity in the off-site area from big players, including Kāinga Ora, which has an off-site construction strategy and makes significant use of prefabricated panels, and Fletcher Building through its Wiri plant - Clever Core.

More existing companies in the F&T sector are considering expanding what they already do into new areas of off-site construction.

Big benefits

Speed, precision, quality and reduced waste are the biggest benefits of off-site construction. While some in the industry say off-site construction can bring cost savings, in many cases, the cost to the

Off-site manufacturing at Smart Solution Homes' factory.

PHOTO – SMART SOLUTION HOMES

homeowner of a house with large elements built off site seems to be approximately the same as for a house built the traditional way.

Concision's off-site manufacturing in partnership with Versatile completed a new four-bedroom/two-bathroom house in 10 weeks from start to finish. Concision made the 43 panels for the house in its Rolleston factory in 2 days. They were installed in a single day.

As PrefabNZ's Scott Fisher points out, time is money, capital can be turned over faster 'and you can monetise the benefits'.

There is also scope here for the industry to improve its dismal track record around productivity growth. Over the years 2008-2020, annual labour productivity growth in the construction industry was less than 1%.

The fact that off-site work takes place in a clean, controlled environment rather than in all weathers on a building site means that precision and quality can be higher. That is regardless of the level of technology involved. A significant part of the off-site industry is relatively low tech - using nail guns, hammers and similar tools - but conducted indoors.

The vastly reduced production of waste from off-site construction compared to typical on-site construction is something that has suddenly grown in importance with the push to build net-zero carbon houses to help meet New Zealand's greenhouse gas emissions targets.

Many surveys have found that construction and demolition waste make up 40-50% of all waste going to landfill, the largest part of that being timber. Each home constructed the traditional way generates on average 4 tonnes of waste. Off-site construction, with its careful control and precision, reduces that enormously, by three-quarters or more in some cases. The result is houses with a much smaller carbon footprint.

Cutting the red tape

Building consent issues have caused friction and acted as a brake on new approaches to building and off-site construction, but this year has seen a big step forward. Streamlining building consents for off-site manufacturing is part of the Building (Building Products and Methods, Modular Components, and Other Matters) Amendment Act 2021.

This new part of the Building Act creates a voluntary certification scheme for manufacturers who can produce building components and modules that are consistently Building Code-compliant. A manufacturer's certificate for a modular component will be considered proof of compliance in a building consent application.

Building consent authorities therefore don't have to put the time into this part of the construction process but can instead focus solely on the sitework such as foundations, electrical, plumbing, wastewater and stormwater connections. For off-site manufacture, this could halve the number of building inspections and remove the possibility of two separate consents being required.

Regulations are now being drawn up to put the scheme into practice. Industry players such as PrefabNZ are involved in the process, which could take 18 months. 'In 10 years' time, we will look back and say this was a watershed moment,' Scott Fisher says.

PHOTO – CONCISION

Challenges remain

While modern manufacturing and construction initiatives are growing at speed in New Zealand and already delivering significant benefits, they still face some challenges:

- Many parts of the construction industry are conservative and slow to accept change.
- House construction suffers from boom and bust cycles that complicate the adoption of new work methods.
- Companies investing millions or tens of millions of dollars in high-tech equipment need a robust pipeline of work to survive. Even in the current housebuilding boom, with all the demonstrated benefits of their services and products, some companies are working well below capacity and don't have long pipelines of work.
- High tech can require scale. Where volumes are low, it can be more cost-effective to do some processes manually. Some industry participants have suggested that parts of the automation process don't break even below 500 houses per year.
- Frictions and disconnects within the industry and between the industry and government remain. There is a lot of scope for government to remove frictions, support innovation and develop a roadmap as the UK Government has with the Construction Innovation Hub.

Lifting skill levels

Where an industry is being transformed, workers need new skills. Sawmills, for example, are moving from where people push sticks of timber through the saws to installing imported computer-controlled systems where nobody physically touches the timber any more.

There are some gaps in industry training, but they are gradually being filled. Competenz has developed an NZQA-approved course *Digital skills for manufacturing* (micro-credential). It involves some classroom work and some on-the-job training. A pilot that took 3 hours per week for 9 weeks proved very successful, but the course allows flexibility around timing.

'The focus is digital literacy,' Competenz Sector Manager Jahn Vannisselroy says. 'Where there are highly valued workers that a business doesn't want to lose, this helps them to develop new skills.' The micro-credential is ideal for modern manufacturing and construction.

'This whole area - Industry 4.0 - is not about the rise of the machines or putting people out of work. We don't have enough people to start off with! We just need to lift the skills base of the people we have.'