



MIND OVER METAL

A new Australian metal forming innovation could be the next big thing out of Geelong, as the city reshapes its industrial profile.
By Brent Balinski.

The list of influential Australian inventions is long. Some of these, such as the Hills Hoist, dual-flush toilets and the Esky, are wonders of both domestic usefulness and deceptive simplicity. If its founders have their way, the FormFlow Bend and the bending process behind it will help expand that list.

The company is commercialising a process in collaboration with Deakin University that allows corrugated steel to be cold bent at a sharp angle, creating a distinctive look, sealing out air, water, animals and embers, and doing away with the need for roof capping and flashing.

"It eliminates all of those issues," Dr Matt Dingle, a co-founder of the Geelong-based startup, tells create. "You'll see the peaks on one side of the bend turn into troughs on the other side and vice versa; that's the tricky bit. It's the key to making this actually work, and we've protected that look, because you can't really do what we're doing unless it looks like that."

The process used was conceived by a retired academic and mentor (he elects to remain nameless) to Dingle and co-founder Dr Matthias Weiss. It is being moved towards the building and architectural market. A proof of concept in mid-2016 was soon followed by the business's registration and an official launch in early-2018.

In an era when startups are sexy and fintech ventures get much of the local attention, FormFlow is among a cluster of exciting manufacturing startups leading the way in Geelong.

"It's a new process, and that's the interesting bit about it," explains Weiss, a sheet metal forming specialist and Senior Research Fellow at Deakin's Institute for Frontier Materials.

"Nobody has published anything on this. People before us potentially had the idea of doing it this way but nobody really showed that it's feasible."

Capturing a small part of Australia's market for metal roof and gutter manufacturing, valued by IBISWorld at \$1 billion, is the target for the company before it sets its sights overseas.

Developing an idea

The concept FormFlow involves developable surfaces, which will be familiar to boatbuilders and others forming structures out of various types of sheet material.

It deals with the wrapping or unwrapping of a family of shapes, based around cones and cylinders, and is represented by the geometric principle of 'zero Gaussian curvature'. This minimises the amount of stretching and straining of a material being formed.

"A developable surface can be formed by bending or rolling a planar surface without stretching or tearing; in other words, it can be developed or unrolled isometrically onto a plane," is how authors put it in the MIT online guide *Shape Interrogation for Computer Aided Design and Manufacturing*.

"We've managed to come up with a process which ensures that you're only bending the

material in one direction at any one time, and so we can produce these complicated shapes."

According to FormFlow, accelerated corrosion tests have shown no degradation to the structure of its bent steel.

Currently they are only able to create 90-degree bends for production, but other angles have been achieved using prototype tooling. Expanding on this is one of many technical challenges to tackle.

Variability, for example in differently-profiled corrugated metal from different suppliers, is also a challenge for scaling up the process. When we speak to Dingle, FormFlow has just produced some of its first jobs. In the future, the plan is to establish partnerships with bigger companies, who will use

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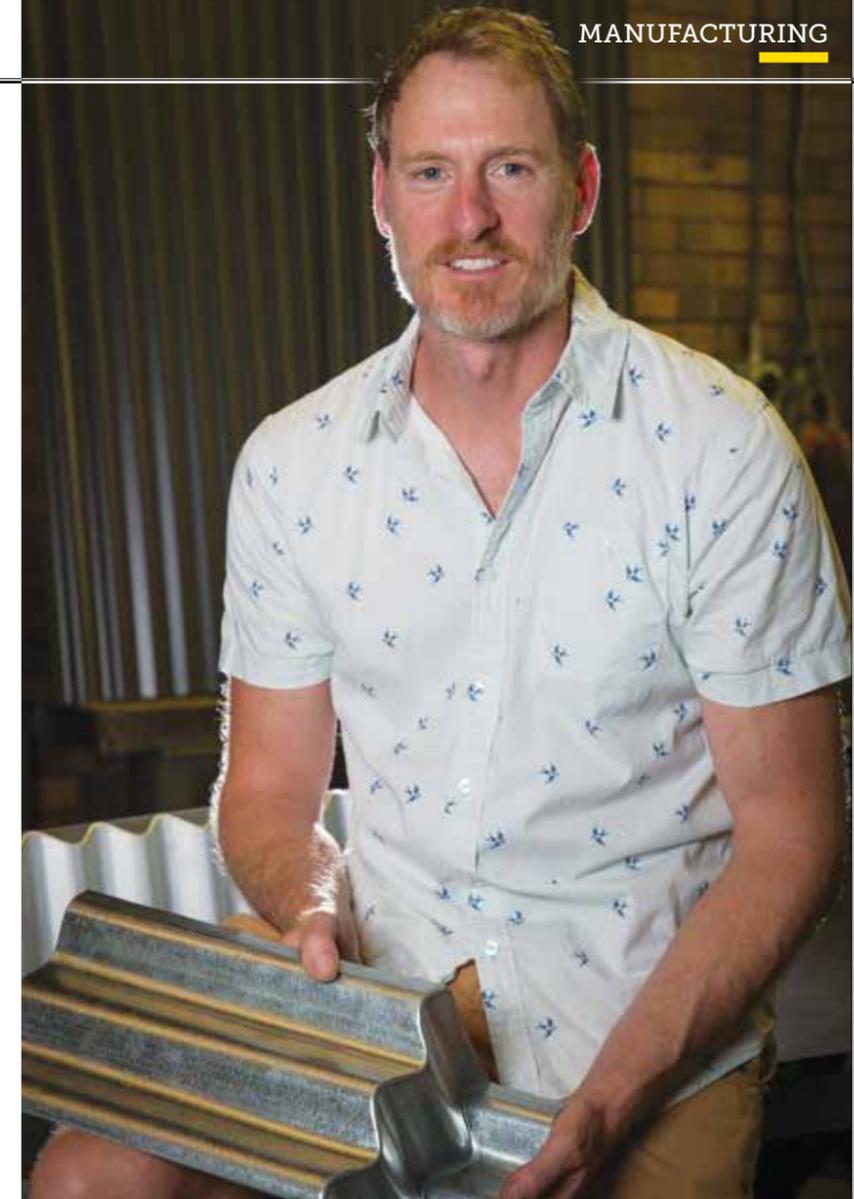
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FormFlow's technology under license, which will help certain supply chain issues.

Designing a manufacturing process will require tooling that is effective as well as easy to change over for different products. Another major challenge is the newness of what the company is trying to do. With any new process there are always 'unknown unknowns'. And then there's an absence of resources to draw on when there are issues.

"You can't go and buy plans for one of these machines off anybody and just build one because the one we've got here is the only one of its kind in the world," says Dingle.

As an academic, as well as a part of the company, Weiss is excited to be in unknown territory. There is a lot of fundamental and applied research ahead, and in a field he is helping pioneer.

"There can be fracture issues, or issues due to elastic recovery, and all of that has been really detailed and investigated for potential stamping processes," he adds. "But for this particular process, nobody knows... Research next year will focus on numerical modelling, with a computer, investigating the forming of materials and understanding how the material performs, depending on specific process parameters."

Engineer as entrepreneur

Dingle has had an unusual career path. A passionate rower and former national



Photo: Buddhika Abeyratna



"As time goes on you realise it's a lengthy process and it's not just about coming up with a good idea."

representative in the sport, he started his first company at 19, fixing boats, to "support this habit".

He got to a point as a boatbuilder when he saw that further study would be necessary and returned to school in his late-20s and with children. He then went straight from his engineering degree to a PhD with Ford Motor company, solving a challenging stamping tooling problem. After Ford he started Applied Research and Development (ARD), spent three years as a Deakin academic, and then became involved in entrepreneurialism programs. ☒

Dr Matt Dingle, a co-founder of the Geelong-based startup Left: Flexible 3D rollform centre.



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CARVING A NEW NICHE

Boutique engineering house Austeng exemplifies its city's industrial shift in recent years from old and volume-oriented to new, niche and high-value-added.

When we speak to Managing Director and co-owner Ross George, he is juggling six current and four upcoming projects. In recent years his company has partnered with companies on everything from tyre recycling to biotech. If there's a sophisticated manufacturing start-up in Geelong, chances are Austeng is involved.

Until only a few years ago, automotive provided over half their revenue, with Ford the major client. This was an unsustainable position.

"The turning point was Lyn, my business partner and wife, saying we've really got to do this differently, we really need to rethink," George tells *create*.

Following an award-winning project with Cytomatrix in 2014, Austeng now sees themselves as tech enablers. This collaborative approach, involving equity and/or manufacturing rights in long-term partnerships with startups, has been part of their reinvention.

As with FormFlow (Austeng provides equipment design and

manufacture), projects can involve something completely novel.

Doing this well largely comes down to attitude, believes George. "You can't Google it, you can't look up the textbook, you can't go and talk to someone, because no-one knows, because it hasn't been done," he says. "You can have two people with exactly the same training, but you've got one person who says, 'I reckon I can have a crack at this,' and we can do this and work through it with a good attitude. And other people will say 'this is way too hard'."

George also believes a positive attitude is the best way to look at Geelong's industrial environment.

"I gave a presentation recently to a Rotary Club and they didn't have any manufacturers in it at all. And I sort of reeled off the things we were doing: graphene, hemp decortication, FormFlow, carbon fibre-reinforced geopolymer and so on and so on, and there's a real future for manufacturing," he says.

"Manufacturing is an exciting place to work, an exciting place for potential employment, and we've just got to really put the message in there that manufacturing is just a really good place to invest in, to work in, and to be trained."

Photo: Austeng



He was a co-founder of highly-successful one-piece carbon fibre composite wheelmaker, Carbon Revolution, which began in ARD. The company is a current supplier of ultra-premium wheels for the Ford Shelby GT350R Mustang and Ford GT.

Dingle is currently able to combine his relationship with Deakin, his expertise in metalforming, and his experience as an entrepreneur, at a time when Geelong is a cluster of several highly promising manufacturing startups.

Based on his career, what advice would he give a person in Geelong or elsewhere with a promising idea they're hoping to commercialise?

An answer could fill each of these and many other pages, but he boils it down to two points. One is to be pigheaded. Superhuman levels of patience and a preparedness to spend a significant amount of time with little or no income might be necessary.



From top: Ross George MD and co-owner of Austeng; Co-founder Dr Matthias Weiss of the Geelong-based startup.



"Our experience with Carbon Rev, let's say the first two years, was, 'This is not so bad. I don't know why more people don't do this,'" he recalls.

"Then another year down the track we were thinking, 'You know, I'm starting to understand now. It's pretty hard and we've had two or three knockbacks this year.' As time goes on you realise it's a lengthy process and it's not just about coming up with a good idea."

Second is to accept your limitations, to find collaborators who complement your talents, and to be willing to share your company. There have been bright people fail because they tried to do everything themselves.

"There's a real opportunity in collaboration," Dingle says.

"You're much better off owning 50 or 60 per cent of something that's really valuable than 100 per cent of something you've never been able to make work." ●