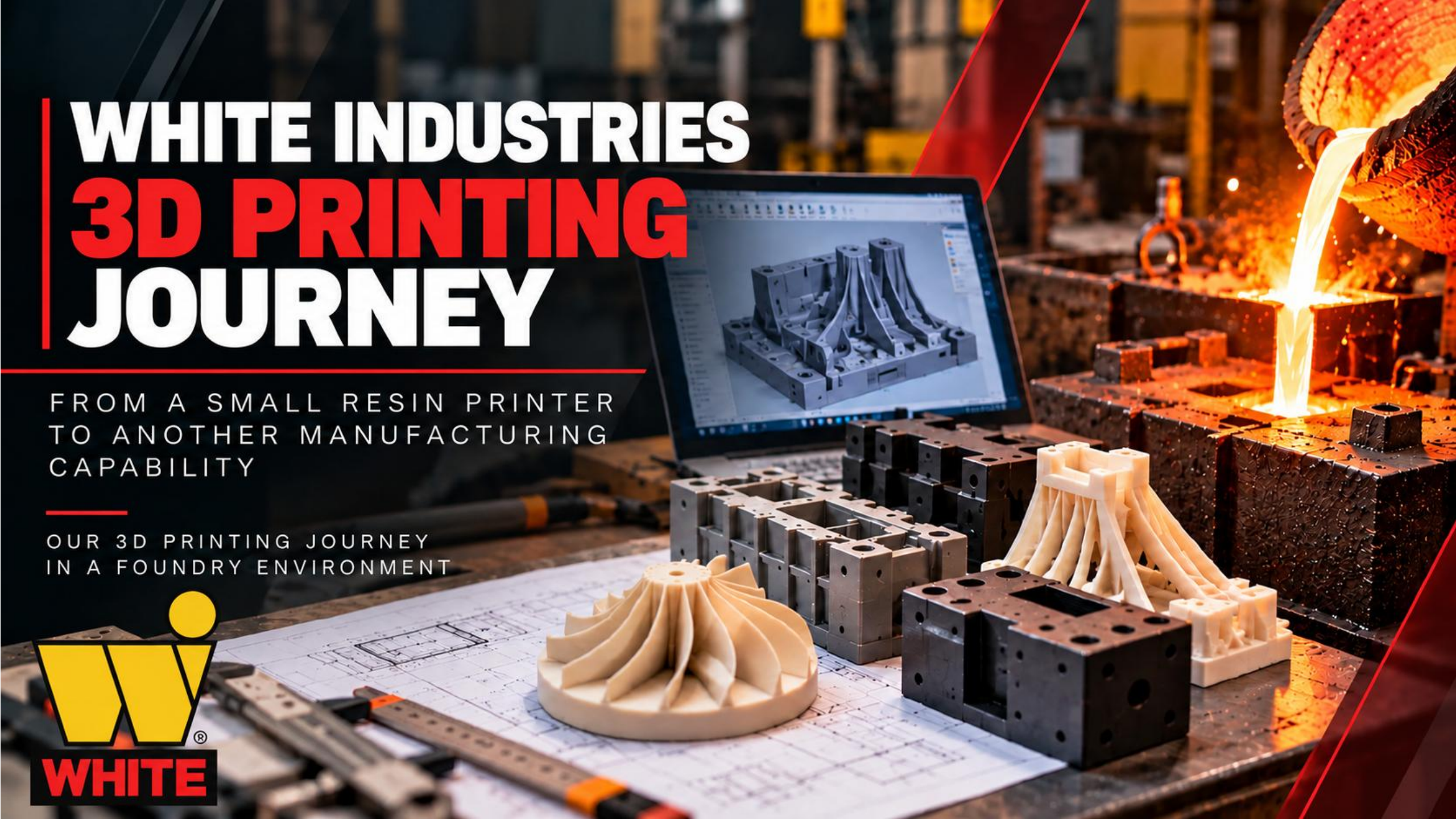


# WHITE INDUSTRIES 3D PRINTING JOURNEY

FROM A SMALL RESIN PRINTER  
TO ANOTHER MANUFACTURING  
CAPABILITY

OUR 3D PRINTING JOURNEY  
IN A FOUNDRY ENVIRONMENT



# WHITE INDUSTRIES

AUSTRALIAN FOUNDRY MANUFACTURING SINCE 1960

From a small regional jobbing shop to a leading Australian foundry and engineering business.



**1960**

Established  
in 1960



**2**

Queensland Foundries  
Dalby + Ipswich



KG

**1 kg → 20 t**

Casting capability  
From small, one-off components  
to large industrial castings



**65+ YEARS**

Australian manufacturing  
100% Australian  
family owned

Dalby  
Foundry

Ipswich  
Foundry

## DALBY FOUNDRY

Est. 1960



## IPSWICH FOUNDRY

Est. 2021



MINING



DEFENCE



RAIL & TRANSPORT



PUMPING



AGRICULTURE



AND OTHER  
AUSTRALIAN INDUSTRIES

**FROM TRADITIONAL PATTERNMAKING TO DIGITAL MANUFACTURING  
WE CONTINUE TO INVEST IN HOW CASTINGS ARE MADE.**



# WHY 3D PRINTING?

A PRACTICAL SOLUTION FOR A MODERN FOUNDRY

Foundries face constant pressure to supply complex, high-quality castings with shorter lead times and lower upfront costs. 3D printing gave White Industries a new tool to solve real-world challenges and create opportunities.



## REDUCE LEAD TIME

Get from design to moulding faster, especially for one-offs and replacement parts.



## LOWER UPFRONT COST

Avoid the cost and time of traditional permanent pattern tooling for low volumes.



## CREATE COMPLEXITY

Easily produce complex geometry that would be difficult or time consuming with traditional methods.



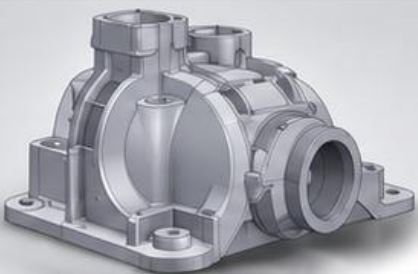
## SUPPORT DEVELOPMENT

Prototype patterns, gating and risers and test ideas before committing to tooling.



## REPLACE OBSOLETE PARTS

Recreate patterns for old or damaged components that no longer have drawings.



## NEW DESIGNS

From concept to casting



## OBSOLETE COMPONENTS

Scan, design and print



## COMPLEX GEOMETRY

Freedom to design and print



## PROTOTYPE & TEST

Verify before production



## LARGER CAPABILITY

From small parts to large sections

3D PRINTING DOESN'T REPLACE OUR FOUNDRY... IT GIVES US MORE WAYS TO MAKE CASTINGS.



# OUR FIRST PRINTERS

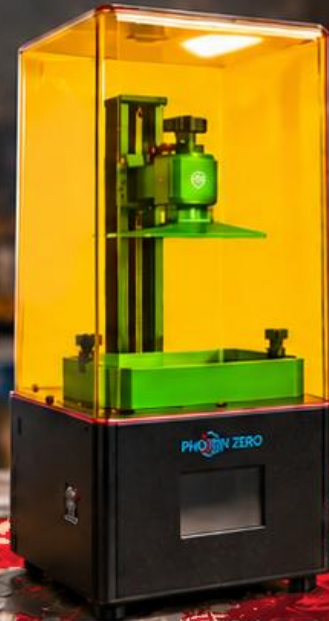
STARTING SMALL, PROVING THE POTENTIAL

We started with two small resin printers to experiment and see if 3D printing could be a practical tool for a foundry environment. The goal was to produce small patterns, core boxes and tooling to solve day-to-day problems and test the technology in real foundry applications.



## Elegoo Mars

Build Size (X × Y × Z)  
120 × 68 × 155 mm



## Photon Zero

Build Size (X × Y × Z)  
97 × 54 × 150 mm

## EARLY RESULTS

THE TECHNOLOGY HAD TO PROVE ITSELF.

To justify the investment, we tracked real jobs that were completed using the printers. The results showed significant time savings and cost savings compared to traditional patternmaking.



282.5  
Hours

Estimated traditional  
manufacturing time  
(by hand)



48.5  
Hours

Total print time  
(including modelling  
and printer touch time)



234  
Hours saved  
≈ 83%  
reduction



\$42,120  
Estimated  
cost savings  
(across 22 jobs)

## APPLICATIONS INCLUDED



PATTERNS



CORE BOXES



CORE PRINTS



TAGS



TOOLING

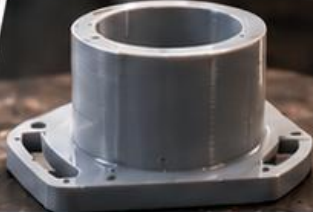


The early results gave us the confidence  
to keep investing.

\* Based on White Industries internal comparison of estimated traditional manufacturing time against modelling and printer touch time.



PATTERNS



CORE BOXES



CORE PRINTS



TOOLING



TAGS



JIGS & FIXTURES



ONE-OFF COMPONENTS



# WHAT WE STARTED MAKING

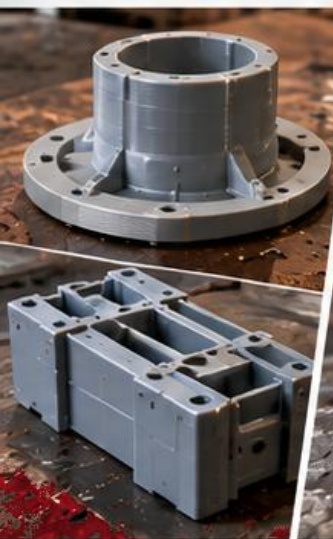
SMALL PRINTS • BIG IMPACT

Our early printers had limited build volume, so we focused on smaller, practical applications that could be used directly in the foundry. These early successes quickly showed us the range of possibilities and helped build confidence in the technology.



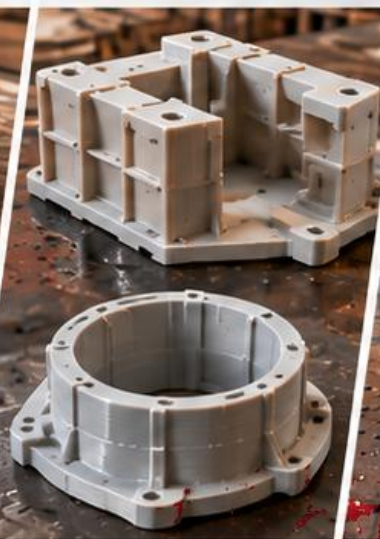
## PATTERNS

Small to medium patterns for one-off and short-run castings.



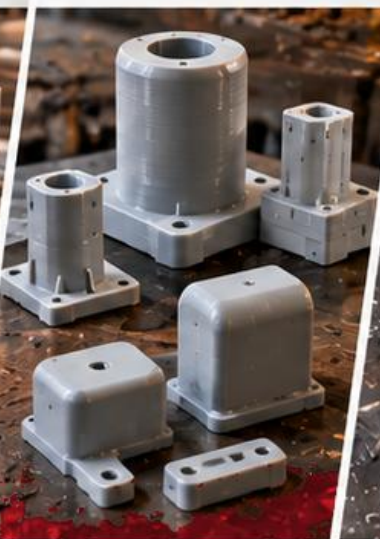
## CORE BOXES

Functional core boxes and inserts to produce accurate cores.



## CORE PRINTS

Core prints, chaplets and core supports.



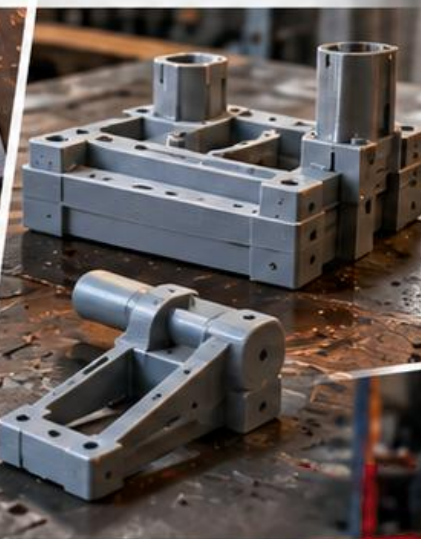
## TAGS

Part number tags, logos and identification components.



## TOOLING

Jigs, fixtures and custom tooling to assist in production.



## EARLY FOCUS

SOLVING REAL FOUNDRY NEEDS



### Real applications

Not just test pieces – parts that were used in the foundry.



### Built confidence

Proved the technology could deliver practical results.



### Expanded quickly

As we gained experience, the variety and size of parts grew.



### Identified new opportunities

Showed us what else might be possible with 3D printing.

## STARTING SMALL GAVE US BIG OPPORTUNITIES.

What began as small, simple prints quickly expanded into a wide range of useful foundry tooling.



# THE LEARNING CURVE

LESSONS LEARNT. PROBLEMS SOLVED. CONTINUOUS IMPROVEMENT.

Getting useful, reliable parts from 3D printers in a foundry environment wasn't just about pressing print. Each application brought new challenges, and through trial, error and iteration, we developed practical solutions and processes to achieve consistent, reliable results.



## RESIN PRINTING

HIGH DETAIL | ACCURACY | SMOOTH FINISH



### DIMENSIONAL ACCURACY

Managing shrinkage and establishing allowances to achieve consistent size.



### ORIENTATION & SUPPORTS

Finding the right orientation, support strategies and drain holes to minimise distortion.



RAW PRINT



POST PROCESSED



### SURFACE FINISH

Refining print settings, orientations and post-processing to achieve the required finish.



### MATERIAL SELECTION

Trialled different resins to match application requirements for strength, heat resistance and durability.



### PRINT FAILURES

Experienced failures with supports, layer separation and suction forces. Used these to improve settings and design approach.



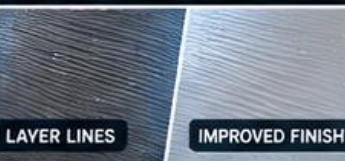
## FDM PRINTING

LARGE PARTS | TOUGH | FUNCTIONAL TOOLING



### LARGER PARTS

Enabled larger build sizes for jigs, fixtures, tooling and patterns.



LAYER LINES

IMPROVED FINISH



### STRENGTH & DURABILITY

Optimised settings, infill and materials for tough, functional parts.



### SPLITTING & JOINING

Developed methods for splitting, locating and joining larger components accurately.



### MATERIAL CHOICE

Used different filaments (e.g. PLA, PETG, ABS, Nylon, Carbon Fibre) to suit the application and environment.



### REAL FOUNDRY CONDITIONS

Tested parts in actual moulding and coremaking environments to ensure they were practical, durable and repeatable.

## KEY TAKEAWAYS

FROM THE LEARNING CURVE



### IT TAKES TRIAL AND ERROR

Early failures were part of the process and helped us learn what works.



### DESIGN MATTERS

Designing for 3D printing is different to traditional manufacturing.



### MATERIAL CHOICE IS CRITICAL

Resin and FDM materials have different properties and suit different applications.



### ACCURACY NEEDS TESTING

Allowances and real-world testing are essential.



### REAL ENVIRONMENT FEEDBACK

Parts need to work in the foundry, not just look good on the screen.



### CONTINUOUS IMPROVEMENT

Each job taught us something new and expanded what we could achieve.



## CHALLENGES TURNED INTO CAPABILITY.

The learning curve helped us build the knowledge, processes and confidence to take on more complex and larger applications using both resin and FDM printing.



# GROWING THE CAPABILITY

FROM SMALL RESIN PRINTERS TO A DIVERSE FLEET

As our knowledge and applications grew, we invested in a range of resin and FDM printers to suit different requirements. This gave us the flexibility to produce everything from high-detail components to large-scale patterns, core boxes and tooling.

|                                                                                                                           | 1. STARTING OUT<br>2022                                                                                                                           | 2. UPGRADED RESIN<br>2023                                                                                                                                  | 3. LARGER RESIN<br>2024                                                                                                                                       | 4. INTRODUCING FDM<br>2024                                                                                                                                             | 5. EXPANDED FDM<br>2025                                                                                                                                                               | 6. CURRENT FLEET<br>2026                                                                                                                                                              |
|---------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <br>RESIN<br>PRINTERS                     | <br>Phrozen<br>(resin)                                           | <br>Elegoo Mars / Saturn Series<br>(resin)                                | <br>Phrozen<br>(resin)                                                      | <br>Bambu Lab X1C<br>(FDM)                                                          | <br>Bambu Lab H2D<br>(FDM)                                                                         | <br>Phrozen (resin)<br>& Bambu Lab H2S<br>(FDM)                                                    |
| <br>TYPICAL<br>BUILD VOLUME<br>(W X D X H) |  120 × 68 × 155 mm                                               |  218 × 123 × 250 mm                                                       |  218 × 123 × 260 mm                                                          |  256 × 256 × 266 mm                                                                 |  350 × 320 × 325 mm                                                                                |  Up to 350 × 320 × 325 mm<br>(and multiple machines)                                               |
| KEY<br>CAPABILITIES                                                                                                       | <ul style="list-style-type: none"><li>Initial testing</li><li>Small detailed parts</li><li>Tags and inserts</li><li>Proving the concept</li></ul> | <ul style="list-style-type: none"><li>Improved reliability</li><li>Better accuracy</li><li>Higher quality finish</li><li>More consistent results</li></ul> | <ul style="list-style-type: none"><li>Larger resin prints</li><li>More complex geometry</li><li>Functional tooling</li><li>Greater material options</li></ul> | <ul style="list-style-type: none"><li>Larger parts</li><li>Tough, functional prototypes</li><li>Jigs, fixtures and tooling</li><li>Cost-effective production</li></ul> | <ul style="list-style-type: none"><li>Significantly larger builds</li><li>Multi-part tooling</li><li>Improved materials</li><li>Production of large patterns and core boxes</li></ul> | <ul style="list-style-type: none"><li>Diverse capability</li><li>Resin and FDM for the right job</li><li>High-detail to large-scale</li><li>Reliable, repeatable production</li></ul> |



## WHAT THIS GAVE US

MORE OPTIONS. MORE OPPORTUNITIES.



### WIDER RANGE OF APPLICATIONS

From small detailed parts to large-scale patterns, core boxes and tooling.



### MORE THAN ONE SOLUTION

We can choose resin or FDM depending on the size, detail, material properties and foundry requirements.



### INCREASED CAPACITY

Multiple machines allow flexibility, faster turnaround and better support for foundry operations.



### CONTINUED GROWTH

Our capability continues to evolve as new machines, materials and applications become available.



## BIGGER MACHINES. MORE POSSIBILITIES.

Expanding our 3D printing capability has given us the flexibility to produce a wider range of patterns, core boxes, core prints, tooling and one-off components for the foundry.



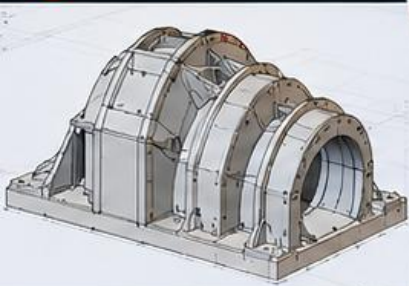
# PRINTING BEYOND THE BUILD PLATE

BIGGER PATTERNS. COMPLEX GEOMETRY. REAL FOUNDRY SOLUTIONS.

We aren't limited by the build volume of our printers. By splitting designs into sections, we can produce patterns, core boxes and tooling that are significantly larger than any single print.



## 1 DESIGN & SPLIT



Model the full component and split into sections to suit build volume and printing orientation.

## 2 PRINT SECTIONS



Print the individual sections using resin or FDM, optimised for strength, accuracy and surface finish.

## 3 POST PROCESS



Remove supports, clean, finish and prepare the joining surfaces.

## 4 JOIN & REINFORCE



Accurately join sections using locating features, adhesives, dowels and internal bracing to maintain strength and geometry.

## 5 FINAL PATTERN



Final pattern ready for use in the foundry.

## EXAMPLE PROCESS

LARGE PATTERN PRODUCED IN SECTIONS



1. CAD MODEL



2. PRINTED SECTIONS



3. JOINED AND REINFORCED



4. FINAL PATTERN



## BIGGER IDEAS. REAL SOLUTIONS.

By combining good design, the right materials and proven joining methods, we can produce large, complex and functional patterns and core boxes that work in the foundry.

## KEY BENEFITS



### LARGER THAN BUILD VOLUME

Produce components much larger than any single print.



### COMPLEX GEOMETRY

Create shapes that are difficult or impractical to make traditionally.



### STRONG & DURABLE

Design joining methods and reinforcement for foundry use.



### COST EFFECTIVE

More economical for large, one-off and complex parts.



### PROVEN IN THE FOUNDRY

Printed patterns and core boxes used in real production environments.

## APPLICATIONS



LARGE PATTERNS



CORE BOXES



COMPLEX GEOMETRY



TOOLING & FIXTURES



ONE-OFF COMPONENTS



WHITE

# 3D PRINTING + REVERSE ENGINEERING

FROM EXISTING COMPONENTS TO FOUNDRY-READY TOOLING

When drawings or original tooling aren't available, reverse engineering combined with 3D printing gives us a practical solution. We can capture an existing component, create an accurate digital model, make design improvements if required and produce foundry-ready tooling.

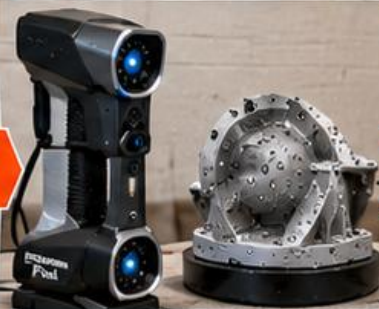


## 1 EXISTING COMPONENT



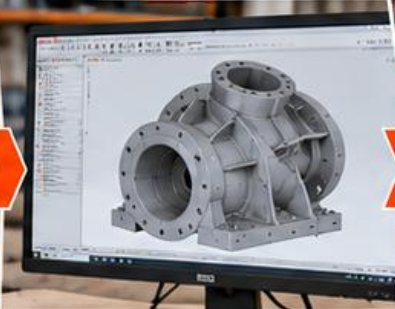
Start with the existing component, even if there are no usable drawings or original tooling available.

## 2 3D SCAN



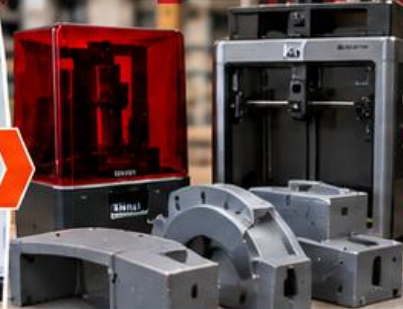
Capture accurate dimensions using our 3D scanner (Peel) to create a detailed digital point cloud.

## 3 CAD MODEL



Convert the scan data into a 3D CAD model (SolidWorks), refine the geometry and make any design improvements for manufacture.

## 4 3D PRINT



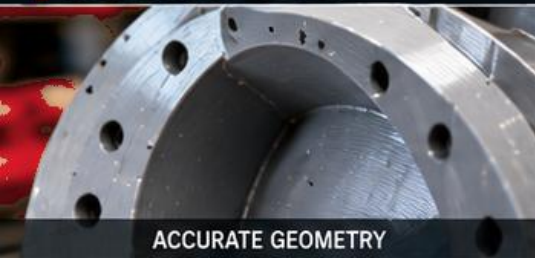
Print the required sections using resin or FDM, depending on the size, detail, strength and application.

## 5 FINISHED TOOLING



Assemble, finish and prepare the pattern or core box, ready for use in the foundry.

## ADDITIONAL VIEWS



ACCURATE GEOMETRY



LOCATING FEATURES



JOINING METHODS



INTERNAL DETAIL



## EXISTING PARTS. NEW POSSIBILITIES.

By combining 3D scanning, CAD and 3D printing, we can turn existing components into accurate, foundry-ready tooling and keep critical equipment in service.

## KEY BENEFITS



### SOLVES LEGACY ISSUES

Recreate components when drawings or tooling are not available.



### HIGH ACCURACY

Captures complex geometry and critical dimensions.



### DESIGN IMPROVEMENTS

Opportunity to improve geometry, add features or address known issues.



### FLEXIBLE MANUFACTURING

Print using resin or FDM based on the application.



### COST EFFECTIVE

More economical than traditional tooling for one-offs and low volumes.



### FOUNDRY READY

Produces patterns and core boxes suitable for real foundry use.

## APPLICATIONS



REPLACEMENT PARTS



LEGACY COMPONENTS



DESIGN IMPROVEMENTS



PATTERNS



CORE BOXES



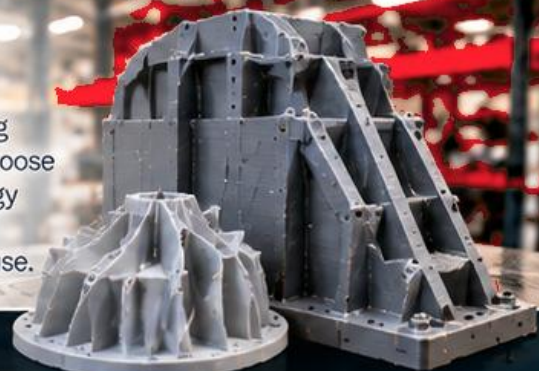
ON LOW TONNAGE



# CHOOSING THE RIGHT PRINTING TECHNOLOGY

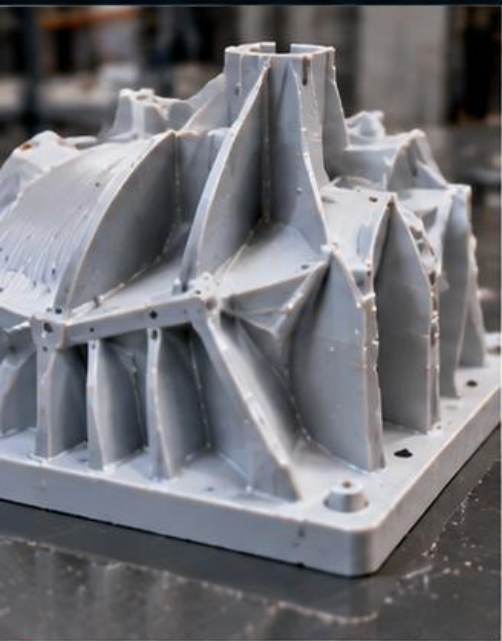
DIFFERENT TOOLS FOR DIFFERENT JOBS

Resin and FDM each have strengths. By understanding their differences, we can choose the most suitable technology based on the application, requirements and foundry use.



## RESIN PRINTING

DETAIL · ACCURACY · SURFACE FINISH



### HIGH DETAIL

Excellent for fine features, complex geometry and lettering.



### SMOOTH SURFACE FINISH

Minimal post-processing required for high-quality surfaces.



### HIGH ACCURACY

Ideal for intricate and dimensionally critical features.



### TYPICAL BUILD SIZE

Best suited to small to medium components.



### MATERIAL COST

Higher material cost.

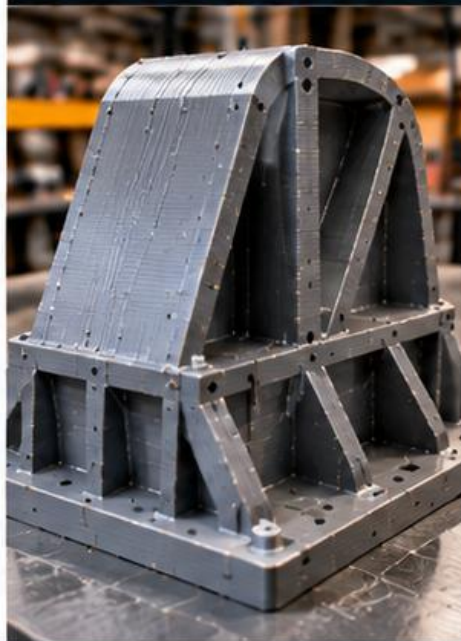


### COMMON FOUNDRY APPLICATIONS

Detailed patterns, small core boxes, letters/identification, complex shapes.

## FDM PRINTING

SIZE · STRENGTH · COST EFFECTIVE



### LARGE BUILD SIZE

Economical for large components and tooling.



### STRONG AND DURABLE

Wide range of materials to suit foundry applications.



### COST EFFECTIVE

Lower material cost for larger parts.



### FASTER PRODUCTION

Generally faster for larger, less detailed components.



### VERSATILE MATERIALS

Multiple material options for strength, heat resistance and application needs.



### COMMON FOUNDRY APPLICATIONS

Large patterns, core boxes, jigs, fixtures and general tooling.

## EXAMPLE APPLICATIONS



DETAIL & LETTERING



COMPLEX GEOMETRY



LARGE PATTERNS



CORE BOXES



TOOLING & FIXTURES



MIXED TECHNOLOGY

## KEY TAKEAWAYS



### USE THE RIGHT TOOL

We choose the process based on size, detail, strength, surface finish, material cost and foundry application.



### IT'S NOT EITHER OR

Resin and FDM aren't competing — they complement each other.



### COMBINATION APPROACH

A single piece of tooling can include both resin and FDM components.



### DRIVEN BY APPLICATION

The requirements of the foundry job determine the most suitable technology.



### BETTER OUTCOMES

Choosing the right process helps deliver accurate, durable and cost-effective tooling.



### MORE FLEXIBILITY

Having both technologies gives us a wider range of solutions for foundry work.

# FROM STUDENT DESIGN TO CAST IRON

A DSHS PROJECT

White Industries designed a jaffle iron for the project, giving DSHS students the opportunity to experience modern and traditional manufacturing techniques while creating their own jaffle irons. Using 3D printing and resin pouring, the design was turned into a physical prototype, created a sand mould and poured the final product in cast iron.

1 DESIGN



White Industries designed the jaffle iron for the project using digital tools.

2 3D PRINT



3D printing was used to produce the pattern for the moulding process.

3 RESIN POUR



Resin pouring was used to create a robust pattern for the moulding process.

4 MOULD

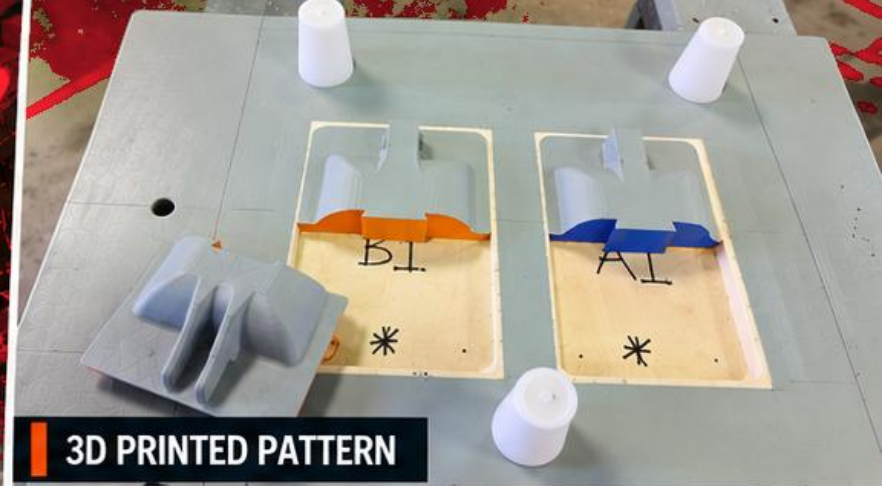


Students took part in preparing the moulds using traditional green-sand moulding.

5 FINISHED PRODUCT



The castings were finished and assembled into working jaffle irons for the students.



## REAL SKILLS. REAL OUTCOMES.

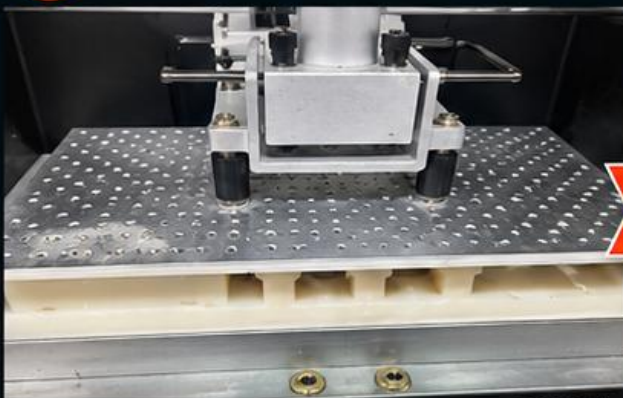
This project connected education, modern technology and traditional foundry manufacturing — giving students a unique, hands-on experience from design to cast iron.

# PRINT THE MOULD. POUR THE METAL.

DIRECT METAL CASTING WITH 3D PRINTING

In collaboration with a resin manufacturer, we trialled direct metal casting using ThermaCAST resin, printing the mould itself and pouring metal directly to produce a functional mining tooth.

## 1 3D PRINT MOULD



The mould was 3D printed using ThermaCAST resin (M/TMC-4141NA-500B), designed for direct metal casting applications.

## 2 CURED MOULD



Printed moulds were cleaned and post-cured as per the manufacturer's recommendations.

## 3 CASTINGS PRODUCED



Molten lead was poured directly into the printed mould. The casting was removed from the mould and we were able to successfully pour several castings from the same 3D printed mould.



**HIGH TEMPERATURE RESIN**  
Designed for direct metal casting moulds. Withstands temperatures up to 550°C under suitable conditions.



**FINE DETAIL**  
Excellent detail reproduction and dimensional accuracy.



**REUSABLE MOULD**  
Successfully produced multiple lead castings from the same 3D printed mould in this trial.



**PRACTICAL APPLICATIONS**  
Suitable for tooling, industrial prototypes, automotive components, mining and more.



**AUSTRALIAN DEVELOPED**  
Developed and manufactured in Australia.



## NEW POSSIBILITIES. SAME FOUNDRY KNOW-HOW.

Direct metal casting with 3D printed moulds removes traditional patternmaking steps for the right application — combining innovative materials with our foundry expertise.

Temperature capability depends on geometry, wall thickness, metal processing conditions.

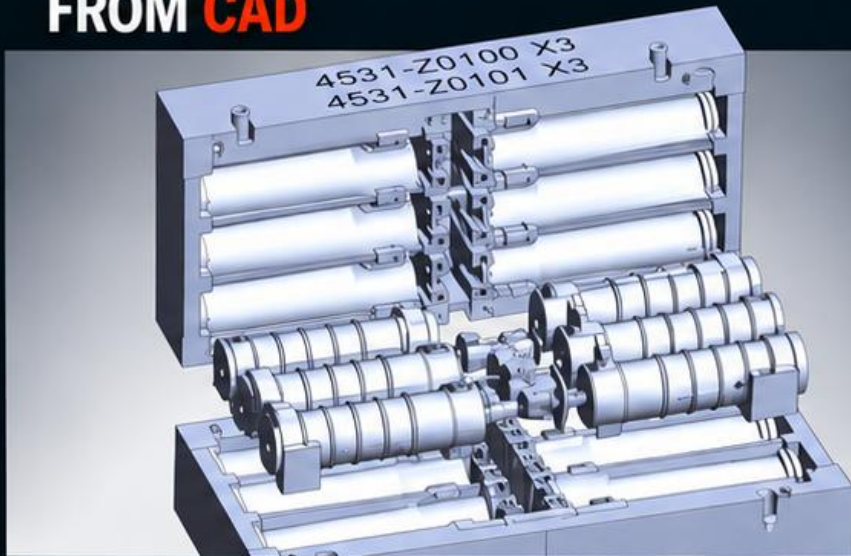


# WHEN THE MOULD BECOMES THE PRINT.

3D SAND PRINTING FOR FOUNDRY APPLICATIONS

We work with Quicksands to produce 3D printed sand moulds and cores, using a voxeljet VX1000, giving us the ability to manufacture complex moulds directly from digital data.

## FROM CAD



Complete mould and core design created in CAD, allowing complex internal features and multi-part tooling to be produced directly from digital data.

## TO 3D PRINTED SAND MOULDS



Moulds and cores 3D printed in sand by Quicksands using a voxeljet VX1000, ready for assembly and casting in our foundry process.



### NO PHYSICAL PATTERN

Moulds and cores produced directly from CAD, reducing traditional patternmaking steps.



### COMPLEX GEOMETRY

Design freedom for intricate internal features, undercuts and multi-part assemblies.



### VOXELJET VX1000

Industrial 3D sand printer with a large build volume (1,000 × 600 × 500 mm).



### INDUSTRY COLLABORATION

Working with Quicksands to access specialist additive manufacturing capability.



### EFFICIENT SOLUTIONS

Ideal for low-to-medium volume, complex and large components.



## REAL FOUNDRY COMPONENTS. A FASTER, MORE FLEXIBLE WAY.

3D sand printing gives us another manufacturing option, complementing our traditional foundry processes and expanding what's possible.



# WHERE TO FROM HERE?

CONTINUING OUR 3D PRINTING JOURNEY

We've come a long way from a small resin printer used to produce simple patterns. 3D printing has now become another valuable manufacturing tool in our foundry, and we see many more opportunities to build on what we've learned.



## OUR FOCUS

Use 3D printing where it adds real value to our foundry, combining new technology with our existing skills and processes.



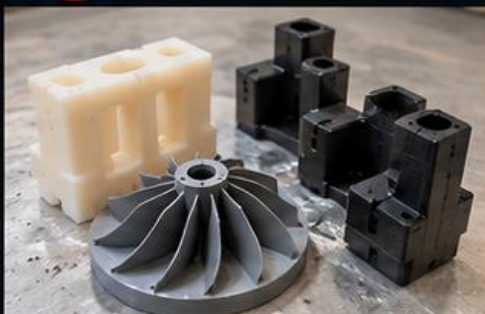
### EXPAND APPLICATIONS



Continue to identify new components and industries where 3D printing can add value, from tooling and prototypes to complex geometries.



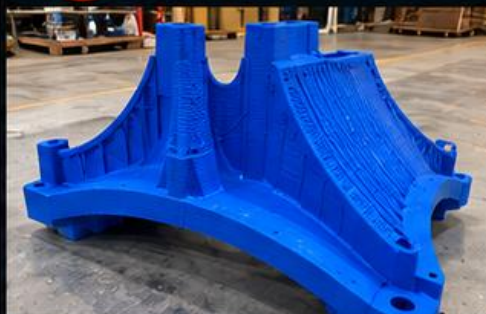
### DEVELOP MATERIALS & PROCESSES



Work with material suppliers to trial and validate new casting resins and printing processes for a wider range of foundry applications.



### LARGER & MORE COMPLEX COMPONENTS



Move into larger prints and more complex tooling, reducing lead times and supporting low-to-medium volume and specialised components.



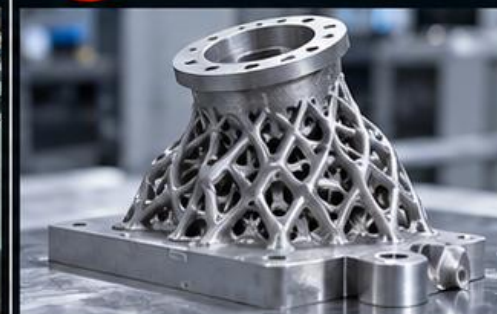
### INDUSTRY COLLABORATION



Continue working with specialist partners, such as Quicksands, for 3D printed sand moulds and cores when industrial capacity is required.



### METAL 3D PRINTING (CURRENTLY RESEARCHING)



Investigating metal additive manufacturing to understand its potential role in our foundry and where it could provide real benefits in the future.



## SAME FOUNDATIONS. BIGGER POSSIBILITIES.

3D printing isn't replacing our traditional foundry skills — it's expanding what we can do, giving us more options to deliver innovative, efficient and cost-effective solutions for the components of tomorrow.



# THANK YOU ANY QUESTIONS?

From a small resin printer to another manufacturing capability.

3D printing has given us new options, expanded what we can do, and created real value in our foundry — and we're still only just getting started.



## PRACTICAL SOLUTIONS

Real applications in our foundry.



## GREATER CAPABILITY

More complex components and faster turnaround.



## INDUSTRY COLLABORATION

Working with specialists to expand what's possible.



## A BRIGHT FUTURE

Continuing to explore new technologies and opportunities.