Where does Rockwood sit in the wider composites industry.
What differentiates us from the rest.
What are the key advantages of Metal Tooling.
The wider composite manufacturing world

There are many different types of composites structure, each combining fibre and resin in different ways, and each has a unique place in the market, and each has a unique processing method. Pre-preg offers the highest level of mechanical performance for the minimum weight. Pre-preg is converted to a structure through heat and pressure. Heat and Pressure can be applied with an Autoclave or by our compression and bladder moulding techniques.
The term “pre-preg” is derived from “pre-impregnated,” indicating that the reinforcing fibres are already impregnated with a resin matrix before they are used in the manufacturing of parts.

Pre-preg materials consist of two main components: reinforcing fibres and a resin matrix.

The fibres typically carbon fibre, glass fibre, or aramid, which provide the appropriate strength and stiffness to the final composite part.

The resin typically thermosetting epoxy provides the matrix holding the fibre in place.

One of the most significant advantages of using pre-preg materials is the precise control over fibre volume fraction and resin content.

This allows manufacturers to optimize the mechanical properties of the composite and achieve consistent results.
The impregnated fibres are then stored at a low temperature, typically -18 Degrees C this is because the resin has an ‘out-life’ which means it will go out of date in a certain timeframe, when stored at -18 the majority of pre-pregs have a 12-month life and within this ‘life’ the pre-preg needs to be moulded and cured into parts, these parts then no longer have an out-life and will last indefinitely.

When handling pre-pregs they are at room temperature, when at this temperature most pre-pregs have a 30 day out-life and must be moulded and cured within this time.

These 30 days can be spread out over the course of 12 months, for example the roll of pre-preg can be defrosted and amount used for 1 day and the rest put back into cold storage for the next parts to be made at a later date within the remainder of its 12-month frozen life span.

If the pre-preg is not used within the 12-month frozen or 30-day room temp timeframe the material will no longer be qualified to be used for manufacture.
Composite Superiority

Optimal Fibre and Resin content gives the best composites

Therefore, the pre-made option of ‘Pre-Preg’ allows for specific and tailored fibre and resin content ratios to suit requirements. Pre-preg forms the basis of nearly all manufacturing at Rockwood.

Pre-Preg is used primarily in the high-tech industries such as Aerospace and Defence

Why Compression and Bladder Moulding Technique can produce parts Autoclave and Vac Bag cannot

Autoclave

Vs

Compression

Labour intensive multi-stage process

Fast one-stage process
Rockwood assists in fibre and resin selection and composite layup to optimise strength and stiffness.

Rockwood also carries out prototyping and development parts, pre-production testing and production optimisation.

At the design stage of all projects, the manufacturing method must be confirmed early, this ensures that ‘Design for Manufacture’ results in Success otherwise failures at the manufacturing stage can occur.
Rockwood’s “Unique Selling point” is composite manufacture with “Metal Tooling”
This presentation illustrates the many, key advantages of metal tooling over traditional “vac bag” or “autoclave” processing.

Fundamentally, composite pre-preg materials only require heat and pressure to form a consolidated composite structure.

The Rockwood moulding process applies heat into mould tool via heated platen presses which are kept closed with hydraulic rams.

Pressure is applied via "compression moulding" or "bladder moulding".

These two process can be used independently for different structures, or they can be used together.
Modular Metal Tooling

Rockwood can design modular tools which provide flexibility to produce non-identical sister parts from the same base mould tool or give the ability to incorporate local design upgrades with different tooling inserts.
Compression and Bladder Moulding

Rockwood Composites specialises in Compression and Bladder moulding which can be utilised individually or combined within the same tool.

In the following slides we will show the alternative techniques, pictures of how they work independently and how a combination of techniques can produce complex one-piece structures.
“Compression moulding”
Produces a solid structure, either solid composite or with a foam core or combination of both:

- Fully tooled, moulded surfaces
- No bag surfaces
- No edge filling required
- Very good surface finish all over
- Fine detail

Typically used on:
- Propellers
- Wings
- Wing tip Electronics
- Structural components
“Bladder moulding”. Produces hollow or single sided parts with only one tooled surface:

Component can have negative draft and undercuts
Large and small parts
Bag can be fully enclosed giving lightweight parts with excellent surfaces
Key Advantages of Metal Tooling

Metal tooling can take advantage of multiple pressure bags, vacuum pulls and compression moulding to achieve complex internal and external features in singular parts.

Thus, reducing part/assembly weight, adding strength and reducing labour time and therefore cost, paramount for the aerospace industry.

We specialise in making components that are “feature rich” - That is to say when it makes economic sense, we incorporate features that would otherwise be contained in other parts.

Combined compression and bladder moulding with sandwich construction in key areas.
Advantages of Metal Tooling—Complex Surfaces

Metal tooling can incorporate complex surface detail, for example tongue and groove edge features for quick and aesthetic bond lines and can accommodate undercut surfaces and fine detail.

Structural attachments:
Tongue and Groove Assembly with 1-ply detail
Key Advantages of Metal Tooling –  
“Net Edge Moulding”

All sides, surfaces and edges are formed and finished during moulding resulting in less machining and ‘A’ surfaces all round

Metal tooling allows machining datum points to be incorporated into the part for flawless repeatable alignment on complex curved parts

Very high-quality parts, straight out of the mould tool

Excellent consolidation giving smooth surfaces and crisp edges
Advantages of Embedded Hardpoints

Sandwich construction accommodates hardpoint areas during moulding giving stronger mounting points.
No hardpoint potting post moulding required.
Lighter weight.

Embedded rolled hardpoints

Embedded ply-stacked hardpoints

Moulded Machining Datum positioning

Advanced mounting points
The way forward - Engineering

Rockwood looks carefully at the proposed design and can offer ‘Design For manufacture’ engineering assistance to ensure parts are designed in a way that coincides with the manufacturing method.

This results in the lowest possible manufacturing cost and complexity.

In parallel with detailed component design comes mould tool design. This ensures that tooling design is not left to the last minute and provides feedback into the component design.
Further Advantages of Rockwood Composites

- Proven track record in delivering exceptional production products into the aerospace industry
- SME business means fast to react and implement design changes
- No autoclave heating times, press moulding allows for one-off parts to be cured quickly for rapid development
- Excellent surface quality is achieved straight out of the tool, no lacquer required
- Short lead times from design agreement to first parts
- Metal tooling means fast turnaround, in large and small batches and long-life tools
- Leaders in Quality Control