COMPOSITE INTEGRATION
INNOVATION IN COMPOSITES TECHNOLOGY

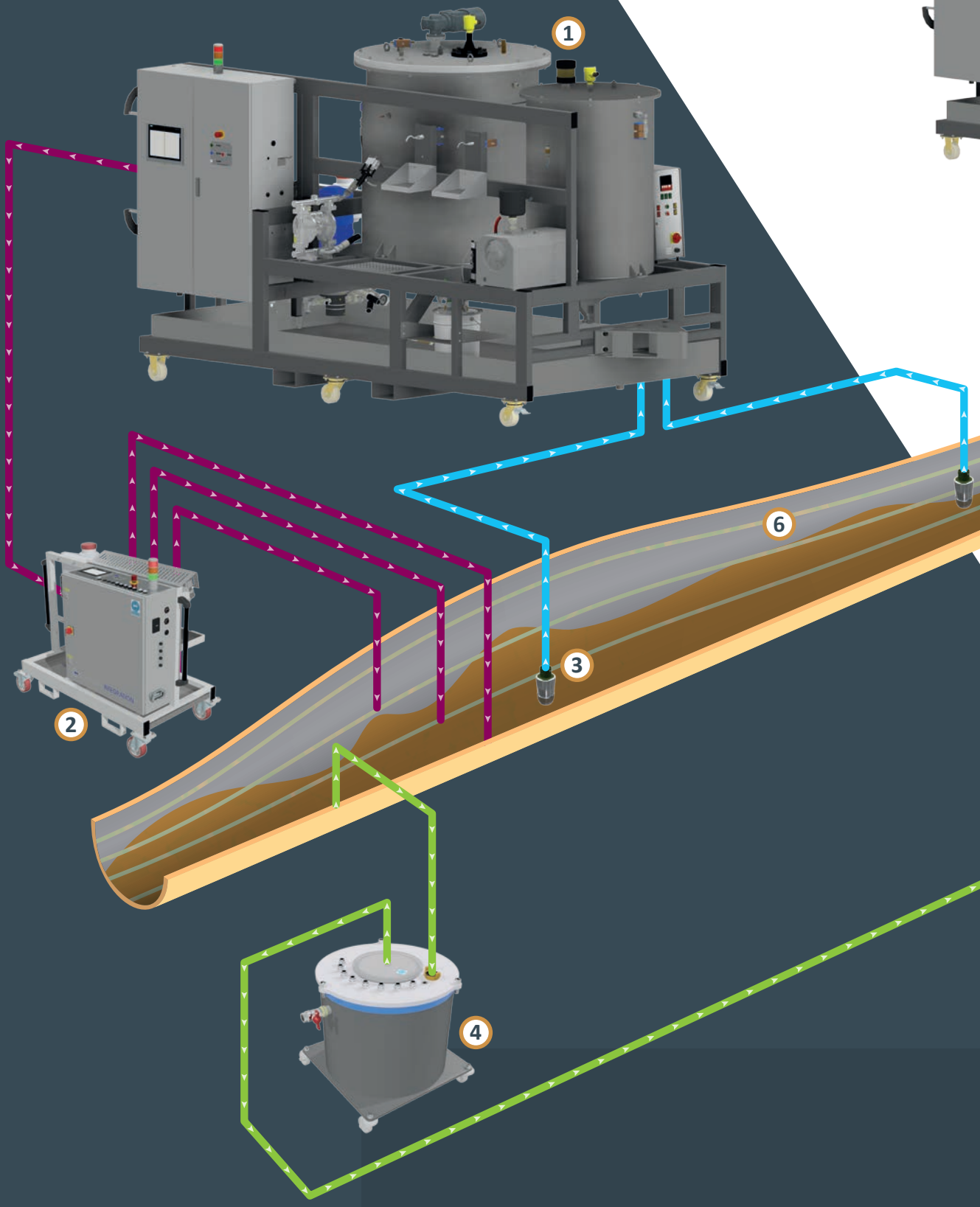
CIJECT

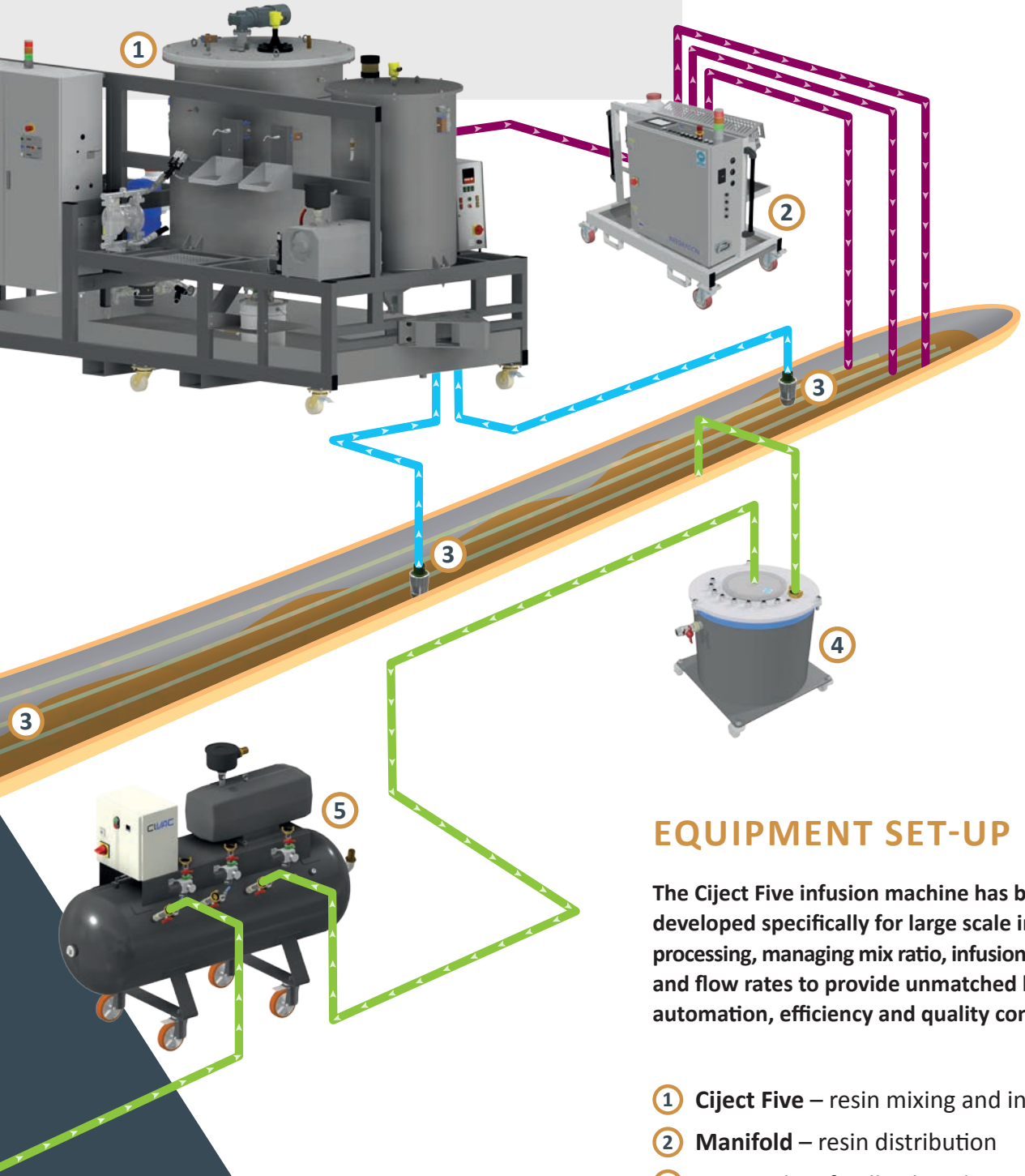
EQUIPMENT & PROCESS

WIND

Typical Direct Infusion Strategy for Large Structures

EFFICIENT BLADE PRODUCTION



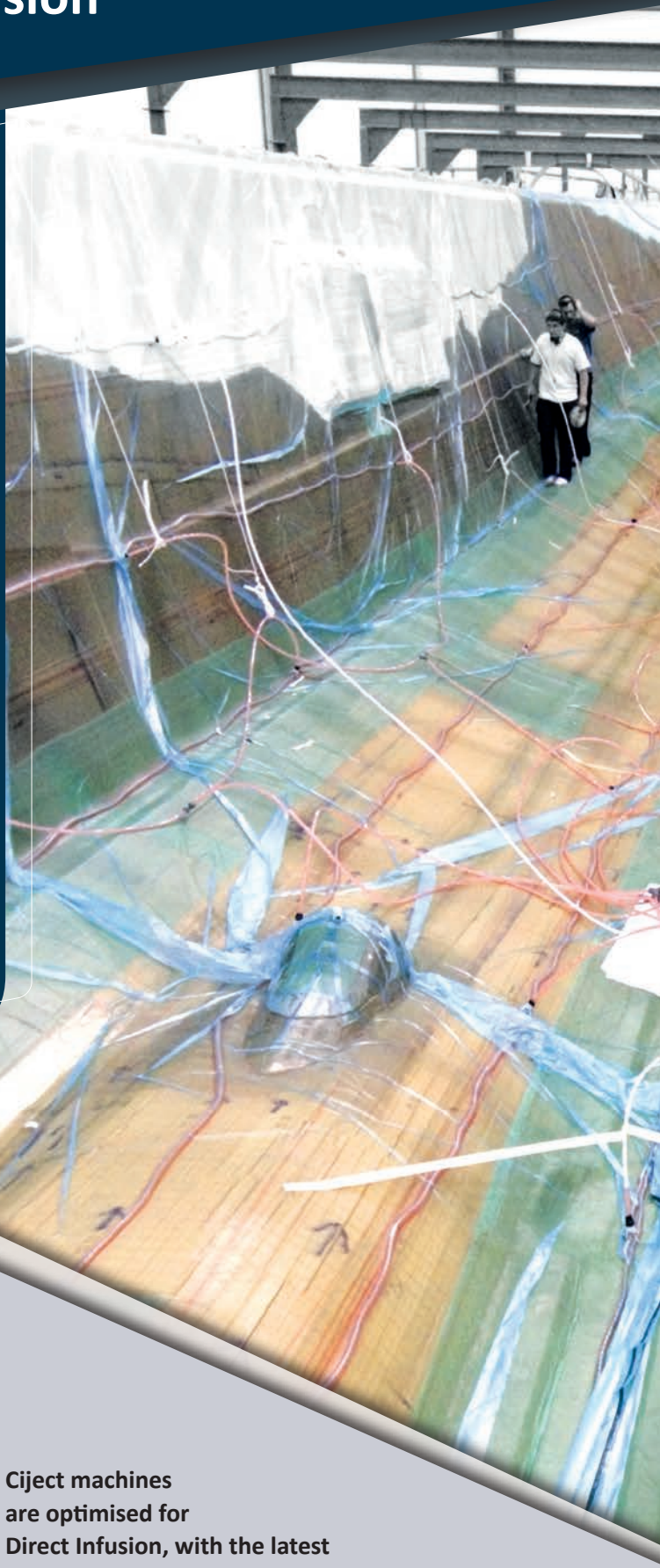


EQUIPMENT SET-UP

The Ciject Five infusion machine has been developed specifically for large scale infusion processing, managing mix ratio, infusion pressure and flow rates to provide unmatched levels of automation, efficiency and quality control.

1. **Ciject Five** – resin mixing and infusion
2. **Manifold** – resin distribution
3. **IMPS** – data feedback and control
4. **Catchpot** – contaminant protection
5. **Civac pump** – vacuum system
6. **Consumables** – infusion film & PVC pipe

Resin Infusion & Direct Infusion



DIRECT INFUSION™

As the infusion process has become more widespread the need to mechanise the handling, mixing and delivery of the resin has become more important. The traditional technique of hand-mixing bulk resin becomes impractical and potentially risky when using the process on any significant scale. Problems with material ratio consistency, potential bulk-exotherm and high levels of waste can have a significant detrimental effect on the viability of the process.

A meter-mixing machine can be used to simply dispense mixed resin 'on demand' into a suitable container but **Composite Integration** have taken the technology a step further by pioneering the development of systems capable of injecting 'directly' into the infusion process. The addition of strategically positioned in-mould pressure sensors (IMPS) to monitor infusion pressure, control flow rate and regulate volumetric compression, enables completely automated, precision control over the whole operation.

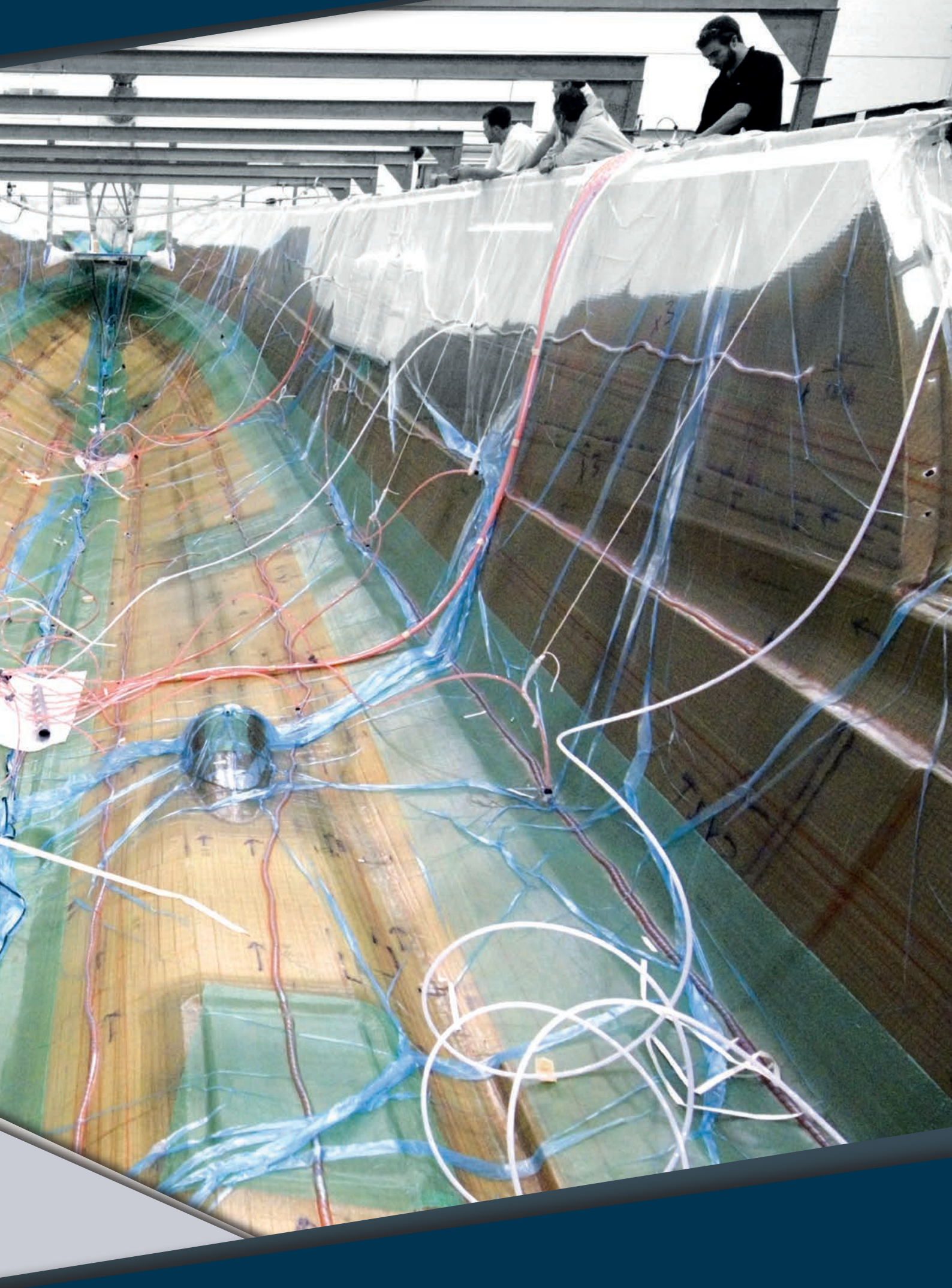
The Ciject® Advantage

Benefits of Direct Infusion:

- **Process repeatability**
- **Resin is delivered to the mould at the optimum pressure**
- **No bulk-exotherm risk**
- **No manual resin mixing**
- **Internal inline mixing avoids air entrapment in resin**
- **Waste reduction**
- **Process data recording**
- **Fewer man-hours**

Ciject machines are optimised for Direct Infusion, with the latest generation of models having been developed specifically for large scale processing where higher volume output is needed.

The Ciject Four and Ciject Five are used to infuse some of the world's largest composite structures currently in production.



Above: **Typical set-up of a large structure Direct Infusion.**

Developed to Deliver High Quality at an Industrial Scale

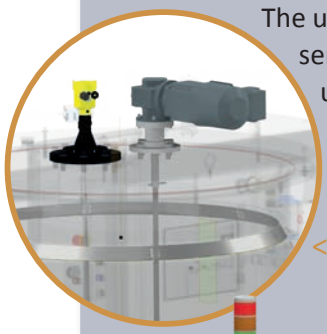
CIJECT FIVE

INFUSION MACHINE

A proven range of highly reliable and controllable resin mixing machines for large scale Direct Infusion™.

Designed specifically for high performance infusion, the Ciject Five uses precision gear pumps to achieve high outputs with inline flow meters providing flow PID feedback to maintain accurate material ratios at all rates.

The unique in-mould pressure sensors (IMPS) system allows unparalleled levels of control during the process.



< Non contact material level sensor

MAXIMUM FLOW RATE
30 Kg/m

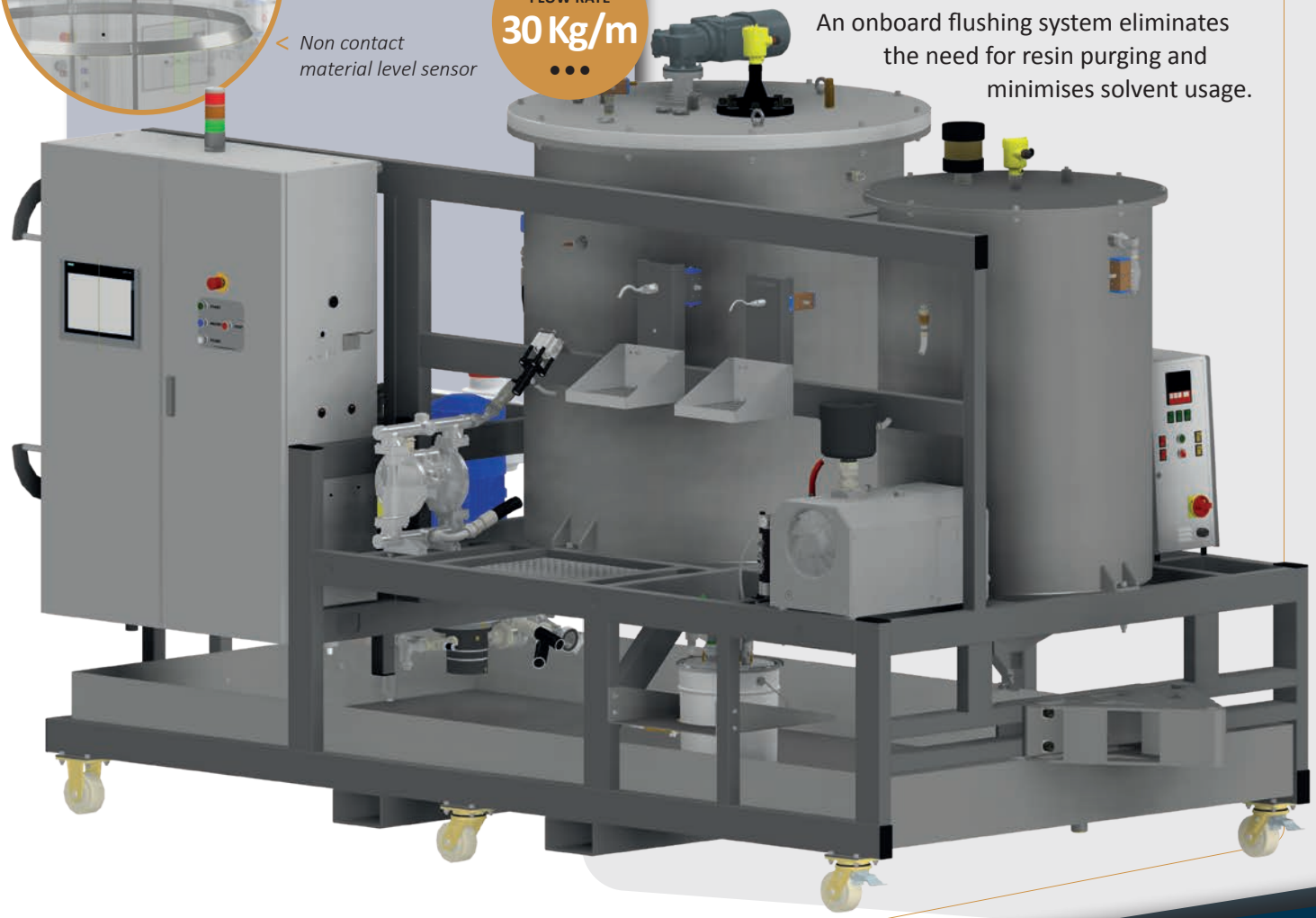
Adaptable and Versatile

Infusions within the wind energy sector are often towards the larger end of the structural scale, which require an accurate, consistent mix-ratio throughout the process.

Working seamlessly in combination with our automated manifold systems, the Ciject Five offers closed loop pressure control in real time, ensuring optimum fill times and laminate quality, whilst maintaining exacting ratios across the flow range.

With the ability to accurately control infusion pressure at the resin inlet point within +/- 10 mbar, variable rates of infusion can be controlled by either pressure or flow rate, each with programmable limits. This fine control allows continuous infusion without risk of over-pressurisation (bag blistering).

An onboard flushing system eliminates the need for resin purging and minimises solvent usage.



CIJECT

AUTOMATED MANIFOLD SYSTEMS

Consisting of modular outlet valves that can be assembled together to create a bank of valves, our automated manifolds are fitted with engineered sealing technologies, which ensures that the system is fully vacuum tight and pressure rated.

Following a successful infusion, the whole manifold can be flushed, resulting in a fully reusable system that generates less waste and provides greater efficiency than standard hand-built manifolds.

Touch screen HMI >

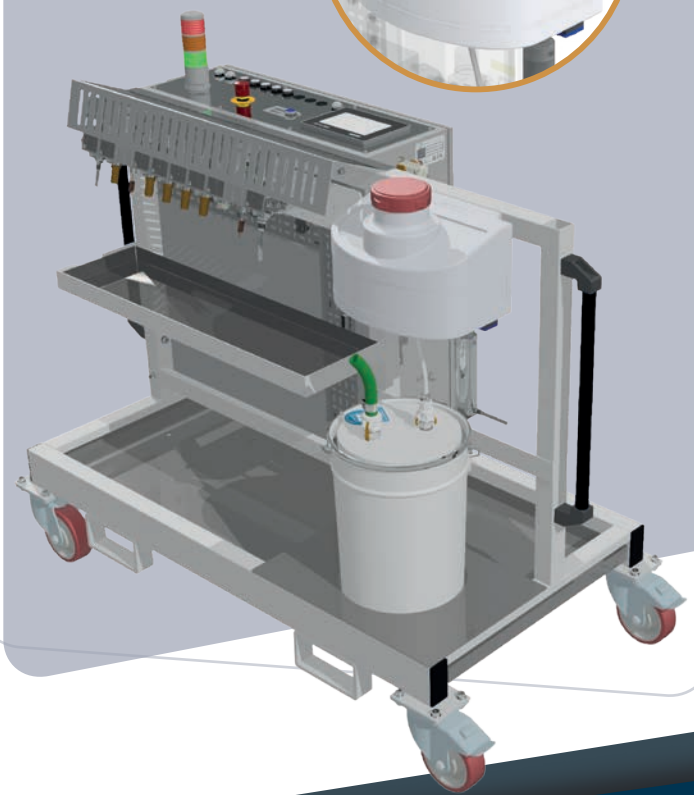
Features include:

- **Reusable, reducing consumable waste**
- **Integrated flush system**
- **Push-button operation to open/close valves**
- **Datalogging of operator actions, allowing full process traceability**
- **Engineered sealing technology to guarantee pressure and vacuum integrity**
- **Enhanced health and safety features, including; integrated pressure sensing and machine interlock system to provide over-pressure protection**

Integrated flush system >

The Ciject Five is designed to:

- **Replace manual resin mixing and handling in the infusion process**
- **Perform thin film degassing as material is loaded, with vacuum maintained until infusion**
- **Control the temperature of stored material accurately**
- **Automatically pump and mix resin/hardener and maintain ratio accuracy over the entire output range**
- **Dispense the mixed resin directly into the infusion process**
- **Deliver a 30 Kg/min maximum flow rate**
- **Automatically control the rate of injection based on pressure feedback from the mould**
- **Enable full operator control over the process with relevant checks, interlocks/alarms and feedback before and during the process**
- **Carry out a safe and efficient integrated flush cycle**
- **Record real-time process data**



SERVING THE WIND INDUSTRY WORLDWIDE

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