

The human aspect

One clear message from the FLASH-COMP project is that the solutions are not designed to replace people – they are designed to help people do their jobs more effectively.

FLASH-COMP is creating a decision support tool that will help workers to control the manufacturing process by either intervening directly or providing suggestions on how to proceed to guarantee the correct progress of the process. It will therefore be essential to put proper consideration into how this interaction between the decision support tool and the person involved works, to ensure that the FLASH-COMP solution is both accepted and valued by those who use it.

Integrating user needs

This will be done in the technical development of the FLASH-COMP solution, using suggestions about how to make the solutions more user-friendly and useful. It will also look to understand the impact of the new solution on the current work environment, identifying learning objectives to help current and future workers cope with the technological, process and cultural change that may come with the new solution.

End-users and workers have been involved in the project from the start to help shape the solution and to consider the learning competencies required to assure integration. Interviews are taking place, as well as observations of different tasks. Through an iterative process, the user's perception of the technologies will be assessed and considered as the development of the solution progresses. This will be done through focus groups that include participants from a wide range of staff positions, from plant operators to management.



The FLASH-COMP pilot sites

The industrial feasibility of the FLASH-COMP solutions will be demonstrated and validated in two industrially relevant environments – shipbuilding and aviation – which cover different materials, part sizes, and monitoring and inspection challenges. An overall performance assessment will be carried out to assess FLASH-COMP's greening capacity for industrial setups.

Azimut Yachts is an Italian yacht-manufacturing company based in Viareggio, Italy. The composite structures such as boat hulls that they produce for these yachts can be anywhere between 14-50 metres in length.



Israel Aerospace Industries (IAI) is Israel's major aerospace and aviation manufacturer, producing aerial and astronautic systems for both military and civilian usage. IAI uses composite manufacturing to produce 72 wings per year.

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The FLASH-COMP consortium



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Composite manufacturing, right first time

FLASH-COMP is an EU-funded project developing a fast and reliable quality control solution using AI to help identify and remove defects during composite manufacturing processes. This zero-defect manufacturing approach will help reduce waste by more than 30% and help Europe transition to climate neutrality

Why LRI? To reduce waste

The reduction of manufacturing waste is a key part of Europe's planned transition towards **climate neutrality**. Composite materials represent an excellent target for reducing waste as they play an important role in several of the EU's strategic manufacturing sectors.

Liquid resin infusion (LRI) is one of the most widely used composite manufacturing processes, accounting for about 33% of composite parts produced in Europe. It is used especially in the production of large parts such as wind turbine blades, airplane parts and ship hulls.

Despite the high value of these parts, both the material processing and quality control are largely done manually at the end of the manufacturing process, after which the parts are repaired or, if defects are too severe, discarded.

It is estimated that a reduction of waste of more than 30% can be achieved in this sector.

To overcome the lack of automated in-line control and to guarantee that defects that arise during the process are not propagated to the final product, LRI manufacturing processes use far more raw materials than are needed for the final product, resulting in an excessive amount of waste.

In this context, controlling and reducing the generation of defects by adopting “**first-time-right**” manufacturing strategies based on novel in-line inspection and monitoring and advanced control strategies – known as a **zero-defect manufacturing approach** – is of high interest in LRI-based manufacturing processes, as it would allow the amount of material used to be optimised, reduce the reworking time, and reduce the number of fully rejected parts.

Traditional LRI manufacturing process



The traditional LRI manufacturing process uses a multi-layer fibre preform placed on a mould and infused with liquid resin. In an ideal world, once the resin is cured, finished, and checked by hand, a final product is delivered, but problems may occur along this process.

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Objectives for a green Europe

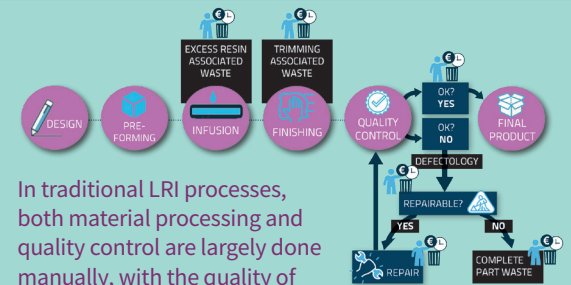
FLASH-COMP will contribute to the four general objectives set out by the **Made in Europe Partnership**. These are to:

- reinforce European leadership and **manufacturing excellence**
- achieve sustainable, circular and **climate-neutral** manufacturing
- promote **digital transformation** of the manufacturing industry
- create attractive, safe and **inclusive** added-value manufacturing jobs.

It will do this by:

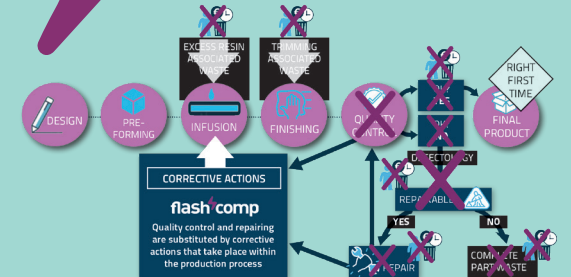
- running demonstrators showcasing the first-time-right approach at **Azimut Yachts** and **Israel Aerospace Industries**
- deploying or developing four **innovative technologies** in the LRI manufacturing process
- reducing repairing and surface finishing time by **30%**
- reducing use of resin by **10%**
- reducing CO₂e emissions per kilo of composite by **0.5kg**
- reducing waste generated by **30%**
- creating a **digital platform** for the project's approach, with two digital twins, a robust and secure industrial real-time communication technology, and a decision-making mechanism

How LRI is done at the moment



In traditional LRI processes, both material processing and quality control are largely done manually, with the quality of the final product being almost totally determined by an experienced operator. In most cases several reworking actions are needed during the process as well as repairs needed to the final product. In some cases, repair is not possible and the whole part is discarded. These activities are complex and account for around 30 per cent of the total production time, which makes the whole process inefficient.

The FLASH-COMP approach



FLASH-COMP will use novel, fast and accurate inspection and monitoring techniques (FLASH-IM) within the most critical manufacturing stages of LRI, pre-forming and infusion, to retrieve key process parameters. This data will feed an AI-based defect severity estimation tool (FLASH-DSET), capable of estimating the generation of defects and, consequently, determining if and what kind of corrective actions should be taken at the pre-forming and resin infusion stage of operations. Instructions will be linked to a real-time feedforward and feedback (FF/FB) control strategy decision support system (FLASH-DSS) which will allow workers to take instant and precise corrective actions, leading to ‘first-time-right’ manufacturing with zero-defects and zero-waste.