

More efficient materials for a more competitive and sustainable industry

A new generation of ready-to-use performance additives for composites



Carbon Waters
ENDLESS HORIZON OF MATERIALS

A large blue hexagon with the letters 'CW' in a bold, sans-serif font inside it. It is part of a larger graphic on the right side of the slide that includes several overlapping hexagons in blue, orange, and dark blue.

CW

About Carbon Waters



Solutions to reduce the impact of industry:

- Alternative to toxic substances
- Energy efficiency to contribute to decarbonizing processes
- Longer service life for materials



High quality graphene:

- Innovative technology based on 15 years of R&D
- 7 patents to guarantee our technological lead
- Optimal performance for materials improvement



Ready-to-use performance additives:

- Compatibility with industrial processes
- Low integration costs
- Strong experience in industrial partnerships

Aramco non-metallic materials challenges

Production optimization

- Maximize the value of oil resources
- Use oil-based technology to answer energy challenges



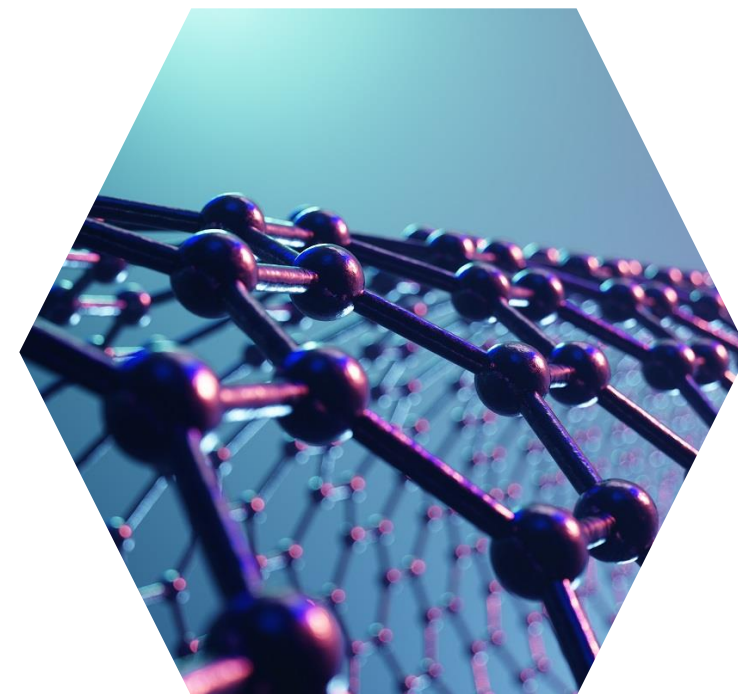
Reduced costs

- Carbon fibers costs
- Minimize maintenance or replacement costs



Quality & safety

- Eliminate corrosion
- Robustness of parts

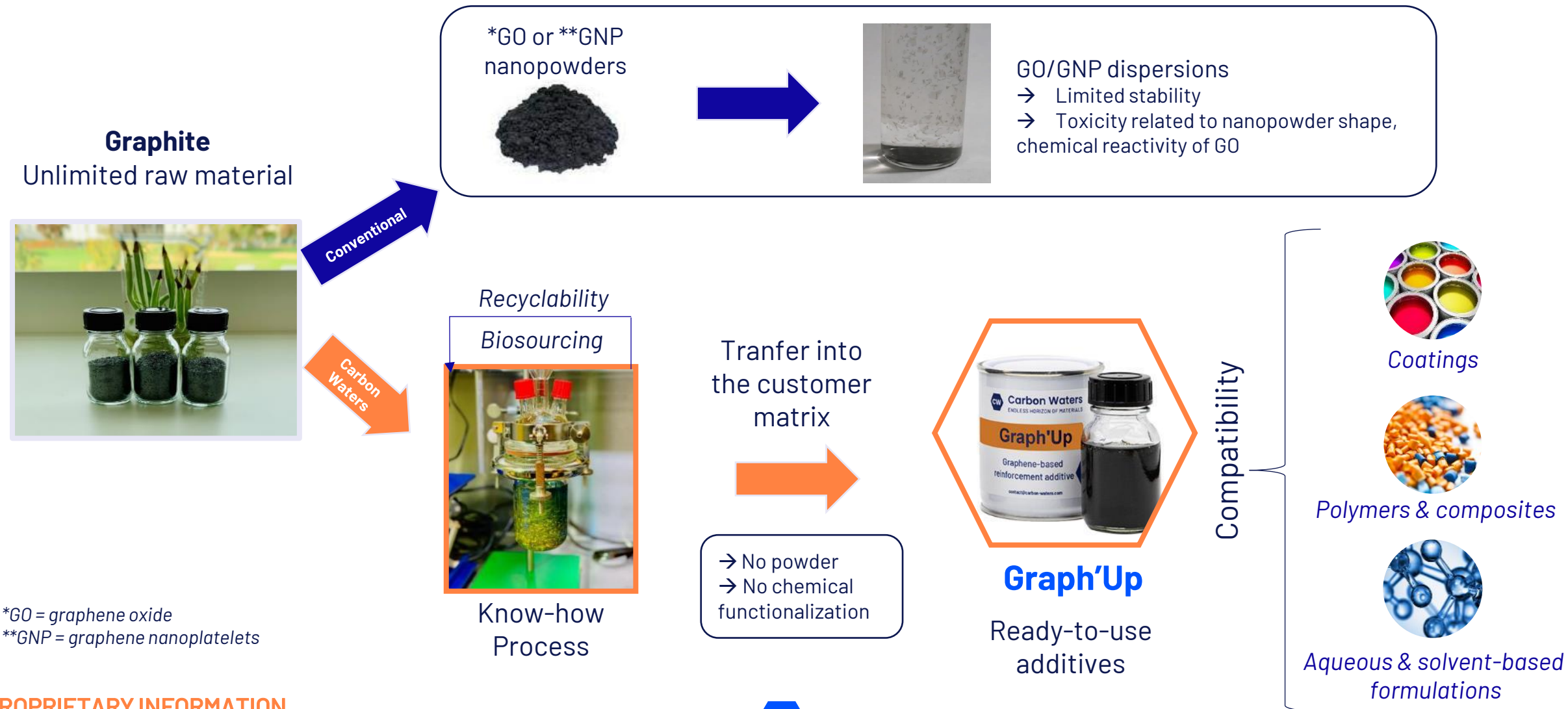


Need for new materials such as advanced materials

Reduction of carbon footprint considering the entire life cycle

Carbon Waters' technology

Combining nanoscale precision and industrial scale volumes



Graph'Up: an asset for gas tank and pipe applications

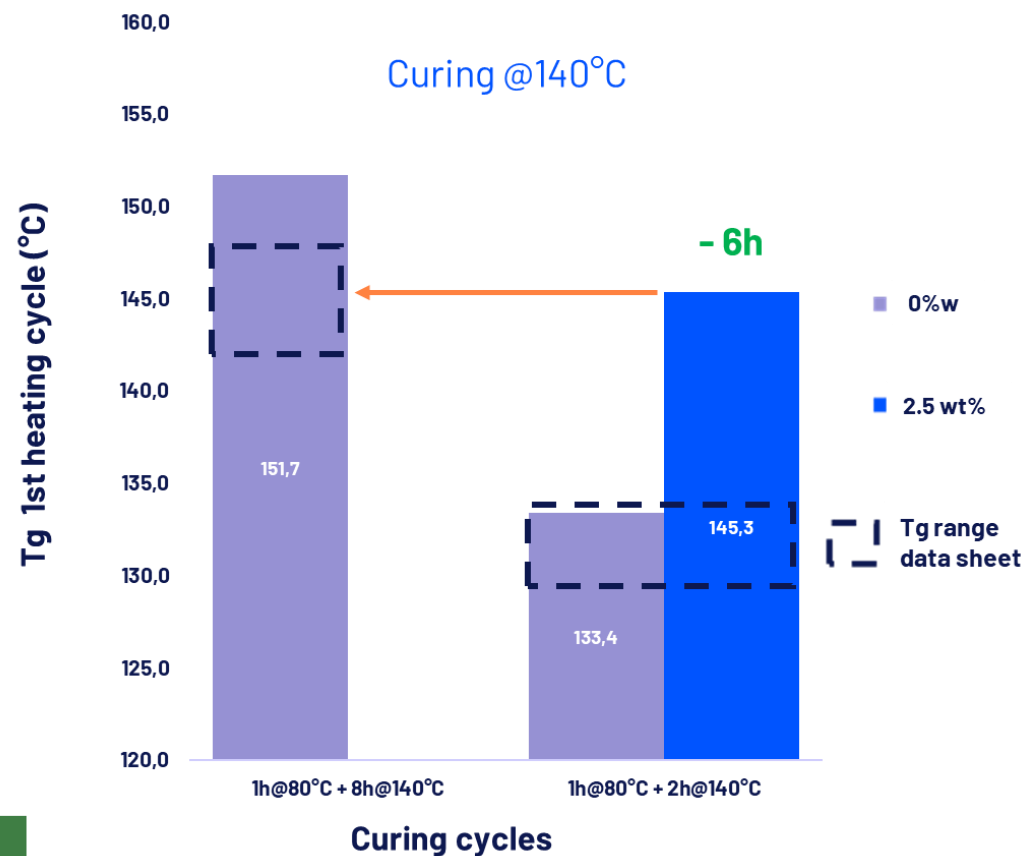
- Optimization of curing processes on reinforced thermosetting resins
 - Lower energy consumption
 - Improve productivity
 - Lower production costs
- Graph'Up provides a significant effect at low concentration on reinforced polymers
 - Enhanced properties
 - Low amount of additive
 - Diminution of raw materials as carbon fibers
 - Maintenance reduction compared to metallic systems
- Carbon Waters is not only a graphene producer but is an additif developer
 - A secured supply chain and controlled prices
 - A robust process of production
 - Additive qualified by industrials



Use case: tanks for oil and gas



Graph'Up Optim optimizes curing cycles by reducing curing time or temperature of thick and complex geometry parts made with reinforced thermoset resins



- The thermal properties of graphene lead the heat faster to the heart of the resin

Trial system = epoxy + hardener (aromatic amine)

- Decrease of the curing time up to - 60%
 - Energy savings: 20-25%
 - Lower COGS & operating margin growth of over 5%.
 - Lower carbon footprint for polymers and composites: saving up to 1 t CO₂/t of composite



Use case: tanks for oil and gas

Graph'Up Force TS boosts the mechanical properties of the resins, and so the composites, leading to a reduction of carbon fiber fabrics involved in reinforced composite parts



- Improved fiberglass laminated composites:
 - increased **stiffness +50%**
 - resistance to **interlaminar shear stress +10%**
 - decrease **crack propagation -25%**
 - Anti-abrasion effect
 - Low graphene concentration with no impact on viscosity
- Enhancement of mechanical properties
 - More resistant composites: **lower costs** of maintenance and repair
 - Raw material saving for equal performance: **-10 to 15% carbon fibers**

➤ **OPEX optimization**



Carbon Waters: your trusted partners



Testimony of a key account partner

Collaborations R&I

« [...] The reliability, competence and professionalism of Carbon Waters' teams are the keys to a successful collaboration. »



Collaboration

- Strong involvement: from the idea to the industrialization
- Dedicated support: definition of specifications, R&D and product implementation
- Management approach to accelerate your innovations



Network

- International Universities and technical centers for materials characterization
- LNE partnership for nano regulation topics
- Tollers for scale-up production

Want to try?

Example of collaboration regarding Aramco's focus on gas tank and pipe applications

Gas tank and pipe application with Graph'Up

- Graphene-based resins to optimize the process of tank manufacturing with Optim and Force
 - Define the use case – Aramco + Carbon Waters
 - First lab scale trials – CW
 - Prototype small scale – In collaboration with Aramco's technical center partners
 - Pilot scale trials and industrialization
- High-performance material for tanks and pipes without increasing the ratio of high-cost C fibers
- Maximize the value of oil resources by using higher-performing resins
- Saving materials
- Saving energy

Graph'Up range products benefits

Low integration costs



Implement our innovative ready-to-use solutions without modifying your processes

Durability



Increase the service life of your products with reinforced materials

Regulation compliance



Secure your operations with non-toxic additives



Carbon Waters

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Keep in touch!

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Committed to a sustainable futur



CSR commitment

- Introduction of a **CSR** approach
- Signature of the worldwide CSR charter for chemical companies: *Responsible Care*®



Safer materials

- Alternatives to **nano-powders**
- **Toxicologic** and **éco-toxicologic analysis** in progress
- **Reducing the harmfulness** of existing additives



Innovation & sustainability

- **Increase service life** of materials
- **Reduce resource exploitation** over the long term



Reduction fo environmental footprint

- **Decrease carbon footprint** of energy-intensive process
- Policy to **encourage sustainable travel** among employees