

# Sustainable Success with CO<sub>2</sub> Reduced Carbon Fibers

Laubholztag 2024



# SGL Carbon SE - Global presence with 29 sites


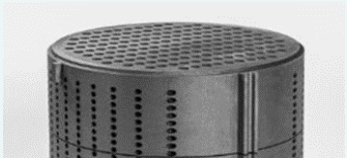

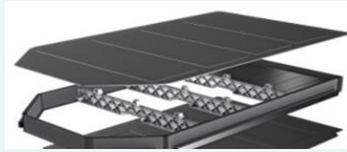


**7 productions sites**  
North America

**16 production sites**  
Europe

**4 production sites**  
Asia

# SGL's business units are known for customer orientation and innovation

	Graphite Solutions	Process Technology	Carbon Fibers	Composite Solutions
				
<b>Sales</b>	€ 565.7m	€ 127.9m	€ 224.9m	€ 153.9m
<b>Business areas</b>	<p>Customized products based on synthetic graphite</p> <ul style="list-style-type: none"> <li>• Graphite specialties</li> <li>• Graphite anode material (Lithium-ion batteries)</li> <li>• Materials for fuel cells</li> </ul>	<p>Equipment and know-how for handling of corrosive substances</p> <ul style="list-style-type: none"> <li>• Process solutions</li> <li>• Components &amp; assemblies</li> <li>• Parts &amp; Services</li> </ul>	<ul style="list-style-type: none"> <li>• Precursor &amp; acrylic fibers</li> <li>• Carbon fibers</li> <li>• Non-crimp &amp; woven fabrics</li> <li>• Pre-impregnated materials</li> </ul>	<p>Customized products based on carbon and glass fibers</p> <ul style="list-style-type: none"> <li>• Composite parts (large &amp; small series)</li> <li>• Wet friction</li> <li>• Insulation materials</li> </ul>

# Commanding the entire value chain: Advantages in cost, quality and differentiation

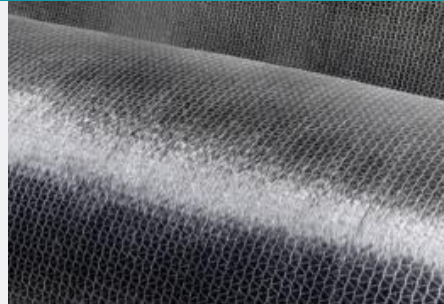
## Carbon fibers



Raw materials



Intermediate stages



Semi finished  
products

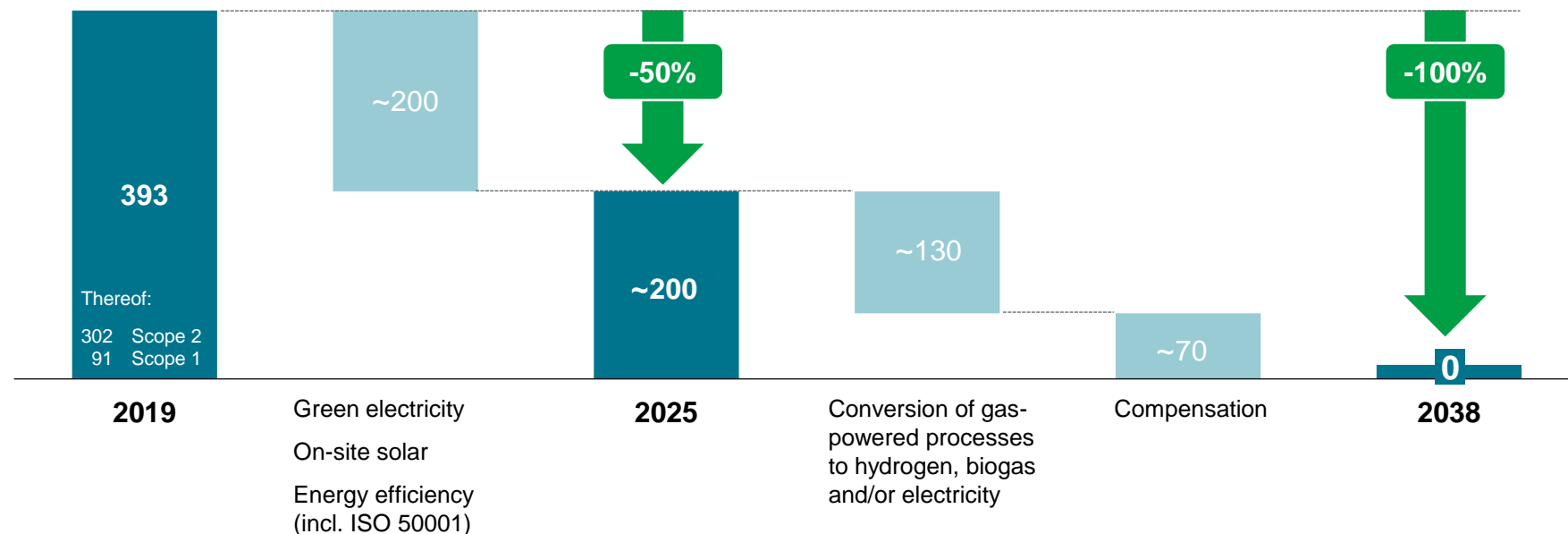


Solutions &  
components

# SGL commits to reduce 2025 emissions by 50% vs. 2019 and to achieve climate neutrality by 2038

## SGL Roadmap towards Climate Neutrality

[GHG emissions in kt CO<sub>2</sub>e, Scope 1 + 2]



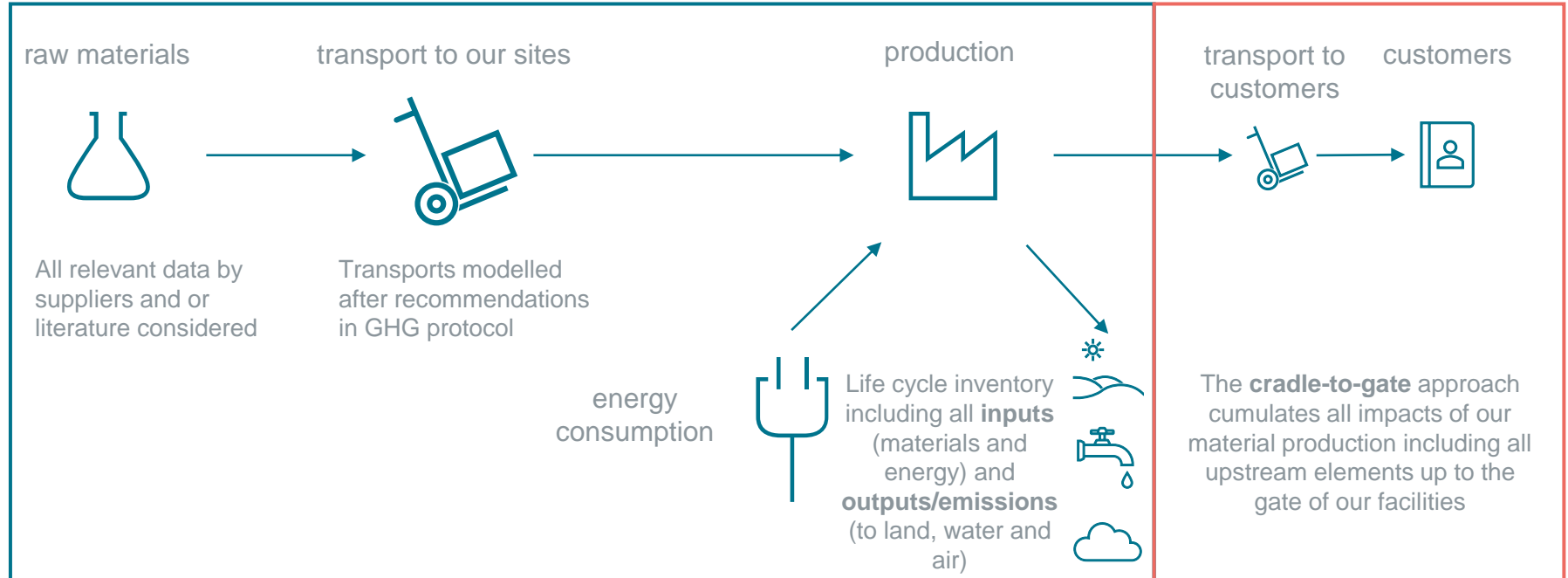
Scope 1: Direct emissions (gas, oil) | Scope 2: Indirect emissions (electricity, steam)

# Product carbon footprint – system boundary definition

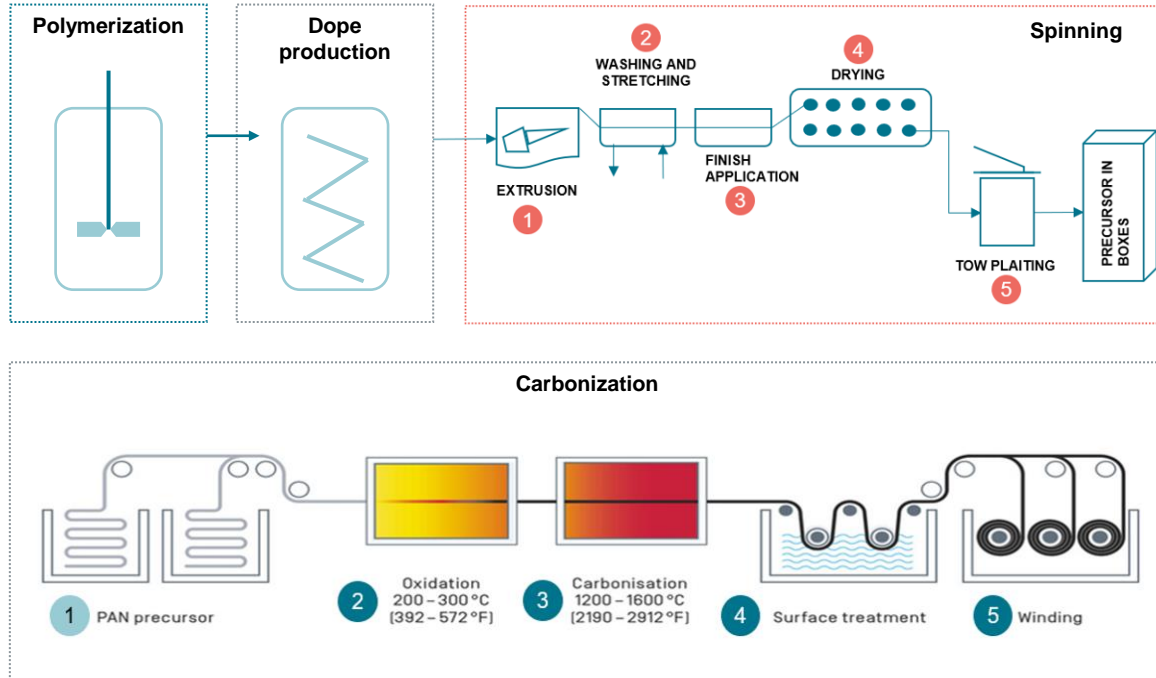
cradle-to-gate approach

Only product related impacts considered

Not considered



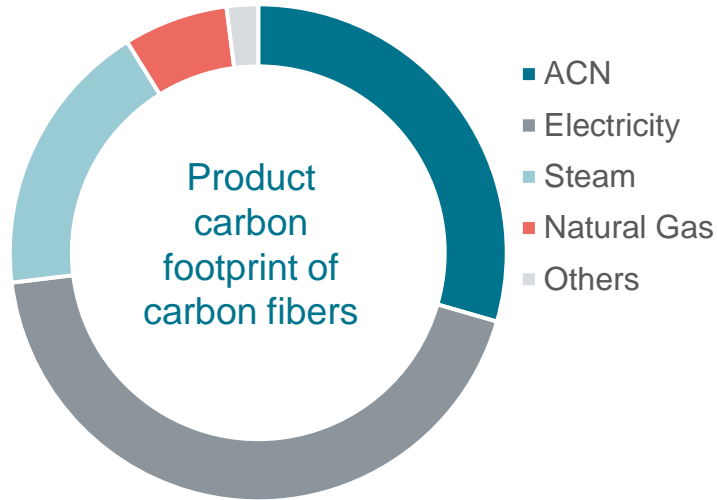
# Process chain from Acrylonitrile to Carbon fibers



- **Acrylonitrile is polymerized, dissolved** in organic solvents and extruded to **filaments**.
- After **washing** and **drying** the **PAN-precursor** fiber is plaited into boxes.
- **Oxidation & Carbonization** produce the **Carbon fibers**, which are **surface treated, sized** and wound on spools.

# SGL focusses on two main factors to attack carbon fiber CO<sub>2</sub> footprint, renewable ACN potentials not leveraged, yet!

## Major CO<sub>2</sub> contributors of Carbon Fibers



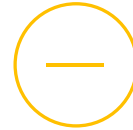
## Identified measures



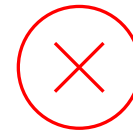
**Switch from electrical energy to renewable electricity**



**Substitution of natural gas for steam production by biomasses**



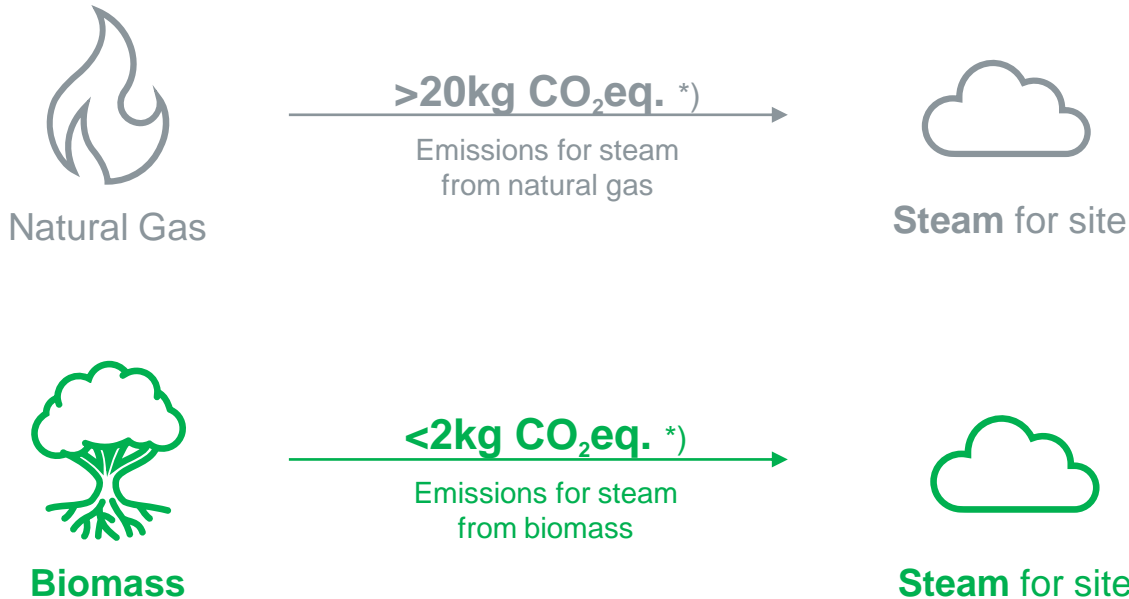
**Bio-based Acrylonitrile bares an additional lever**



**All other impacts cannot be reduced in short-term**



# In our site Lavradio we are switching our steam generation from a Natural Gas fired co-generation plant to Biomass fired boilers



- Switching from an **imported fossil gas** to a **renewable regional product** does not only ensure the **reliability** of supply and give us **flexibility** in sourcing
- We also **reduce our CO<sub>2</sub> emissions** for our thermal energy by a factor >10
- These CO<sub>2</sub> emission **reductions affect** all other **subsequent products** down the **whole value chain**

\*) Data for emission factors based on SPHERA LCA database for energy carriers in Portugal for 1MWh

# Our sustainable Biomass sourcing will start with industrial pellets



*“The carbon footprint of forest biomass for energy purposes is considered 0 (zero), as long as this forest biomass comes from sustainably managed forests.”*

**Pellets in the beginning, alternative biomasses after implementation phase**



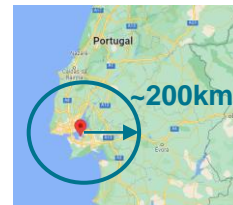
**Biomasses must be sourced from producers which hold relevant certificates**



**Portugal is an exporting country for wooden biomasses**



**Our biomasses are regional products (maximum range to site <200km)**



# Our newly installed biomass boiler system can produce steam very flexibly, operation started in 2024

## Brief look on Lavradio Biomass boilers



Installation completed in **November 2023**

# Green Carbon – Algae as basis for composites

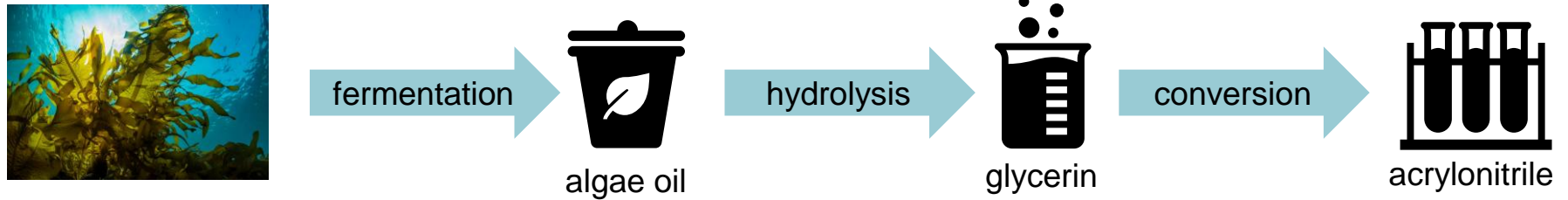
## R&D project with TU Munich & Fraunhofer Gesellschaft



July 2019 – January 2023

### Project description

Evaluation of **bio-based acrylonitrile** as raw material for **PAN** (polyacrylonitrile) - carbon fiber precursors.



Algae biomass is converted to yeast oil, fat split into glycerin, which is then converted to acrylonitrile as well as resins for thermosets and thermoplastics. This means a high usage of green chemistry.

Within the early stage of the project SGL evaluated already commercially available acrylonitrile grades which are partial bio based

→ Airbus flies bio-based carbon fiber helicopter nose panel

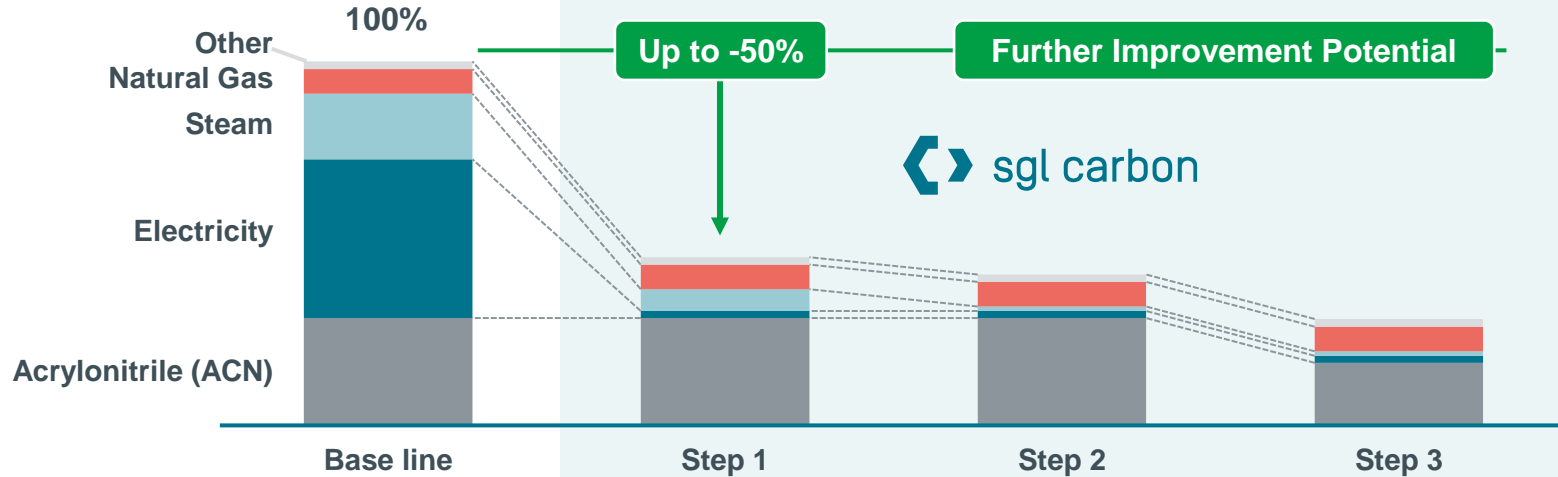


CompositesWorld (6/10/2024) <https://www.compositesworld.com/news/airbus-flies-bio-based-carbon-fiber-helicopter-nose-panel>




# SGL SIGRAFIL® Carbon Fiber - Product Carbon Footprint

[kg CO<sub>2</sub>e/kg Carbon Fiber, Index]

CO<sub>2</sub>-reduced 50k Carbon Fiber\*)



## Levers (schematic)

- Electricity from renewables 
- Biomass (steam generation) 
- Bio-based Acrylonitrile (GreenCarbon; AnQore; Trillium) 

\*) Displayed information based on internal calculations – detailed explanations can be provided via LCA reporting

# Carbon fibers with a reduced carbon footprint are possible!



## Contact

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**Thank you !**