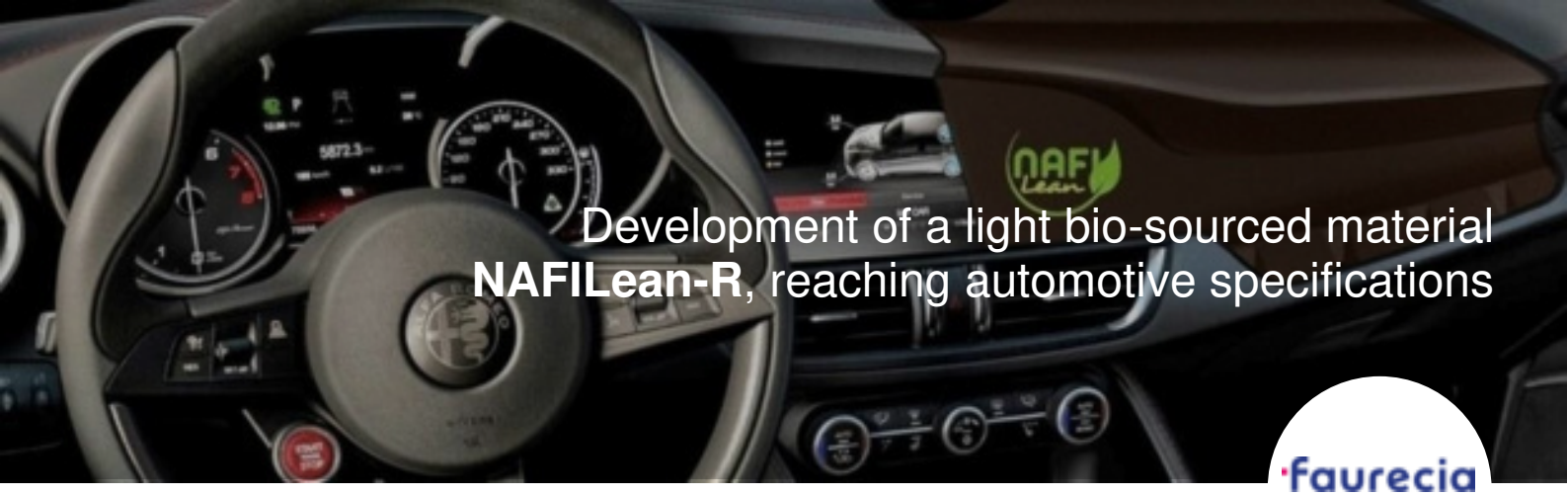

Development of a light bio-sourced material **NAFILean-R**, reaching automotive specifications

Faurecia has developed NAFILean-R, a light composite material, recycled and recyclable, its usage allows a significant carbon footprint reduction of automotive non-visible interior parts.

Starting date of the project	2018
Project Localisation Places of implementation of the project at this stage and targeted geography if replicable.	The development and the production of NAFILean-R material are taking place in France. The geographic target is Europe.
Project objectives Type of climate innovation of the project with a description of the problem/issue addressed	Carbon footprint reduction of some automotive parts by using low carbon material, recycled and bio-sourced and allowing weight reduction.
Detailed project description	Both the gradual exhaustion of fossil resources and increasing environmental concerns were among the factors that led Faurecia to define a clear strategy regarding sustainable development based on Six Convictions. In this context, Faurecia's ambition is to reach CO2 neutrality by 2030. Based on the most rigorous and conclusive scientific facts, Faurecia has built a roadmap to deploy by several stages : carbon neutral on direct emissions by 2025 (scope 1), carbon neutral for controlled emissions by 2030 (scope2 and scope3 upstream) and carbon neutral for total emissions (car usage integration) by 2050 (scope3 downstream). In this context, by replacing traditional products based on glass fibers reinforced polypropylene, **Faurecia adopted a pro-active approach by developing effective material made of renewable resources. Faurecia offers a material family, NAFILeanTM** answering two key automotive trends which are lightweight and use of low CO2 emission material. Within this family, the new grade NAFILean-R offers the following advantages: • NAFILean-R is made of recycled polypropylene (at 100%) reinforced by hemp fibers (natural and renewable) at 20%, with an emission factor significantly lower than standard automotive material reinforced by glass fibers. • NAFILean-R is processable on classic injection molding machines and allows, by architecture optimization and density reduction, 11% weight reduction compared to standard automotive material reinforced by glass fibers. • 25% complete life cycle analysis improvement compared to classic parts made of reinforced glass fibers material (LCA covering material production (hemp and recycled use), part injection (process temperature and cycle time reduction), usage (weight reduction) and the end of life considered same for both parts). • This material is 100% recyclable. NAFILean-R allows Faurecia to produce light automotive parts with very high environmental performance. Moreover, NAFILean-R is a commercial grade validated on automotive structural non-visible parts.
Main project's drivers for reducing the greenhouse gas emissions	**Reduction levers** / **Details on the aspects of the project** ☐ Energy and resource efficiency (including behaviour) / ☐ Energy Decarbonisation / ☒ Energy efficiency improvements / The energy efficiency improvement concerns two aspects: • Automotive parts manufacturing using this material: Process temperature reduction (-50°C) versus standard material (glass fiber reinforced polypropylene) and cycle time

		reduction generating an energy requirement reduction of 20% per part. The usage of vehicles using those parts: The density reduction combined with the part thickness decrease generate 11% of weight reduction and consequently fuel consumption reduction linked to this weight saving.
	☒ Improving efficiency in non-energy resources	Thanks to its thermomechanical properties, NAFILean-R allows a part thickness reduction and then reduces the required amount of material necessary to produce those parts. This, combined with usage of recycled material, reduces the use of new resources, in particular carbonated one.
	☒ Emissions absorption: creation of carbon sinks, negative emissions (BECCS, CCU/S, ...)	CO2 absorption by biomass corresponds to hemp (original material), the total balance depending on the part end-of-life treatment.
	☐ Financing low-carbon producers or disinvestment from carbon assets	
	☐ Reduction of other greenhouse gases emission	

Emission scope(s) on which the project has a significant impact and quantification of GHG emission reductions per emission scope

	Aspects of the project contributing to the reduction of emissions by emission category	Quantification of associated GHG emissions by emission category Please follow the quantification methodology used in the Afep guidelines.
Reduction of the company's carbon dependency		
Scope 1 *Direct emissions generated by the company's activity.*		
Scope 2 *Indirect emissions associated with the company's electricity and heat consumption.*	Use of recycled polypropylene and hemp fibers in replacement of virgin polypropylene and glass fibers. Process temperature decrease and cycle time reduction.	**Based on 300,000 parts produced in France (1kg each),** it corresponds to a saving of **3T CO2 eq per year.**
Scope 3 *Emissions induced (upstream or downstream) by the company's activities, products and/or services in its value chain.*	Weight reduction if the car integrating parts designed with this material (all other things remaining equal)	The 1kg weight reduction of a vehicle thanks NAFILean-R use versus standard solution generates an emission reduction of 0,04g CO2 per driven km.
Increase of carbon sinks		
Emissions Absorption *Carbon sinks creation, (BECCS, CCU/S, …)*	Carbon storage in hemp	By taking the difference between emission factor with and without biogenic carbon, we estimate 330g of CO2 extracted from atmosphere by the biomass to produce 1kg of NAFILean-R
GHG emissions avoided by the company at third parties		
Avoided Emissions *Emissions avoided by the activities, products and/or services in charge of the project, or by the financing of emission reduction projects.*	Weight reduction of vehicle using parts designed with this material (all other things remaining equal)	The 1kg weight reduction of a vehicle thanks NAFILean-R use versus standard solution generates an emission reduction of 0,04g CO2 per driven km.

Clarification on the calculation or other remarks:

- The use of NAFILean-R (recycled polypropylene and hemp fibers) in replacement of glass fiber reinforced polypropylene (for which emission factor is 2,24 kgCO2/kg of material), generates a carbon footprint reduction of automotive parts made of this material. The emission factor of NAFILean-R is then 0,16 kgCO2/kg of material (cradle to gate).

- The hemp use in replacement of glass fibers generates a part carbon footprint reduction and also allows to sequester carbon (store in hemp). The hemp growth is not an issue neither in terms of availability of agricultural lands nor in food diversity: hemp is cultivated on land in fallow (soil rotation). Moreover, it would be possible to equip all European carmakers with about 5000 hectares of land.

	- Parts designed and made of NAFILean-R can offer a weight reduction (about 11%) and so then a CO2 emission reduction for use phase of the car. This reduction can be estimated at about **- 0,04gCO2/km per 1kg of NAFILean-R used.**
Modality of verification of the quantification.	**Calculation standard used (ADEME base, GHG protocol, etc.):** ISO 14040 et ISO 14044 **Verification of the calculation (internal or external): :** Gabi database (version 9.2.0.58) and method CML 2001 - Jan. 2016

Other environmental and social benefits of the project	• **Production advantages:** Using NAFILean-R allows:
	  ○ Less quantity of material (thickness reduction) consumption,
	  ○ Less new resources consumption by using recycled matrix,
	  ○ Natural fibers as reinforcement integration, coming from French hemp sector, organized, and known as virtuous (no irrigation, no phytosanitary products, no GMO, plant with several co-products and improving naturally agricultural yield).
	• **Usage advantages:** The weight saving generates a fuel consumption reduction and, proportionally, a reduction of all associated externalities.
	• **End-of-Life advantages:** NAFILean-R can be integrated in classic recycling sector, with a density below 1 it can be separated and revalorized.
	• **Society advantages:** This material constitutes an complement of activity and incomes for French agricultural sector, without entering in competition with food productions.
	Moreover, it allows the reduction of fossils energy and carbonated material dependency.

Project maturity level	☐ Prototype laboratory test (TRL 7) ☐ Real life testing (TRL 7-8) ☐ Pre-commercial prototype (TRL 9) ☐ Small-scale implementation ☒ Medium to large scale implementation **Remarks**: click here to enter the level of maturity of the project
Capacity and conditions of the project reproducibility, with associated climate impact mitigation potential	No reproductivity issue. The success factors to pursue this project are mainly qualitative recycled polypropylene capacity extension, which means an improvement on sortig technologies and plastic wastes collection.
Amount of investment made (in €)	• Adaptation/complementation of production equipment and quality control: 150k€ • R&D : 300k€
Economic profitability of the project (ROI)	☒ ST (0-3 years) ☐ MT (4-10 years) ☐ LT (> 10 years) **Remarks:** • In current context of low oil price, use of NAFILean-R generates no overcost to Faurecia customers. • Oil price high would generate a significant price reduction by using NAFILean-R. • Current situation might change depending if any regulations obliging the use and integration of low environmental footprint material would have been putting in place national, European, or even global level.
Engaged partnerships	NAFILean-R producer is Automotive Performance Materials (APM): a joint Venture between Faurecia and Interval, based in Dijon. Internet Website: https://www.apm-planet.com/
Open comments from the project owner	/
More about the project	
Contact the company carrying the project	For any further information, please contact APM at the following address: contact@apm-planet.com
Project URL links	https://www.faurecia.com/newsroom/les-biomateriaux-legers-une-tendance-lourde

Illustrations of the project