



MANE

MANE is the first French and family-owned company among the worldwide leaders of the Fragrance and Flavour industry. The Group's headquarters are based in the southeast of France, surrounded by nature.

It is therefore in MANE's DNA to protect this nature and to create flavours and fragrances that respect the environment in which they are created. MANE was also the first Fragrance and Flavour company to sign the United Nations Global Compact in 2003.



Interview

with Elodie Schaffner
Green Chemistry Projects Engineer
MANE, France



Elodie Schaffner holds a degree in engineering from the Toulouse Graduate School of Chemical, Materials, and Industrial Engineering (INP ENSIACET) specialised in material sciences and sustainability engineering. She joined MANE in 2022 as a green chemistry projects engineer and has since become our expert in MANE GREEN MOTION™ and life cycle assessment.

In addition to the traditional method of production of plant extracts for flavours and fragrances, you also produce nature-identical molecules using biotechnology. What made you decide to produce identical molecules with the help of biotechnology instead of extracting them? In which cases do you favour extraction and in which cases biotechnology?

Most aroma compounds are typically produced through chemical processes like de novo synthesis or extraction and purification from fruits, vegetables, and plant matrices. However, biotechnological processes, which utilise the activity of microbial cells or microbial extracts offer a promising natural alternative for producing aromatic compounds. MANE masters all these three production methods: extraction, chemical synthesis, and biotechnological biosynthesis.

The ability of micro-organisms to produce aromatic compounds has long been described in products such as wine, bread, and dairy. In the US and according to European regulations (e.g. CFR 1990 and EEC 1334/2008), compounds isolated from natural resources or obtained through microbial or enzymatic processes involving natural precursors are classified as natural (European Commission 2008; FDA 2013).

Extraction from plants and biotechnological molecules are complementary. Fruits flavours are quite difficult to extract, they are very few fruits essential oils for example. Biotechnology allows the production of these compounds of interest in bioreactors, in large quantities, with consistently high quality, sustainably, and with low environmental impact. This is why biotechnology is such a remarkable science. At MANE, we have been involved in biotechnology since 1987, when the company decided to explore the possibilities offered by bioconversion for producing natural aromatic molecules.

You use both extracted and biotechnologically produced natural substances, e.g. for natural fragrances and flavours. Do you use both pathways in combination or individually? Is there demand and acceptance for these products among consumers?

Both extracted and biotechnologically manufactured natural ingredients are combined in our composition. They both contribute to the creativity and performance of our products. Microbial aromatic compounds are gaining popularity due to the increasing consumer demand for sustainable and natural products. Additionally, we ensure compliance with all Kosher and Halal standards for aromas.

Do you also biotechnologically manufacture molecules for fragrances and flavours that do not occur in nature? What is your experience with them?

Today, the company's biotechnology catalogue exclusively features natural molecules identified in plant sources. The processes we develop are directly inspired by the biological processes that create these molecules in nature, ensuring that the bioconversion product is identical in nature.

Certain biocatalytic processes can significantly simplify chemical processes and produce compounds not identified in nature. The selectivity conferred by enzymes can be used to carry out difficult chemical transformations and improve the synthesis of complex molecules. This is an area of research that we are not ignoring.

Referring to your first alcohol-free and fully biodegradable AQUAFINE™ fragrance microemulsion: Are your fragrances similar in stability and longevity as fossil ones or do they degrade faster?

In 2009, MANE invented the first biodegradable and alcohol-free fragrance with the patented solution AQUAFINE™. While biodegradable fragrances are

not necessarily 100% natural, AQUAFINE™ contains a large majority of water and a small quantity of fully biodegradable molecules, both natural and fossil-based. When comparing AQUAFINE™ with traditional alcoholic fragrances under the same conditions, they are just as stable and performant.

Besides your molecules, do you also make sure that the packaging of your products is fossil-free and sustainable?

At MANE, we are also focusing on our packaging, even if it represents only 2.3 % of our corporate carbon footprint. While our packaging are not yet 100 % fossil free, we are taking steps to reduce our plastic footprint. We prioritise criteria such as recyclability and recycled content. For example, our packaging for liquids are now fully recyclable and our plastic bottles contain a minimum of 30 % recycled content. We are also working on projects to deploy reusable and circular packaging for metallic and glass containers. All these initiatives contribute to reduce our plastic packaging consumption in the end and are aligned with our customers' expectations.

You claim to use eco-friendly processes to synthesise your fragrance and flavour ingredients. Furthermore, until 2030 you aim at reducing direct carbon emissions per ton of sold product by 69% (scope 1 & 2). How are you going to reduce your scope 3 emissions by 58% by 2030 compared to 2018? Which role does Life Cycle Assessment play for your decision-making?

The big contributor to MANE's scope 3, as for many other industries, is scope 3.1 with purchases of goods and services, representing 67 % of our overall carbon emissions in 2023. To tackle our scope 3 emission, we have 3 priority actions at MANE: engaging our suppliers toward more responsible value chains, developing carbon reduction or removal projects within our value chain, and eco-design of products. We can already see benefits of changes performed, through life cycle assessment.

On other categories of Scope 3 emissions, we implement projects to optimise our logistic flows and to favour as much as possible low-impact modes of transport. We also work on the recovery and reuse of waste flows, whether coming from our own operational activities or from other industries.

In all these cases, life cycle assessment helps us identify where are impact hotspots within the manufacturing process of ingredient and within the value chain. It allows us to monitor the effects of changes made in agricultural practices or processing parts and see if we are moving in the right direction or not.

Regarding MANE scope 1 and 2 emissions, MANE is working on reducing the energy consumption of its operations and using renewable energy wherever it is possible: we are aiming to reach 100 % of renewable electricity by 2030 (through contracts and self-production) and we explore other renewable energies like biomass, waste heat recovery or geothermal energy uses.

MANE has developed the GREEN MOTION™ digital tool to measure the safety and environmental impact of fragrance and flavour ingredients. How does it work and how does it ensure compliance with the 12 Principles of Green Chemistry and the renewable carbon concept? Why did you decide to make it available to your customers?

GREEN MOTION™ is the first Green Chemistry evaluation tool to be published in the Journal of Green Chemistry. With this tool, MANE pioneered an innovative and quantitative method to evaluate the environmental impact of products. Created in 2011 by Jean MANE, Tony PHAN and Cyril GALLARDO, GREEN MOTION™ is based on the 12 principles of green chemistry developed by Dr. John WARNER and Paul T. ANASTAS, a reference in all industries.

How does GREEN MOTION™ work? We have consolidated the 12 green chemistry principles into 7 key concepts: raw materials, solvents, toxicity and hazards, reaction efficiency, energy consumption,

final product impact on safety and hazards, and waste production. Each concept includes a series of questions, and based on the answers, a certain number of penalty points are applied. Ultimately, the product receives a GREEN MOTION™ score between 0 and 100, with 100 being the highest possible score for environmental friendliness.

GREEN MOTION™ is a free and accessible online application. The assessment takes approximately half an hour. We decided to make the GREEN MOTION™ tool available to everyone, not just our customers, to ensure transparency and allow easy comparison of different products.

The renewable carbon is the second question when doing the assessment. Since the creation of GREEN MOTION™, we have defined renewable carbon as the number of carbons from natural raw materials in the product divided by the total number of carbons in the product. For natural raw materials, we adhere to the definition provided by ISO 9235.

Why did you decide to become part of the RCI and how can the RCI profit from your membership?

In 2021, MANE decided to join the Renewable Carbon Initiative (RCI) because we believe that reducing the environmental impact of our activities is essential to our company’s performance and social acceptability. We are convinced that the RCI can offer sustainable and efficient solutions. At that time, we were also defining renewable carbon, and now, the renewable carbon percentage is a mandatory specification for every ingredient we produce and purchase. We were also anticipating the creation of a renewable carbon share label, which we recently learned will be available soon, as announced at the last RCI general meeting.

Additionally, the RCI’s active involvement in EU-level meetings and actions to bring renewable carbon to the attention of policymakers and raise awareness is of great interest to us. The RCI also provides an excellent platform for networking with various companies and involving our customers in the initiative.

