

Advancing Automotive Interiors - July 2024

– Avery Dennison Performance Tapes



The EU Chemical Strategy for Sustainability and its implications for automotive interior manufacturers

The EU Chemical Strategy for Sustainability (CSS), released in 2020, is a wide-ranging document that sets a trajectory for the use of chemicals in all sectors. The reduction of chemicals considered harmful to health is naturally a focus, but also mentioned in it are broader sustainability goals around resource use and recycling, which have significant implications for the automotive interior sector. In this white paper, we examine these issues, and look at how innovative adhesive technologies, along with other initiatives from Avery Dennison, are helping the sector move to a more sustainable future.

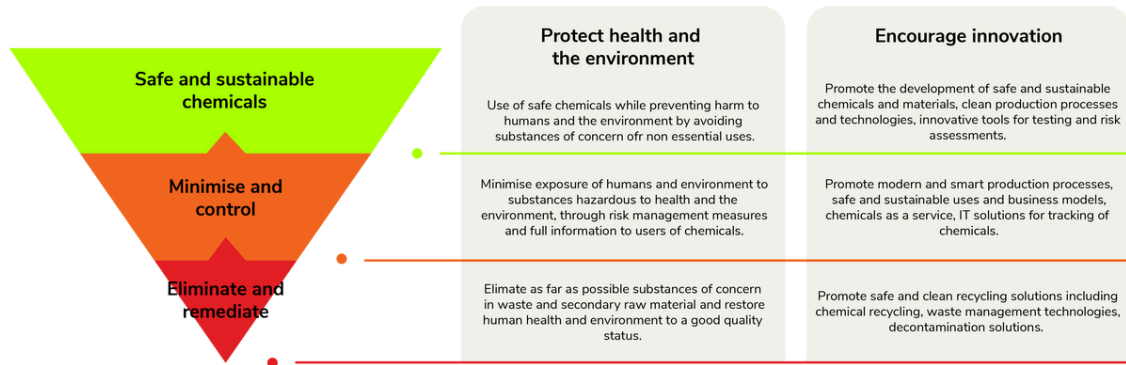


Background to the CSS

The European Union's Chemical Strategy for Sustainability (CSS) is a package of over 80 actions that aims to better protect citizens and the environment from hazardous chemicals, while also supporting businesses in a transition to safe and sustainable chemicals. It was announced as part of the zero-pollution ambition within the European Green Deal, a wide-ranging package of measures focused on turning the EU into a resource-efficient, competitive economy aligned with the goal of reducing net emissions of greenhouse gases to zero by 2050.

The main drivers for the release of the CSS are predictions that global chemicals production will double by 2030, and that use of chemicals in consumer products will increase accordingly. In addition, research is showing increasing links between health and exposure to chemicals, even those previously believed to be relatively benign. So although it is recognized that sophisticated chemical laws are already in place in the EU, it is also clear that there is a need to go further to guard against future potential harms.

The European Commission published the CSS on 14 October 2020, and is currently in the process of making proposals for the various actions, each with their own timeline for implementation. It has set up a 32-member “high-level roundtable” – comprising representatives from the EU member states, European Chemical Agency (ECHA), industry, NGOs, international organizations and scientists – to ensure that the objectives of the CSS are achieved.



The 'toxic-free hierarchy for chemicals management', as outlined in the CSS.¹

The CSS proposes to achieve its aims by various actions, including:

- Restricting harmful chemicals except where their use is deemed essential for specific purposes
- Strengthening enforcement of chemical regulations
- Encouraging innovation to develop safer alternatives that are 'sustainable by design'
- Improving exchange of information about chemicals
- Enhancing monitoring of hazardous chemicals.

Carcinogenic, mutagenic or reprotoxic substances (CMRs) are also of relevance to this discussion, and were subject to a revised EU regulation in 2023.



The implications of CSS for the automotive interior sector


The automotive sector is not mentioned specifically under any of the above-mentioned actions in the CSS, but there are nevertheless several aspects that are directly or indirectly relevant. The most important of these are **chemical regulations** that are aimed at protecting consumers against the effects of the most harmful chemicals. These are of particular importance to the automotive interior sector, because of the number of chemicals that may be present in car trim, for example as residual monomers or solvents in plastics or adhesives, or intentionally added to impart particular properties, such as plasticizers or flame retardants.

Those involved in the automotive sector have of course long been aware of the risks associated with emissions of volatile chemicals from the materials used in automotive interiors. Concerns around the health implications of the 'new car smell' date back to the early 2000s, and over the last 20 years have led to numerous methods aimed at assessing content of volatile organic compounds (VOCs) in car cabins, for example the widely-used VDA 278 issued by the German Association of the Automotive Industry.

However, as a result of the CSS, it's clear that original equipment manufacturers (OEMs) and those in their supply chains can expect to have to adapt to more stringent regulations over the coming years. Classes of chemicals mentioned in the CSS include:

- Substances of very high concern (SVHCs)
- Carcinogenic, mutagenic and reprotoxic (CMR) chemicals
- Endocrine disruptors
- (Very) Persistent, mobile and toxic substances
- Per- and poly-fluoroalkylated substances (PFAS).

These regulations will apply both to chemicals that are already in the spotlight for health reasons. But in the future, it could also potentially affect chemicals that are not so heavily regulated, for example those that have less favorable sustainability credentials. Whatever the reason for restrictions being imposed, the EU is ahead of other jurisdictions in this regard, and so taking the lead from the CSS is a sound strategy for anyone involved in making decisions on the chemicals present in automotive interior trim.

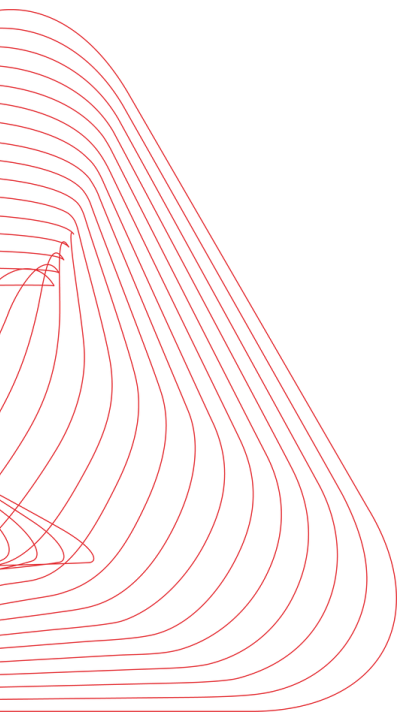


Another key point mentioned in the CSS is the move towards '**sustainability by design**' with regard to chemical use. The CSS states that this involves "avoiding volumes and chemical properties that may be harmful to human health or the environment", with particular reference to chemicals that are likely to be (eco)toxic, persistent, bio-accumulative or mobile. It also incorporates a wider perspective on sustainability, which it says "should be ensured by minimizing the environmental footprint of chemicals in particular on climate change, resource use, ecosystems and biodiversity from a lifecycle perspective". Also mentioned is support for efforts to deal with problematic chemicals in legacy waste streams.

Another issue for automotive is the confined nature of vehicle cabins, which may exacerbate the effect of the already higher exposures by posing the risk of '**combination effects**' from simultaneous exposure to multiple chemicals. As a result, as a result of the CSS, manufacturers can expect the EU to introduce measures to take account of the combination effect of mixtures, for example by adjusting the provisions within REACH.

Other points in the CSS that are relevant to automotive interiors include:

- Encouragement of innovation
- Enhancement of information exchange
- Setting up a simplified assessment framework
- Putting in place a rigorous non-compliance policy
- Furthering the available information on chemicals (including emissions of greenhouse gases).



How Performance Tapes can help suppliers adapt to the CSS

From the broad range of actions that are likely to stem from the CSS, it is clear that forward-thinking suppliers and OEMs will want to keep ahead of forthcoming regulations, to give themselves time to adapt and so remain competitive.

To do this, it will be necessary to consider every part of the automotive interior, and examine how each can be designed to be as sustainable as possible. This should be done not just by reference to current regulations relating to solvents and other chemicals, but by metrics that are likely to become increasingly important in the future – for example, lifecycle greenhouse gas emissions, use of fossil sources, energy consumption, recyclability or water usage.

Performance tapes already play a vital role in automotive interiors, by allowing materials to be securely, easily and unobtrusively fixed to each other without recourse to heavier, bulkier mechanical fixings. These materials are numerous, and include polyurethane, EPDM, PVC and TPO surfacing materials, EVA and polyethylene foams, nonwovens and other textiles, as well as steel, aluminium and glass. It's therefore already necessary to be innovative and adaptable when devising pressure-sensitive adhesive (PSA) tapes for a specific automotive interior application – and this need will only grow as the implications of the CSS feed through.

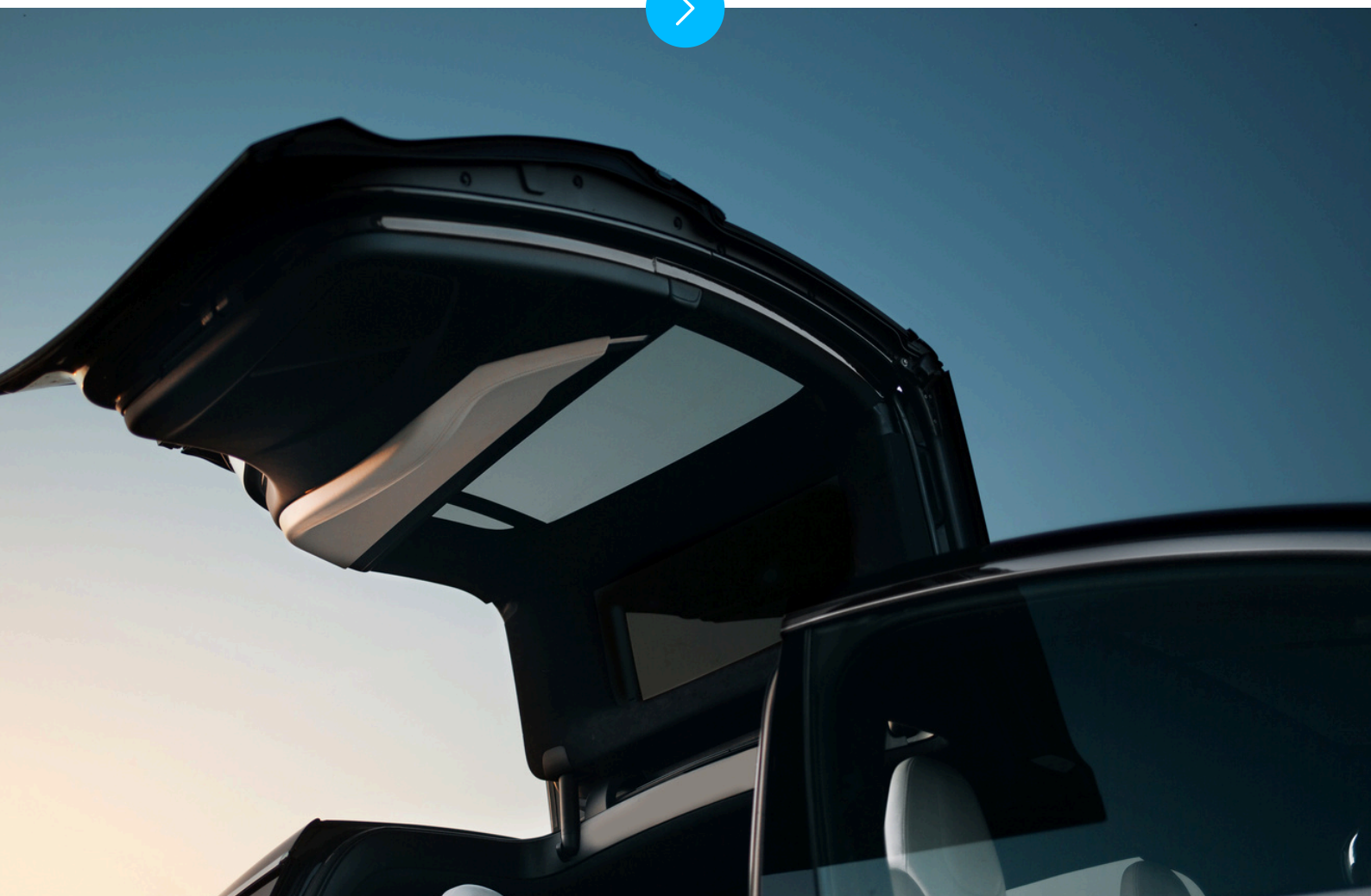


Performance tapes are available in various formats to bond together a wide variety of materials that are used in automotive interiors.

The use of solvents in the manufacture of PSA tapes is an obvious factor when considering alignment with CSS objectives. Such solvents are often integral to the process of dissolving the adhesive polymer and depositing it as a solution on the carrier; but under the whole-lifecycle approach advocated by the CSS, they may well be subject to regulation even though very low quantities typically remain in the final assembled component. Finding solvents that can dissolve polymers easily, as well as having properties such as relatively low volatility and high flash point, can be difficult, even before additional factors such as sustainability and cost-effectiveness are considered.

An approach that works in some cases is to replace a solvent with another that still provides adequate functionality and cost-effectiveness. However, in other cases, the functionality provided by the solvent is indispensable, making this task impossible. Moreover, in light of the CSS, the fact that a solvent is currently unregulated is no guarantee that it will remain so in the future. Therefore, a better (and more innovative) approach is to completely 'design out' any solvents or other chemicals that may be problematic now or in the future.

That need for innovation in performance tapes is nicely demonstrated by two product classes developed at Avery Dennison – **UV acrylic adhesives** and **hot-melt adhesives**. These products are designed to eliminate solvents, as well as addressing other themes raised by the CSS, and are discussed in more detail below.





Performance tapes for automotive interiors from Avery Dennison

At Avery Dennison, as well as specific performance tapes for electric vehicle batteries, electronics, powertrain and exterior fixings, we are also deeply involved in helping customers with their vehicle interior trim challenges.

Our portfolio of bonding tapes for automotive interiors includes solutions that are applicable to this wide variety of surfaces and materials, including:

- Flock, felt and cable attachment tapes for eliminating 'buzz, squeak & rattle' (BSR)
- Foam and fiber bonding tapes
- Soft trim bonding & adhesive tapes
- Tapes for flooring systems (including functional materials).

Our online [OEM certification finder](#) provides guidance when deciding which tape to choose for a specific substrate, and in addition our application and technical service teams can provide detailed recommendations based on customer experience and our internal laboratory results.

Achieving the optimum balance of function and appearance for automotive interiors requires the use of easily-applied and unobtrusive performance tapes to ensure that materials stay in place – and at Avery Dennison we're ready to find the solution that addresses your specific needs.

UV acrylic adhesives for performance tapes

Nevertheless, conventional acrylic formulations require polymerizing the adhesive in a solvent, and then applying the solvent solution to the carrier film. This doesn't align well with CSS objectives, so an alternative that we have developed at Avery Dennison is a 'warm melt' formulation. This involves heating the adhesive to 130–140 °C (lower than for a conventional hotmelt) to make it liquid enough to be coated, rather than using solvent. Exposing the cooled adhesive to a UV source then results in a sufficient degree of crosslinking to enable it to function as a regular PSA. As a result, the whole process from base monomer to the final coated tape can be carried out without using solvents (or indeed water).

UV acrylic pressure-sensitive adhesives are ideal for automotive interior applications because parts can be quickly bonded. Bonds are also strong and durable, and the adhesives can be formulated for a diverse range of materials, including metals, glass and some plastics.

These modified UV acrylics have already been widely used for some automotive interior applications that demand very low VOC content. Seat heating mats are one example, which because they are heated in use, would give rise to high VOC levels if residual solvents were present. However, very similar adhesive formulations being developed at Avery Dennison are suitable for tapes used elsewhere in automotive interiors, for example to affix polyurethane foams or polyester fleeces.



Solvent-free UV acrylic adhesives are a potential solution to the challenge of finding solvents for adhesives that will not be affected by CSS, now or in the future.



Hotmelt rubber adhesives for performance tapes

Although UV acrylic adhesives are an excellent solution in many cases, they lack strong adherence to some plastic substrates. In such cases, a different solution is therefore needed – and hotmelt rubber adhesives are emerging as a strong candidate, following research at Avery Dennison.

Hotmelt rubbers are rather different chemically, being a rubber such as styrene-butadiene-styrene that is mixed with tackifiers and heated to about 160–190 °C for coating on the carrier tape. The result is a typical pressure-sensitive adhesive that provides instant, strong adhesion without the need for curing – but also without the need for solvents to be involved.

Hotmelt rubbers also provide a stronger bond to plastics within the temperature range that is relevant to automotive interiors, which is especially important because of the growth of the EV market and the trend for ‘lightweighting’ using plastic components in that sector.

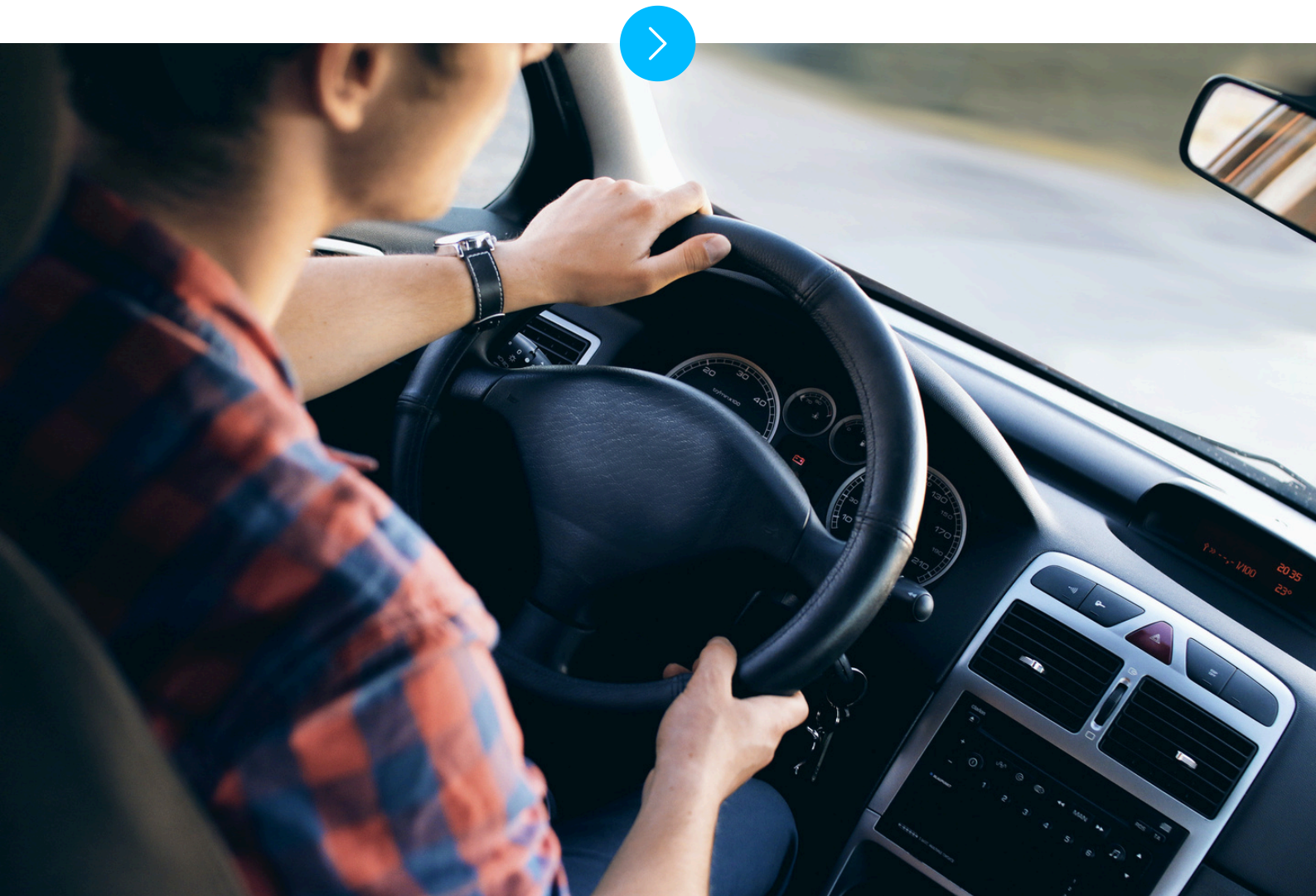
Hotmelt rubber adhesives are so-called because of the application of heat during the process of coating them on the carrier tape. Being inherently solvent-free, they are ready for the more stringent rules on volatile chemicals that will result from the CSS.

The wider sustainability picture

As referenced in the CSS, avoiding the use of solvents in the manufacture of products has another benefit, beyond that of human and environmental health – namely simplifying and streamlining end-of-life processing of materials, by eliminating the complication of accounting for the potential presence of solvents in the product. This is important because it can assist in the development of a circular economy, which is one of the stated aims of the CSS. Low-VOC performance tapes from Avery Dennison therefore align with that goal too, with the added advantage that using them makes it easier to deconstruct assemblies that otherwise might have used permanent fixings.

An additional benefit of the UV acrylic and hotmelt adhesives are that they involve less energy-intensive processes – for example, the absence of solvents or water in our UV acrylics means that there is no need to use long drying tunnels, which keeps down energy consumption. As a result, the final product has a lower overall carbon footprint compared to solvent-based adhesives. It's also important to look at the wider picture, and to align with the European Green Deal, of which the CSS forms a part, we have developed three 2030 sustainability goals, with actions including using recycled materials in our products, using more renewable energy, and diverting waste away from landfill, amongst others.

Our ESG efforts have been recognized by several organizations, and we have been rated highly for sustainability and ESG performance. The innovation that has taken place at Avery Dennison regarding our PSA tapes is therefore part of a bigger picture around sustainability. This is reflected in the focus on innovation mentioned in the CSS, which states that the transition to chemicals that are 'safe and sustainable by design' is "an opportunity for the EU chemical industry to regain competitiveness by further developing safe and sustainable chemicals and to bring sustainable solutions across sectors".



Conclusions

As highlighted in this white paper, the release of the CSS continues a previous trend for the reduction or elimination of chemicals that pose potential risks to human health or the environment. As a result, we can expect some solvents and chemicals typically used in adhesive tapes to be further restricted in the coming years, placing emphasis on finding alternative, 'future-proof' solutions for automotive interiors.

But more than that, the CSS has set in place a trajectory in chemicals use that also brings in a wider perspective of sustainability. As the CSS states, "overall sustainability should be ensured by minimizing the environmental footprint of chemicals in particular on climate change, resource use, ecosystems and biodiversity from a lifecycle perspective". This means that new regulations are likely to apply both to chemicals that are already 'on the radar', but also others that are currently not under consideration.

With the materials used in automotive interiors having been fine-tuned over decades for performance, appearance and cost-effectiveness, that shift will upend the status quo for materials selection and processing. It will also mark a change in what drives chemicals use in the sector. Previously, most of the impetus for restrictions on chemicals in automotive interiors came from customers and OEMs themselves, with regulators only addressing issues posed by the chemicals considered most harmful. The more overarching approach embodied by the CSS is likely to mean that regulators take a more prominent role in the automotive interior sector than they have done up to now.

As the CSS itself points out, all of this will require a renewed focus on innovation – especially in parts of the supply chain that in recent decades have dealt with a familiar portfolio of chemicals and materials. New materials, new sustainability targets, and new processing technologies will demand that tier suppliers can draw on the skills of formulation scientists and product specialists with an understanding of a wide range of materials, and an eye for devising tailored solutions to customer challenges.

That's certainly our thinking at Avery Dennison, we believe that in doing so, we will be able to align with the objectives of the CSS and the regulations that will stem from it over the coming years – helping our customers, society and the planet in equal measure.

If you would like to learn more about how performance tapes from Avery Dennison are helping our customers move towards the goals outlined in the CSS, then please contact us.

Please refer to Tapes. AveryDennison.com for complete terms and conditions, including warranty terms, relating to this product. You should periodically review the site as terms and conditions are subject to change without notice.

The information contained herein is believed to be reliable but Avery Dennison makes no representations concerning the accuracy or correctness of the data. This product, like any other, should be tested by the customer/user thoroughly using end user conditions to ensure the product meets the particular requirements. Independent results may vary.

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Europe 08/22, POD



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