



New Plastics Economy Global Commitment

Digimarc Activities and Progress 2021-2022

In February of 2019, Digimarc was proud to sign the New Plastics Economy Global Commitment of the Ellen MacArthur Foundation. The initiative aims to build a circular economy for plastics by bringing together key shareholders to rethink and redesign the future of plastics, starting with packaging. To date there are more than 500 signatories, which include the most noted brands, retailers and government entities. More information can be found [here](#).

A requirement for all participants is an annual reporting process of activities to demonstrate transparency in meeting their pledges. Driven by the goal of tackling plastic pollution at its source, companies representing 20% of all plastic packaging produced globally have committed to ambitious 2025 targets to eliminate the plastic items we don't need; innovate so all plastic we do need is designed to be safely reused, recycled, or composted; and circulate everything we use to keep it in the economy and out of the environment.

Digimarc's industry category is "Collection, Sorting, and Recycling." Our pledge for mid 2021-2022 reads:

"Support the plastics packaging industry through collaborative projects for development of harmonized technology to increase sorting accuracy, obtain higher yields of recyclates, and engage consumers to drive collections and increase feedstocks for recycling."

Among our activities and progress through July 2022:

Advancing our product digitization platform for recycling

In January 2022, Digimarc [completed the acquisition](#) of Product Cloud company EVERYTHING Ltd, based in London, UK. Combining our companies' technologies enables fully integrated solutions, from enabling more sustainable, more transparent, and more secure supply chains to empowering consumers to verify the authenticity of products and recyclability of its packaging. In addition to the proven plastics sorting benefits of digital watermarks, our combined product digitization platform allows direct-to-consumer communications to deliver recycling instructions or sustainability content, as well as powerful insights into recyclability in the real world. More information about how our platform supports improved sorting accuracy, higher yields of recyclates, and sustainability-focused consumer engagement can be found [here](#).



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Important results achieved as part of HolyGrail 2.0

Our technology continues to be at the center of the pan-industry [Digital Watermarks Initiative HolyGrail 2.0](#), driven by AIM – European Brands Association and powered by the Alliance to End Plastic Waste. Over 175 companies and organizations from the complete packaging value chain have joined forces with the ambitious goal to assess whether a pioneering digital technology can enable better sorting and higher-quality recycling rates for packaging in the EU, driving a truly circular economy.

In September 2021, a prototype detection sorting unit developed by Pellenc ST and Digimarc, which combines our digital watermarks technology and NIR/VIS infrared for sorting of packaging waste, was validated successfully. This successful prototype advanced to the semi-industrial test phase at the Amager Resource Center (ARC) in Copenhagen, Denmark. As part of this phase, around 125,000 pieces of packaging representing up to 260 different stockkeeping units (SKUs) provided by HolyGrail 2.0 member companies were coded with digital watermarks and trialed.

Three physical and two virtual Open Houses were held in October and November 2021 to showcase the semi-industrial test phase. Approximately 700 participants attended these Open Houses, which featured demonstrations of the machine prototype and the digital watermarks technology, as well as updates on developments and Q&A sessions.

In March 2022, [the results](#) from the semi-industrial testing phase of the Pellenc ST and Digimarc prototype were announced, with an average detection rate of 99%, ejection rate of 95%, and purity of 95%. In June 2022, HolyGrail 2.0 [announced](#) the successful semi-industrial validation of a second prototype developed by machine vendor Tomra and Digimarc, which achieved 99% detection, 96% ejection, and 93% purity rates, on average. With an average detection rate of 99%, achieved in two separate tests, results from the semi-industrial trials clearly demonstrate that Digimarc's technology performs exceptionally well across all tested categories of plastic packaging material in conditions representing routine industrial operations. Even in harsher conditions – with higher belt speed and severe soiling and crushing – Digimarc digital watermarks maintained the same level of high performance. As governments and industry groups move toward circular economies for recycling and reusing plastics in consumer packaging, there is a critical need for a means of accurate and reliable automatic identification to classify and sort various packaging materials during the recycling process that works at scale, even in the harshest of conditions.

Our work as part of the collaborative initiative continues to accelerate adoption of the technology validated by the HolyGrail 2.0 initiative in order to drive improved recycling outcomes.

Flexible packaging sorting pilot launched in Canada

In June 2022, The Circular Plastic Taskforce (CPT) announced a partnership with Digimarc to test Digimarc® Recycle for optimizing the sortation of flexible plastic packaging in Canada, a first in

North America. The initiative is an example of our collaborative efforts to improve sortation of post-consumer plastics at scale. The pilot aims to carry out or support projects to improve the recycling of all plastic packaging within the evolving Extended Producer Responsibility (EPR) landscape in Quebec and Canada.

The first part of the project consists of testing the ability of specialized optical sorters to adequately capture flexible packaging with digital watermarks in a controlled environment. This test will be performed at the Pellenc R&D Center in Pertuis, France. Following the results of this initial test, the second part of the project, which should begin in 2023, will aim at testing this solution in a real-life environment and at a much larger scale, with the goal of producing film bales meeting the high-quality specifications of recyclers.

Technical improvements in enhancing packaging with digital watermarks in 2D and 3D

We continue to make further improvements in our abilities to enhance plastic packaging with both 2D and 3D, attaining greater flexibility in terms of methods to add the watermark, achieving the appropriate balance between high reliability of detection and aesthetics.

Notable improvements in 2D watermarking include the development of several new techniques to enhance packaging with no ink, black ink, or only white ink, in collaboration with our partners. New enhancement options have also been developed to improve aesthetics and signal strength for transparent and metallic substrates.

We have successfully worked with various plastic manufacturers to enable direct enhancement of the plastic substrate with a watermark (i.e., 3D watermarks). Our advances in 3D watermarking cover thermoforming, extrusion blow molding, injection molding, and laser engraving. 3D capabilities are now proven across all key plastic manufacturing processes and resin types and provide high reliability of detection, ensuring high efficiency of sorting for packaging that may have no labels or with missing labels.

Knowledge sharing and amplification of recycling solutions

Throughout the year, Digimarc has been a vocal participant in conversations about recycling system improvements. We are eager to share our knowledge and experience in the field, and engage with stakeholders to drive progress at scale.

Our experts have spoken at many conferences and industry events on recycling sortation over the past year, including GreenBiz's Circularity 22, WasteExpo 22, and Petcore Europe.

We've hosted and contributed to webinars and events, such as Packaging Europe's "Watermarks for Plastics Recycling: Accelerate from Planning to Action" webinar in May 2022. The focus of this webinar was to provide actionable instructions for brands to improve the recyclability of their packaging, aiming to turn industry momentum into concrete action.

We have also shared important insights from our work on recycling sortation with stakeholders through various outlets, such as [guest columns](#) and [podcasts](#).

Continued collaboration through industry groups

Underpinning much of our engagement with stakeholders is our continued membership in the most important industry groups and associations. These include the Sustainable Packaging Coalition, Petcore Europe, and the Association of Plastics Recyclers, among others. Digimarc experts contribute actively to these groups by participating in events and serving on technical working groups.