

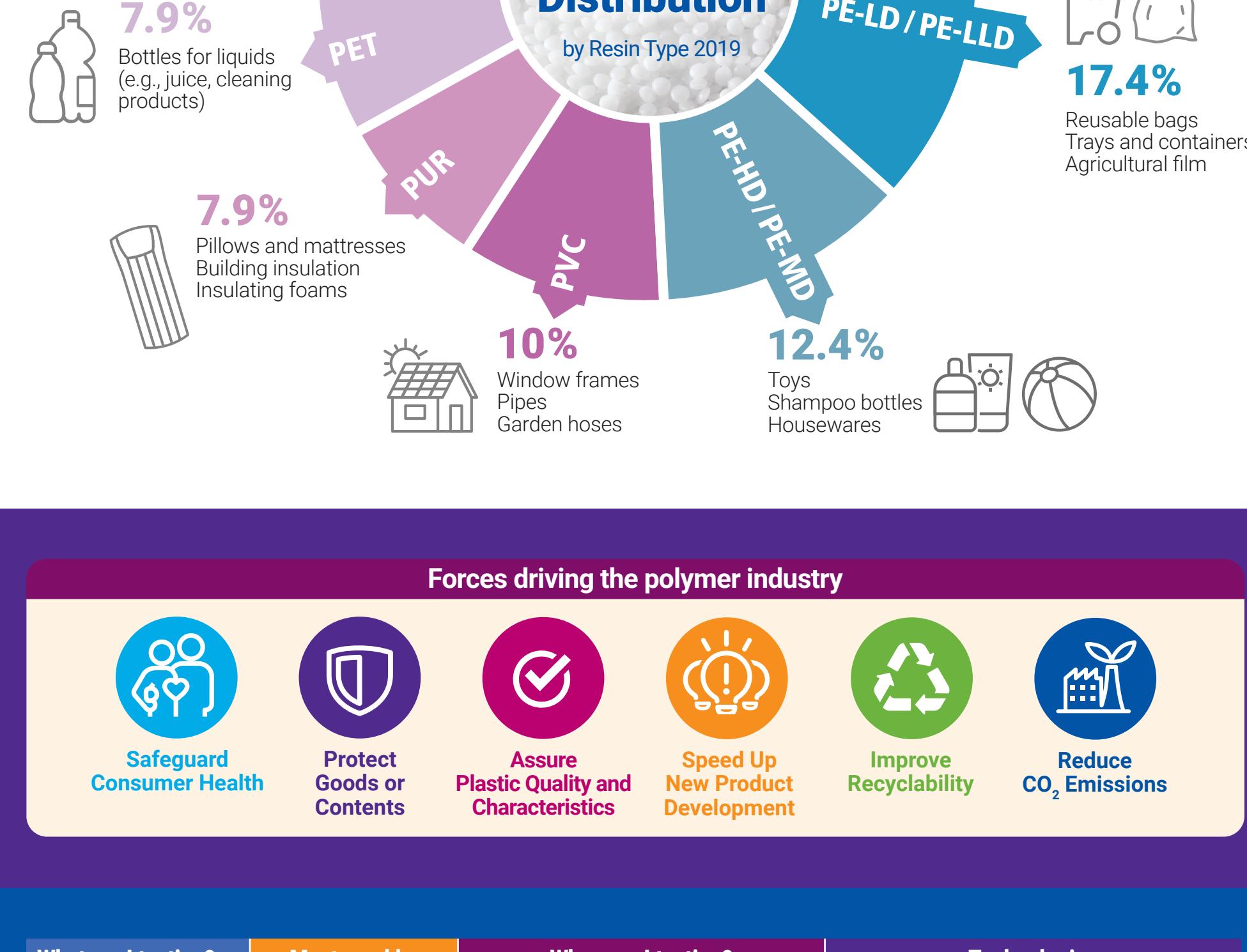
POLYMERS AND PLASTICS BUYERS GUIDE

TO MATERIALS LIFECYCLE TESTING



With the value of the global plastics market forecasted to reach \$838B by 2030, opportunities within the polymer lifecycle will also continue to grow. One contributing factor is that thermoplastic production is set to increase 30% by 2050 – reaching 520M metric tons per year. Another factor is, with a global recycling rates approaching 18%, recycled plastic is predicted to displace over 1.7M metric tons of virgin polymer feedstocks by 2030.

When it comes to selecting the best technology and instruments to use for your testing needs, many factors need to be considered, including scalability, easy-of-use, sensitivity, and automation. Each buyer's needs will vary, sometimes even within the same area. Use this guide to help you sort through the ins-and-outs to find the best technology for your needs.



Forces driving the polymer industry



What am I testing?	Most used by	When am I testing?	Technologies
Identification	• All	• On arrival • During recycling sorting process	• FT-IR, IR microscopy • DSC
Mechanical and thermal attributes	• Compounder • Converter	• Throughout research and development • Final product and packaging	• DSC, DMA, TMA, TGA
Impurity Testing	• Raw material supplier	• End of raw materials production	• FT-IR • ICP-OES, ICP-MS
Residual monomers and contaminants	• Resin producer • Compounder • Recycler	• Pre-shipping • On arrival • Production checkpoints • End of the recycling process	• IR Microscopy • GC, GC/MS • ICP-OES, ICP-MS
Crystal orientation	• Compounder	• End of manufacture • Pre-shipping	• FT-IR
Toxins	• Converter • Recycler	• Final product and packaging	• GC, GC/MS, HPLC, LC/MS • ICP-OES, ICP-MS
Leachates and volatile emissions	• Converter	• Final product and packaging	• FT-IR, IR Microscopy • GC, Headspace, GC/MS, HPLC, LC-MS/MS • ICP-OES, ICP-MS • Hyphenation TG-IR, TG-GC/MS, TG-IR-GC/MS
Failure analysis and reverse engineering a material	• Compounder	• Throughout research and development	• FT-IR, IR microscopy • GC, LC • DSC, DMA, TMA, TGA • ICP-OES, ICP-MS • Hyphenation TG-IR, TG-GC/MS, TG-IR-GC/MS

LEGEND

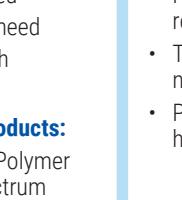
ICP: Inductively coupled plasma
OES: Optical emission spectrometry
MS: Mass spectrometry
DMA: Dynamic mechanical analysis

TMA: Thermomechanical analysis
TGA: Thermogravimetry analysis
FT-IR: Fourier-transform infrared spectroscopy

GC: Gas chromatography
DSC: Differential scanning calorimetry
HPLC: High-performance liquid chromatography

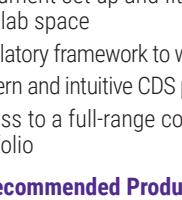
LC: Liquid chromatography
AA: Atomic absorption
IR: Infrared

As your technology shortlist comes together, be sure to keep these field-specific considerations in mind



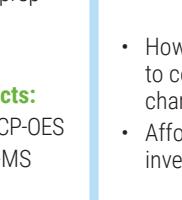
R&D

Look for qualities that allow for greater innovation and/or uniqueness to give you an edge in your field, including performance; scalability; ability to hyphenate; sensitivity and resolution; experience of supplier.



Quality

You'll want to consider ease-of-use; robustness; automation; compliance conformity (ASTM, ISO); size and portability; and if there is a common software platform available across all technologies.



Safety

Same considerations as quality but be sure to give high priority to the sensitivity and resolution capabilities of your chosen instruments.

Now you are ready to compare analytical technologies



Spectroscopy and Microscopy

FT-IR, FT-NIR, IR Microscopy and Imaging, UV-Vis, UV-VIS NIR



Thermal and Mechanical Analysis

DSC, TGA, STA, DMA, TMA



Chromatography

GC, GC/MS, Headspace, Thermodesorption, HPLC, LC-MS/MS



Elemental Analysis

Atomic Spectroscopy, ICP-OES, ICP-MS



Hyphenation

TG-IR, TG-MS, TG-GC/MS, TG-IR-GC/MS

Global market value forecast figures – sourced from Prescient & Strategic Intelligence report January 2021 www.psmarketresearch.com/market-analysis/polymer-market

Thermoplastic production statistics – sourced from Statista June 2021 www.statista.com/statistics/1192886/thermoplastics-production-volume-by-type-globally/

Recycling and displacement data – sourced from S&P Global Platts Insights March 2021 www.spglobal.com/platts/en/market-insights/blogs/petrochemicals/031121-recycled-plastics-global-market-commoditization-standards-pricing, and OECD 2018 Policy Report#12 pg10 www.oecd.org/environment/waste/policy-highlights/improving-plastics-management.pdf

Distribution chart by resin type – sourced from PlasticsEurope Market Research Group (PEMRG) and Conversio Market & Strategy GmbH

Developed in collaboration with PerkinElmer White Paper: Criteria for Analytical Technologies that Meet Polymer Manufacture and Recycling Testing Needs. Download for complete content and insights