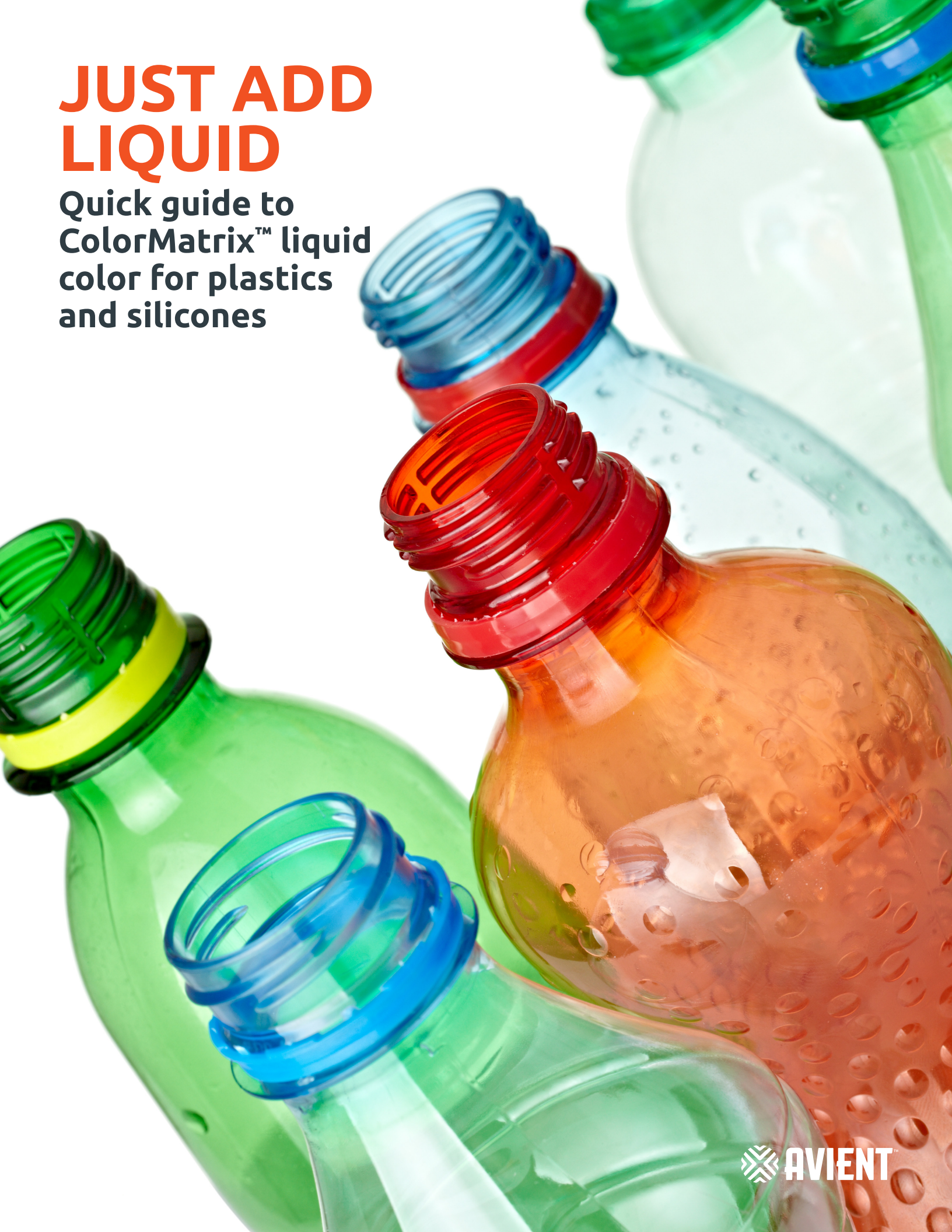


JUST ADD LIQUID

Quick guide to ColorMatrix™ liquid color for plastics and silicones



THE RIGHT COLORANT FOR YOU

Understanding which colorant technology best suits your particular product application will help ensure you gain maximum performance and value from your colorant processing.

Avient is able to service customers globally with a full range of solid masterbatch and liquid colorant solutions to meet your product requirements.

This 'quick guide' focuses specifically on ColorMatrix™ liquid colorant systems, providing a practical overview of factors to consider when selecting a colorant solution.

Whether you are using color for functional or aesthetic purposes, careful consideration of each of the following points will prove valuable in your color selection and implementation:

- Is your color formulation and polymer fully compatible and optimized for your production process?
- How efficiently can you specify, trial and implement a new color?
- How stable, consistent and repeatable is your color processing?
- How quickly can you change colors during processing?
- What level of technical support do you receive from your colorant supplier?
- Does your colorant meet all the regulatory requirements of your intended market?





LIQUID COLOR VERSATILITY

Liquid colorant systems are increasingly used throughout the world in an expanding range of polymers and product applications.

POLYMERS

- PET
- Polyolefins
- PVC

PROCESSES

- Injection Stretch Blow Molding (ISBM)
- Injection molding
- Extrusion Blow Molding (EBM)
- Extrusion Sheet, Fiber, Film

COLOR TYPES*

- Tints
- Transluents
- Opaques
- Special effects
- Additive additions (functional colors)

Specialized liquid color dispersions for Silicones are also available. More information can be found at avient.com.

*available from Avient

THE MAGIC OF LIQUID COLOR

Liquid color is a uniform dispersion of color pigment or dye into a liquid carrier material. Typically additional products such as surfactants are also added to help stabilize the color formulation.

However, not all liquid colorants are the same! To ensure you have a formulation that will perform to its maximum effect, your liquid colorant should:

- maintain consistent particulate dispersion and remain fully stable during storage, dispensing and processing
- be engineered to be fully compatible with your particular polymer and production process set-up
- be fully supported with dispensing equipment and expert technical services

Avient ColorMatrix has pioneered the development of liquid color dispersions since the 1970s and is now considered the leading global innovator and supplier of liquid colorants for thermoplastic and silicone applications.



HOW LIQUID HELPS

Expertly formulated liquid color systems can deliver significant benefits and greater long-term value in use than alternative colorant systems for an ever expanding range of product applications and production processes.

Main advantages of liquid color systems include:

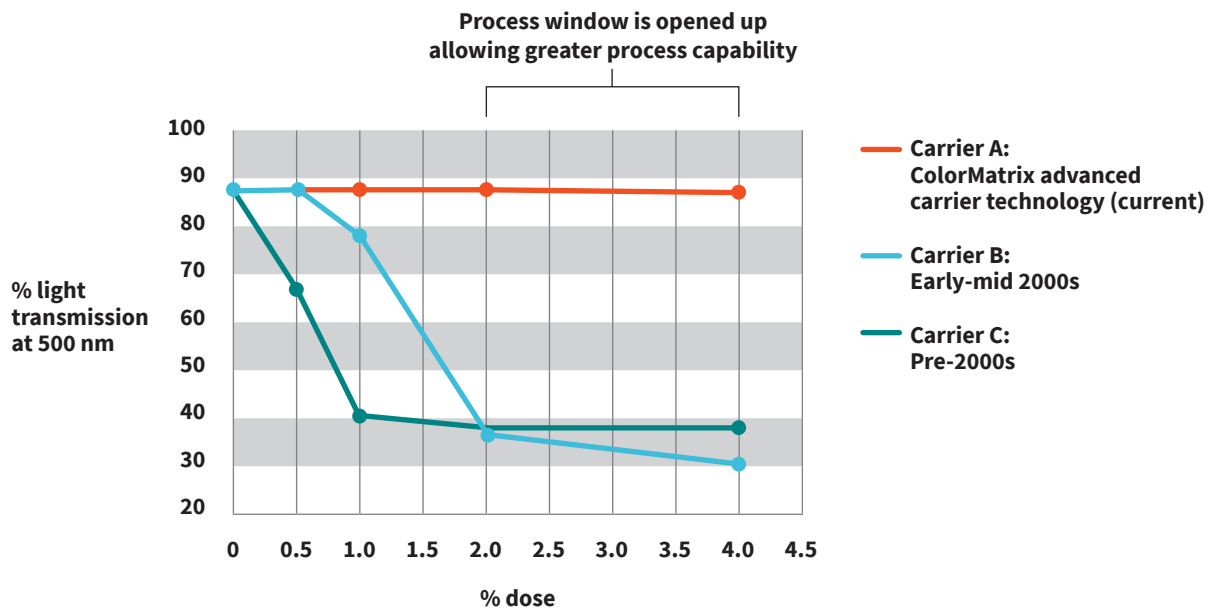
- Excellent statistical distribution for consistently high quality products
- Shot-to-shot and batch-to-batch consistency
- Single heat history
- Minimal wastage due to high level dosing accuracy and product recovery rates
- Highly concentrated formulations with capability of very low addition rates
- Reduced inventory and storage requirements



INTELLIGENT FORMULATION

In addition, advances in liquid carrier vehicle systems mean that today liquid colorants can be highly engineered to ensure compatibility with an increasing range of polymer types. Importantly these advances also now allow color to be combined with additional functional additives without impacting process stability.

POLYMER/CARRIER COMPATIBILITY IN PET



CHARACTERISTICS OF HIGH PERFORMANCE STABLE LIQUID FORMULATIONS

Under storage

- Remains stable
- Solid-like at low shear
- No sedimentation

During dosing

- Exceeds yield stress
- Liquid-like behavior
- Flows easily

After dispensing

- Self-levelling
- Rebuilds its structure



EXPAND YOUR COLOR SPECTRUM

INSPIRATION AND INSIGHT

When developing a brand new color, consulting with your color provider early in the decision process can prove invaluable in gaining insight into which formulation will be most effective and can open up new ideas and opportunities for new colors, color effects, polymer options or finishes that you may not be familiar with.

When it comes to the creative application of color

and special effects in product design and branding, Avient's ColorWorks™ centers are a source of ideas, inspiration and technical guidance. At four global ColorWorks centers, teams of experts work to establish high-impact color concepts at the earliest stages of product development to help you heighten shelf impact, differentiate brands, control costs and time-to-market, and manage color across multiple resins all around the world.

ColorWorks®
DESIGN & TECHNOLOGY



SELECT-ACCELERATED DESIGN DEVELOPMENT

Selecting and approving new colors for full-scale production can prove a lengthy process particularly if regulatory approval and exacting color specifications are an important factor.

Streamlining this process and being able to react quickly and cost-effectively to market dynamics can give that all-important competitive edge.

The Avient ColorMatrix Select online color management system can help reduce development time from weeks down to days.

For product manufacturers ColorMatrix Select provides:

- Instant on-line development of approved colors with full visibility of multiple formulation and pricing options
- On-demand product delivery with virtually no minimal order value or quantity requirement
- Lean color management

For brand owners managing colors across multiple products, supplier sites and geographic locations, color management can be challenging and costly.

ColorMatrix Select provides:

- Assurance of color consistency
- More efficient color portfolio management

EASY COLOR DOSING

An advanced liquid formulation can provide an excellent, well dispersed and homogenized mix that will enhance the visual and technical characteristics of a finished product. However, if dosing is inconsistent or inaccurate these benefits can be lost.

Avient's proprietary metering systems are designed specifically to complement its liquid formulations. By controlling the quality and technical capabilities of these systems, dosing consistency and accuracy is fully optimized. This delivers enhanced efficiency performance and significant reductions in waste due to inconsistent overdosing.

Some key questions to consider when implementing liquid color:

- Is your colorant addition negatively impacting or enhancing your process efficiency?
- Is your dosing accuracy and product recovery optimized?
- How quickly can you implement color changes?
- How consistent is your color over long production runs?
- How clean is your color processing?
- How much wastage do you have to account for?

Avient's range of ColorMatrix FlexCart™ dosing systems are ergonomically designed for easy, flexible use whatever your production environment. Product packaging is recyclable with recovery rates of up to 99%.



HELPING YOU WITH LIQUID COLOR

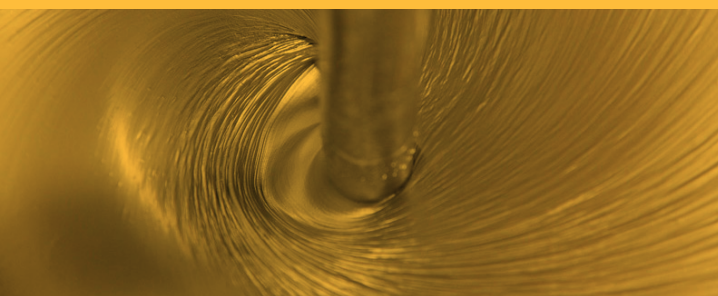
There are many important technical factors to consider when implementing new technologies into new or existing injection molding and extrusion processes. Just some of these factors include:

- Tool design
- Machine type
- Dryer requirements
- Cooling capacities
- Raw material selection

Understanding how to process all these combined variables to produce consistently high quality parts is core to ColorMatrix's Full Service Package approach and in helping our customers to meet their business goals.

Our industry leading team of Technical Service Engineers are highly experienced process specialists dedicated to providing local on-site support for Avient customers around the globe. Support services include:

- New product trial support
- On-site product and equipment training programs
- Issue troubleshooting
- Best practice production process and maintenance reviews
- Equipment selection guidance
- Process reporting
- Inventory management support
- Equipment housekeeping



COLOR COMPLIANCE

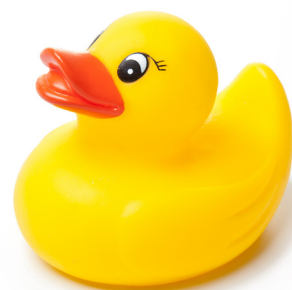
REGULATORY ADVICE AND DOCUMENTATION

There are extensive requirements governing polymer based products, from chemical legislation imposing requirements on the manufacture, marketing and use of the initial raw materials to compositional and good manufacturing practice requirements for the finished materials.

Ensuring regulatory compliance for products such as food contact, toys or medical applications can be a complex and time consuming process. Choosing a supplier that understands these requirements will reduce business risk and give the assurance of knowing that your products are fully compliant.

Avient closely monitors all relevant legal developments and provides a comprehensive regulatory advice and documentation service to support its portfolio of colorant, additive and equipment technologies. It also invests in both internal and external analytical services to investigate impurity profiles of materials used to ensure absence of undesirable compounds. Such testing often goes beyond what is required by the legislation.

An expert regulatory team is on hand to assist with your compliance needs, whatever your application at avient.com.



COLOR SUSTAINABILITY



Reducing carbon footprint in the way that a colorant is formulated and processed has become an increasing priority for plastics processors. Liquid colorants are helping to minimize the environmental impact of coloring in a number of ways:

- Liquid carrier systems are typically made largely from natural oil-based renewable sources
- Liquid systems can be dosed with the highest degree of accuracy and control, minimizing wastage through overdosing
- ColorMatrix's latest PLANETPAK™ delivery packs have a fully recyclable outer and are engineered to enable 99% product recovery allowing further efficiencies to be made
- The concentrated nature of liquid colorant systems mean that inventory requirements are inherently very low. Manufacturers operating lean manufacturing systems can also benefit by driving down inventory requirements even further
- Avient's advanced liquid systems can be run at lower temperatures whilst maintaining stability allowing important energy cost and carbon footprint savings to be made

LIQUID COLOR SERVICE PACKAGE

Avient is dedicated to supporting its customers with a full package of support services to ensure optimum value from our advanced colorant and additive technologies.

Rapid color development

Accelerated color match, development and delivery for rapid market access.

Dosing systems

Proprietary dosing systems designed specifically for optimized metering of Avient advanced ColorMatrix liquid technologies.

Regulatory advice and support services

A team of experts in global regulatory compliance can advise and provide required supporting documentation.

Process reporting

Advice and direction on where production efficiencies can be achieved through applying Avient technologies.

Technical Support Services

A team of technical service engineers are located globally to provide full training and manufacturing support.



Colorant and additive technologies



Rapid color development



Custom dosing systems



Regulatory advice and documentation



Process reporting



Full on-site technical support

COLOR IS GLOBAL

At Avient we think a lot about plastics: how to make them process better, perform better, look better and be kinder to the planet. With a passion for innovation and more than 40 years' experience, this advanced thinking in specialist polymer additives and liquid colorants is now helping our expanding network of customers around the globe to prosper and grow.

Avient delivers globally consistent formulations to its customers around the world. To find your nearest ColorMatrix facility, go to **avient.com**.

Avient liquid color and additives in combination with state-of-the-art dosing equipment deliver extremely high dosing accuracy, reduced material usage and product recovery rates of 99+%. These can be considered as Avient sustainable solutions. To learn more, visit the Sustainability page on **avient.com**.





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