EPSON Archival™ Inks are used in the professional "P"-series EPSON Stylus Photo printers and in select models of the professional graphics EPSON Stylus Pro models. This technical brief will provide detailed information on the following topics:

- EPSON Archival Ink Technology
- Comparison of different types of ink
  - EPSON MicroCrystal Encapsulation Technology

## EPSON Archival Ink Technology—Comparison of different types of ink

EPSON Archival Ink Technology uses pigment inks, but includes a breakthrough technology that combines the advantages of conventional pigment inks with the advantages of dye inks. The key differences between the types of inks are:

<table>
<thead>
<tr>
<th>Key Differences</th>
<th>EPSON Archival Inks</th>
<th>Conventional Pigment Inks</th>
<th>Dye Inks</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Typical use</strong></td>
<td>Photography (Fine Art and Print for Pay) and wide format ink jet printer market where archival printing and Photo Quality output is required</td>
<td>Wide format ink jet printer market for outdoor signage; NOT optimal for photography</td>
<td>Standard with desktop ink jet printers; photography, presentations, artwork, etc.</td>
</tr>
<tr>
<td><strong>Lightfastness</strong></td>
<td>High lightfastness, over 100 years</td>
<td>High lightfastness, over 100 years</td>
<td>Poor to excellent lightfastness</td>
</tr>
<tr>
<td><strong>Short-Term Stability</strong></td>
<td>Highly stable, with nominal short-term color shifting</td>
<td>Highly stable, with nominal short-term color shifting</td>
<td>Good stability, with minimal short-term color shifting</td>
</tr>
<tr>
<td><strong>Waterfastness</strong></td>
<td>Extremely waterfast</td>
<td>Very waterfast</td>
<td>Waterfast on many specialty papers (not plain paper)</td>
</tr>
<tr>
<td><strong>Color Gamut and Gloss</strong></td>
<td>Superb color gamut and gloss due to even reflection of inks when using EPSON RC (Resin Coated) media</td>
<td>Lowest color gamut and dull (no gloss) prints due to uneven reflection and high scattering</td>
<td>Superb color gamut and gloss due to even reflection of inks from the paper</td>
</tr>
<tr>
<td><strong>Durability</strong></td>
<td>Good durability because pigments are coated with resin and are fixed on specialty media</td>
<td>Susceptible to scratching because pigment particles sit on top of the paper</td>
<td>Extremely durable, since inks are absorbed into the paper</td>
</tr>
<tr>
<td><strong>Media choices</strong></td>
<td>Wide media selection: matte, watercolor, and RC photo type papers</td>
<td>Limited media selection: limited to signage media only</td>
<td>Greatest media selection: plain, matte, and RC photo and high gloss paper types</td>
</tr>
</tbody>
</table>

As the chart indicates, the EPSON Archival Inks combine the lightfastness, short-term stability, and waterfastness advantages of conventional pigment inks with the color gamut, durability, and wide media selection advantages of dye inks.

¹ Lightfastness ratings over 100 years before noticeable fading occurs, under a glass frame in normal indoor fluorescent lighting conditions, when using Epson Archival Inks and Epson Fine Art Papers. Lightfastness ratings based on accelerated testing of prints on EPSON special media, displayed indoors, under glass. Actual print stability will vary according to image, display conditions, light intensity, humidity, and atmospheric conditions. Epson does not guarantee longevity of prints. Ratings do not estimate the durability of the paper itself. For maximum print life, display all prints under glass or laminations or properly store them.

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EPSON Archival Ink Technology—EPSON MicroCrystal Encapsulation Technology

EPSON MicroCrystal Encapsulation Technology is a breakthrough technology that overcomes many of the shortcomings of pigment inks, while maintaining the lightfast, waterfast, and stability advantages.

With this exclusive, patented technology, each pigment crystal is encapsulated in resin:

- EPSON uses a unique resin polymer which pulls the particles apart so that they are suspended in the solution and never coagulate.
- Because of this unique mixing method, each pigment particle is completely encapsulated.

This technology offers the following advantages:

1. **Greater color gamut**: Because each pigment particle is completely encapsulated in the resin, EPSON's pigments are evenly distributed. With conventional pigment inks, the covering/coating of the pigments is random and less consistent, which results in uneven distribution.

   Because EPSON resin-coated pigments are evenly distributed, they produce a higher color gamut that even rivals that of dye-based inks. For this reason, EPSON inks can print on RC glossy media, while conventional pigments inks cannot because of their erratic distribution and placement on the paper.

   EPSON’s MicroCrystal Encapsulation Technology:
   - Even distribution of particles results in higher color gamut and higher gloss for a smooth image appearance

   Conventional Pigment Inks:
   - Pigments either penetrate into the crevices of the media or lay on the surface (much like oil paint on a canvas)
   - Uneven distribution results in lower color gamut

   Dye based ink, on the other hand, is absorbed into the media, and the even reflection of light results in a greater color gamut and gloss as the eye perceives the full spectrum of colors (much like a watercolor painting).

   Dye-Based Ink:
   - Color molecules are absorbed into the media for even reflection

   ![Appropriate light reflection](image)
2. **Greater durability:** With EPSON MicroCrystal Encapsulation Technology, the resin pulls the pigment into the crevices of the media. Because the pigments reside in the crevices of the media, prints are more scratch-resistant.

**EPSON's MicroCrystal Encapsulation Technology:**
- Pigments are fixed on specialty media by the polymerizing resin and are more durable and scratch-resistant

**Conventional Pigment Inks:**
- Pigments lay on top of the media and are easily scratched

![Image of MicroCrystal Encapsulation Technology](image1)

Stability of Pigment Inks and Dye Inks: Pigment inks provide higher short-term stability because they have much faster setting time than dye-based inks, which results in a lesser color shift.

![Graph: Short-Term Color Shift](image2)

A rating less than 3% delta is only noticeable to the trained eye. A rating less than 2% delta is unnoticeable to the human eye.

3. **Unprecedented gloss for RC (Resin Coated) Photographic Prints:** EPSON RC media is specially designed to provide the highest gloss with the EPSON Archival Inks.

**Un-Optimized Media:**
- If third-party fine art papers are used, pigments will penetrate the media, but may go too far into the crevices, resulting in lower gloss

**Optimized Media:**
- EPSON RC media allows the pigment particles to penetrate the paper but keeps them close to the surface for the highest gloss

![Graph: Media Cross-Section](image3)

Additionally, third-party fine art papers are not recommended for use because they may damage the printers with excessive dust. EPSON offers a variety of media compatible with the Archival Inks.
4. **Better lightfastness:** EPSON Archival Inks have a higher lightfastness rating than conventional pigment inks.

**EPSON's MicroCrystal Encapsulation Technology:**
- An extremely light-resistant material protects the pigment particles and minimizes light damage.

**Conventional Pigment Inks:**
- Because pigments exist in a solid particle state, they have good lightfastness, however, over time the outer color fades, leaving color only in the interior portion of the particle.

Lightfastness of the EPSON Archival Inks is rated over 100 years before noticeable fading occurs, under normal indoor fluorescent lighting conditions, in a glass frame, when using Epson Archival Inks and Epson Fine Art Papers.¹

### Summary

EPSON Archival Ink offers the following benefits:
- Longest life—lightfastness up to 200 years
- High degree of stability after printing
- Widest color gamut of any pigment ink
- Strongest durability
- Highest gloss that allows the widest media selection, including matte, watercolor, and RC photo type papers—other pigment inks can only be used with matte papers.

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