

Xerox Technology

EA (Emulsion Aggregation) Toner

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January 2003

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EA Toner White Paper

Background Information

Technology advances sometimes come in unexpected places. To most of us, the black powder we have been adding to copiers and printers for the last sixty years doesn't seem to have changed very much. It certainly looks the same. But looks can be deceiving. As a result of sixty years of research and thousands of patents, today's toners flow better, store better, fuse better, and develop more efficiently, resulting in cleaner, better looking prints. But under the surface, other technological advances in toner design have also enabled better, less expensive, and safer photoreceptor and fuser materials not to mention faster and cleaner operating machines. The newest advancement in toner technology is EA toner.

What is EA Toner?

EA Toner is chemical toner prepared by Emulsion Aggregation, or a chemical process used to "grow" very small, uniform particle sizes from even smaller (sub-micron) size toner components. The EA process can deliver the desired size and narrow particle size distribution required for excellent color image quality. This small size and the relative uniformity of all the particles in a particular "batch" of EA toner is more predictable than the conventional mechanical process of pulverizing extruded plastic for toner. It is also less energy intensive. Emulsion refers to the synthetic chemical process to form latex toner resin and aggregation means to bring the toner ingredient's particles together to form the desired particle size and spherical shape.

How is it different from other toners?

The conventional toner manufacturing process, consists of starting with just the right plastic, melt mixing in pigment and special ingredients, and pulverizing the resulting block of composite plastic to a fine powder. Finally, the powder still has to be processed to remove oversized chunks and ultra fine particles. This multi-step process results in non-uniform angular particles with a somewhat wide size and shape distribution. As amazing as the resulting toners were, to step up to the challenges that each new generation of xerography required, the manufacturing process still limited engineers in creating toner with all the capabilities they wanted.

Some desirable additives and pigment just would not withstand the melt mix step. Others would not distribute evenly to give each toner particle the right amount of added ingredients. Some formulas resulted in particles that wouldn't flow. Lower melting plastics, which were desirable to produce toners that fused at lower temperatures, just wouldn't pulverize efficiently. And waxes, that would have allowed oil-less fusers, disrupted the process at the melt mix stage. There were just some things that couldn't be done by the conventional process. That's why the newer xerographic engines are optimized using EA toner resulting in significant benefits for customers.

Top three customer benefits:

1. Sharper image quality and improved fine lines and text
2. Higher reliability/lower service costs
3. Faster warm-up time — Always ready



Sharper Image quality

What is it about EA Toner that contributes to these benefits?

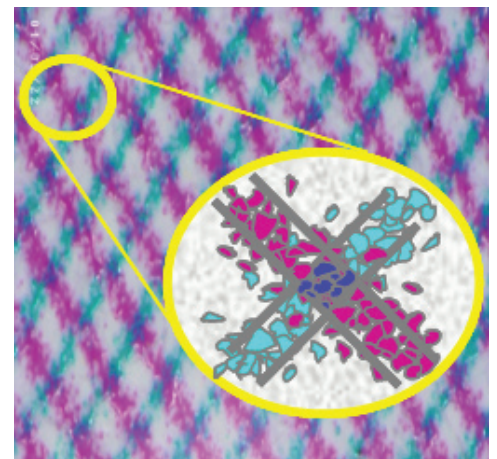
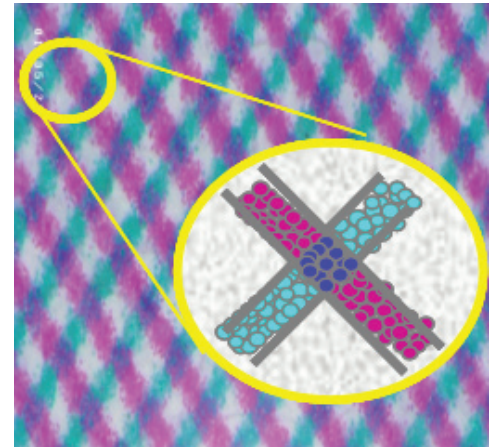
EA toner is grown rather than ground to a very small and consistent particles. Sharp fine lines and text are the result of these small, uniform size and shape toners.

In developing EA toner, Xerox scientists went all the way back to the beginning. Instead of starting with plastic from the manufacturer, they fabricated the plastic in the form of very small particles much smaller than the size of toner. The technology used to create water-based latex paints was used to make emulsion of these extremely fine plastic particles. Other toner ingredients such as wax and pigment charging agents are also prepared in the form of fine particles dispersed in water. All these ingredients are then brought together in the “aggregation” step to form toner. In EA toner, Xerox is bringing to the market a revolutionary new toner manufacturing process. This emulsion process, coupled with a controlled aggregation process, yields the exact toner size required.

With the advent of this new manufacturing process, toner ingredients no longer have to be limited to materials that will withstand the pulverization step. The desired particle sizes can be controlled scientifically and created in higher yield than they could by the conventional pulverization process.

EA toner also eliminates the need for fuser oil. This allows for a more professional, offset appearance and allows for easy “writability” on the page. Post-it™ notes actually stick better as well.

With smaller toner particles, copies and prints can be created using less toner on the paper and finer lines yielding a higher quality appearance. With control over the toner particle shapes during the aggregation step, toners can be manufactured that transfer to the paper more efficiently, resulting in less waste toner to discard.



EA Toner
Precise reproduction due to uniform toner size and shape.

Higher reliability / lower service costs

The latex toner resins in EA melt at a lower temperature than other toners.

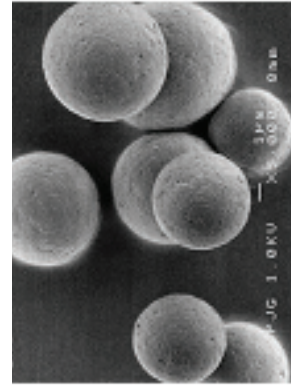
There are two major factors that contribute to lower melt temperatures for EA toner:

1. Thinner layer of toner on the paper enabled by smaller particle size
2. The core/shell structure of the particle
 - shell melts faster to adhere to the paper better while the core of the particle is left on the image surface providing easy release from the fuser

Oil-less fusing also contributes to higher reliability and improved print quality. Where there is no oil to attract wayward toner particles, you don't have toner collecting in the fuser component. This eliminates oil streaks and non-uniform fusing fix which would cause a service call to correct the print quality defect. The 2° C lower setpoint also drives down the fuser costs and the need to replace the fuser as often. This also contributes to lower energy consumption in the office leading to lower energy costs.

Faster Warm-Up Time — Always ready

There is nothing more frustrating than walking up to a printer after sending a mission critical document and seeing the “Please wait while machine warms up” message. With EA toner and the new Xerox xerographic engines they are optimized with, the machine is always “At your service.” This is because of the thinner, more lightweight fuser which allows the heat from the internal lamp to reach the heat roll surface very quickly (almost instantaneously). The fact that EA toner has a low melt point and can work with a wide range of temperatures (cold to hot offset) makes this less complicated fuser design feasible.



Particle Comparison

