

Contributing to the Realization of a Sustainable Society
by Reducing the Environmental Impact of Offices

Polymerized Toner —an Innovative Choice

Toner is used to print text and image on copiers, Multi-functional peripherals (MFPs), and printers. Polymerized toner is a path-breaking toner product that offers both enhanced printing quality and high environmental performance. Konica Minolta actively promotes the use of polymerized toner, which can make a difference in saving energy and conserving resources in the office environment.

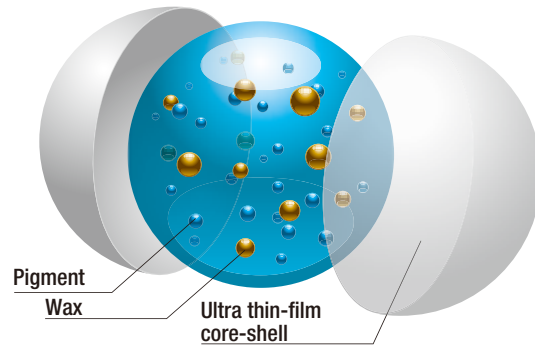
Polymerized toner

A Next-Generation, High-Performance Toner Created through Chemical Reaction

Polymerized toner is a high-performance toner produced by chemically combining a resin with color pigment particles. Unlike conventional pulverized toner, which is made by crushing lumps of plastic into small particles, the polymerized method enables precise control of the structure of each toner particle. This, in turn, makes it possible to tailor the size and shape of each particle and impart various properties to it.

The polymerized toner developed by Konica Minolta achieves a print product that exhibits a high-quality image while reducing environmental impact. The Group is continually working to upgrade its polymerized toner to realize an ever higher quality product.

Core-shell Configuration of Konica Minolta's Polymerized Toner
(The diagram represents Simitri HD+^{*1} toner)



^{*1} Simitri is the trademark for Konica Minolta polymerized toner. The term "Simitri" was coined from the word symmetry.



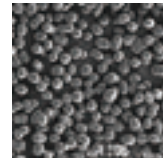
Polymerized Toner Saves Energy and Conserves Resources When in Use

When printing images using MFPs and printers, the process of fusing the toner with heat and fixing it to paper consumes the most electricity. The small and uniform polymerized toner particles conduct heat more efficiently than pulverized toner particles, and their low fusing point also means that less electricity is consumed during the fusing process.

In an effort to achieve greater power savings through the performance of low-temperature fusing, Konica Minolta developed a new type of polymerized toner, Simitri HD toner. This product features a core-shell configuration [▶P13](#) comprised of a thin outer layer of hard resin wrapped around a soft core of inner resin, to enable fusing at a lower temperature while also offering the thermostability required for high-speed printing. With such characteristics, polymerized toner has been adopted and used in many of Konica Minolta MFPs and printers.

The small size of polymerized toner particles also helps reduce the amount of toner consumed when printing the

image. Thus Konica Minolta's polymerized toner products not only save energy, but also conserve resources.

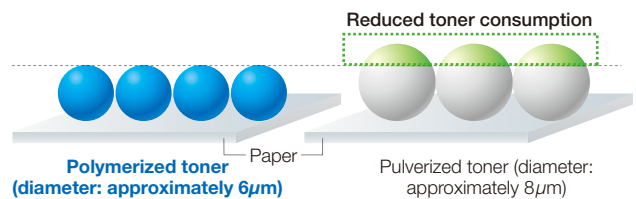


Polymerized toner



Pulverized toner

Illustration of How Smaller Particles Can Reduce Toner Consumption



Spotlight 1 The History of Konica Minolta's Development and Application of Polymerized Toner

Nearly every model, whether monochrome or color, uses polymerized toner

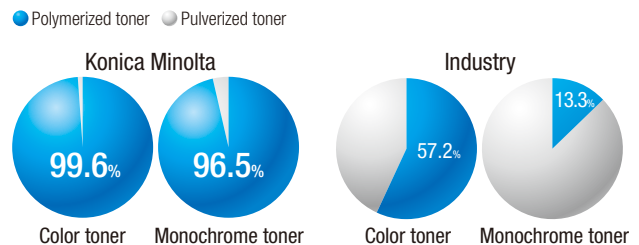
Early on, Konica Minolta focused on the potential of toner made through chemical reaction that could enable high-quality printing and save energy, and thus began research and development of an emulsion polymerization method*2. The Group began to manufacture its original polymerized toner, Simitri toner, in December 2000, and became the first in the world to introduce polymerized toner for use in a monochrome MFP.

Konica Minolta has always led the way in the advancement of polymerized toners. In 2006 the Group began manufacturing its second-generation polymerized toner, Simitri HD toner, which improved performance in low-temperature fusing; and in 2010, it released Simitri HD+ toner, which represents a further advance in toner technology.

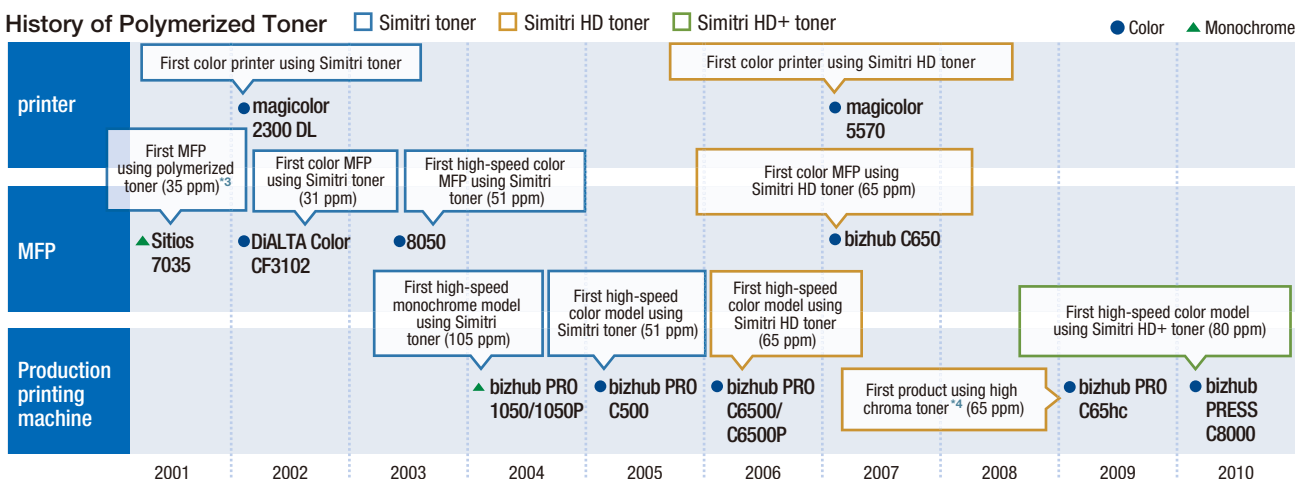
Capitalizing on its development capabilities, Konica Minolta has adopted polymerized toner in nearly all Konica Minolta printing products, from entry-level models to high-speed production printing machines, whether monochrome or color. Today, 99.6% of Konica Minolta's color toners and 96.5% of its monochrome toners are polymerized—the highest rates in the industry.

*2 Emulsion polymerization method: A method of chemically combining a resin base, a color pigment and wax by dispersing them in an aqueous surfactant solution.

Adoption of Polymerized Toner (2009)



Source: The estimated toner production for 2009 from the 2009 Toner Market Directory by Data Supply Inc.



³ Paper per minute. All print speeds are for monochrome, letter or A4 landscape format continuous print.

⁴ A toner that extends the range of color reproduction by redesigning the granular structure of the color pigment. Produces broad chromatic spectrum and clarity.

2 Polymerized toner—an innovative choice

Reducing Petroleum Resource Usage by Adopting Plant-based Biomass Material

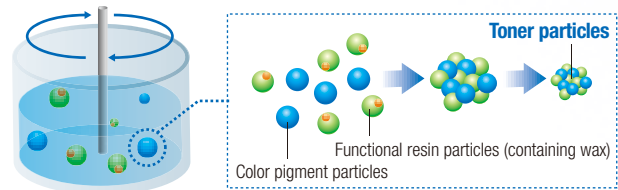
Since first manufacturing polymerized toner in 2000, roughly 9% of the raw material used to make Konica Minolta toners has been plant-based biomass.*1

Konica Minolta polymerized toner contains wax dispersed evenly during manufacturing, thereby realizing oil-free fixing*2 when printing. By using plant-based materials for the wax component in all colors of toner—cyan, magenta, yellow, black—it reduces the use of materials derived from petroleum, a finite resource.

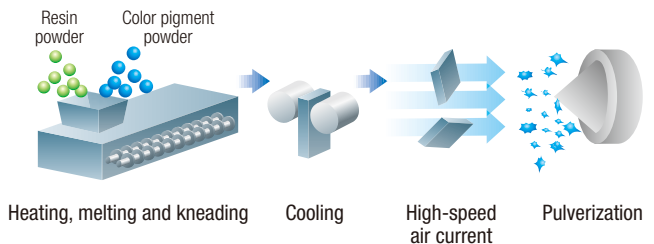
*1 Biomass: Renewable bio-organic resources other than fossil-derived resources.

*2 Oil-free fixing: This is a way to exfoliate toner from the roller and fix it to the paper without using oil applied to a heat roller. It enables higher quality output by suppressing unwanted glare and blur in the image.

How Polymerized Toner Is Manufactured



How Pulverized Toner Is Manufactured

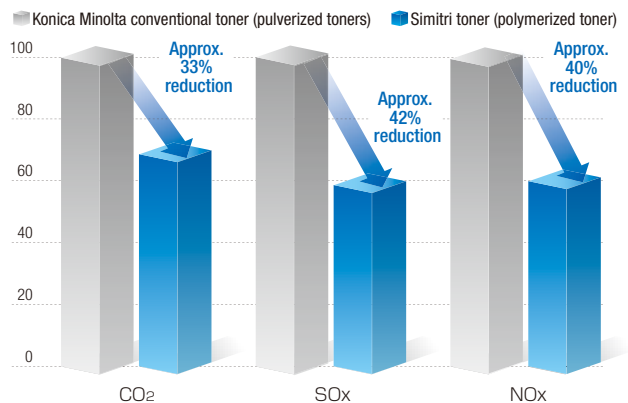


Simple Manufacturing Methods Greatly Reduce CO₂, SO_x, and NO_x Emissions

Producing pulverized toner entails an involved process for crushing after making the lumps of plastic and consumes a great amount of energy for pulverization. It produces irregular sized particles which need sorting, and also results in lower production yields.

Polymerized toners, on the other hand, entail a relatively simple manufacturing process using chemical synthesis to make the toner particles. This reduces energy consumption and also ensures uniform particle size, which minimizes the sorting needed. Compared to pulverization methods, these advantages help to reduce generation of CO₂ and the acid-rain causes SO_x (sulfur oxide) and NO_x (nitrogen oxide), thereby significantly reducing environmental impact.

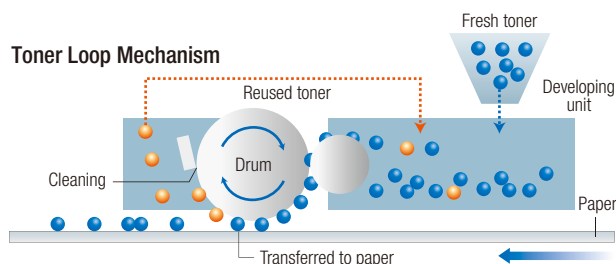
Environmental Impact Reduction Effectiveness (Index of 100 for Conventional Toners)



Spotlight 2 Resource-Saving Efforts in Toner Products

Toner Loop Mechanism Uses Toner without Waste

Konica Minolta equips nearly all of its monochrome MFP models and some monochrome laser printers with its unique Toner Loop Mechanism inside the machine which collects, circulates and reuses any toner not fixed to the paper during printing. This system helps realize resource conservation by reducing the amount of wasted toner to zero—a big improvement over the 5-10% of toner normally wasted.



Toner Bottles Incorporate Recycled Plastic

Konica Minolta incorporates up to 40% recycled plastic material in the toner bottles used for MFPs, which helps to lower total use of petroleum-based resources. The Group also collects and recycles used toner bottles.



Toner bottles containing recycled plastic

The Great Potential of Polymerized Toners

Constantly Enhancing Toners to Improve Image Quality and Environmental Performance

Meizo Shirōse
General Manager, Chemical Products R&D Center
R&D Headquarters
Konica Minolta Business Technologies, Inc.



Environmental Advantages Discovered While Pursuing Better Quality Prints

Compared to conventional pulverized toners, the polymerized Simitri toner developed by Konica Minolta in 2000 achieves a dramatic reduction in energy consumed during both manufacturing and use. The original purpose of toner development in the 1990s, however, was not to reduce environmental impact, but to improve image quality by using smaller toner particles. Ultimately, the pursuit of an effective toner structure led to the realization of a simple manufacturing process, which in turn made a big difference in energy savings.

When Simitri toner was released in 2001, the Group decided to make a full changeover to polymerized toners, with management setting the policy that all new models were to be equipped with this toner. The main reason for this switchover was the superior environmental performance of the new toner.

Pursuing Even Better Image Quality and Greater Reduction in Environmental Impact

The main theme in the development of Simitri HD toner—the second-generation polymerized toner used in Konica Minolta products since 2006—was improvement of the low-temperature fusing capability to further reduce impact on the environment as well as image quality. Our focus was to achieve fusing at a

lower temperature, while also maintaining the thermostability required for offering high image quality with high-speed printing. After much trial and error, we successfully developed a core-shell configuration (▶P13) in which a soft inner core of resin, efficient in low-temperature fusing, is wrapped in a thin, hard layer of outer coating.

This development enabled us to introduce polymerized toner to a wide-range of models, from low-speed to high-speed.

Pursuing an Environmentally Friendly Approach to Other Consumables

In product development, it is our obligation at Konica Minolta to meet customer expectations with respect to product quality, environmental performance, and economy. Only then can our products earn the loyalty of our customers.

Currently, we are continuing to work on ways to extend the service life of consumables such as the photoconductors used in MFPs and printers. Such efforts not only curtail the impact on the environment but also improve the convenience of our products for customers.

Konica Minolta is moving forward with new development, continuing to pursue high-quality printing and product convenience—all the while aiming to realize greater environmental benefits.



The Tatsuno Plant of Konica Minolta Supplies Manufacturing Co., Ltd. manufactures polymerized toners. At the company's three plants in Japan the total production capacity is 15,000t/year, which is the largest in the industry.