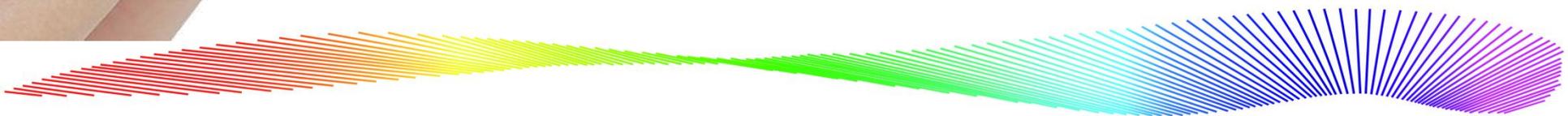




Advances in modern toner technology: Chemical and bio-based Toners



Colour Toner

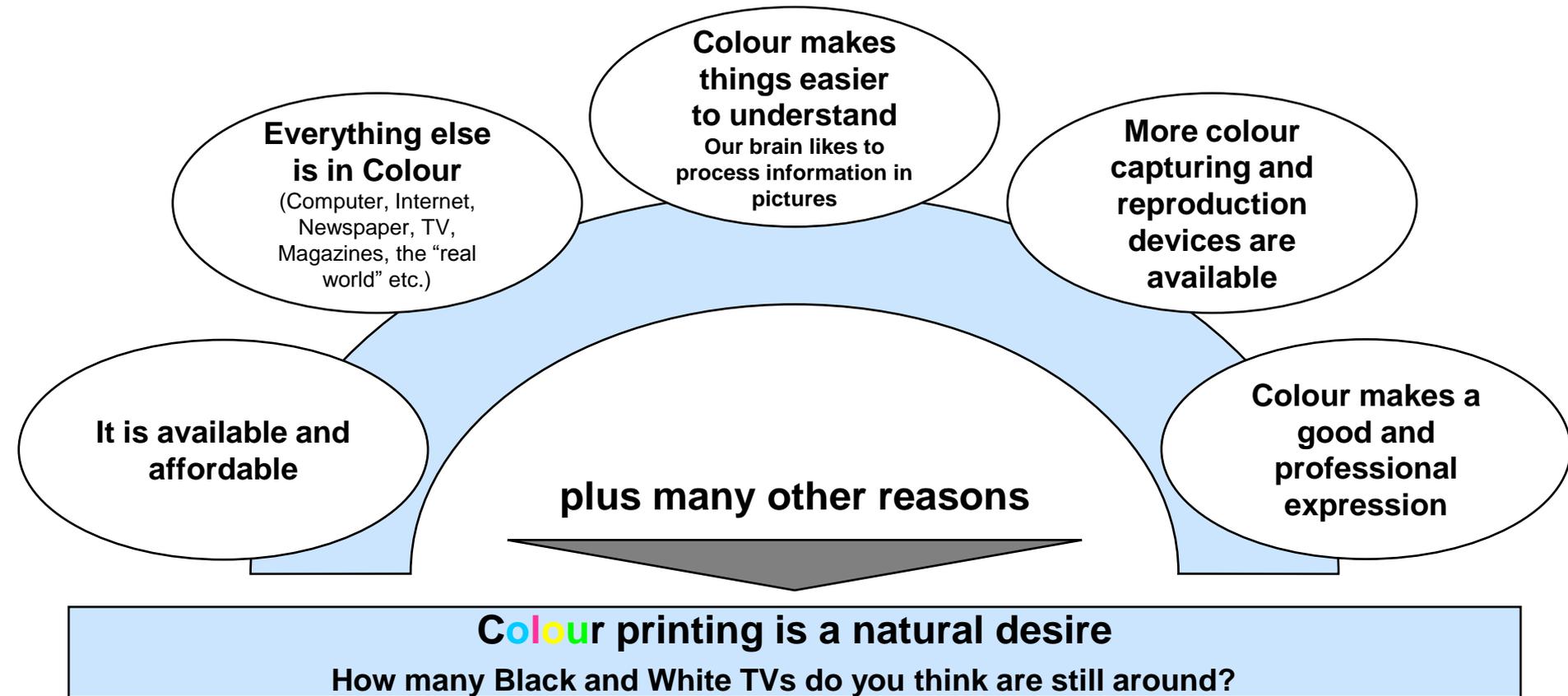
- Why was Chemical Toner developed?
- Chemical Toner Manufacturing
- Advantages of Chemical Toner

Bio-based Toner: True innovation

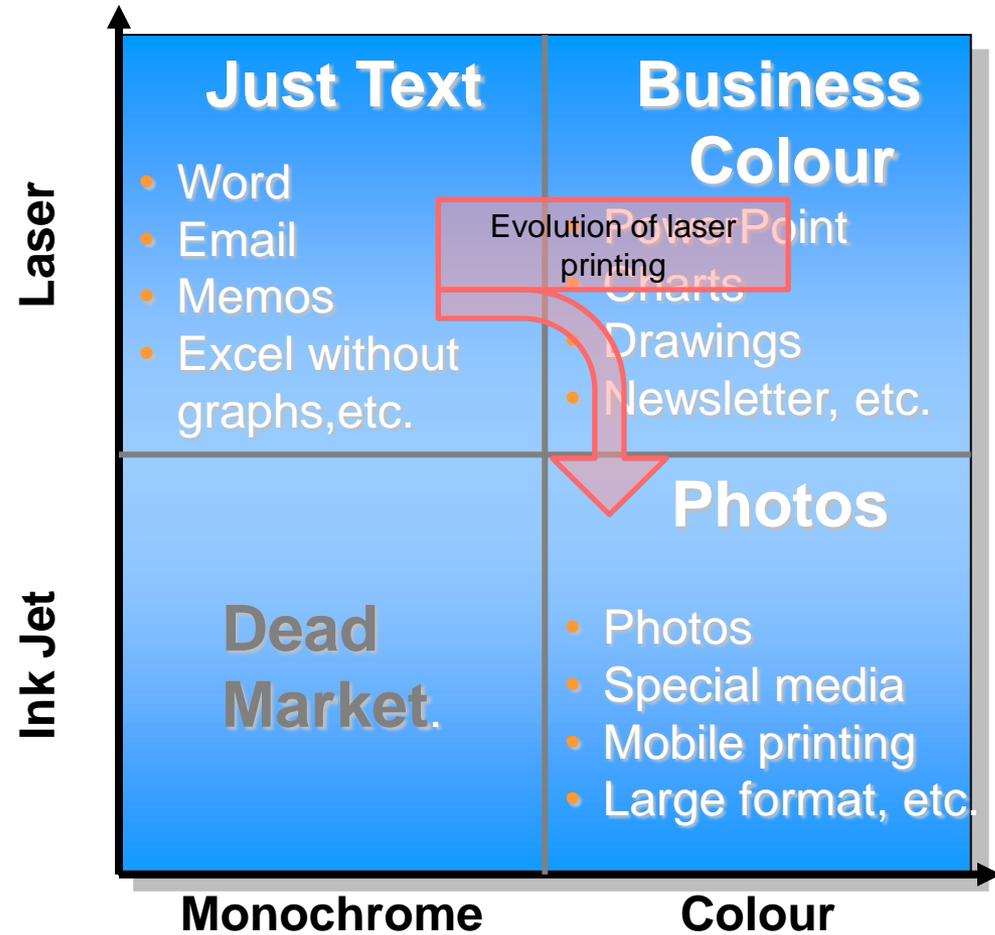
- Why are bio-based toners being developed?
- Bio-based Toner Manufacturing
- Advantages of bio-based Toner



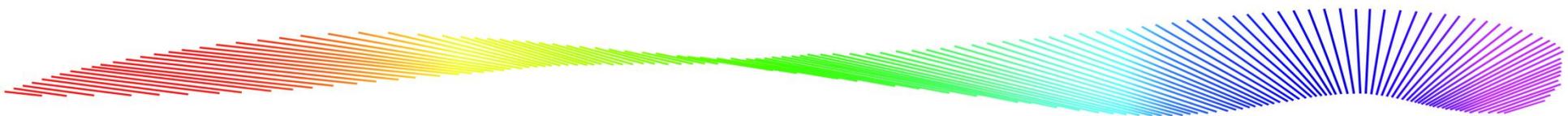
Why colour printing? Because people love colours



Ink Jet or Laser?



- The customer has to have the right expectations.
- If the customer thinks that he can print Photos using a Colour laser in the same quality than he can print them using ink, then he has the wrong expectations.
- Laser has constructional constraints to picture quality (4 colours against up to 6 and pico liters against dpi).



Chemical Toner is Future in colour Laser printing



Why are the OEMs turning to Chemical Toner?

- In order to print at 600 DPI, the toner size must be about 6-8 microns. To print at 1200 DPI (e.g. HP CP4525), control of particle size and shape is critical – this is virtually impossible with conventional toner. Chemical Toner is more consistent → consistent particle size and shape equals consistent charging properties.
- The higher yield of Chemical Toner allows for smaller cartridges resulting in smaller footprint printers → which are demanded by the market.
- Encapsulation permits good fusing at low energy levels (allows for Energy Star® qualification)
- Less V.O.C.s and CO₂

Which OEMs use Chemical toner?

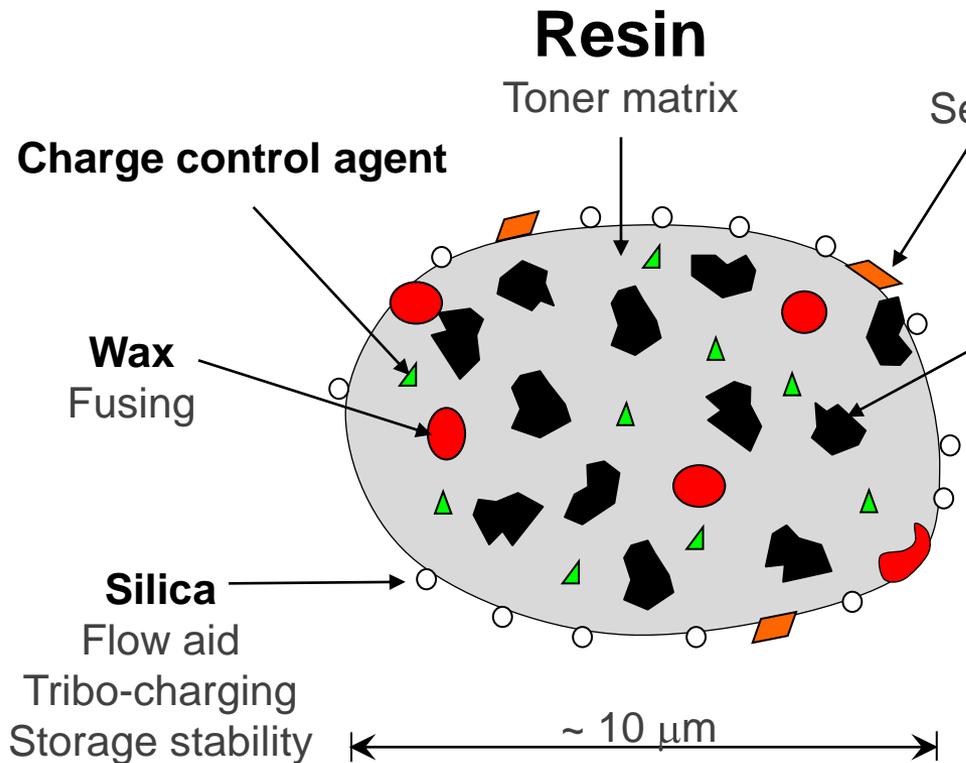
- All major LBP OEMs! Canon, HP, Samsung (CLP320/325 is their first), Xerox, Ricoh, Konica Minolta, brother, etc.

Why the Aftermarket is clinging to Conventional Toner?

- Cost of Technology (e.g. R&D, Water Treatment and the cost of failure!)
- Intellectual Property

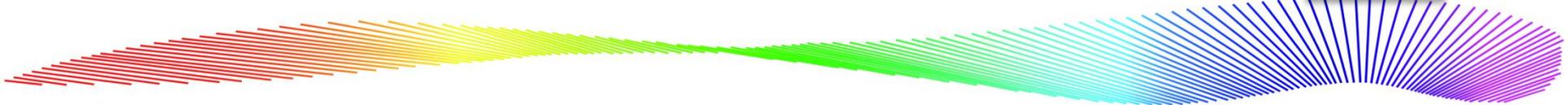
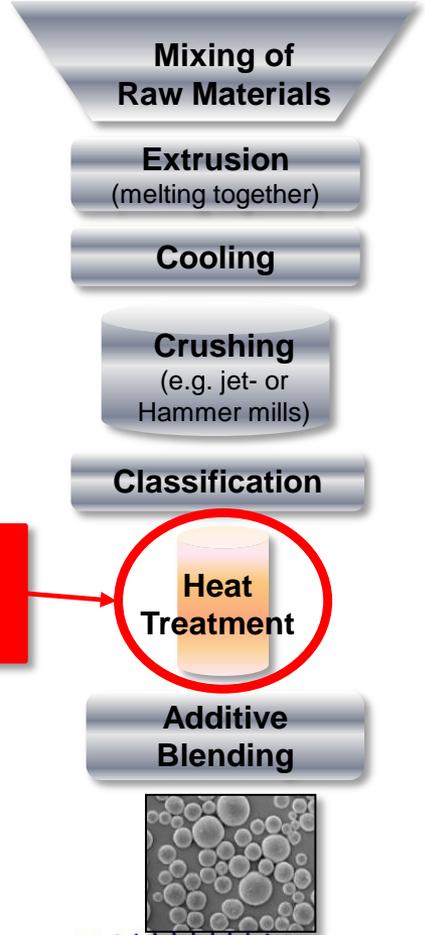
All brand names and trademarks are the property of their respective owners. Product names mentioned are intended to show compatibility only.

Spheridized Toner



Only real difference to the normal conventional toner process.

Conventional Toner



Emulsion Aggregation Toner

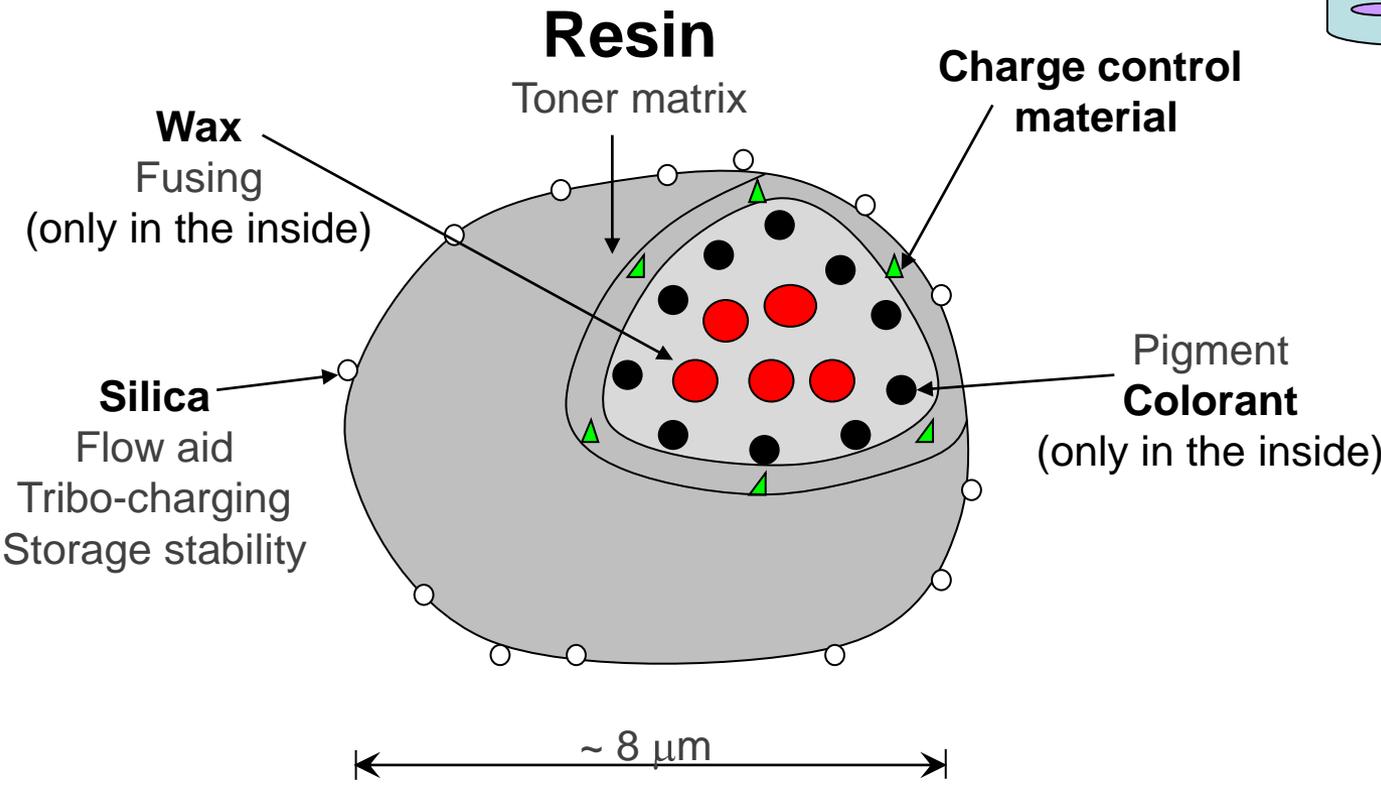


all the colors in the world

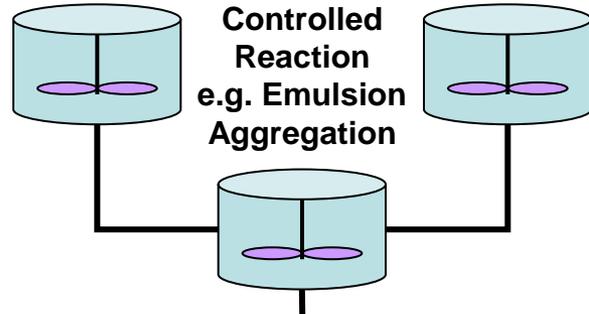


FOR A BETTER IMPRESSION

Encapsulation: Wax and colorant on the inside- shell and additives on the outside

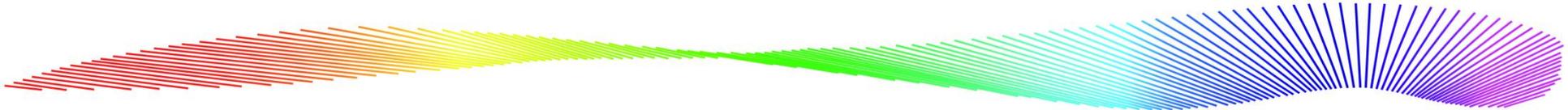
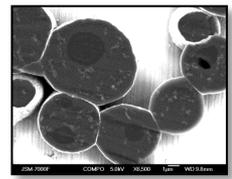


Chemical Toner



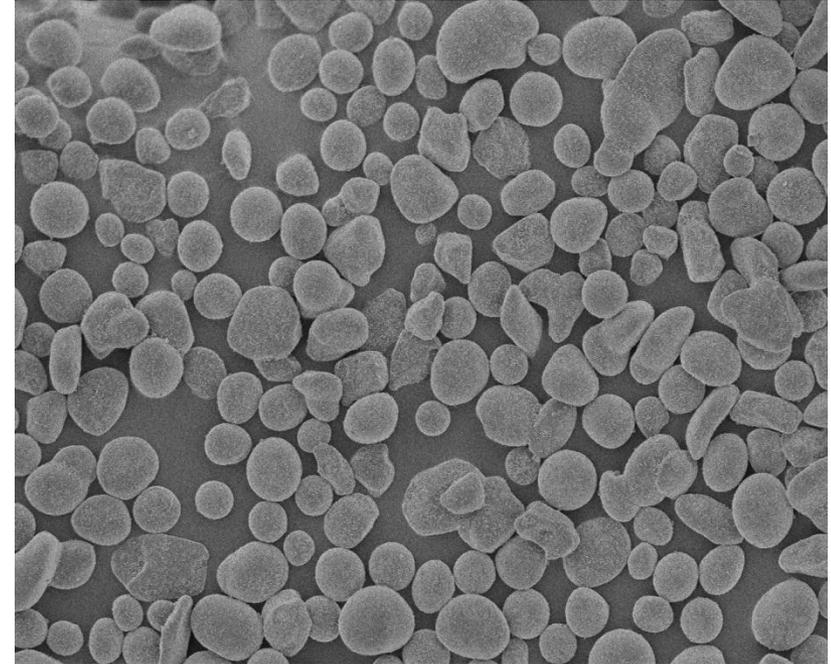
Washing & Drying

Additive Blending



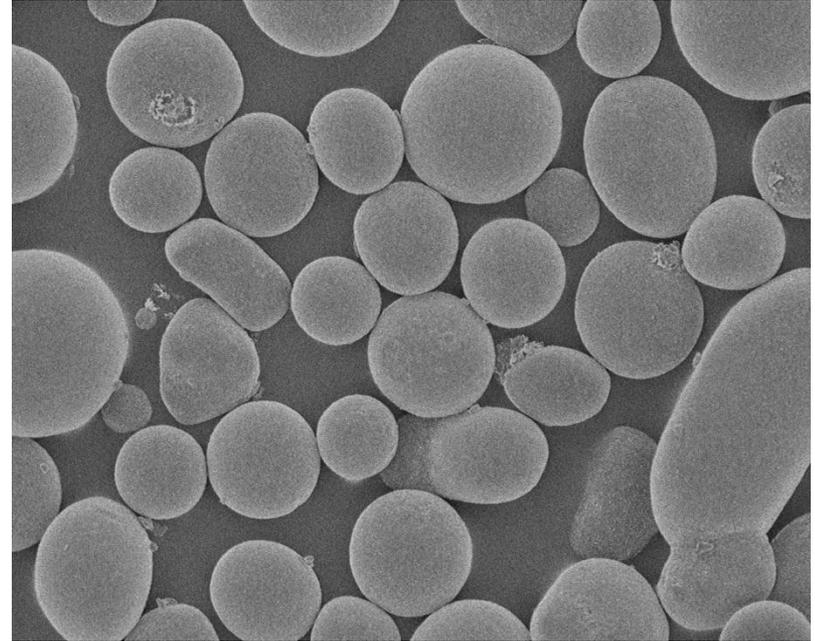
- **Spheridising**

- **Conventional toner is produced and then smoothed by heat and mechanical process.**
- **Strong Points**
 - Less expensive than chemical
- **Weak Points**
 - Wide particle size distribution
 - Higher pile heights
 - Interaction with OEM
 - Poorer fusing
 - Non-uniform shape
 - Wax on surface – poor flow



• Chemical Milling

- **Components are mixed with a plasticiser, melted, and processed through high shear mixing.**
- **Strong Points:**
 - Enables easy use of all conventional resins, including polyesters
 - Simple process – low investment
 - Good colour gamut
 - Surface roughness can be controlled
 - Can use either dye or pigments for colorant
- **Weak Points:**
 - Solvent based process
 - Potential for solvent fumes during fusing
 - Poor image permanence with dye colorants



- **Emulsion Aggregation**

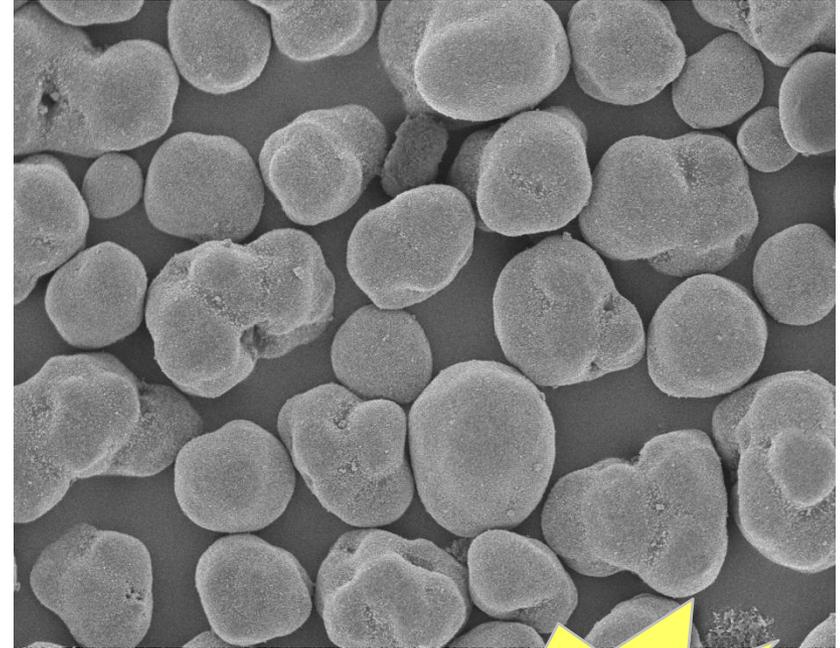
- **Coagulation**

- **Strong Points:**

- It's a smooth potato shaped
- Cleans easier
- Tight particle size distribution
- Good fusing
- Wider colour gamut
- Better control of particle shape
- Glossy or matte finish

- **Weak Points:**

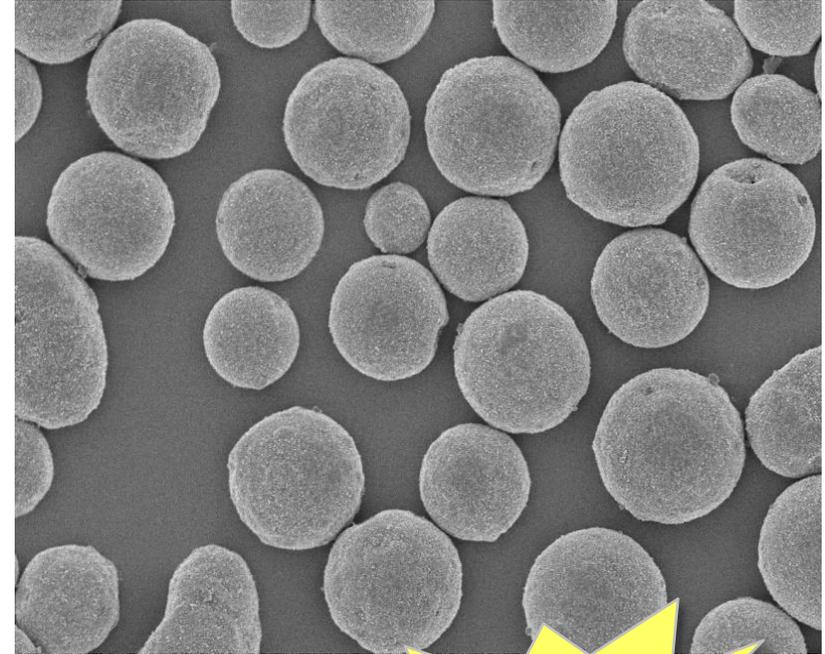
- Complex process
- Difficult to use polyesters



**MK
Process**

- **Suspension Polymerisation**

- **High-speed Dispersion**
- **Strong Points:**
 - Round
 - Good Charge Control, Flow and Transfer
 - Perfect match with the OEM
- **Weak Points:**
 - Difficult Cleaning
 - Heavily Patented
 - Limited to Spherical Shapes



**Canon/HP
Process**

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Chemical Colour Toner offers real advantages in print quality



Conventional Toner



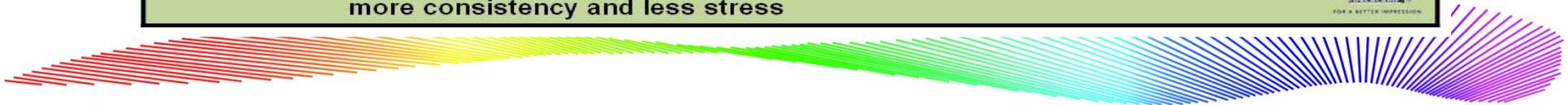
Spheridised Toner



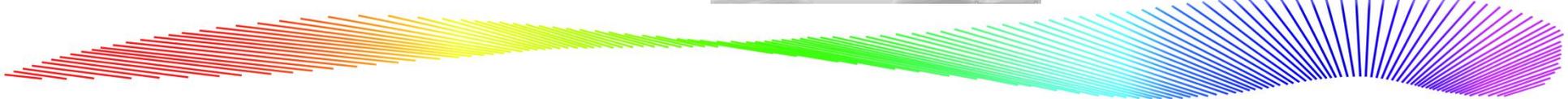
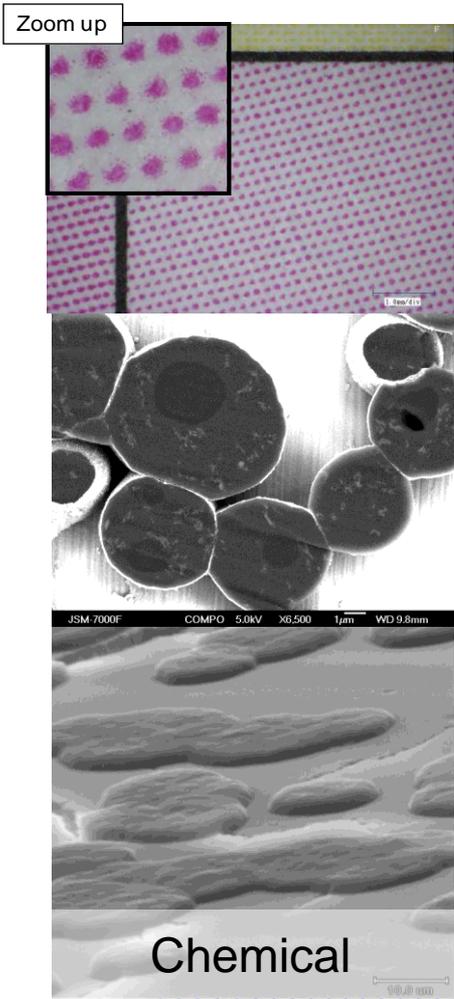
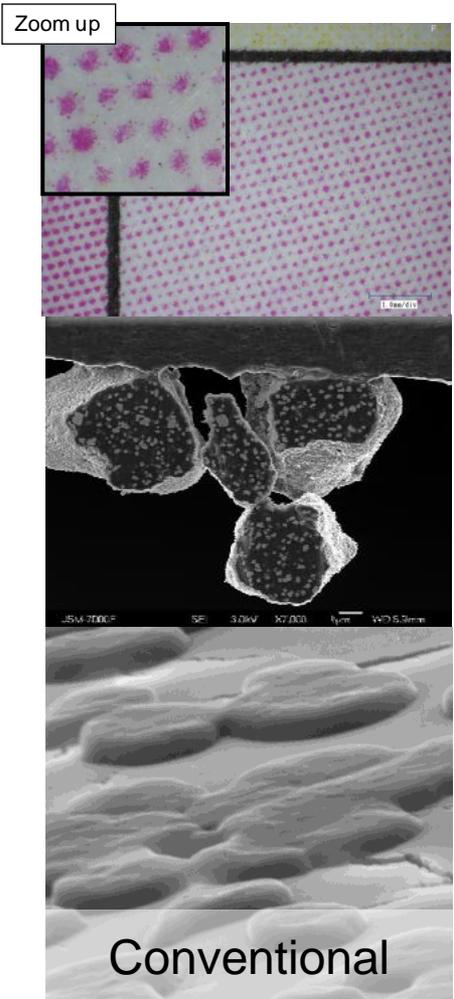
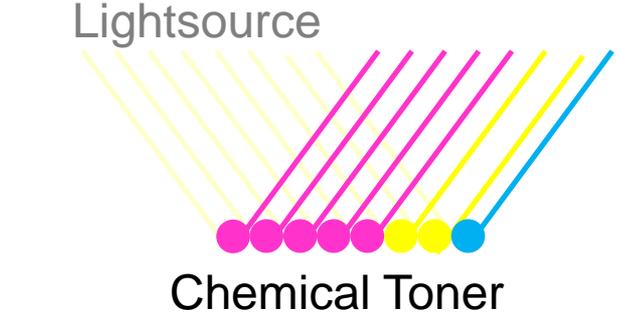
Chemical Toner



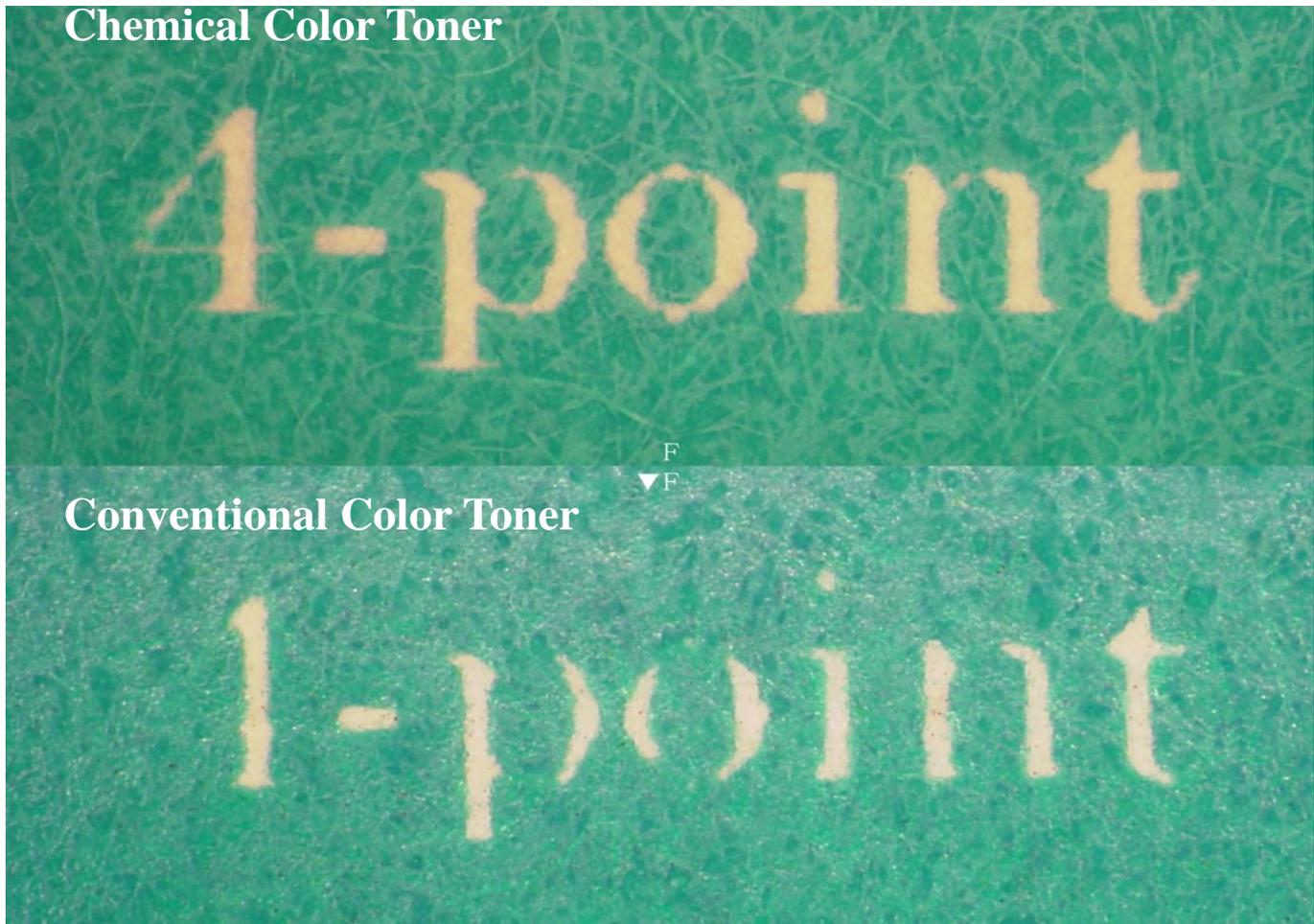
Benefits compared to conventional toner	Apply to spheridised Toner	Apply to Chemical toner
Uniform particle size	😊	😊😊
Uniform particle shape	😐	😊
High transfer efficiency	😐	😊
High flow	😐	😊
Uniform charging	😞	😊
Low pile height	😐	😊
Good Fusing	😐	😊
Wide colour gamut	😐	😊
Sharp half tones	😐	😊
Minimal batch to batch variations	😐	😊
Consequence: Chemical Toner offers better yield, better fusing, crisp colours, more consistency and less stress		



Chemical Toner offers better colours, better fusing and better halftones



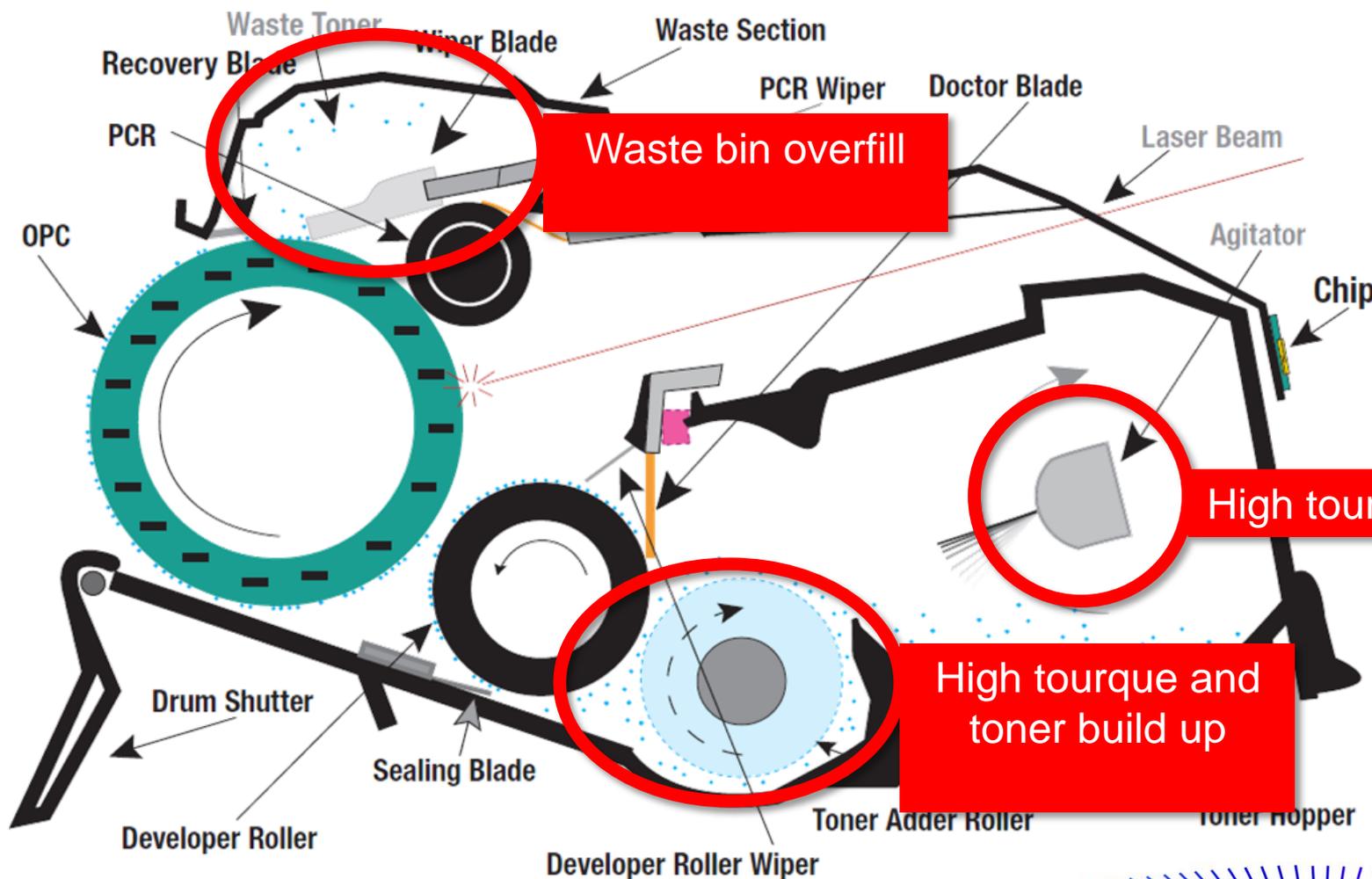
Chemical Toner produces well defined letters



4-point Font in a HP 3600

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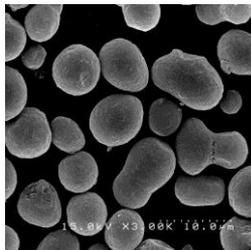
Typical issues with non chemical toner in a modern Colour Cartridge



Canon/HP OEM Chemical Toner Evolution



S-Toner™



HP4500
Release 1998
Speed (C/B)
 4/16ppm
 (4-cycle)

HP4500 W.U. Speed
Toner Analysis 250sec
 (Halogen)
 D50 vol. : 7.3um
 <5 pop. : 13%
 Circularity : 0.975
 Sp : 137deg-C

Fuser exposure
 time pp C* : **<15sec.**



New S-Toner™



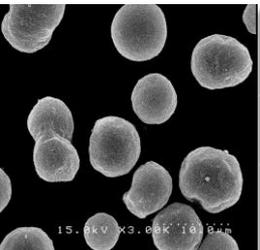
HP4600
Release 2002
Speed (C/B)
 17/17ppm
 (Tandem)

HP4600 W.U. Speed
Toner Analysis 29sec
 (IH)
 D50 vol. : 6.6um
 <5 pop. : 22%
 Circularity : 0.974
 Sp : 123deg-C

Fuser exposure
 time pp C* : **<3,5sec.**



Color Sphere™



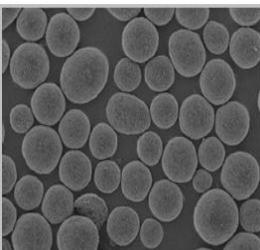
HP4700
Release 2005
Speed (C/B)
 31/31ppm
 (Tandem)

HP4700 W.U. Speed
Toner Analysis 0sec
 (Ceramic)
 D50 vol. : 6.9um
 <5 pop. : 22%
 Circularity : 0.978
 Sp : 119deg-C

Fuser exposure
 time pp C* : **<1,9sec.**



New Color Sphere™



HP CP3525
Release 2008
Speed (C/B)
 30/30ppm
 (Tandem)

HP CP3525 W.U. Speed
Toner Analysis 0sec
 (Ceramic)
 D50 vol. : 6.9um
 <5 pop. : 10%
 Circularity : 0.978
 Sp : 123deg-C

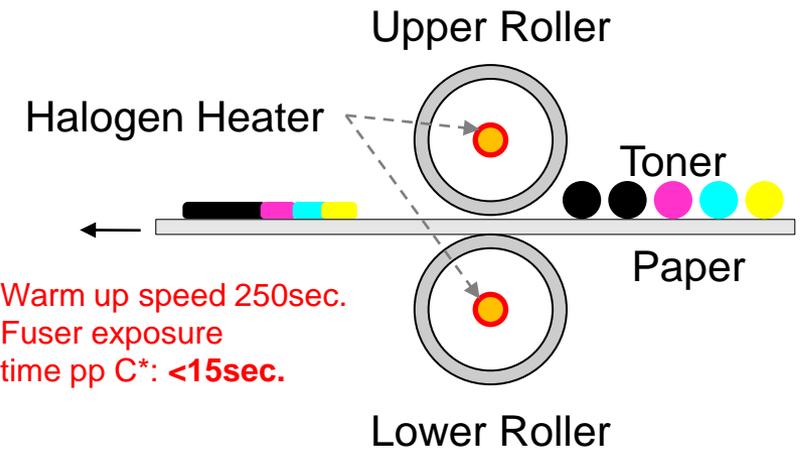
Fuser exposure
 time pp C* : **<2sec.**

*minus time in between pages

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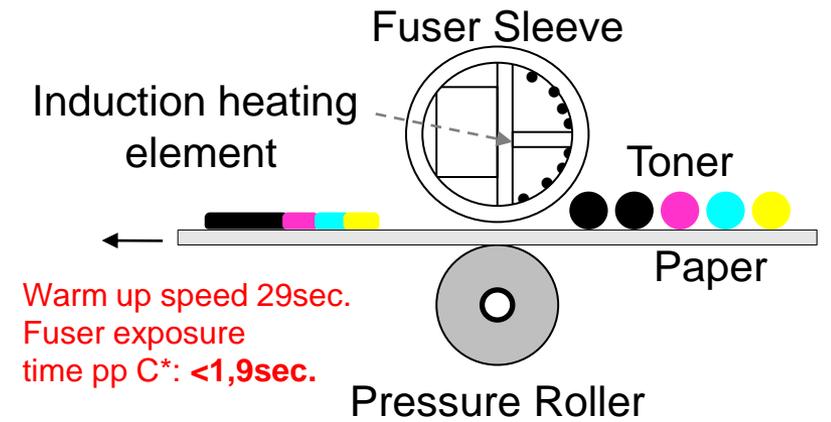
Advances in Fuser technology

Old Style Fuser (HP 4500)



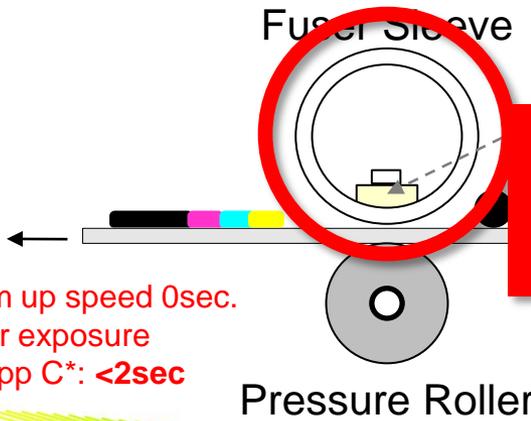
Warm up speed 250sec.
Fuser exposure time pp C*: <15sec.

„Intermediate“ Style Fuser (HP 4600)



Warm up speed 29sec.
Fuser exposure time pp C*: <1,9sec.

New Style Fuser (HP 4700)



Warm up speed 0sec.
Fuser exposure time pp C*: <2sec

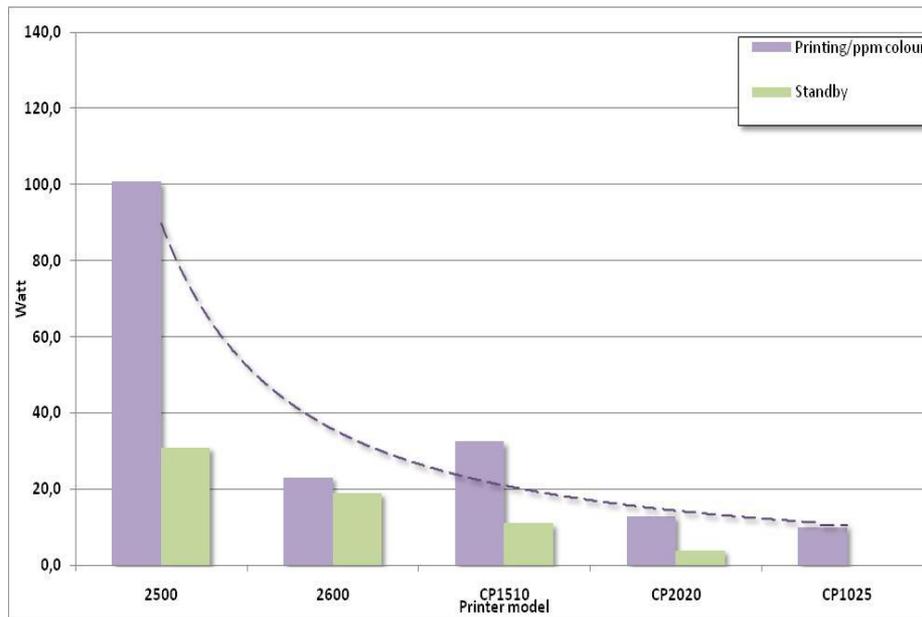
Non Chemical toners can produce build up on the fuser sleeve

*minus time in between pages

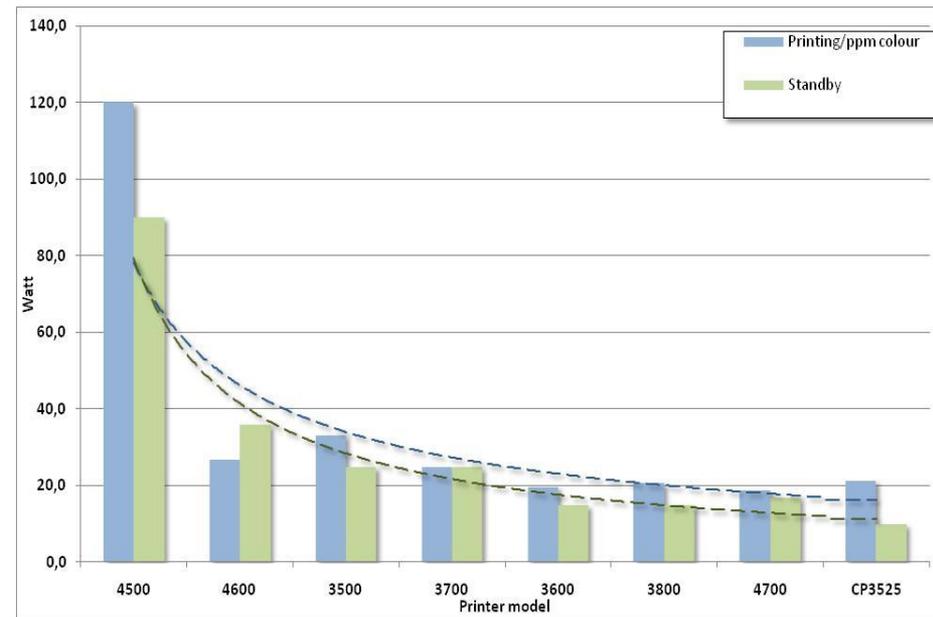
All brand names and trademarks are the property of their respective owners. Product names mentioned are intended to show compatibility only.

The new fuser technologies lower the Power Consumption

- **Chemical Toner allow for lower energy consumption per page in colour printing and in standby mode.**
 - Helps to reduce precious resources by saving energy.
 - Enables the OEM to be Energy Star® qualified.



Smaller footprint colour printers



Group level colour printers

All brand names and trademarks are the property of their respective owners. Product names mentioned are intended to show compatibility only.

Chemical Toner offers better fusing

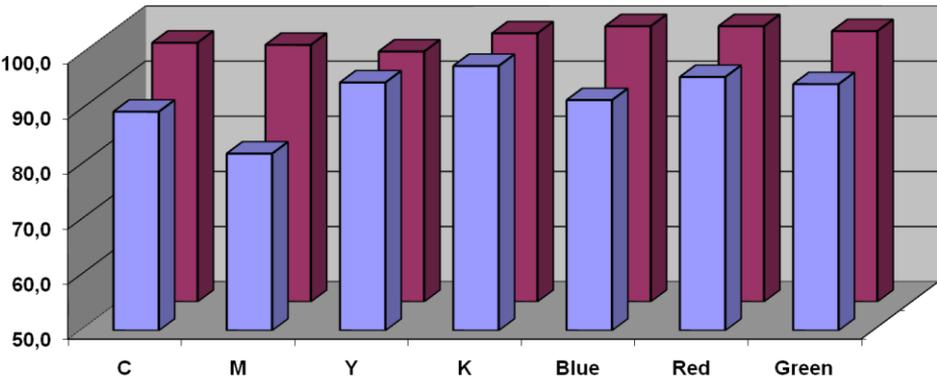


all the colors in the world

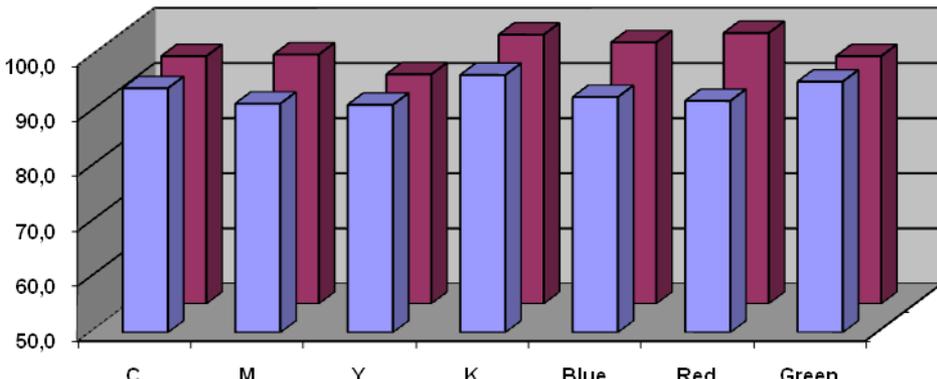


FOR A BETTER IMPRESSION

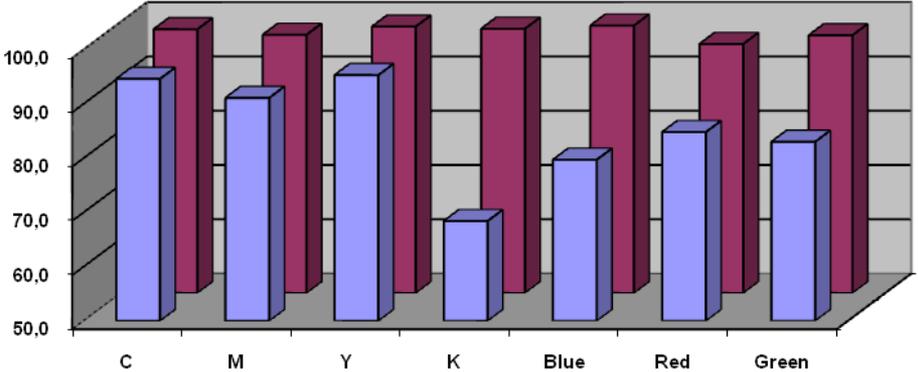
Percent Fusing - 75 gsm (20lb) Paper



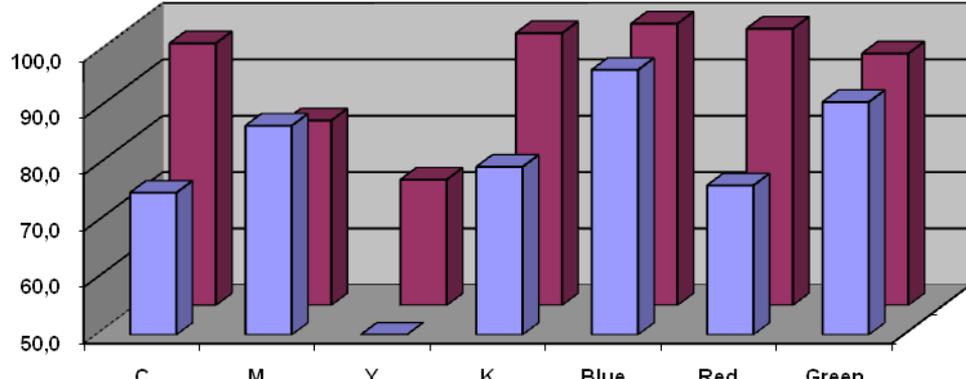
Percent Fusing - 160 gsm (60lb) Paper



Percent Fusing - Labels



Percent Fusing - Photo Paper



■ Conventional ■ Chemical

Tape Test in a HP 3600

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CHEMICAL TONER IS MORE GREEN!

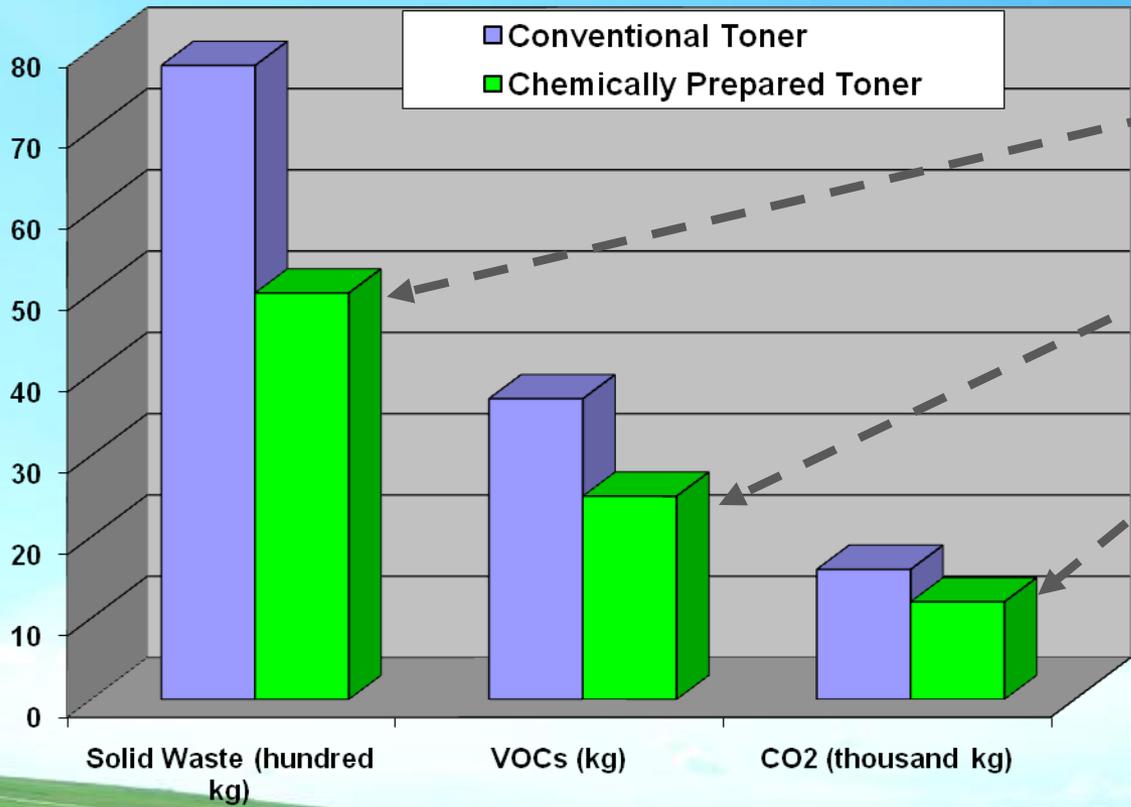


all the colors in the world



FOR A BETTER IMPRESSION

Comparison of the energy & emissions of EA toner & conventional toner



More than 35% less solid waste

~32% Less VOC's!

Some estimates as much as 35% lower CO₂ emissions*

Per metric ton of toner produced and used.

Source: Ahamadi, A, et al, Life-cycle inventory of toner produced for xerographic processes, J Cleaner Production, 2001

* Kiyono, Eiko. EA Process Technology, <http://www.fujixerox.co.jp/eng/company/technical/interview/ea/index.html>

Colour Toner

- Why was Chemical Toner developed?
- Chemical Toner Manufacturing
- Advantages of Chemical Toner

Bio-based Toner: True innovation

- Why are bio-based toners being developed?
- Bio-based Toner Manufacturing
- Advantages of bio-based Toner



Sad, but true. . .

BIOBLACK™



Laser and Copier Toner Uses
146,000,000*
Gallons of Oil per Year

*** 552.670.120 liters per year!**

That is about as much as the BP drill hole would have spilled into the gulf in one and a half year.

Sustainability should be important to everybody

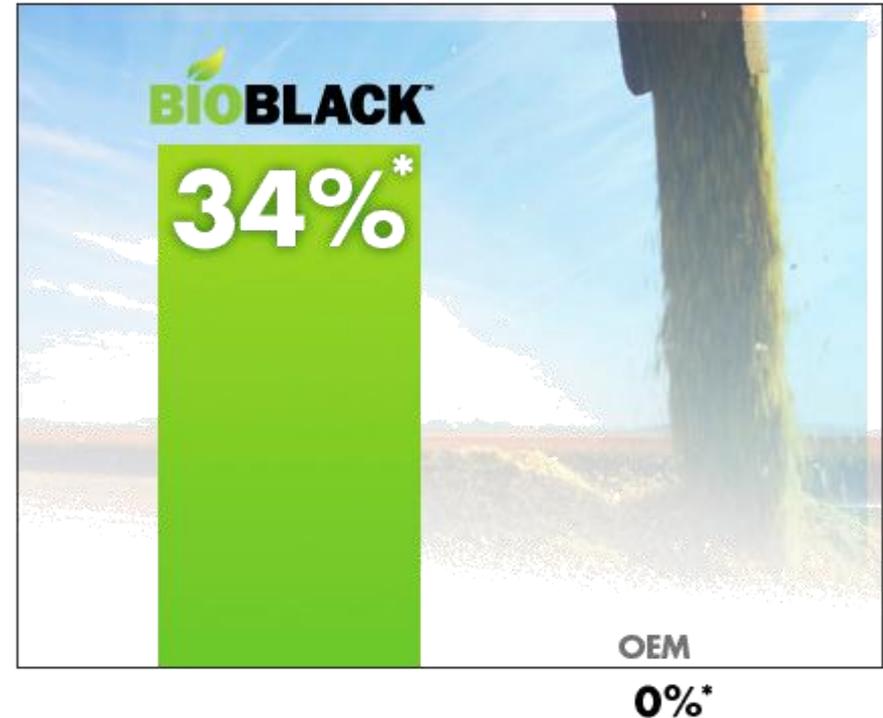


- In December 2006 the EU Competitiveness Council agreed to launch an initiative as a new policy approach aiming at supporting the development of markets with high economic and social value, in which European companies could develop a globally leading role.
- In May 2007 the Competitiveness Council invited the Commission to propose further steps for the creation of lead markets and other measures to enhance market demand for eco-efficient bio-based products, in order to exploit the positive environmental impact of bio-based products.
- Some of the major factors driving the future markets and demand for bio-based products are:
 - Limited availability and increased cost of fossil resources vs. renewable bio-based resources;
 - Policy development, in particular climate change mitigation, sustainable production and consumption, Lisbon agenda, industrial policy and employment growth;
 - A changing consumer demand based on the awareness of the need to ensure sustainable production and consumption.

What is bio-based Toner?

- A Toner in which petroleum-based raw materials are substituted to a certain degree (> 20%) with renewable raw materials.
- Bio-based Toner is in an ecological competition with the OEM and not with conventional aftermarket cartridges.
- BioBlack™ is a Toner made using a bio-based resin with a proprietary patent-pending toner formulation using various agriculturally derived materials, which may include corn, cottonseed and soy.
- BioBlack™ Toner are tested according to STMC on print performance.

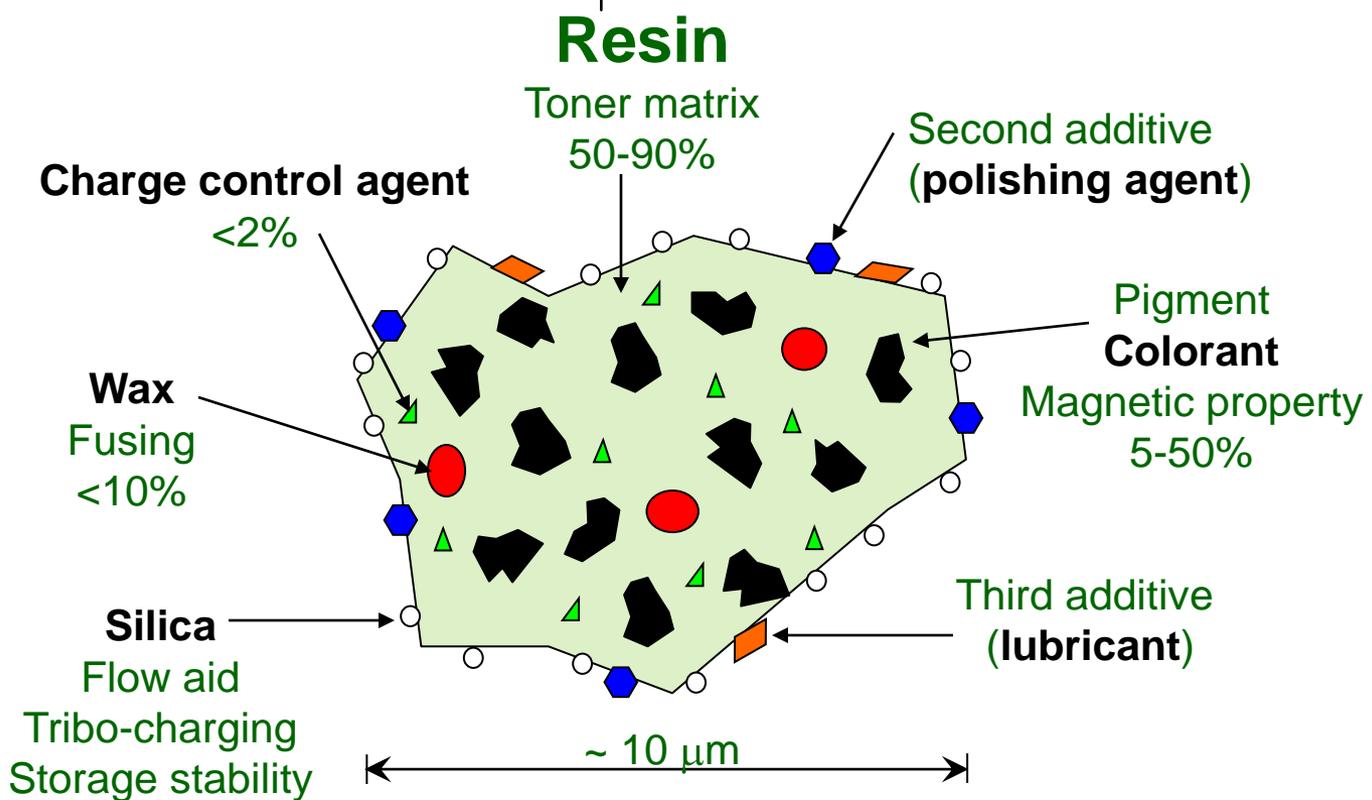
BIOBASED CONTENT



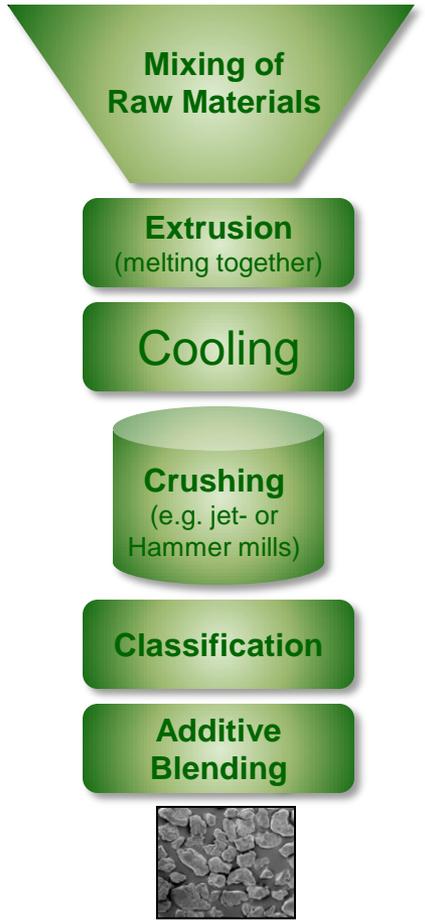
* While the ASTM-D6866 method cites a precision of +/-3%, these results indicate that the amount of bio-derived carbon in BioBlack™ toner is far greater than a competitive toner (and infinitely greater than the OEM) for the same amount of carbon in toner.

** The ASTM-D6866 method is similar to the radiocarbon dating method, which measures the amount of carbon-14, which exists in bio-based materials, but is non-existent in fossil-based materials such as petroleum.

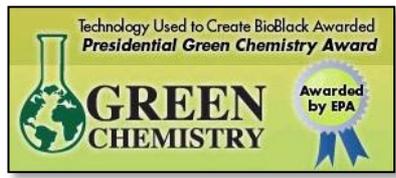
Resin can consist of up to 70% of crude oil. With BioBlack™ up to 34% of the crude oil can be substituted by bio-based materials.



Conventional Toner



- BioBlack™ Toner are LGA tested for contaminants.
- BioBlack™ is the first officially bio-based certified toner in the world.



Toner BioBlack™ UT19H1 Certification No. B 10-037-A



Toner BioBlack™ UT19H2 Certification No. B 10-052-A





Thank you