




Toner Particles as Microplastics

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Function

Toner description

- Particles of synthetic polymer combined with wax and pigment
 - Styrene acrylate
 - Polyester
- Treated with surface additives
- Particle size range is 4.5 – 12 microns

Inside the device

- Particles as applied to the paper in the prescribed pattern
- With heat the particle (polymer & wax) “melts” and fuses to the paper

Once the toner particle is fused to the paper it becomes a coating and can no longer be considered a microplastic

- Toner particles are not dislodged from the paper under normal use

Pathways for release

Under normal use conditions toner is not released into the aquatic environment

- Delivery is done via a closed system to minimize the amount of toner particles that are released into the machine or the environment
 - Cartridges/bottles are sealed and fit directly into the printer without being opened to the environment
 - Minimizes spills and leakage
- After toner particles are fused to the paper they are no longer particles
 - Particles cannot be dislodged from the paper
 - Paper can be recycled or disposed of without particles being released into the environment
- Spent cartridges with very small amounts of residual toner
 - Recycled and residual toner reclaimed
 - Incinerated or landfilled
- Unintentional releases (damaged cartridges)
 - Recommended clean up – sweep or vacuum and dispose of properly (incinerate or landfill)

Alternatives

There is no alternative to existing toner particles

- Toner is uniquely formulated to function in laser printers
- No other materials have the same properties
- Only toner can provide the quality and versatility business requires

Alternatives

Current liquid inks are not an acceptable solution for most business or production applications

- Aqueous
 - Limited and very specific substrates (paper) to obtain acceptable color saturation
 - Color palette is severely limited
 - Slow / poor quality (washed out colors, ink shows through on duplex printing)
- Solvent based
 - Elevated VOC's
 - More hazardous to people and the environment

Production settings (historically done with off-set printing)

- Approximately 60% of printing is done on coated stock
 - Ink jet does not “cure” on coated stock unless it is specially prepared or pretreated
- Alternative options are more hazardous materials



Transitioning

Liquid ink options for business settings are not available

- Ink jet / liquid ink have been under development for almost 20 years with no acceptable options for most business applications on the horizon

2017 printing device sales

- In total, 21M laser devices were sold with 11M sold into the business setting
- Ink jet devices were only 3% of sales into business settings
 - The vast majority of ink jet devices were sold into home and small offices
 - Approximately 300K sold into business settings

The cost to business to replace the millions of laser devices with ink jet devices would be astronomical

Additional costs

- Cost of developing functionally acceptable liquid inks
- Cost to increase manufacturing capacity of ink jet devices



Conclusions

Toner should be excluded from the restriction of microplastics

- Under normal use conditions, toner
 - Fuses to the substrate (paper) and is no longer a particle (microplastic)
 - Is not released into the aquatic environment
 - Spent cartridges can be recycled and residual toner reclaimed
- Acceptable alternatives to toner do not exist
 - Outlook for acceptable alternatives is years away
 - Cost of transitioning to ink jet, when and if it becomes available, would be astronomical

Questions?

