

**NEW
PROCESS
IMPROVED
SENSITIVITY**

**NEW ADVANCEMENTS IN THE PIGMENT
BONDING PROCESS FOR**

MAGNETIC PARTICLES



Circle Systems, Inc.

NEW ADVANCEMENTS IN THE PIGMENT BONDING PROCESS FOR

MAGNETIC PARTICLES

Our commitment to innovation at Circle Systems means that we are continually working to improve the quality of our products to provide the end user with a more durable product and more reliable test results. A direct result of this commitment is our recent and exciting advancement in our pigment bonding process. This advancement has allowed us to achieve a more durable and complete bond of the pigment to the particle, a particle that is receptive to more solvents and wetting agents as well as a more uniform particle size, thereby improving accuracy, sensitivity and clarity of indications.

By improving the integrity of the bond we have almost completely eliminated the occurrence of free pigment in the testing solution. The absence of loose pigment increases the clarity and intensity of the detected discontinuities and reduces the background over the complete test part surface.

Additionally, by creating a more durable bond we have

improved the receptiveness of the particle to solvents and wetting agents outside the Mi-Glow® product line.

The new process has also produced a more uniform particle size with increased surface area. In the case of the Mi-Glow® 800 iron oxide particle, the size ranges from 2 to 5 microns with an average of 3 microns. The increased surface area has been achieved by fracturing the particle into a finer, more consistent size. The smaller size thereby creates more surface area for more pigment to bond to while strengthening the integrity of the bond. All these factors combine to provide a very high concentration of the same sized particles, resulting in a smooth background with a strong buildup of particles on the discontinuity.

The improved bonding process has been applied to both the iron oxide and iron particles we manufacture for the wet method testing application. The uniformity of the particles

are demonstrated in the tight sizing curves that are now being produced.

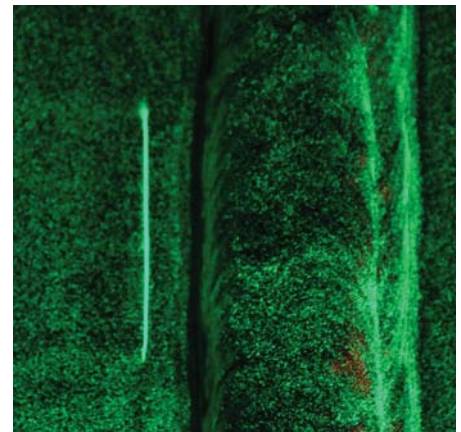
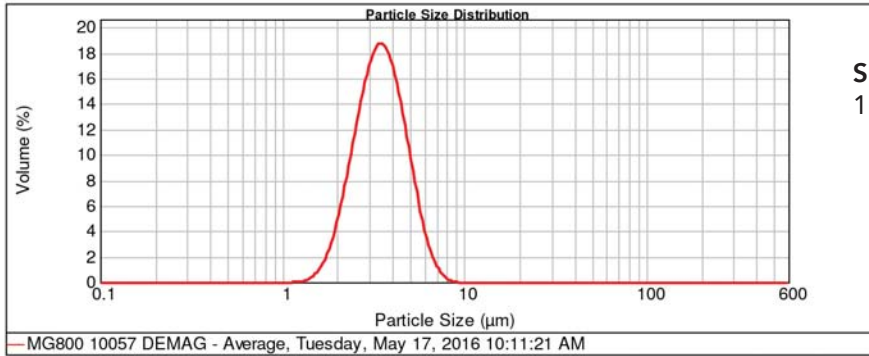


Figure 1: Mi-Glow® 800 in a water-based media displaying a smooth, even background with a strong, sharp buildup of particles on the discontinuity. The flaw is a .5" (13mm) long Heat Affected Zone Crack on a Carbon Steel Plate.

Iron Oxide Particle - Mi-Glow® 800

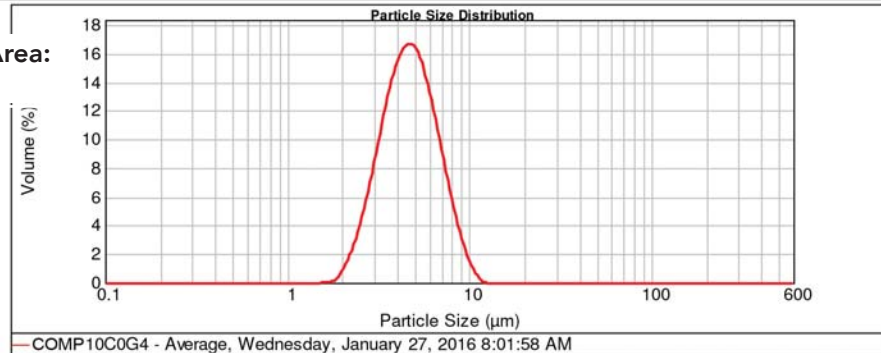
d(0.1): 2.278 um d(0.5): 3.438 um d(0.9): 5.122 um



Specific Surface Area:
1.84 m²/g

Figure 2a: Mi-Glow® 800 iron oxide particle sizing curve, made with the new bonding process, demonstrating a very smooth and tight curve with no tails.

d(0.1): 2.950 um d(0.5): 4.648 um d(0.9): 7.268 um

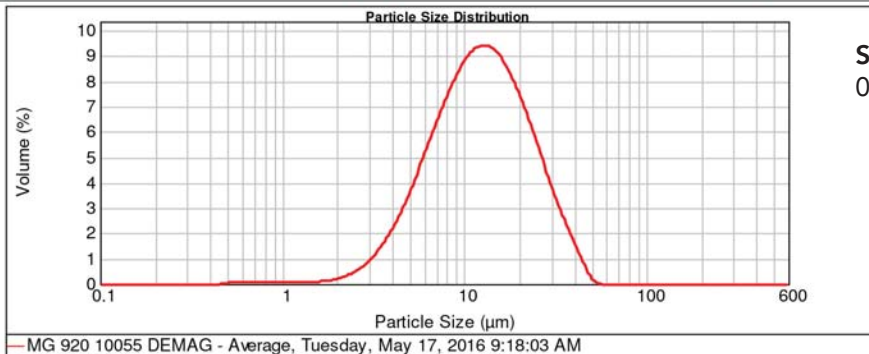


Specific Surface Area:
1.37 m²/g

Figure 2b: Competitive iron oxide material showing a slightly broader and shorter curve, smaller surface area and an average particle size of 4 microns.

Iron Particle - Mi-Glow® 920

d(0.1): 5.178 um d(0.5): 12.199 um d(0.9): 26.474 um



Specific Surface Area:
0.652 m²/g

Figure 3: Mi-Glow® 920 iron particle sizing curve, made with the new bonding process, demonstrating a smooth and tight curve with very little tailing.

Combination (iron oxide and iron mixture)

By combining the iron oxide (Mi-Glow® 800) and iron (Mi-Glow® 920) particles it has been possible to offer a product that is capable of detecting a broader range of discontinuities. The combination creates a particle that has a size ranging from 2 to 18 microns, with an average of 7.5 microns.

Over 40 years of specialization in magnetic particle material development has given us the experience and knowledge to develop products that answer all of your testing needs. The improved process of bonding pigments to the particles along with our continued work to advance our wetting agent chemistries represents our continued commitment to keep pace with the high standards of testing into the future.

Products for Fluorescent Wet Method Inspection

Mi-Glow® 800	Particles designed for use in solvent media to detect fine discontinuities such as those associated with the steel rolling, forming, machining, welding and heat treatment processes. The sizing of the of the Mi-Glow® 800 particle typically ranges from 1 to 5 µm, with an average of 3 µm.
Mi-Glow® 834	A premix of Mi-Glow® 800 fluorescent particles and powdered wetting agent for use in water media. Designed to detect fine discontinuities in finished products.
Mi-Glow® 778	A liquid concentrate with Mi-Glow® 800 fluorescent particles and liquid wetting agent for use in water media. This advanced formulation allows for superior corrosion protection, wetting and particle mobility. It is designed to detect fine discontinuities in finished products. This material is recommended for use in the automotive and aerospace industries on finished component parts, where extra corrosion protection is required.
Mi-Glow® 920	Iron particles designed for use in solvent media to detect medium sized discontinuities caused by steel rolling, forming, machining, welding and heat treatment processes. The sizing of the Mi-Glow® 920 particle typically ranges from 2 to 22 µm, with an average of 12 µm.
Mi-Glow® 318	A premix of Mi-Glow® 800, Mi-Glow® 920 fluorescent particles and powdered wetting agent for use in water media. Designed to detect small to medium sized discontinuities. Can also be used in high temperature applications.
Mi-Glow® 418	A premix of Mi-Glow® 800, Mi-Glow® 920 fluorescent particles and powdered wetting agent for use in water media. Designed to detect small to medium sized discontinuities in a darkened inspection area or in a dual response environment using a combination of visible and UV-A light. Can also be used in high temperature applications.

Product	Media	Particle Size	AMS Standard*	SAE Sensitivity†	Particle Type	Recommended Temperature Range
Mi-Glow® 800	Oil	3 µm	3044	8	Iron Oxide	32-120°F/0-49°C
Mi-Glow® 834	Water	3 µm	3044	8	Iron Oxide	32-120°F/0-49°C
Mi-Glow® 778	Water	3 µm	3044	8	Iron Oxide	32-120°F/0-49°C
Mi-Glow® 920	Oil	12 µm	3044	8	Iron	32-120°F/0-49°C
Mi-Glow® 318	Water	7.5 µm	3044	8	Combination	32-300°F/0-149°C‡
Mi-Glow® 418	Water	7.5 µm	3044	8	Combination	32-300°F/0-149°C‡

* Aerospace Material Specification Documents, as called out by ASTM E-709, ASTM E-1444, ASME Boiler/Pressure Vessel Code, and others.

† Representative of the number of lines shown on a tool steel ring as defined in SAE AS5282.

‡ Refer to special instructions in the respective product Technical Bulletin when using in temperatures above 120° F.



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*Innovators in the Manufacturing of
 Magnetic Particle Inspection Materials*