

**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

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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.

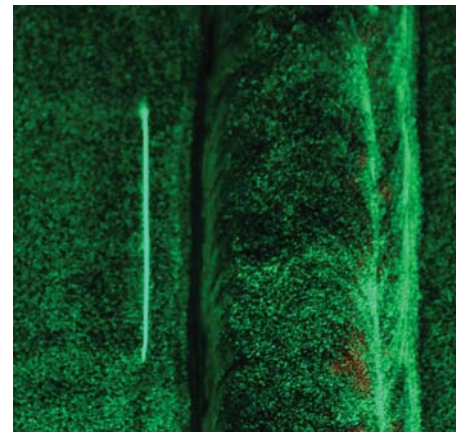
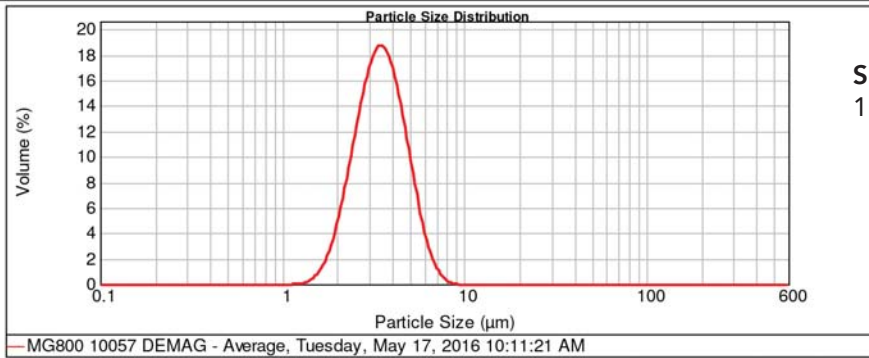


Figure 1: Mi-Glow® 800 in a water-based media displaying a smooth, even background with a strong, sharp buildup of particles on the discontinuity. The flaw is a .5" (13mm) long Heat Affected Zone Crack on a Carbon Steel Plate.

## 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 m<sup>2</sup>/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 m<sup>2</sup>/g

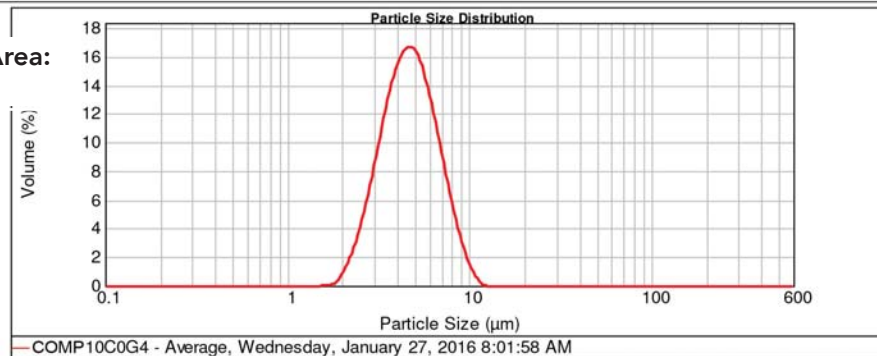
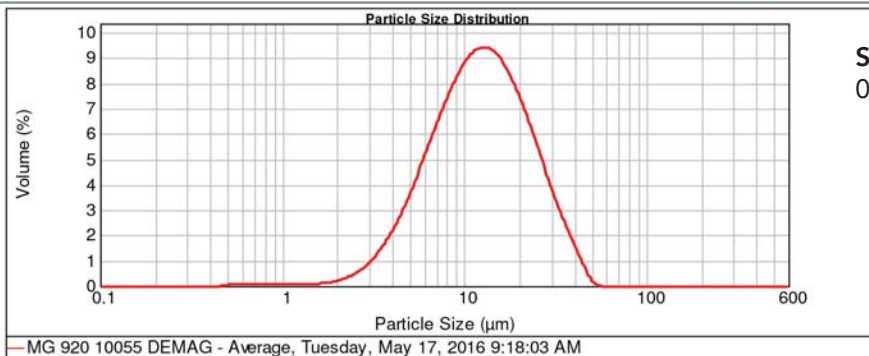


Figure 2b: Competitive iron oxide material showing a slightly broader and shorter curve, smaller surface area and an average particle size of 4 microns.

## 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 m<sup>2</sup>/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.