

VULCANIZED VS. BINDER TECHNOLOGY

Black Iron Rubber Company – 1701 Scott Road – Babbitt, MN 55706

www.blackironrubber.com

There are basically two distinctly different manufacturing technologies used to make molded rubber products. Black Iron Rubber Co. is most likely the only company that has used both in manufacturing recycled rubber products. We feel we have earned the right to briefly describe the differences in the technology and the resulting product.

VULCANIZATION

Charles Goodyear discovered the process of vulcanization in the 19th century and it opened the door for the modern day automotive tire industry. Vulcanization is a chemical process for converting natural rubber into a more durable stable material by the addition of sulfur. Rubber is a thermoset material, meaning unlike plastic once it is cured it cannot be melted back down into its raw form. The process is generally irreversible. To vulcanize uncured rubber it must first be mixed at low temperatures with sulfur and usually other curing chemicals. Then the rubber is loaded into a hydraulic press which is above 300 degrees F. The time, temperature and pressure vulcanizes the rubber. The sulfur atoms cross-link with the rubber at the molecular level. The result is a product with very desirable physical characteristics: tensile strength and elasticity. This is why when you are driving down the road in your car and you run over a rock or even a piece of glass you do not even feel it. The rubber has stretched without rupturing and then moved back to its original cured position.

BINDER TECHNOLOGY

Binder technology or sometimes called “cold pressed” or even “grind and glue” is a more modern development born mainly of the waste tire recycling industry. Since auto tires are made of vulcanized rubber, to be recycled they either can be incinerated (energy recovery) or they can be size-reduced by shredding and grinding the tires, then separating their non-rubber components like steel and fiber (material recovery). The resulting “crumb rubber” is then used as a raw material in rubberized asphalt, athletic fields, and making molded parts using binder technology. To make molded parts the crumb rubber is mixed with a binder such as polyurethane or latex. Just prior to loading into a mold, water is added as a catalyst to trigger a chemical reaction with the polyurethane binder. The material is immediately loaded into a mold and compressed with lower temperatures (cold pressed) into a new shape to form a product like a patio tile or livestock mat. The binder technology is adequate in making these types of low tech parts, but you wouldn't want your car tires made that way. They would not last long and they would not be safe. The same holds true for ballistic rubber.

BALLISTIC RUBBER

Black Iron Rubber Co. began making ballistic rubber panels, blocks and sheets shortly after our inception in 2001. After making our vulcanized ballistic rubber panels we were asked to make them with binder technology to be able to compete on a price point only. So, we decided we would make a binder panel. While the part looked good and we could have made them all day long, we soon realized that the vulcanized panel was so far superior, lasted much longer and was safer to use. The binder process is much less expensive to make, but the resulting physical properties did not compare to a vulcanized product. We believe that tensile strength and elongation are the most important properties in ballistic control rubber. When rubber is shot, the rubber moves out of the way (elasticity) allowing the round to make a path through the rubber, then when the stress is relieved the rubber reverts to its original position. Our rubber has been tested by the Akron Rubber Development Lab and has over 200% ultimate elongation. This means the rubber will stretch 200% of its original cured dimension before it breaks. We believe this is the most important physical property of ballistic rubber.

COMPETITION

Our main competition in the ballistic rubber industry has been active, to say the least, in disparaging vulcanized rubber. They will tell their prospects that it is not as good as theirs because, after all, they were the first to make panels for ranges, but they will not say how or why that is. They really are hoping that people will not investigate further. They will cite ballistic tests that have been done at military proving grounds, but the tests are only on their product. No comparative tests with ours or other manufacturers. We have asked them to have a test of our two products conducted by an independent agency, but they do not respond. They say that their product is “engineered” for ballistic applications, but they will not publish even typical physical properties for rubber like tensile strength or elongation. We believe their product is made to be REPLACED. Yes, all ballistic rubber will eventually need to be replaced, but it is the performance longevity and safety level that are the most important attributes of ballistic rubber. Our competition has done an excellent job marketing their product. They have gotten government bids to be written excluding vulcanized rubber from being used as ballistic rubber. One specification actually read “no vulcanized rubber is to be used.” Ironically, binder rubber products contain 95-97% vulcanized rubber (in either shredded or crumb form), which is then simply glued back together again in a new shape. But they know that vulcanized rubber is the superior product. Otherwise, why would they have ordered multiple pallets from us for a very important project? Copies of their purchase orders available upon request.

DENSITY

One other very important physical characteristic in ballistic rubber is density, or the weight of the product per cubic foot. Our 9” x 12” x 24” ballistic vulcanized block weighs 105 pounds (72 pounds per cubic foot). Our competition’s block, same size, weighs 78 pounds. Over 25% less weight for the same volume. If you are looking for rubber blocks to encapsulate a bullet, then you would think density would be probably the most important characteristic. This is why other manufacturers of binder blocks

recommend that you shoot through the 12" dimension (not the 9") and then place another 2" rubber panel behind it and then AR500 steel. This means that only 1.5 sq. ft. of block is actually facing the shooter.

If you have read this far then this issue is important to you. Quality, performance and SAFETY are important in ballistic ranges. Ask questions of your suppliers and thank you for reading this.