Watch Out For Hitchhikers

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Magnetism and electrostatic attraction are two forces to be reckoned with in shot blasting operations. Either of these phenomenons will leave residual dust and fine particles tightly adhered to the work. This can cause problems when the so called clean work is further processed. Dies and other tooling are severely damaged by these hitchhikers.

Magnetism is a class of phenomenon exhibited by the field of force produced by a magnet or an electric current. A magnet is a body that attracts substances containing iron by virtue of a field of force produced by the motion of its atomic electrons and the alignment of its atoms. The greater the percent of iron the stronger the attraction. The degree of attraction is in Gauss, named after Karl F. Gauss who defined the CSG unit of flux density. Thus to degauss is to remove magnetism by coils containing electric current that neutralizes the magnetic effect. Ships are degaussed for this reason. Bundles of bars or other steel objects moved on electromagnets and tooling held on magnetic holders are routinely degaussed.

First and foremost, every blasting machine must be properly grounded. Believe it or not it should be positioned in an East-West direction if working long lengths such as bars, strips or plate. Producers of bars and tubing have established that their product picked up magnetism when worked North-South. A lengthy article on this subject entitled "Magnetism - A Neglected Factor in Positioning of Equipment for Processing Magnetic Metals" by Ike Tripp, Sr. appeared in the Wire Journal International in May of 1997. The author cited many cases where induced magnetism was corrected by repositioning equipment. He further cited a manufacturer of non-ferrous tubing who was never satisfied with the appearance of their product after processing through pickle tanks containing sulfuric acid and sodium bicarbonates in sulfuric acid. Further they were getting short life on their tanks and contents. In a later plant revision these tanks were laid out East-West and they experienced much longer life from their solution and the non-ferrous tubes have emerged looking cleaner with little oxides and films. They also believe that high tension lines located approximately 200 yards away from the plant probably contributed to poor results when the tanks were running North-South.

Some bar mills degauss the hot rolled bars before shot blasting to remove scale and degauss again if the shot blasting and conveying system has caused a return of magnetism. Grade 1141 steel is the most problematic for magnetism pick up. Another troublesome Grade is 4140.

Producers of cut wire shot have observed magnetism in the shot made from wire drawn in a North-South direction. Conditioning or impacting of the shot in use appears to dissipate all traces of this phenomenon. Work objects traveling through machines on conveyors or rolls are considered grounded. Room blasters, however, must insure their work is grounded. This means it must not be positioned on wood pallets or other fixtures where grounding would be lost.

Anyway, this is poor practice as blasting of wood produces a cellulose fiber that is harmful to filters in the dust collector. The author was once called to examine a room whose steel walls were covered in what looked like mohair which was a buildup of dust one half inch thick. The room builder had simply not grounded the structure. Consequently his work left the room with a layer of dust that may be invisible to a cursory inspection but not really clean for good coating practice.

The electrostatic phenomenon is caused by media movement through hoses or by sliding contact. Either of these build up a static charge. That is why hoses are fabricated with a high carbon conducting layer or formerly a cooper wire to dissipate the charge. The lighter abrasives such as glass beads and aluminum oxide are more susceptible to this attraction than metal abrasive. Sometimes this attraction is confused with embedding or entrapment where a minute piece of media become trapped by an overhanging peak.

Machine throwing some types of plastic media with bladed wheels have had to use water spray to dissipate the electrostatic charge as it became so great is was a hazard to workers servicing the machine.

Cold working some stainless alloys change their magnetic characteristics. Thus, a tank fabricated of a 304 cold rolled stainless alloy will exhibit no attraction to a magnet. The welds on tanks or similar products are often shot peened to prevent stress corrosion cracking from carbide precipitation at the grain boundaries. The cold working induced by shot peening changes the stainless metallurgical structure from austenitic to martensitic. The peener can verify transformation by simply touching a magnet to the peened area which will now be magnetic.

A useful test that can reveal ferrous contamination on non-ferrous work objects is to apply a copper sulfate solution. This chemical is readily available at hardware stores in crystalline form. A solution brushed on will instantly blacken any ferrous contamination. Cleanliness of blasted surfaces is important for their durability. Any contamination that lies under plating, coatings or anodizing will cause premature failure.

Brain teaser

Q: Situation: You just bought an old house. One of the rooms upstairs has a single light bulb which is controlled by one of three switches located downstairs, but you don’t know exactly which switch it is. You cannot see the light bulb from the switches downstairs. How do you make only one trip upstairs to solve the riddle?

A: Turn on switch #1 and leave it on for only one minute. Next turn on switch #2 and go upstairs. If the bulb is "on" then switch #2 is controlling it. If the bulb is "off" touch it to see if it is hot or cold. If it is hot it had been on for one minute but is now turned off but still warm from its one minute excitation, therefore switch #1 was controlling it. If it is cold then switch #3 would be used to turn it on.