Working Practice: How to Work with Permanent Magnets

Purpose

This note describes permanent magnet materials used for accelerators and detector assemblies at LBNL, along with hazards entailed in their machining and assembly, and outlines safe general handling procedure.

Scope

This note is a useful guide for technicians, machinists, and others working with permanent magnets.

Definitions

Rare-earth magnets are strong permanent magnets (PM's) made from alloys of rare-earth elements. There are two types: neodymium magnets and samarium-cobalt magnets. These magnets are substantially stronger than ferrite or alnico magnets. Rare-earth magnets are extremely brittle and also vulnerable to corrosion, so they are usually plated or coated to prevent corrosion and help reduce chipping or breaking.

Understand the Hazards

The greater force exerted by rare-earth magnets creates hazards that are not seen with other types of magnets. Magnets larger than a few centimeters are strong enough to cause injuries to body parts pinched between two magnets, or a magnet and an adjacent metal surface, even causing broken bones. Magnets allowed to get too near each other can strike each other with enough force to chip and shatter the brittle material, creating flying chips that can cause serious injuries, particularly to the eyes. The strong magnetic fields can also erase magnetic media such as hard drives, credit cards, and can damage wrist watches. Individuals with pacemakers or internal medical devices should not handle rare-earth magnets. Studies have shown that magnetic fields can effect the operation of these devices. Children should not be allowed near rare-earth magnets. Even small magnets swallowed by children have caused severe injuries due to internal pinch injuries in the digestive tract.

General Handling Procedures

1. Be sure to wear safety glasses at all times when handling magnets.

2. Mark magnet work area with appropriate warning labels and signs and barricade area if possible. Alert co-workers of the hazards, and keep all unauthorized people out of the work area.
3. Remove all metallic objects (pens, pocket knives, flashlights, scales, watches, keys, wallet etc.) from your person and store well away from the area the magnet will occupy
4. Clear the area of all clutter and magnetic materials before opening magnet container.
5. Open magnet container on a non-magnetic work surface. Wood or plastic surfaces are preferable. Make sure there is not a magnetic surface underneath the wood or plastic work surface.
6. Open only one magnet at a time. Never have two unprotected magnets within four feet of each other.
7. Never leave an exposed magnet unattended. Return magnet to it's protective enclosure before leaving the area.
8. Use only non-magnetic tools, fixturing, and measuring devices when working with magnets.

Reference

"How to remove a finger with two super magnets" http://scienceblogs.com/sciencepunk/2009/03/how_to_remove_a_finger_with_tw.php