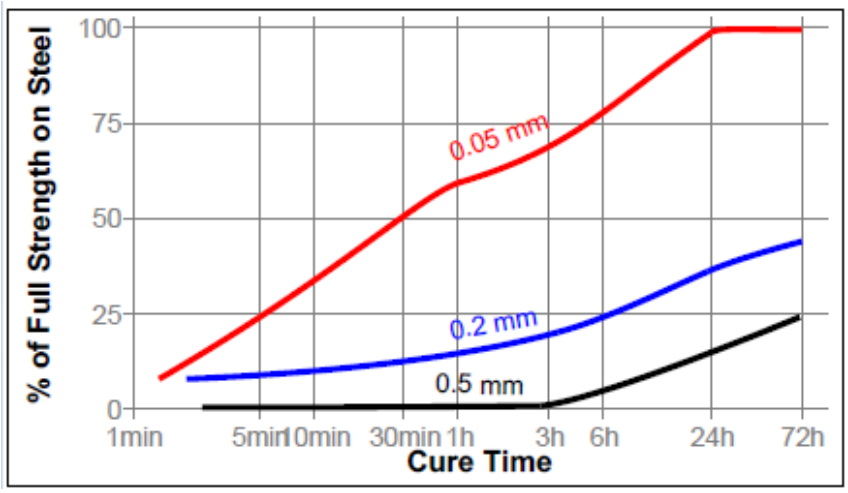
Adhesives Used to Attach Mounting Pads to Machinery for Vibration Analysis

Mike Johnson, DLI Engineering Corp.

I work on a condition based maintenance (CBM) program that includes fleet of about 100 ships each with about 250 notched triaxial accelerometer mounting pads attached to steel bearing housings. The program has run continuously from 1988 to present and some of the original pads are still in place used for quarterly narrowband measurements. We did studies back in the 90's to measure high frequency attenuation, toughness, and ease of use for various types of adhesives. Cyanoacrylate (CA) also referred to as "super glue" came out the best in terms of limiting high frequency (HF) attenuation. The problem with CA is that the bond will not hold up very long and the pads tend to fall off and collect in the bilge (lacks toughness). It was important to the success of the CBM program that the pads remain in exactly the same location and notch orientation, which ensured the same HF attenuation for each axis of the triaxial accelerometer cluster.

We found acrylic adhesives like Loctite Speedbonder 325 and Hernon React 730 to be almost as good as CA in terms of limiting HF attenuation (up to 16KHz). Both of these use an acetone based catalyst, which is flammable. Most airlines will not allow acetone as carry-on luggage, and UPS will not ship it w/o significant costs. For this reason, we settled on Loctite 325 with an optional solvent-less activator (Loctite part#:7380) that UPS will ship and TSA will leave alone in checked luggage. If doing a test, I would encourage including either Loctite, Hernon, or some other acrylic adhesive. As shown in the graph below, acrylic adhesive performance depends on the bondline gap dimension. This graph from the Loctite tech data sheet suggests a gap of 0.05mm is optimum.



The issue we found with Epoxy based adhesives is that bond quality is very sensitive to a precise mix ratio (A & B), as well as the cleanliness of the surface. Some manufacturers have devised ingenious tips that precisely mix parts A & B, however I have not seen one that will produce a precisely mixed final volume of epoxy the size of a green pea, which is all that we needed for our 1" pad. For this reason, we had to mix more than was needed which produced waste. Acrylic adhesives are not as sensitive to a precise mix ratio and are less sensitive to the level of surface prep. It has been a while, but I seem to remember every epoxy we tested had more HF attenuation than Loctite 325, which made it less favorable.

In conclusion, here are my recommendations if mounting pads on steel bearing housings: If doing a one-off test, use CA. If you want a super rigid bond that will last in excess of 25 years, use acrylic. If you want to spend time precisely mixing parts A & B, dealing with waste disposal, and live with more HF attenuation than CA or A, then use epoxy. If mounting a pad to concrete, I suspect epoxy would be better as it can fill voids and maintain near full strength.