Machine Tool Compatibility – Windows

The modern machine tool is now "fully" enclosed meaning that if you want to see what is going on, you must have a window in that enclosure. As an integral part of that enclosure, the window not only lets you see in but should also keep the material sealed in the enclosure. All this means is that the selection of the glazing material and its installation are critical to the functioning of the enclosure.

From the standpoint of compatibility with the metalworking fluids, glass is the first choice with plastic coming in a long way behind. However, because of its ease in fabrication, etc. plastic is still a very attractive alternative in some situations. Let's look at the issues associated with each.

For all practical purposes, metalworking fluids do not react with glass. Instead the issues associated with selecting the appropriate glass revolve around the type of safety glass best suited to the application and how strong the glass and its mounting system need to be to keep "everything enclosed in the enclosure". To assist in doing this, check with your machine tool builder and/or someone who specializes in specifying, fabricating, and installing safety glass.

None of the water-clear plastics are anywhere near as chemical resistant as glass; so when plastic is the glazing material of choice in machine tool enclosures, it now becomes a "wear part" and, to insure operator safety, needs to be changed periodically.

The plastic most commonly used in machine tool windows is polycarbonate (popular trade names such as LEXAN, and MERLON). Over time the impact resistance (that which keeps ejected parts in the machine enclosure) is reduced both by exposure to the metalworking fluid (pH, oil, surfactants, etc.) and the general environment (sunlight, scratches from chips, etc.). To reduce the effects of exposure to metalworking fluids, the polycarbonate is typically coated. To get full advantage of the coating, it must be applied to all surfaces that may become exposed to the environment, including sawed or routed edges and drilled holes, etc. Once this coating is penetrated and then exposed to fluid, it rapidly looses its strength.

Polycarbonate parts that have been bent or formed are particularly susceptible to stress fracturing when they are exposed to high pH materials like machine cleaner.

We are aware of one safety study of this subject that strongly recommends that a polycarbonate window sealed on both sides and the edges be changed after five years of use. Material that has unprotected surfaces should be changed every two years.

There is no nondestructive way of testing the impact resistance (strength) of a sheet polycarbonate or other glazing plastic. Because of this, we need to adopt a very conservative approach to evaluating the life of the glazing. We would suggest an approach something like this: "If it looks bad, change it; if it is uncoated and over 24 months old (60 months for coated) and looks OK change it! When in doubt, change it."

The other portion of the window system, the mounting hardware, etc. is equally important. As all glazing materials are brittle to one extent or another, it is important that they be insulated from vibration and shock as much as possible. This means that nearly all machine tool window mounting systems have an elastomer (flexible rubber-like material) bumper or vibration dampers. Some mounting systems use a rubber or plastic gasket to actually secure the glazing in the machine tool enclosure.

These elastomers are subject to the same type of chemical and environmental degradation as the plastic glazing. Additionally, they need to be compatible with the glazing itself.

NOTES:

1. If you have particularly dirty plastic windows, clean them with something like Master STAGES™ Whamex™ diluted with coolant working solution or Master STAGES™ TASK2™ Grime Fighter.
2. Currently the coating is not available for application at the "fabricator" level but must be applied by the manufacturer. Polycarbonate sheet is available coated either on one side or two sides.
3. When installing or sealing plastic windows, make sure that the sealing material is compatible with both the plastic and the coolant.

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