

Unbreakable windscreens

Using nano-coated polycarbonate sheets, a Swedish company has made unbreakable screens for construction machinery. Hammerglass protects the machine driver from rocks and stones and solar radiation.

FÖRSLÖV, Sweden: “No more broken windows!” That’s the guiding principle of the Swedish company Hammerglass AB. The firm manufactures unbreakable glazing panels, among other things for construction machinery. These are nano-coated polycarbonate (thermoplastic) panels with almost the same properties as glass, apart from one thing: according to the manufacturer, they never break. The product is only half the weight of glass, but is 300 times stronger.

– Normal glass doesn’t belong in construction machinery. It doesn’t matter whether it’s hardened or laminated. If a screen breaks, then the machine is unusable until a new screen has been fitted. It costs time and money and causes a lot of hassle. What’s more, it’s almost impossible to get rid of all the glass fragments scattered around the cab. They’re gradually shaken out as the machine is being used, Anders Bergsten recalls. He is responsible for vehicle-related exports at Hammerglass AB.

Building

This product, Hammerglass, was actually developed for the building industry. In the middle of the 1990s the company experimented with various surface treatments in order to find a way of ensuring that the panels could be used in insulated glazing units. Normally, polycarbonate cannot be employed for such purposes. Moisture molecules penetrate the plastic and create condensation within the sealed cavity.

– But we solved this problem in 1995. We are still – as far as we know – the only company in the world able to produce unbreakable thermopane panels. Now we supply to the vast majority of Scandinavian window manufacturers, and also to a series of countries both in Europe and beyond.

In 2009 the company began selling glazing panels specially coated for use in construction machinery.

– One of the problems is that screens are expensive per se. But when a screen breaks, that means the machine can’t be used, and that makes them even more expensive. And they often break at the most awkward time. Also, there have been some nasty accidents involving explosives, where the driver has been seriously injured by broken glass from screens in the machine, says Technical Manager Peter Andersson at Hammerglass.

Legal requirements

The Swedish Work Environment Authority issued new statutory provisions in 2010, stipulating that machine drivers must continue to be safe within their cabs when there was a risk of accidental explosion or of large rocks striking the machine. However, precisely what this meant in practice was not so easy to determine.

– When we started looking into this it turned out that there were no industry standards for testing and certifying glass for construction machinery. In very tough environments bullet-proof glass has been fitted, but this is both expensive and heavy, and breaks when

it is hit by a rock. The industry was caught napping by the new legislation, as there was no indication as to what solutions would actually satisfy the requirements, says Andersson.

– In the course of 2010 and 2011 the company got together with the Swedish machinery industry and the Swedish Work Environment Authority to draft a proposal for how tests like these should be performed, Anders Bergsten tells us.

Four test methods were found, each of which was to test the resistance of the screens to various forces:

- Scratches, for example from windscreen wipers
- Sharp stones at high speed
- Explosions from undetonated explosives
- Large, heavy rocks and stones at high speed

We also agreed about the need for a common system of marking for screens which had passed all four tests. From the English designations for the various test methods (R43, Axe, Blast, Stone) came the name RABS.

– Together with SP Technical Research Institute of Sweden we tested our screens in various thicknesses in order to find a screen which could withstand all of these. It turned out that the toughest test was explosion, says Bergsten.

Explosives

What happens if a machine digs up undetonated explosives which – in the worst case scenario – explode in the shovel? This has been tested with three kilos of TNT going off at a distance of three metres - equivalent to 100 kg from 14 meters distance!

– What was needed here was a sturdy steel frame to hold our 12 mm screens in place in the vacuum caused by the explosion. We've produced frames for the most common types of machine on the market, and new models are coming out all the time, says Bergsten.

Hammerglass informs us that the new 'RABS class' has become popular in many countries. But it is the regular 6 and 8 mm Hammerglass screens that are selling best.

– We've produced several hundred drawings of various screens for diggers and wheel loaders, and signed contracts with machine importers in those countries that we're working in. We're able to despatch screens from stock not later than the day after receipt of order. In Norway several importers have chosen to keep a stock of the most common screens, says Technical Manager Peter Andersson.

– How does Hammerglass withstand scratches and gravel?

– Generally the regular Hammerglass screens perform well. We have customers who've used the screens for many years without any problems at all. But when you're working on quarrying, for example, then there's heavy wear and tear on normal glass as well. We have a special sacrificial film which the driver himself can replace when it becomes too worn. All the adhesive remains on the film, so when the film is removed you only have to squirt a soap and water mixture onto the screen and then apply a new film using a special scraper. The whole operation only takes 10-20 minutes, says Andersson. We also offer a system for

quarrying machines, where a 6 mm sacrificial Hammerglass screen is mounted 15 cm in front of the normal Hammerglass screen. This solution is highly cost-effective and the driver can change the screen in just 5 minutes when it is worn or damaged.

– And how does it cope with heat from solar radiation?

–Just like normal glass, except that it keeps out 99.96% of UV radiation. This is a function of the surface coating. But we've also got a model called IR (InfraRed), which blocks half of the solar heat. Infrared absorbents in the polycarbonate mixture are amazingly effective, Anders continues. When we demonstrate this with the aid of an IR lamp alongside a normal glazing panel, the difference in thermal conductivity is like that between night and day. We've seen a big increase in the sales of these screens, especially since they radically lower the cooling cost of the cabin, says Anders Bergsten.