

Birth of an insert

The world of metal cutting wouldn't be the same without inserts. The inserts themselves are made of some of the hardest materials in the world. So we went to the production facility in Gimo, Sweden, to see how the inserts are made.

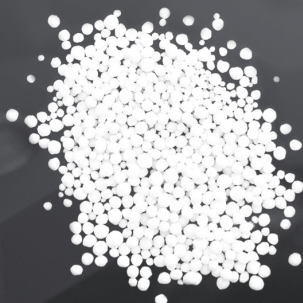


1. Inserts, mainly tungsten carbide and cobalt in various combinations, start out as a powder. Here a container is filled with the right mixture of ingredients for the specific powder ordered.

2. In the mill, the dry raw material is mixed with a solution of ethanol and water. The result is a gray slurry that is about the consistency of a yogurt drink.



3. After the slurry has been dried, samples are sent to the laboratory for a quality check. The powder consists of agglomerates, small balls of 20 to 200 microns in diameter. That's tiny – a strand of hair is 50 to 60 microns thick.



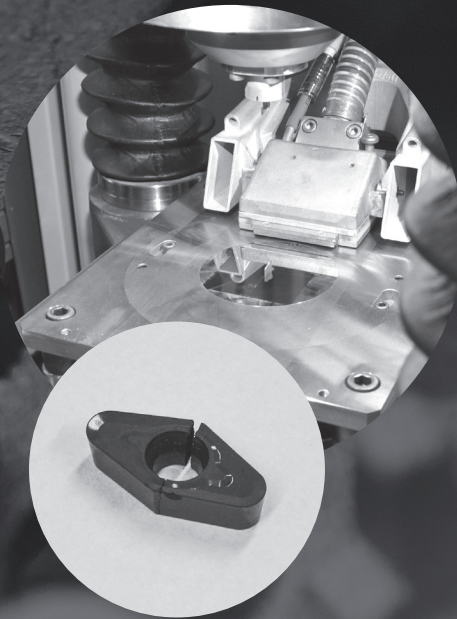
Ø
20–200
MICRONS

A STRAND OF HAIR

Ø
50–60
MICRONS

12 TONS
OF PRESSURE

4 & 5. The powder is transported in 100-kg barrels to the pressing machines where the inserts are made. The operator places the pressing tool, a mold for the specific insert about to be pressed, in the machine and enters the order number into the computer. The cavity of the press tool is filled with powder. Each insert is pressed with 12 tons of pressure, and it's weighted by the machine and controlled visually by the operator. At this stage the insert is extremely fragile, breaking easily.



1,500°C 13H

6. The pressed inserts need to be heated in order to harden. For this a sintering oven is used. The oven can take several thousand inserts at a time. The inserts are heated to approximately 1,500 degrees Celsius in a process that takes some 13 hours and fuses the pressed powder into cemented carbide, an extremely hard material. Shrinkage in the sintering process is about 50 percent, so sintered insert is only about half the size of the pressed piece.



7. After another visit to the laboratory for a quality check, the top and bottom of the insert are ground to the correct thickness. Because the cemented carbide is so hard, industrial diamond – the world's hardest material – is used to grind it.



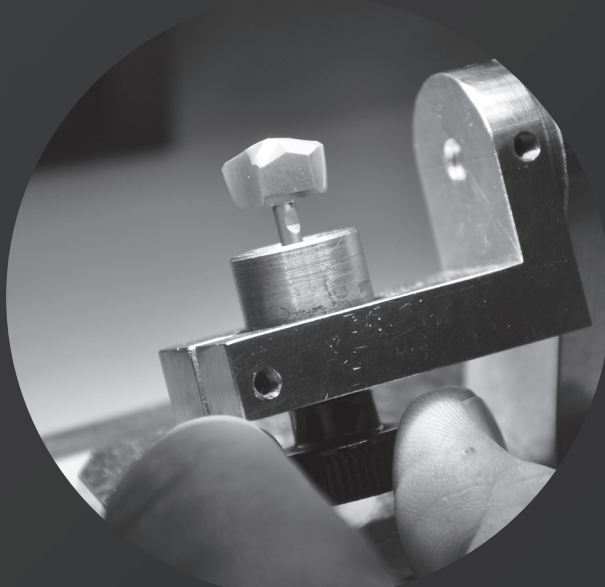
8. When the insert is the right thickness, it's sent for more grinding to get its geometry and size exactly right. This is the most advanced grinding done in Gimo, using 6-axis grinding plates to achieve very tight tolerances.



9. Once ground, the inserts are cleaned and sent for coating. At this stage, to avoid any grease or dust, the inserts must be handled with gloves. They are placed in fixtures on a carousel and entered into an oven with a low pressure where they are coated. This is where the insert gets its specific color.



10. The insert is now finished. Samples from each batch are inspected with a microscope to ensure that the quality is right.



11. Before being packaged, each insert is inspected again and compared with the blueprints and batch order. A laser marks the insert with the correct grade, and it's placed in a grey box with a printed label. It's now ready to be distributed to customers.

