

Nitrocoat Duplex Treatment Successful on Cold Forming Tools

In Italy, job coating company CRT is often the first to introduce new surface finishing processes to the market. Recently the company has experimented with the plasma qualities of its new Flexicoat® 1000 machine. They tested plasma nitriding and PVD coating in one process step (Nitrocoat Duplex Treatment) on the forming tools they coat for their customers. The results in terms of process stability, surface hardness, compound layer and reduced process time are very promising. And the tools coated with Nitrocoat Duplex Treatment last longer than ever.

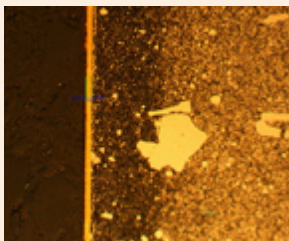
Donato Mattavelli, Production Manager, explains that the Flexicoat® 1000 bought by CRT last year is equipped with a plasma source, creating a plasma using the common PVD process gases. "This plasma, consisting of ions, electrons, molecules and atoms, provides many opportunities for improvement of PVD processes," says Mattavelli, "such as plasma cleaning, or heating. We decided to focus our interest on the possibility to get plasma nitriding and PVD coating in one process. This technology is interesting for us because our business is not only cutting tools, we also deal with cold forming tools, die casting and other tools in the plastics industry. Plasma nitriding is a very common treatment for these tools, so we tested Nitrocoat Duplex Treatment instead."

Nitrocoat Duplex Treatment

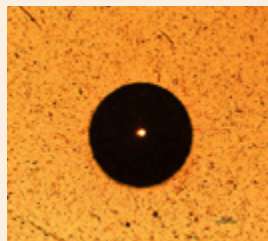
Plasma nitriding is a technology whereby nitrogen is diffused - using plasma in a vacuum chamber - into the surface of a workpiece. The result is a hardened steel surface (hardness limited to ~1000 HV) with a longer lifespan, better strain limit and fatigue strength. In Hauzer equipment the two process steps - plasma nitriding and PVD coating - can be combined as Nitrocoat Duplex Treatment. The quantity of nitrogen atoms is reduced using low pressure, thus preventing the typical white layer to be formed. This white layer would result in poor adhesion of the PVD coating. During the nitriding part of the process a hardness of 1100-1200 HV is achieved. Additionally a PVD layer is deposited to give the material even higher hardness (> 2000 HV).

Longer Lifespan for Tools

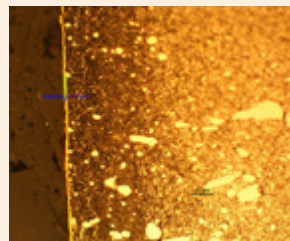
"For our tests we used high speed steels, hot working steel (H11), cold forming steel with a secondary hardness peak (1.2379) and nitriding steels (1.8579)", says Mattavelli. "And we must admit, we are very happy with the results! The nitriding time needed was only two hours for a hundred micron on single rotation. We noticed a very thin compound layer, around five micron thick, but as it is a very compact and dense layer, it does not influence the performance negatively. The nitrided layer is very hard, around 1100-1200 Vickers, which is 200 Vickers more than can be



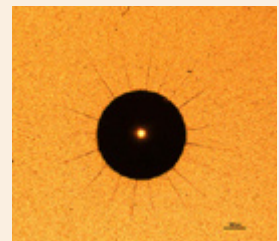
Steel grade 1.2379 sample, treated with Nitrocoat Duplex Treatment (Surface hardness 1100-1130 HV_{0.05})



Rockwell indentation of coated nitrided sample. Coating thickness 2.8µm



High speed steel sample, treated with Nitrocoat Duplex Treatment (Surface hardness 1180-1220 HV_{0.05})



Rockwell indentation of coated nitrided sample. Coating thickness 1.2µm

expected from conventional plasma nitriding. At this moment, a customer is testing the final performance of cold forming tools treated with Nitrocoat Duplex Treatment. But we can already say that many tools are still working after the usual life of a conventionally coated tool. As the first results are very encouraging, we intend to continue the development of this new technology. It gives us a competitive edge in our Italian market and that is something we are always looking for.”

Advantages Nitrocoat Duplex Treatment

CRT noticed the following advantages when applying Nitrocoat Duplex Treatment:

- All coatings are suitable to be deposited after nitriding (no white layer);
- The low process pressure widens the plasma, whereas in classical nitriding the plasma only forms around the product to be treated;
- The low bias voltage avoids the undesired phenomenon of overheating of edges or hollow cathodes effects;
- The time necessary for an effective case depth of 0.1 mm is sensitively less than with conventional plasma nitriding.

Meet Our Colleague



Lucien Peeters is the new Product Manager for tool coating applications. He has a background in technical sales positions and will concentrate his efforts on tool markets and their specific coating equipment needs. Together with your local contacts from our global sales network he will be offering you solutions for a more sustainable use of your tools.

Flexicoat[®] Configurations for Tool Coatings

In order to provide for all requirements in the cutting and forming tool market, Hauzer has defined a range of equipment especially suitable for tool coatings:

- **Flexicoat[®] RTC**
A low cost basic model. Fully functional with recipes for a broad range of tool applications;
- **Flexicoat[®] RTC⁺**
A high speed tool coating machine with recipes for a broad range of tool applications;
- **Flexicoat[®] DMS⁺**
Equipment with Dual Magnetron Sputtering in combination with circular arc technology, supplied

with recipes for a broad range of coatings for dry and challenging machining;

- **Flexicoat[®] HIPIMS⁺**
Equipment with a High Power Impulse Magnetron Sputtering process for R&D and tool coating production, supplied with recipes for smooth coatings for challenging machining;
- **MY Flexicoat[®]**
A flexible machine, built according to your own requirements.
Systems are upgradable to RTC⁺, DMS⁺, HIPIMS⁺ or MY Flexicoat[®]