

PPD

Wear Protection Treatment Process for Large Parts Opens New Horizons

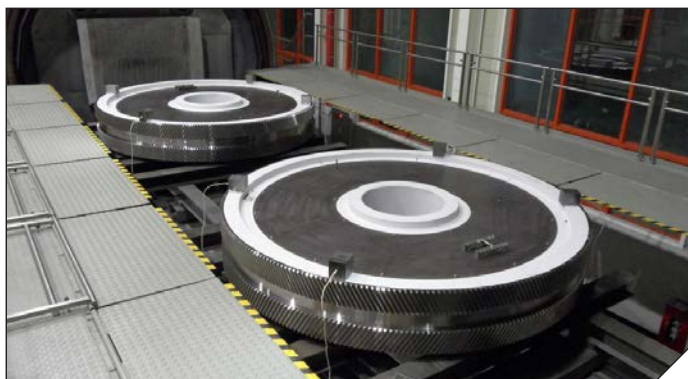


Figure 1 Large steel gears for the shipping industry weighing multiple tons and 8.8 feet (3 meters) in diameter have been wear-protected with the PPD solution (all photos courtesy Oerlikon Balzers).

Environmentally friendly, highly efficient and lasting a product's lifetime. With characteristics like this, Pulsed-Plasma Diffusion (PPD) technology from Oerlikon Balzers has established itself as an industry standard for the treatment of large automotive press tooling. Now the technology specialists are targeting new applications with this advanced process, offering an alternative to traditional hard-chrome processes. Large rollers for the steel industry and large gears for shipping and wind turbines are being processed.

In the PPD vessel, parts with a weight of up to 40 metric tons and dimensions of 32.2 feet × 8.9 feet × 5 feet can be treated. With a single PPD treatment the large automotive tooling dies are wear-protected and ready for five years model life production. Typical production volumes of 300,000 vehicles per year and a total production volume of 1.5–3 million parts can be stamped with a single PPD treatment of the tool; and with the tools always ready for production, productivity improvements of up to 25%, compared to the traditional used and constantly re-treated hard chrome tools, are typically found. The PPD technology also protects the tools without the use of dangerous chemicals such as hexavalent chrome.

With advantages like this, leading automotive companies and suppliers worldwide rely on PPD technology to safeguard their production. But this is just the start. "We want to open new markets for PPD technology and introduce the benefits of this technology to other industrial branches," says Phil Read, head of sales and business development, PPD, at Oerlikon Balzers Schopfheim, Germany—worldwide development center for the technology.

The target is, however, not automotive tooling, but, for example, large steel rollers for the transportation of painted steel coils through the production lines. These rollers, typically made of 4140 material, are responsible for removing the entry burrs on the steel coils before painting. These rollers are subject to deep wear tracks from the burrs—leading to quality issues on the finished painted coil. For this reason the rollers are traditionally hard-chrome-plated. "PPD-treated roll-



Figure 2 In the PPD chamber, parts with a weight of up to 40 metric tons and dimensions of 32.2 ft. × 8.9 ft. × 5 ft. can be processed.

ers last 10 times longer and the results have been confirmed with customer trials,” Read ensures.

In addition, large industrial gears for shipping wind turbines (32CrMo12) weighing multiple tons and spanning meters in diameter are being PPD-treated. Here the PPD technology shows its advantages over traditional case-hardening technologies such as flame and induction hardening. Through the improved surface quality, reduced part deformation and, therefore, minimal rework of the part after treatment, the PPD technology allows a reduction in the production steps for steel, cast steel and cast iron parts.

PPD technology is available worldwide. PPD machines are installed in Germany (Schopfheim), United States (Pell City, Alabama), Korea (Busan), China (Suzhou) and Japan (Shizuoka).

PPD: Diffusion process with integrated cleaning cycle

Powered by a combination of nitrogen, hydrogen and electricity, PPD technology uses a diffusion process to build a wear-protective, compound layer and a reinforcing, diffused hardness increase in the material. The process occurs in the PPD vacuum chamber—among the largest of its type in the world. Unlike typical nitriding, the required bake-out or cleaning of the parts before treatment—which typically oxidizes the part surface—is unnecessary, as this is integrated into the PPD process cycle. The part cleaning cycle is performed in the PPD chamber under vacuum. This process integration ensures safe temperature control of the part at all times and produces an extremely smooth surface treatment. After PPD treatment the surface can easily be re-worked, welded or heat-popped, providing a maintenance-friendly solution. ⚙️

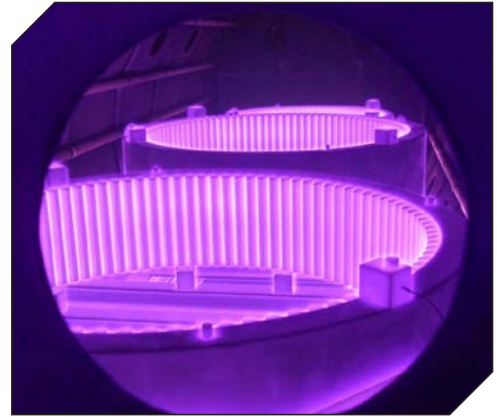


Figure 3 A PPD treatment in a pulsed-plasma atmosphere not only protects large automotive forming tools, but also large, heavy-industrial parts such as these gears for wind turbines.

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