PLASMA NITRIDING OF SHIP DIESEL VALVES

An example of nitriding ship diesel valves with the provided guidelines of longitudes of up to one meter and valve disc dimensions of up to 190 mm, the following points must be considered:

- The nitriding process has to be appropriate for high alloyed chromium steel, separate mechanical or chemical treatments for the necessary removal of the chromium oxide layer before nitriding are not to be considered.
- Controlled and reproducible layer structure, nitriding depth has to be 0.2 +/- 0.5mm, white layer has to be 8 + 4 μ. The hardness must be at least 750 HV3.
- The combustion space side of the valve disc and the top of the valve stem must not be nitrided.
- Attention to the difficulty of vibration crack corrosion in the lower area of the valve.
- The nitriding temperature must not be higher that 535°C to hold distortion as low as possible.

Of the most common nitriding processes, salt bath drops out without attention to technical feasibility for safety reasons of employees and environmental protection. Furthermore, gas nitriding is not possible. Especially with regard to the fact that in this process the oxide layer may not be removed on the surface of high chromium alloyed steels, as well as, the inadequate reproducibility. Plasma nitriding is the only logical alternative with a series of technical, commercial and ecological advantages.

ADVANTAGES OF PLASMA NITRIDING OF SHIP DIESEL VALVES

- Just before the intrinsic nitriding process, the parts are sputtered. Thereby the chromium oxide layer on the upper surface of the parts are removed which enables a trouble-free nitriding of the parts. The sputtering process is carried out in the plasma system, so additional handling is not necessary.
- Plasma nitriding of high chromium alloyed steels is also feasible at lower temperatures, thereby distortion is reduced to a minimum.
- Due to the used technology in plasma process a controlled and 100% reproducible layer structure becomes achievable. Ready upscaled processes guarantee the full efficiency of the system at the shortest possible process time.
- Surface that should not be nitrided may be masked in a very simple way. In this case, the bottom side of the valve disc is not nitrided as it stands upright on the charging plate and in this area no plasma is ignited. The upper part of the valve shaft is masked by a jacket and therefore also not nitrided.
- Due to the adjustable layer morphology in plasma nitriding, the white layer is set to the specific maximum and as a result the vibration crack corrosion is prevented.