



SupraHard Barrels

Products

The Quinn SupraHard barrel is a high quality hardened carbon steel barrel with some significant improvements over other types of H&H barrels. Quinn's uses our own in-house patented high frequency induction and quench process. The integral induction coil and quench head provide a very consistent **selectively surface hardened case**. The heat affected zone is typically only 0.035" thick, leaving the rest of the barrel wall thickness in a tough and ductile condition (<Rc 22) to resist pumping stresses and Sulfide Stress Corrosion cracking.

Quinn's SupraHard barrel uses a special high carbon content steel tubing (1040) which enables the barrel to attain hardness' consistently above **60 Rockwell C**. The fully martensitic structure has a very uniform case depth which is a minimum of **0.010" thick**. The increase in carbon also makes them 15-30% stronger than a regular carbon steel (1020/1026) barrel tube.

Because of Quinn's special heat treating method the inside diameter surface is imparted with **beneficial high residual compressive stresses**. Recall that only the inside surface of the barrel tube is heated. When this thin heated layer is quenched (cooled rapidly) the material wants to expand and form the very hard case (martensite). However, this martensite is not able to expand because the rest of the barrel wall has not been heated and it acts to hold the expanding material in. What this does is to force the hardened layer back in on itself. This forcing the hardened material together is what sets up the compressive stresses. Now, when actually pumping, a barrel wants to expand and stretch on each stroke. However, the compressive stresses are opposite to these cyclical pumping stresses and they work to cancel each other out.

Microstructure of a SupraHard inner diameter case. Notice the microhardness indentations.





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In H₂S environments, sulfide stress corrosion can occur when hardened steel is subjected to high tensile stresses. With the residual compressive stresses in a SupraHard barrel these tensile stresses are reduced. This means that even though the case is very hard, it is not susceptible to sulfide stress corrosion cracking. Also, because the ID case is under a compressive stress it is less likely for hydrogen embrittlement to occur.

Other hardened steel barrels are typically surface enriched (carburized) with a post heat treat process that affects the whole barrel tube wall. Surface enrichment processes only affect the very near surface (0.001” - 0.002”) and are very sensitive to material and process variables. Therefore, these barrels do not have a uniform case depth or a consistent, flat hardness profile. They also do not have the beneficial residual stresses or the tough, ductile core to withstand pumping stresses and corrosion.

Each batch of Quinn SupraHard barrels undergo a stringent metallurgical evaluation to ensure that they meet our ISO 9000 quality control requirements. Quinn’s SupraHard barrel is now referenced under API 11AX as a B6 Induction Case Hardened pump barrel.

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Photomicrograph of the induction heat treated inner diameter. Magnified 400x and etched with 5% Nital.