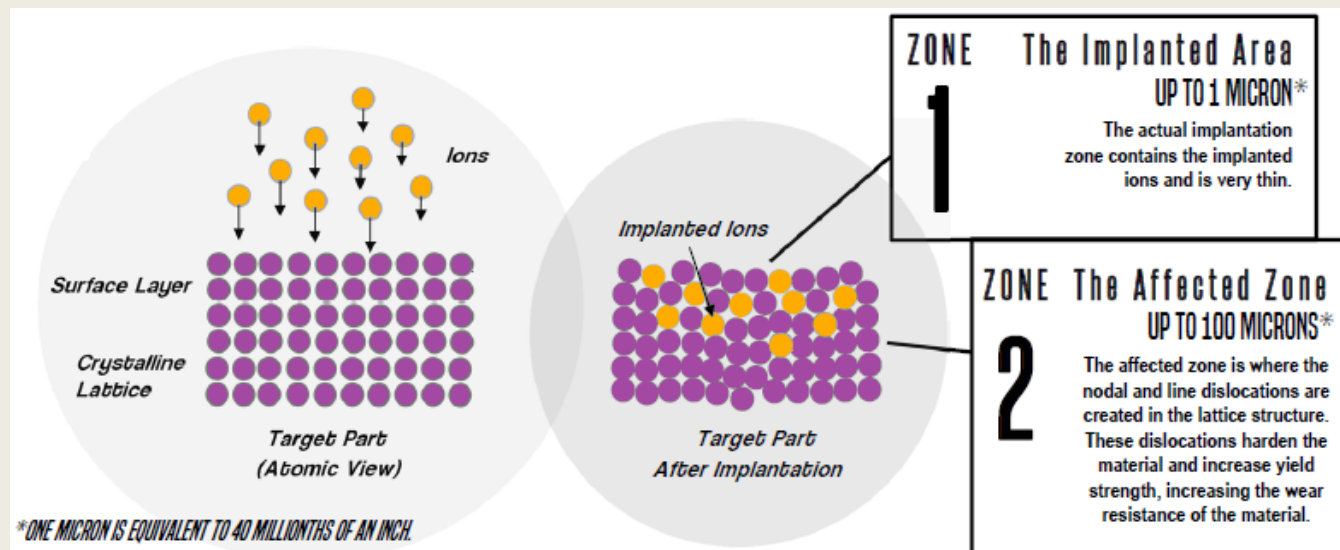




Metal Ion Implantation in Modern Industry

Surface Engineering Technologies LLC leads the industry in a type of surface treatment known as Heavy Metal Ion Implantation (HMII) which significantly increases fatigue life, hardness, toughness, and tensile strength of most materials. In this process metal ions are accelerated to approximately 1/500 the speed of light (600km/s). Once accelerated, the ions collide with the part being implanted, embedding themselves up to a micron into its surface, changing the surface material composition and characteristics dramatically. The HMII process addresses the problem of wear in two ways: a peening effect and an ion infusion effect which combine to give exponential gains in wear life and properties rather than a multiplicative one. The impact of the ions onto the surface of the parts creates an effect analogous to shot peening but with a shot size of single atoms, allowing the process to be done with zero dimensional change to the part. This ionic peening puts compressive stresses on the microcracks in the material to prevent them from propagating by increasing the stress or energy required to deform or fracture the part. The area of effect of this compressive locking is up to 100 microns.



When the HMII process is completed, any cracks which propagate must work their way through these compressive forces as well as the improved grain boundaries altered by the implanted ions. Since most part failures begin as micro-crack dislocations in a material, the results are large increases in part life. Unlike shot peening ions that impact the surface do not bounce off the surface but rather infuse into the surface, creating new bonding mechanisms and creating substitutional defects which create new structures within the surface and add an additional network of resistance against fatigue and wear.



Surface Engineering Technologies LLC

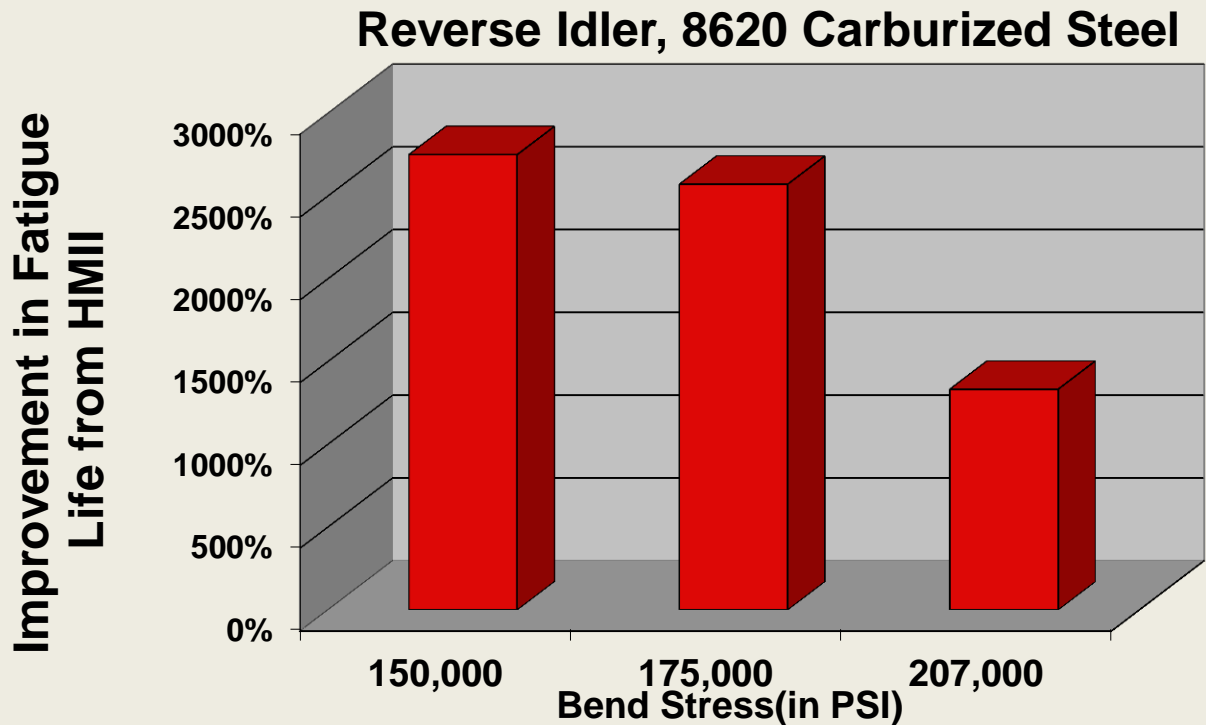
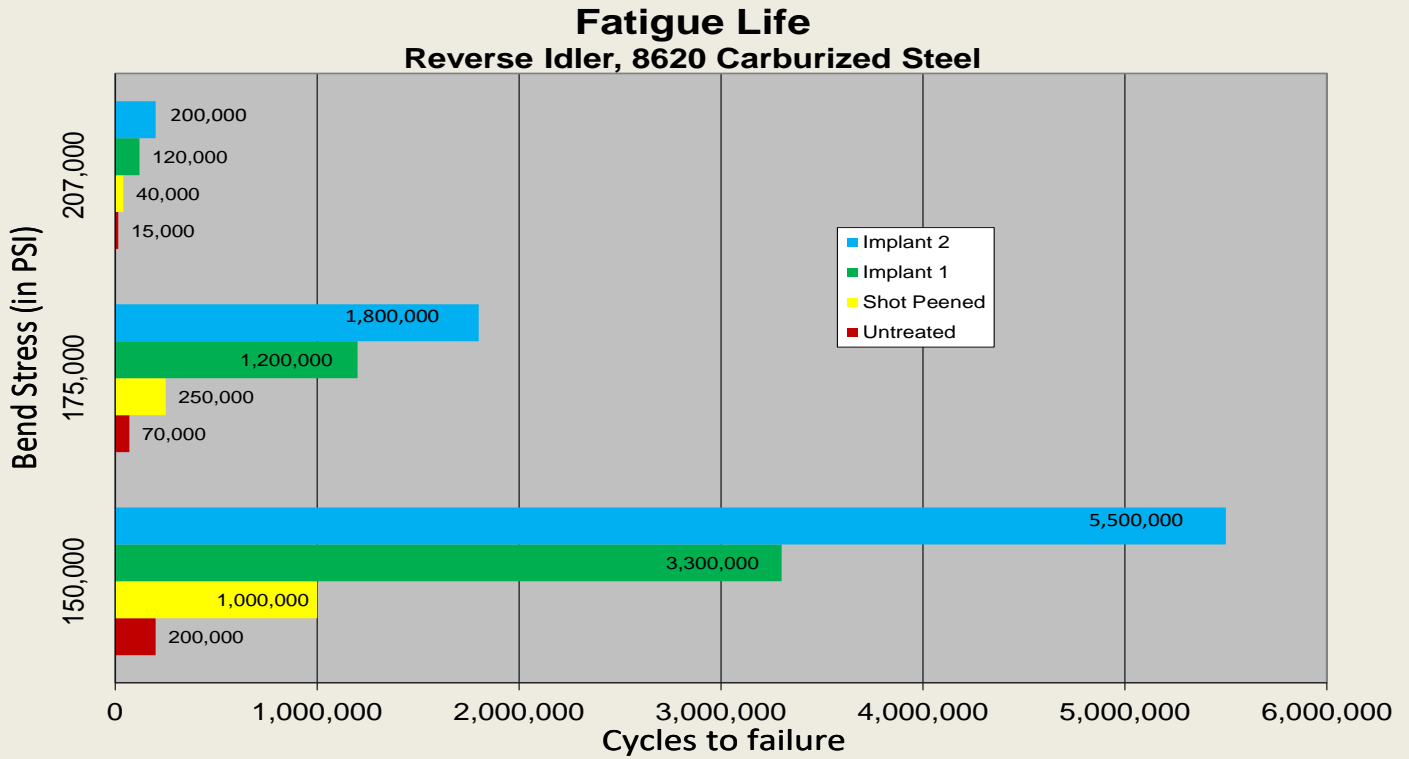
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When the combined effects of ion infusion and peening are present the performance of parts can see exponential gains in fatigue life, hardness, toughness, and tensile strength. Our HMII process can implant ions of almost any element on the periodic table from Carbon up to and including Uranium (popular ones include Chromium, Titanium, Molybdenum and Tungsten). This ion infusion effect can also imbue the surface with the properties of the implanted ion allowing for the addition of corrosion resistance, electrical properties and other specific material properties. Surface Engineering Technologies LLC can implant into nearly any solid material, such as ceramic, metal, carbide, and plastic.

	Strength	Fatigue Life	Surface Hardness	Wear Resistance	Corrosion Resistance	Friction Coefficient	Impact Resistance	Fracture Toughness
Metals	+	+	+	+	+	+	+	+
Ceramics				+		+	+	+
Plastics	+		+	+		+		

These improvements in the properties of materials have allowed parts treated by Heavy Metal Implantation to have many beneficial results over our Ion Implanter's history, including:

- Microhardness of steels and plastics: **3x -9x**
- Fracture toughness of ceramics: **10x**
- Tool life of carbide: **200% to 900%**
- Tool life of HSS: **375% to 1,125%**
- Hobs life: increased **300+%** (out lasted the customers job)
- Tool life of specialized medical dental drills: **500% -1050%**
- Huge part life increases in a reverse idler gear under various stress levels (**See below**)





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Surface Engineering Technologies LLC is providing our customers great opportunities for their businesses to cut costs and innovate. The ability to alter the characteristics of materials to enhance both their lifetime and performance allows for new and designs to become possible. HMII treatments can be a direct replacement to many common processes such as powder/PVD coating, plating, case hardening, and shot peening, or simply applied to surfaces which have already been treated in these ways for even further improvement. By using HMII on your in-house tooling and equipment you can lower production costs associated with part failures and replacement, or increase feed rates that the treated tools can now easily handle. You also save money on the downtime and labor required making repairs and exchanging spare or worn parts. HMII can allow your products to have unique capabilities not otherwise on the market, such as adding corrosion resistance, surface conductivity and catalytic surfaces. It allows for the replacement of inferior surface treatments or allows for inexpensive materials to withstand the same design parameters as much more expensive materials. For example, rather than use expensive steels to have a strong corrosion resistant part, you can use HMII on certain less expensive steels allowing for increased savings with same performance or better. Since HMII is done at a low temperature and causes no dimensional changes, it can easily be added to an existing production chain.

Contact one of our sales representatives to get started today!

