



## Power that Lasts

Dyna-Drill power sections, products of choice in the world's oil fields for nearly a half century, have earned industry-wide recognition for long, reliable performance.

In 1999, new leadership focused on this core competence to form Dyna-Drill Technologies, and the company relocated to a new 40,000 square foot facility in Houston, TX.

Here, in an ultra-modern plant, computerized engineering capabilities merge seamlessly with sophisticated machining tools and quality-assurance technologies to produce the next generation of power sections and components.

Among the specialized new products are Matrix-3™ coated bearings. These uniquely engineered coatings give superior resistance to wear, corrosion and mechanical fatigue. The coated bearings will be fabricated in a totally new facility designed solely for their manufacture.

With all human resources centered on advancing power section technology, Dyna-Drill's culture precludes bureaucratic delays and multi-layered decision making. Customers count on a high level of prompt, professional, personalized service support. In short, they can reach the person they want for the answers they need with one phone call or e-mail.



## New Matrix-3™ Coated Bearings Boost Performance of Mud Motors

### ***Raising the standard for reliability.***

Unique Matrix-3 coated bearings combine innovative metallurgy and brazing technologies to deliver unsurpassed mud motor performance. Their superior resistance to wear, corrosion and mechanical fatigue raises the industry standard for reliability to give sustained production in the most demanding operations.

### ***Solid microstructural bonding.***

Matrix-3 coatings exhibit a dense, uniform microstructure of selected tungsten and other specific carbide phases, bonded by a corrosion-resistant nickel-chrome matrix. This super-hard composite is metallurgically fused to the base metal to create a solid, inseparable union. Extended performance advantages include exceptional resistance to metal-to-metal impact, wear (abrasion/erosion), corrosion and mechanical fatigue.

### ***Customer-engineered properties.***

Matrix-3 chemistry allows heat-treating of bearings to a full range of required mechanical properties with no affect on the coatings. Just as important, the Matrix-3 composition can be custom-formulated to provide performance characteristics that best serve diverse operating environments. Coating thicknesses range from .020" to .250" and apply to virtually any shape, in line-of-sight or out.

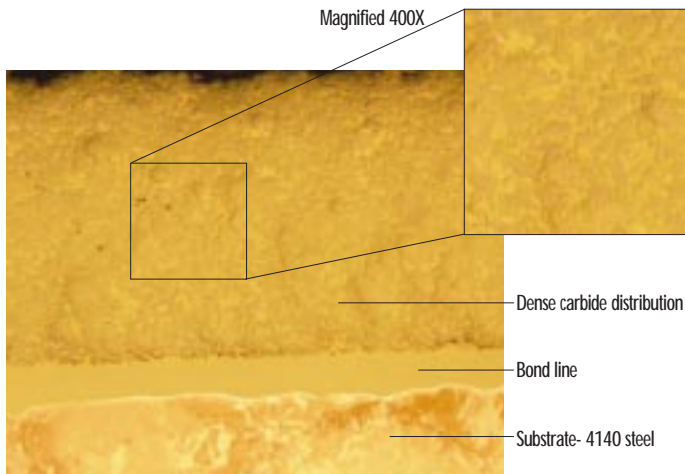
### ***Greater application versatility.***

The application spectrum of Matrix-3 coated bearings far exceeds the limited uses of quickly degraded thermal sprays, plating and weld overlays (see back page). Unavailable from any other vendor, Matrix-3 coated bearings outperform and outlast inherently deficient materials to ensure drilling power that lasts.

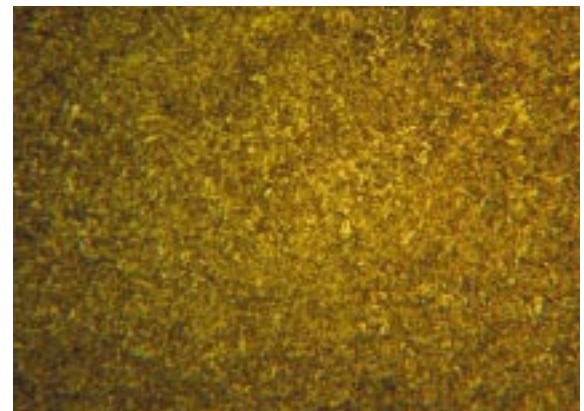
For more information, visit the Dyna-Drill website at [www.dyna-drill.com](http://www.dyna-drill.com) or phone 281-227-1250.

*See test results on back page.*

<i>Matrix-3 Coating System</i>		<i>Other Systems' Characteristics</i>	
<i>Characteristics</i>	<i>Benefits</i>	<i>Thermal Spray Coatings</i>	<i>Weld Overlays</i>
Very dense, high carbide content (>60% by volume)	Harder, more wear resistant	Low to medium carbide concentrations.	Low carbide concentrations (typically <40% by volume)
Metallurgically bonded (>70,000 psi)	Impact resistant. Eliminates wear due to particle pullout.	Metallurgical/Mechanical bond (<25,000 psi)	Metallurgically bonded but highly diluted with base metal.
Low porosity (<2%)	Impact resistant, corrosion resistance, wear resistance	Interconnected porosity throughout. Low to medium porosity.	Low to medium porosity.
Uniform distribution of carbide phases	Consistent coating performance from surface to substrate	Uniform carbide distribution, but some carbide degradation.	Carbide phases separate and settle to bottom.
Low dilution between carbide/matrix phases and substrate	Predictable, consistent performance of coating.	Carbide degradation. High levels of oxides dispersed throughout.	High dilution between phases and with substrate.
Low application variable dependent	Consistent coating characteristics.	Operator and process variable dependent.	Operator and process variable dependent.

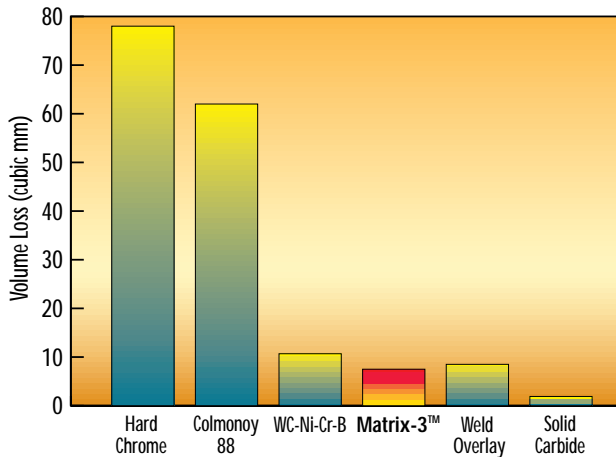


Magnified 100X – Visible in a Matrix-3 coating is a densely uniform distribution of carbide particles, metallurgically fused in a nickel matrix to the base metal. Note the absence of carbides in the bond line, which ensures a solid, inseparable union to give longer-life bearing performance.



Examination of the Matrix-3 coated base material after heat treating reveals a fully tempered martensite structure, with excellent mechanical and impact strength. Because the Matrix-3 coating is metallurgically fused to the base metal at extremely high temperatures, lower heat-treating temperatures will not impair its integrity or solid bond. This factor contributes to longer bearing life.

### ASTM G65-00a Abrasion Test



Matrix-3 coatings in laboratory tests exhibit exceptional abrasion resistance without sacrificing toughness, a common failing with conventional materials tested. This balanced performance is especially advantageous in high impact applications.

### Mechanical Properties of Matrix-3 Coated Substrates

Tensile Strength	150,000 Psi
Yield Strength	140,000 Psi
Charpy Impact	81 ft-lbs

Bearing substrate and heat treat conditions can be modified to meet customer requirements.

