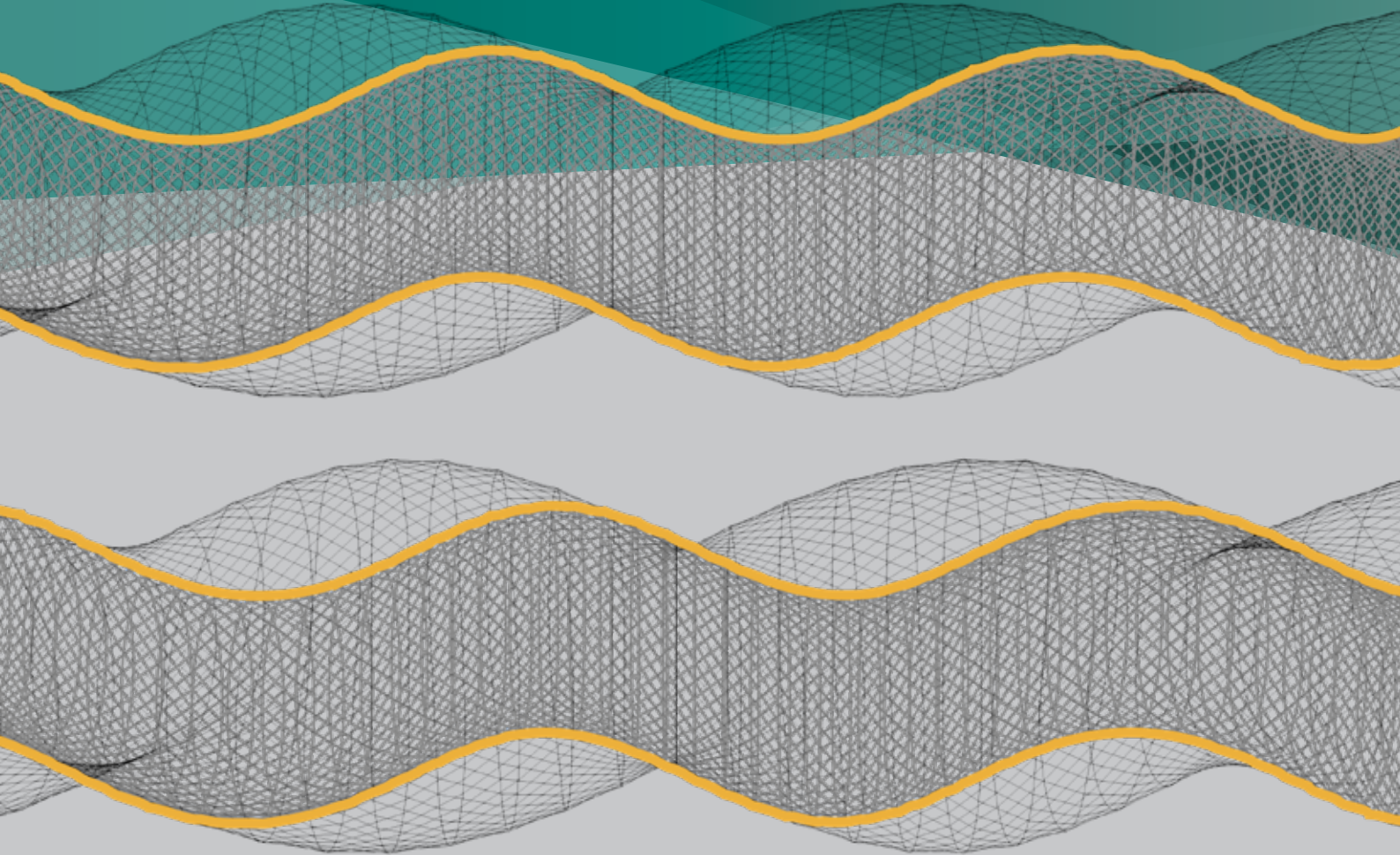


NETZSCH
Proven Excellence.



Products & Accessories

NETZSCH N.Durance™

Tungsten Carbide Fusion Coating Technology

Pumps & Systems

NETZSCH N.Durance™

TUNGSTEN CARBIDE FUSION COATING TECHNOLOGY

A Game-Changing Innovation for complex fluid handling solutions

Introducing the N.Durance™ Tungsten Carbide Fusion Coating Technology Series – a technological breakthrough in wear resistance performance with enhanced surface treatment technology. Designed to improve the durability, performance, and reliability of your NETZSCH NEMO® Progressing Cavity Pumps.

N.Durance™ Advanced, N.Durance™ Pro, and N.Durance™ Ultimate leverage advanced tungsten carbide fusion technology optimized by NETZSCH to outperform traditional surface treatment options, delivering unrivaled protection and extending the service life of your NEMO® pump's core components. Additionally, *the lifetime of all other critical pump components – most prominently the stator – will improve* as well, maximizing overall pump reliability and performance and lower total cost of ownership.

NEMO® Progressing Cavity Pumps (PCP) are rotating, positive displacement pumps. The basis of the PCP principle is the geometrical fit between the rotating precision-engineered element (Rotor) and the stationary component (Stator).

The rotor is typically a single helix shape and is normally made of a metallic, wear-resistant material. The stator is formed as a double helix shape made out of durable elastomer. Both components are designed for an interference fit, meaning the OD of the rotor is greater than the ID of the stator. Due to this design a series of sealed chambers (called cavities) are created. As the rotor turns eccentrically within the stator fluid enters the cavity formed at the inlet and progresses gently within that cavity to the outlet. The result is a positive, non-pulsating flow that is directly proportional to the pump's speed.

The interference fit along the sealing line is critical to the proper and long lasting operation and that is where the rubber meets the rotor.

As the NEMO® pump is also capable of pumping highly abrasive products loaded with solids, it is imperative to choose the right rotor surface material which provides a hardness which is greater than the hardness of the solids in the liquid. As a result, we can assure a long life time of the rotor and as result also an increased lifetime of the stator.

With a critical interference fit along the sealing line—where the rubber meets the rotor—N.Durance™ coated Rotors deliver longer-lasting performance and significantly extend Rotor and Stator lifetime.



NEMO® BY

REVOLUTIONIZING DURABILITY AND PERFORMANCE

The N.Durance™ surface treatment will dramatically improve the MTBF (Mean Time Between Failures) of demanding NEMO® Progressing Cavity Pumps applications. Advance to the next level with results in:

Lower TCO (Total Cost of Ownership):

- Reduced downtime, prolonged maintenance intervals, and extended lifespan.

Unparalleled wear resistance:

- Designed for abrasive and extreme abrasive applications, erosive environments.
- Impermeable to gas and liquids.
- High density.
- Low porosity.
- Higher ductility than other coatings.

Fusion Coating Technology:

- Replaces Hard Chrome technology due to better wear resistance.
- No chipping or peeling.
- Replaces coarse traditional HVOF and Plasma coatings.

Precision Engineering:

- Maintain peak rotor performance over long time.
- Attain much longer wear life.

Environmentally Friendly Manufacturing Process:

- Fusion carbide coating process does not use harmful chemicals or produce toxic waste, unlike other surface treatment processes.
- Traditional hard chrome plating is highly toxic and produces carcinogenic hexavalent chrome, a substance which requires specialized disposal.

In-house Manufacturing in Exton, PA USA ensures:

- Controlled, consistent and highest quality.
- Short delivery times.



THE PROCESS AND ITS RESULTS

The NETZSCH N.Durance™ Tungsten Carbide Fusion Coating heavy-duty technology was developed to optimize the performance and longevity of NETZSCH Rotors for extreme harsh and abrasive applications.

It is superior to traditional HVOF or Plasma spray systems. This coating technology exhibits:

- Greater hardness, toughness, lower porosity and superior cavitation resistance compared to HVOF coatings.
- Improved ductility.
- Very low porosity, typically only 0.6 to 1.5%.
- Increased consistency in scratch depth results.
- Increased higher spray velocities (from 800 to over 1,000 m/s / 2,600 - 3,300 ft/sec) results in improved toughness and cohesiveness of splat layers which provides better cracking resistance under bubble implosions.
- Effective WC-matrix interface cohesiveness.
- Lower combustion temperature (compared to traditional HVOF systems) of typically 1,000 °C (1,830 °F) is ideal for gradual heating of the

feedstock particles of metals and cemented carbides. Prevents oxidation of metals and decomposition of carbides.

- Increased particle velocity creates a dense coating with increased level of compressive stress and provides higher elastic strain energy during indentation.
- Minimized oxidation and decarburization of the tungsten carbide particles.



NETZSCH N.Durance™

KEY FEATURES

N.Durance™ Advanced

Advanced Rotor Surface Treatment Excellence

Superior Alternative to conventional Hard Chrome Plating/Ductile:

- Improved wear resistance to abrasion at *no additional cost*.

High Hardness:

- Built for demanding applications when wear and tear are unavoidable.

Upgraded Corrosion Protection:

- Resists chemical attack and ensures rotor integrity through low porosity and fusion process.

Improved Lifecycle Costs:

- Substantially lower costs by extending maintenance and replacement intervals.

N.Durance™ Advanced is the ideal solution for applications requiring a balance of performance and value. Perfect for moderately abrasive and corrosive environments at *no additional cost compared to hard chrome plated rotors*.

N.Durance™ Pro

High-Performance Rotor Surface Treatment Technology

Next-Generation surface treatment to Hard Chrome Plating/Ductile:

- Greatly Improved wear resistance to abrasion.

High Hardness Level:

- Engineered to excel in the tough applications where harsh conditions are certain with increased number of coating layers.

Optimal Corrosion Protection:

- Delivers superior resistance to chemical attack and ensures rotor integrity through low porosity and fusion process.

Improved Lifecycle Costs:

- Delivers considerable savings through reduced maintenance and longer service life.

N.Durance™ Pro is the ideal solution for challenging applications requiring a balance of performance and value. Perfect for highly abrasive and corrosive environments.

N.Durance™ Ultimate

The Pinnacle of Rotor Surface Treatment Innovation

Exceptional Durability:

- Maximum resistance to wear, impact, and thermal stress.

Enhanced Strength:

- Surface treatment remains intact under extreme operating conditions due to up to 7 layers.

Unmatched Performance:

- Outlasts the competitors most notably in the harshest environments.

Improved Lifecycle Costs:

- Maximizes long-term value with significant cost savings by minimizing replacements and maintenance demands.

N.Durance™ Ultimate represents the paramount advancement in wear resistant rotor technology. Engineered for extreme applications, it ensures maximum uptime and total pump reliability.



Comparison Table:

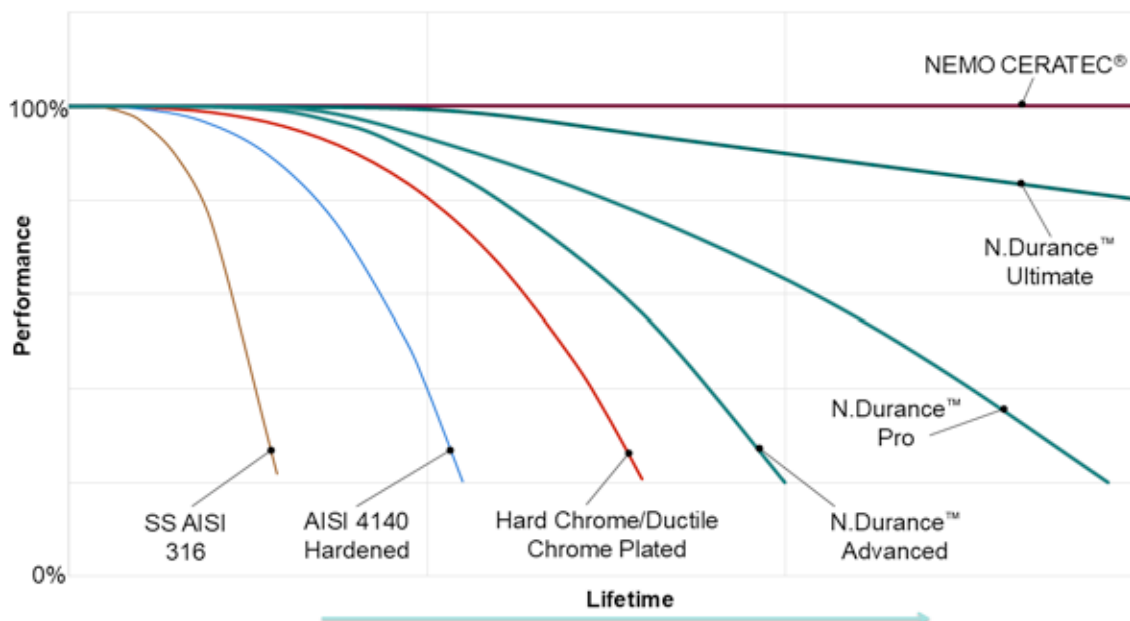
ROTOR COATING TECHNOLOGIES

While there are many different types of surfact treatments and processes to choose from, N.Durance™ is ideally suited and offers the best option to balance performance and cost.

Attribute	Hardened Cr Steel	Stainless Steel 316	Hard chrome plating / Ductile	Traditional HVOF	N.Durance™ Advanced	N.Durance™ Pro	N.Durance™ Ultimate	NEMO CERATEC® *
Wear Resistance	Low	Very Low	Moderate	Moderate	High	Higher	Very High	Exceptional
Corrosion Resistance	Low	High	Medium**	Moderate	High	High	High	Very High
Impact Resistance	High	High	Low	Moderate	High	High	High	Very Low
Hardness (Vickers)	700	200	800 - 1,050	1,200	1,300	1,300	1,300	2,600
Porosity	None	None	**	Moderate	Low	Low	Low	None
Surface Finish	+	+++	++	+	++	++	+	+++
Lifespan in Harsh Conditions	Short	Very Short	Short	Moderate	Long	Longer	Very Long	Maximum
Initial Cost	\$	\$\$	\$\$	\$\$\$\$	\$	\$\$\$	\$\$\$\$	\$\$\$\$\$
Life Cycle Cost (LCC)	High	High	Moderate	Low	Low	Lower	Very Low	Exceptionally Low
Manufacturing Environmental Impact	Low	Low	High	Moderate	Low	Low	Low	Low

*Additional information NEMO CERATEC® Brochure NPA 347

** Typical microcrack density: 200 – 800 cracks per linear inch (cpli)



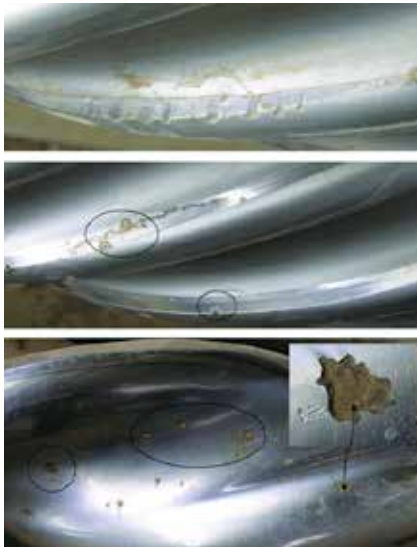
NETZSCH N.Durance™

OTHER TECHNOLOGICAL FEATURES

Hard Chrome Plating / Ductile Cracks

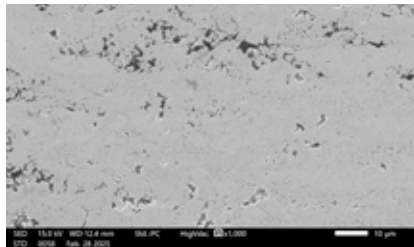


This image shows the typical microcracks that provide pathways for corrosive products to the base metal as well as air entrapment between the substrate and the hard-chrome plating.

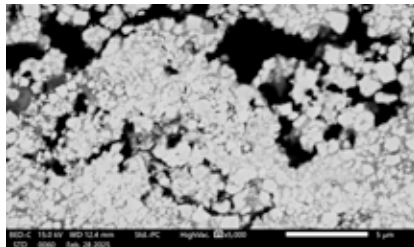


Various chrome coated rotors surface failures in the form of spalling and cutting.

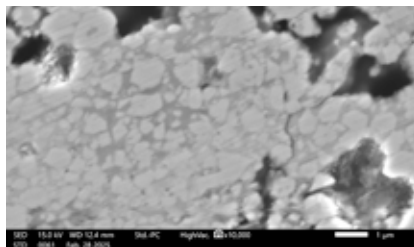
Traditional HVOF Tungsten Carbide Coating



magnification 1,000 times, porosity 6.28%

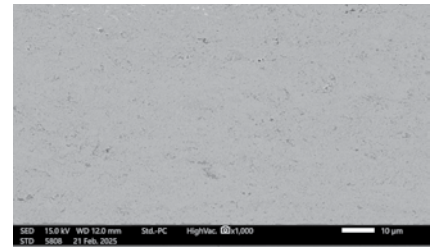


backscattered HighVac 5,000 times

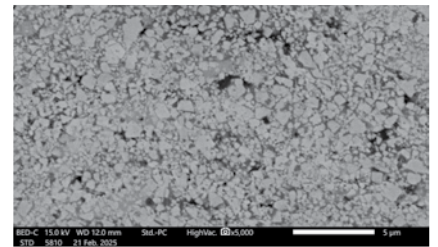


cross section magnification 10,000 times

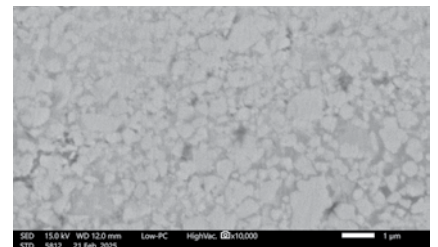
N.Durance™ Advanced Fusion Coating (shown below)



magnification 1,000 times, porosity 1.06%



backscattered HighVac 5,000 times



cross section magnification 10,000 times

The above comparison shows very clearly the dense, compact build-up of the N.Durance fusion coating with highest density and an even build-up, leading to a much lower porosity and improved bonding with the substrate material resulting in better wear and corrosion resistance.



Increased corrosion resistance of the N.Durance™ Coating over traditional HVOF Tungsten Carbide coating shown in results of this Salt Spray Test with Sodium Chloride (NaCl) 5.4% concentration at 35 °C / 95 °F.

PLATING AND COATING FEATURES COMPARISON

Feature	Hard Chrome Plating / Ductile	Traditional HVOF Coating	N.Durance™ Coating
Porosity Level	Inherently porous. A network of fine microcracks that form during the electrodeposition process provides pathways (corrosive elements like water and salt can penetrate these cracks) that attack the base metal, and cause corrosion under the plating which leads to peel-off of the plating.	Higher than N.Durance™, typically 5–12 times more, depending on process parameters.	Very low, typically only 0.6 to 1.5%.
Hole Characteristics	Typical microcrack density 200 to 800 cracks per linear inch (cpli) or more.	Pores are larger and more numerous, with some through-porosity that can allow corrosives to penetrate.	Holes and pores are smaller and less frequent, leading to a denser and less permeable coating.
Microstructure	Due to tensile stresses, chrome plating develops a network of tiny cracks as it builds thickness, which can be a point of failure.	Less homogeneous microstructure with coarser carbides and a higher content of oxides and other undesirable phases.	Denser, more homogeneous microstructure with finer, well-distributed carbide grains.
Performance Implications	A generally durable surface for applications with moderate wear and tear; prone to cracking and may not perform well under very high stress or extreme wear.	Higher porosity makes the coating more susceptible to corrosion, especially with chlorides and other corrosive environments.	The lower porosity results in superior corrosion and cavitation resistance, as there are fewer pathways for corrosive agents to attack the substrate (base metal).

APPLICATIONS

The NETZSCH N.Durance™ Rotor is the perfect solution for challenging applications in all industries to improve lifetime and reduce overall Total Cost of Ownership.



NEMO® SY pump transfers lime milk



NEMO® BY Pumps transfer hydrolized food waste with extremely low pH



NEMO® BY Pump for the transfer of coal slurry

The NETZSCH Group is an owner-managed, international technology company with headquarters in Germany. The Business Units Analyzing & Testing, Grinding & Dispersing and Pumps & Systems represent customized solutions at the highest level. Almost 5,000 employees in 36 countries and a worldwide sales and service network ensure customer proximity and competent service.

Our performance standards are high. We promise our customers Proven Excellence – exceptional performance in everything we do, proven time and again since 1873.

The NETZSCH Business Unit Pumps & Systems offers NEMO® progressing cavity pumps, TORNADO® rotary lobe pumps, NOTOS® screw pumps, PERIPRO® peristaltic pumps, macerators/grinders, metering technology and equipment custom built for challenging solutions for different applications globally.

Proven Excellence.■

NETZSCH Pumps USA
119 Pickering Way
EXTON, PA 19341
Tel.: 610 363-8010
Fax: 610 363-0971
npa@netsch.com

NETZSCH Pumps USA
1511 FM 1960 Road
Houston, TX 77073
Tel.: 346 445-2400
npa@netsch.com

NETZSCH Canada, Incorporated
500 Welham Road
Barrie, ON L4N 8Z7
Tel.: 866 683-7867
Fax: 705 797-8427
ntc@netsch.com

NETZSCH Canada, Incorporated
5050 76th Ave SE
Calgary, AB T2C 2X2
Tel.: 866 683-7867
ntc@netsch.com



NETZSCH®

pumps-systems.netsch.com