



NEDOX[®]

5055 Cranswick Rd. • Houston, TX 77041 / Tel: (713) 541.2020 • Fax: (713) 541.9090

NEDOX "synergistic" surface enhancement coatings were initially developed to insure reliability, wear, and performance of metal parts in NASA's space vehicles. Today, all types of metal parts, including those made of aluminum, are treated with NEDOX to create a harder-than-steel, self-lubricating surface that resists corrosion, friction, sticking, galling, and static buildup, and exhibits superior mold release as well.

The process improves

parts made of less durable and/or less costly metals by adding physical properties that permit them to outperform and outwear even chrome and stainless steel. Because NEDOX-treated surfaces are superior in performance to the base metal itself or to any of the individual components used in the enhancement process, NEDOX coatings are considered "synergistic."

* MSFC Handbook 527F (NEDOX SF-2), Johnson Space Flight Center #096041

Engineering Data and Performance Characteristics

Wear resistance

Hardness is up to Rc 68 (940 Vickers scale) — better than hard chrome plate. There is no degradation of fatigue strength. NEDOX coatings also eliminate the likelihood of galling or seizing.

Corrosion resistance

NEDOX "synergistic" coatings are superior in corrosion resistance to chromium or standard electrolytic-nickel plated coatings. A 0.001" coating

NEDOX vs. chromium plating

High-efficiency NEDOX coatings provide optimum uniformity and do not build up on high current density areas. Thus, costly and labor-intensive secondary machining and secondary finishing steps can be completely eliminated. An added feature is the ductility of NEDOX which allows a 180° Bend-Test without flaking or chipping.

The poor efficiency of chromium plating systems (10% – 14% under optimum conditions, even less with some configurations), when complicated by high and low current density areas, can lead to extremely uneven deposition rates and leave large variations in the coating thickness. Uneven deposition of chrome also results in a very brittle coating.

Wide range of NEDOX surface enhancement coatings offers design flexibility

During the multiple steps of the NEDOX process, there are a number of variables that can be controlled to produce different surface enhancement characteristics.

Through experience and research, the exact control required to produce the desired results of a specific coating type has been refined. There are many different types of coatings within the NEDOX family of "synergistic" coatings. Each one has unique characteristics to meet application needs or can be modified to achieve special performance requirements.

shows little or no corrosion after 14 months of continuous exposure to atmosphere and salt water. Good resistance to most common chemicals. Coatings show no effect after 90 days immersion in pH 3.0 – 9.5 solutions. Some NEDOX coatings are especially resistant to phosphate-free bleach used in washdown solutions in food processing and packaging operations. NEDOX coatings on aluminum also provide resistance to a wide range of chemicals.

Value-added coatings permit substitution of carbon steel or aluminum for expensive metals

In order to reduce bottomline costs, innovative design engineers today are utilizing Magnaplate "synergistic" coatings such as NEDOX to permit substitution of aluminum and low-cost steels for more expensive metals such as stainless steel.

Stainless costs about five times more than carbon steel. Yet in many applications, a carbon steel part that has been protected by the proper type of NEDOX coating will have the corrosion resistance of stainless steel and can be used in place of the stainless part. Similarly, other lower cost ferrous alloys can be specified in a wide range of applications where higher cost substrate materials are currently used.

NEDOX-coated aluminum, too, has become a popular choice of design engineers, as well as of plant and materials engineers. NEDOX on aluminum exceeds the requirements of MIL SPEC-C-26074 Class 3 and 4.

A few typical applications

Aircraft, aerospace, chemical processing equipment, electronic equipment, food processing, heat sinks, meters (gas & electric), molds (release media), packaging equipment, pharmaceutical processing, pumps, sealing equipment, textile manufacturing, and valves.

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email: sales@odrillmcm.com
www.odrillmcm.com

**NEDOX FAMILY OF
"SYNERGISTIC" COATINGS**

| | |
|-------------------|---|
| SF-2 | Hardness (up to Rc 65) combined with lubricity. NSF, AgriCanada, USDA-approved/FDA-compliant. NASA material #20386*. |
| SF-2R | Same as SF-2, but with superior mold release. USDA-approved/FDA-compliant/NSF-compliant. |
| SF-2SB | Resists bleach washdown solutions and lactic acid from dairy equipment. USDA approved/FDA-compliant. |
| 604 | Maximum chemical resistance, mold release, and abrasion resistance. High dielectric strength. FDA-compliant. |
| 615 | Maximum release properties. Operating temperatures up to 550°F (288°C). Sparking black or white color. USDA approved/FDA-compliant. |
| 641 | Excellent release for food and drug molding and manufacturing applications. Grey in color, USDA/FDA compliant. |
| NH-2 | Hardness of coating can be varied for excellent corrosion and chemical resistance. |
| CR+ | Maximum wear resistance. Hardness up to an equivalent of Rc 68. Maximum salt spray resistance. |
| FM-5 | Special combination of proprietary polymers and dry-lubricants. Low coefficient of friction after burnishing. |
| MR-3 (U-4) | Excellent mold release for plastics, urethane epoxies and rubber. Black color. Recommended for UV curing. |
| NH-1 | Excellent for resistance to wear and corrosion. Hardness of coating can be varied based upon specific requirements. |
| NH-15B | Same as NH-1, with superior corrosion resistance to chlorinated solvents. |
| HTR | Excellent release at temperatures up to 1,400°F (760°C). |

■ **FDA/USDA/AgriCanada compliance**

Compliance with FDA, USDA, and AgriCanada codes makes many NEDOX coatings particularly advantageous for food and pharmaceutical applications. These non-stick coatings eliminate the potential growth of mold and bacteria by creating a dense, non-porous surface. They are used extensively on processing, packaging and handling equipment to prevent product residue from clinging to machinery and add the benefits of quicker equipment cleanup and sanitation maintenance.

■ **Non-stick release properties**

Very few solid substances, even adhesives, adhesive-backed products or glues, will permanently adhere to the proprietary polymer-impregnated surface of a NEDOX coated part. Most substances, such as plastics, rubber or slurries, release easily. Some extremely tacky materials may exhibit mild temporary adhesion.

■ **Anti-static electrical properties**

The proprietary polymeric impregnation usually imparts dielectric resistance, a low dissipation factor, and very high surface resistivity over a wide range of frequencies. However, special techniques developed by R&D Group permit NEDOX to be made conductive enough to be used as an anti-static coating.

■ **Thickness**

Typical normal surface buildup is 0.0002" - 0.003" (±10%) and is based upon thickness requirement and coating formulation.

■ **Non-wetting**

Since our proprietary polymer-impregnated surfaces are both oleophobic and hydrophobic, they resist wetting by most liquids. Hence, clean-up is faster, easier and more thorough. In many cases, parts become self-cleaning. Maintenance time and labor are greatly reduced. Drop tests exhibit excellent performance.

■ **Temperature**

Exhibits high strength, toughness and self-lubricity down to -250°F (-157°C). Exhibits high flexibility down to -110°F (-79°C). Operates at 550°F (288°C). Some NEDOX coatings will survive temperatures of 1,400°F (760°C).

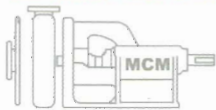
■ **Thermal coefficients**

Typical Coefficient of Thermal Expansion:
7.22 x 10⁻⁶ in/in/1°F. (13 x 10⁻⁶ in/in/1°C).
Typical Coefficient of Thermal Conductivity:
0.105 - 0.135 Cal-cm/sec/°C.

■ **Versatility**

With few exceptions, NEDOX coatings can be applied to parts of any configuration, any weight, virtually any size or thickness, and almost any metal (including aluminum). Precise control of coating thickness permits use on machine threads and similar tolerances.

Instead of Stain Steel, try NEDOX at 1/3 the price!!



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