

# **NIP<sup>3</sup>**®

**ELECTROLESS NICKEL/PTFE  
AEROSPACE ACCREDITED COATING**  
[WWW.COATINGTECHNOLOGIESINC.COM](http://WWW.COATINGTECHNOLOGIESINC.COM)



Accredited  
*Nadcap*™



Coating  
Technologies Inc.  
PRECISION ENGINEERED COATINGS

# A BRIEF HISTORY

**T**he Electroless Nickel / PTFE process was developed in Holland and later refined and commercialized in England. Coating Technologies Inc. became a licensed facility in the United States for this process in 1987. In 1988 CTI hired one of the developers of this process ( Dr. Paul Ebdon PHD ) to help train and develop the market for this new technology.

This relationship has made CTI the undisputed leader in the Electroless Nickel/PTFE composite market today.

# A UNIQUE CONCEPT IN COATING TECHNOLOGY

**N**P<sub>3</sub> is a surface treatment for various metals and alloys that combines sub-micron particles of PTFE (Polytetrafluoroethylene) with autocatalytically applied nickel/phosphorus. The result is an accurately applied, dry lubricated, low friction surface that is extremely hard and resistant to wear.

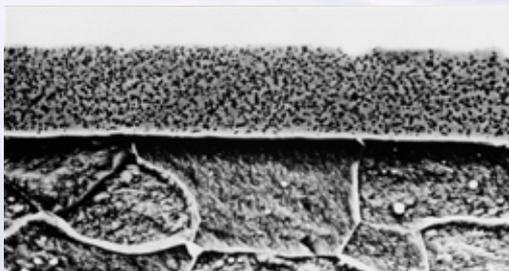
The PTFE is evenly distributed throughout and locked into the nickel phosphorus matrix creating a true and stable composite. As wear occurs fresh particles of PTFE are exposed to keep the surface lubricated. This lubrication is available as long as the integrity of the coating is intact.

With NP<sub>3</sub>, the innovative engineer can specify surface characteristics that were previously thought unattainable.

**PH: (623) 581-2648**

# THE NP<sub>3</sub> / ELECTROLESS NICKEL PROCESS

The NP<sub>3</sub> process is an evolution of autocatalytic (Electroless) nickel plating. Electroless Nickel is a time proven technology that accurately deposits hard, corrosion resistant nickel phosphorus onto metal. One of the greatest attributes of this technology is no matter how complex the shape, the coating thickness remains consistent. This type of accuracy is not possible with conventional electrolytic plating.



Plating is accomplished by using reducing agents in the bath. Sodium hypophosphate fuels the reduction reaction to deposit the nickel along with the co-deposition of small amounts of phosphorus. The phosphorus enhances the nickel's corrosion resistance by forming a thin tarnish film and gives a deposited hardness ranging from Rc 35-50. Heat treatment can increase hardnesses into the Rc 68-70 range.

With NP<sub>3</sub>, PTFE is introduced into the solution with a blend of surfactants and other chemicals which enable the PTFE to be co-deposited with the nickel. This composition incorporates approximately 25 volume percent of PTFE into the nickel matrix. Unlike other nickel /PTFE products, NP<sub>3</sub> is a true composite.

# **NP<sub>3</sub> BENEFITS**

***HARD, CORROSION RESISTANT, SELF LUBRICATING***  
and dimensionally accurate finish.

## ***EXTREMELY CORROSION RESISTANT***

A 1 mil (.001) thick coating can withstand a salt spray corrosion test of 100+ hours per ASTM B-117.

## ***TOLERANCES CAN BE PREDETERMINED***

to meet your specific needs. Parts that are dimensionally undersized can be built up and retrieved rather than scrapping.

## ***CAN BE SELECTIVELY APPLIED***

by masking out any zero tolerance areas.

## ***SELF LUBRICATING COATING***

Parts that reciprocate, slide, turn or in any way interface with other parts are prime candidates for this coating. NP<sub>3</sub> will provide long term lubrication, a great benefit to parts that are inaccessible.

## ***CAN OPERATE IN A WIDE RANGE OF TEMPERATURES***

NP<sub>3</sub> has been used in a wide spectrum of applications from cryogenic atmospheres to high temperature mold applications.

## ***CAN BE USED IN MANY HOSTILE ENVIRONMENTS***

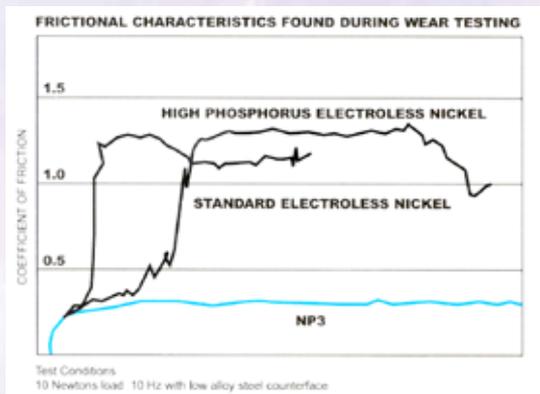
without any degradation. Medical equipment, food processing, firearms, rocket components, aircraft parts, machines, electronic assemblies and a multitude of other sensitive equipment have benefited from the attributes of NP<sub>3</sub>.

## ***VERY ABRASION RESISTANT***

with an as-plated hardness of Rc 35-50. This property alone makes NP<sub>3</sub> viable as a coating in high friction or high load applications. With post-plate heat treat, hardness can be elevated into the Rc 68 - 70 range.

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# NP<sub>3</sub><sup>®</sup> NI – PTFE DEPOSIT PERFORMANCE FACTS



<b>COMPOSITION:</b>	Nickel	84 – 84% by weight
	Phosphorus	9 – 11% by weight
	PTFE	8 – 9% by weight 23 - 25% by volume)
<b>DENSITY:</b>	6.5 g/cm3	
<b>HARDNESS:</b>	As-Plated	300-350 HV100 (32-35 Rc)
	Heat Treated@ 300°C for 4 hr	400-450 HV100 (42-46 Rc)
<b>MELTING TEMPERATURE:</b>	Nickel Phosphorus Alloy	1650°F, 900°C
	PTFE	620°F, 325° C
<b>CO-EFFICIENT OF FRICTION:</b>	LFW-1, ASTM D-2714	
	Wet (white oil)	.07 - 0.10
	Dry	0.17 - .21
<b>WEAR RESISTANCE:</b>	Excellent, Mild Load/Sliding Wear Conditions	
<b>ABRASION RESISTANCE:</b>	Taber Abrasive Test	
	CS – 10 Wheel; 1000g load	
	Weight loss, mg/1000 cycles 20	
<b>CORROSION RESISTANCE:</b>	ASTM B – 117 Salt Spray	
	1.0 mil 100+ hours	
<b>ELECTRICAL RESISTANCE:</b>	Ohms Per Square	0.06 ohm (0.84 mil deposit)

# COST SAVING

The uniform thickness and dimensional accuracy of NP<sub>3</sub> negates the need for post-plate grinding operations. Thinner, accurate coatings mean reduced cost in materials and handling. Coatings can be applied to very exact tolerances easing the design and processing problems for engineers and designers.

Processing of the NP<sub>3</sub> can be done expeditiously on most parts thus allowing for quicker assembly or replacement of time sensitive components.

Components plated in NP<sub>3</sub> that have shown wear can be chemically stripped and re-plated with a fresh coating of NP<sub>3</sub>, thereby saving on component replacement costs.

Importantly, NP<sub>3</sub> is competitively priced.

## NP<sub>3</sub> (ELECTROLESS NICKEL/PTFE) AEROSPACE SPECIFICATIONS

*GPS3117-1 (HONEYWELL), HP4-90 (BOEING),  
M7019883 (HONEYWELL), EMS52545 (ALLIED ENGINES)*

The plating of components with electroless or autocatalytic nickel is one of the most rapidly developing metal finishing processes. The advantages of coating uniformity, corrosion resistance and hardness are providing designers with opportunities to protect and improve base materials in ways that were not previously possible.

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In addition to the benefits mentioned above, the autocatalytic nickel coating confers a degree of lubricity on the component, enhancing the coating's suitability for pumps, compressors, pistons, brake cylinders and hydraulic components. The precise uniformity of the deposit enables the coating to be utilized as a true finishing process, with no post plate grinding or polishing required after plating.

## **PROVEN APPLICATIONS**

**ELECTRICAL SWITCHES**

**FIREARMS COMPONENTS**

**ARMATURES**

**SOLENOIDS**

**PNEUMATIC PISTONS**

**FOOD PROCESSING EQUIPMENT**

**AIRCRAFT ENGINE PARTS**

**MOLDS**

**PHARMACEUTICAL PROCESSING EQUIPMENT**

**VALVES**

**ARCHERY COMPONENTS**

**GOLF CLUBS**

**ELECTRONIC ENCLOSURES**

**RESTRAINT SYSTEM COMPONENTS**

**PUMP GEARS**

**AMMUNITION**

**CLEAN ROOM EQUIPMENT**

**ROBOTICS**

**AIR CARGO DELIVERY SYSTEMS**

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