



# Surface Engineered Die Cast Tooling



ISO 9001, ISO/TS 16949, AS 9100B, NADCAP Certified



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# IONIC TECHNOLOGIES

- ✓ PVD Coatings
- ✓ Plasma Nitriding
- ✓ Vacuum Hardening (NADCA Specification)
- ✓ Vacuum Tempering
- ✓ Deep Cryogenics



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# GEMINI DDC+

- ✓ Low Temperature Diffusion Process  
(896°F / 480°C)
- ✓ Diffusion into and onto the work piece



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# MOLD COMPONENTS

- Cores
- Cavities
- Slides
- Pins
- Shot Sleeves
- Shot Tips



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# GEMINI DDC+

## ADVANTAGES

- ✓ Non Wetting Characteristics
  - Reduction Of Soldering
  
- ✓ Abrasion resistant
  - Elimination of wash out
  
- ✓ Significant increase in fatigue strength
  - Reduction of thermal fatigue cracking

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# High Performance High Performance

## GEMINI DC+

PROCESS	OPTIMAL THICKNESS	COLOR	MICRO HARDNESS HV	MAXIMUM WORKING TEMPERATURE	FRICITION ON STEEL	TYPICAL APPLICATION
<i>New Generation</i> <b>GEMINI DC+</b>	3-4 microns	Dark Blue	3800-4500	2012°F	.35	Die Casting, Hot Forging Dry Machining & Aluminum Extrusion. Upgrade from AlTiN

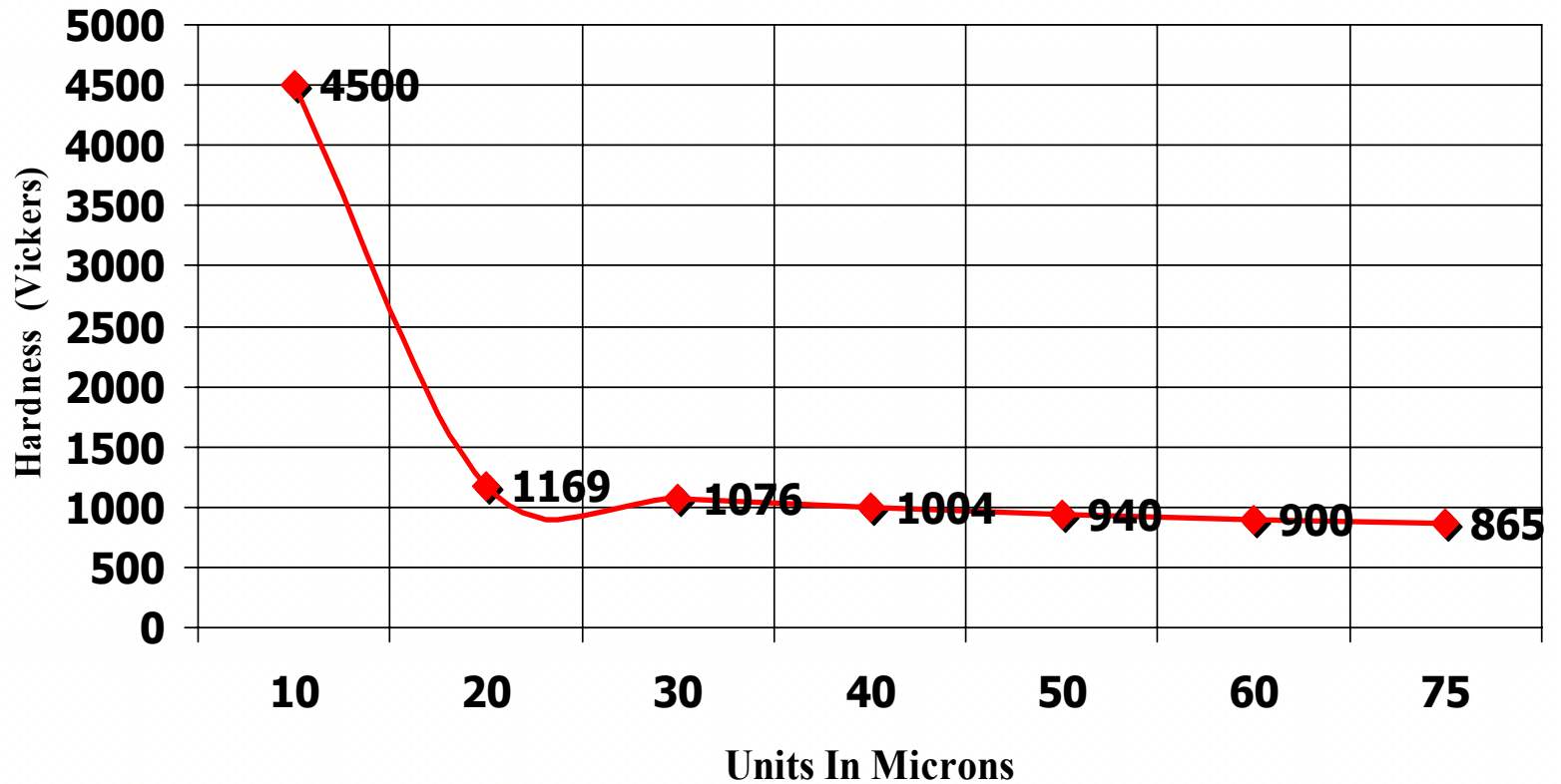
Our IONIC Diffusion<sup>SM</sup> technique is used to apply our proprietary *GEMINI DC+ Process*. This will increase fatigue and compressive strength of H-series material



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# *GEMINI DC+*

## *Hardness Profile*



# OPTIMIZATION OF COATINGS

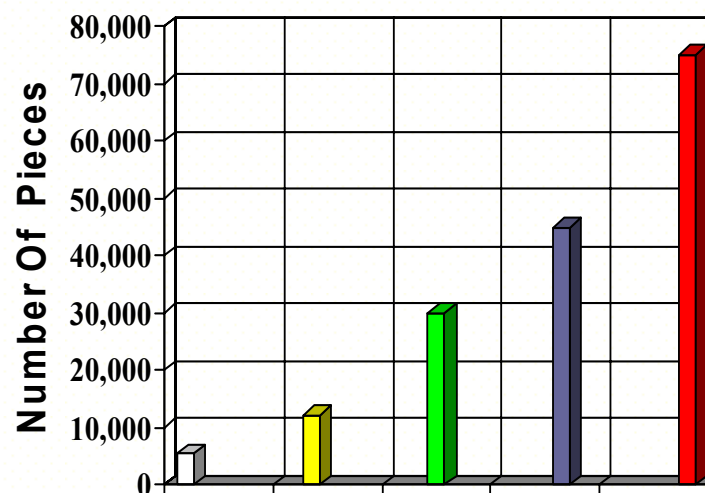
- ✓ Assembled components must be separated
- ✓ Water jackets flushed clean
- ✓ Removal of excessive thread tape
- ✓ Residual Aluminum must be removed.
- ✓ Vacuum Degassing
  - Removes gaseous contamination
  - Stress tempers tools. Good for tools which have been previously welded.

# GEMINI DC+

## Performance Comparison

### Application: *Squeeze Pin*

- PIN MATERIAL H-13  
ORVAR SUPREME
- HARDNESS 48/ 50 HRC
- WORK MATERIAL 390  
ALUMINUM
- TEMPERATURE 1300<sup>o</sup>F
- LUBRICANT - YES
- BASE - NO SURFACE  
TREATMENT
- GOAL - REDUCE  
WASHOUT
- 13.6 TIMES  
IMPROVEMENT
- REDUCTION OF  
THERMAL FATIGUE



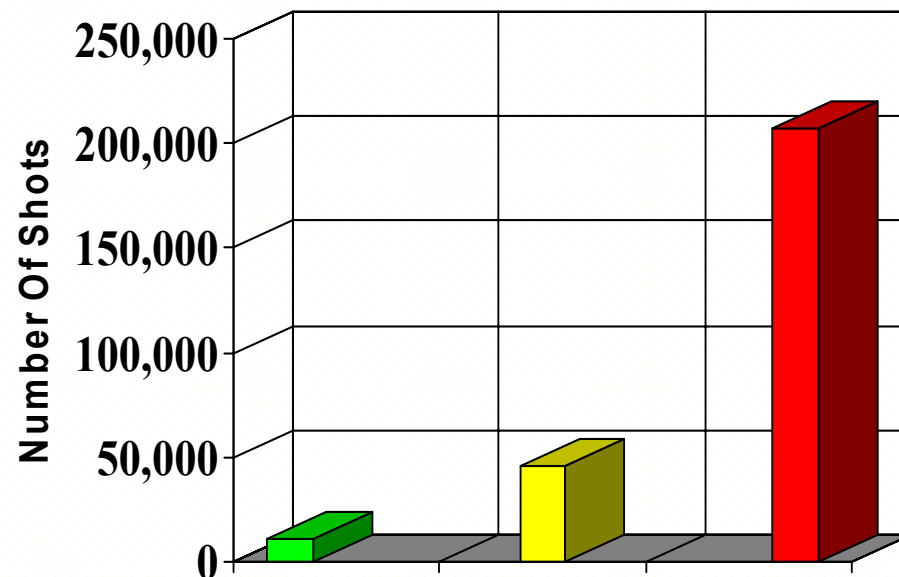
□ Base Metal	5,500				
■ Plasma Nitride		12,100			
■ CrN			30,000		
■ FUTURA				45,000	
■ GEMINI DC+					75,000

# GEMINI DC+

## Performance Test

### Application: *Shot Sleeve*

- H-13 Hardness 46-48 RC
- Work material - 383 Al
- Temperature 1300<sup>o</sup>F
- Lubricant - yes
- Base – Gas Nitride
- Goal - reduction of wash out
- Results - 18 times increased life over gas NITRIDING
- Reduced tip usage of 50% - 60%
- Better part quality due to reduced tip drag



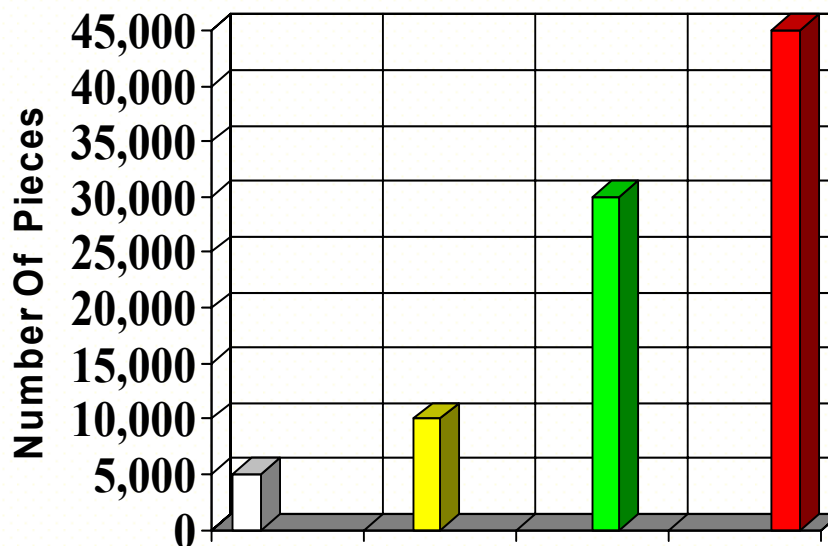
<span style="color: green;">■</span> Ion Nitriding	11,000		
<span style="color: yellow;">■</span> CrN		46,000	
<span style="color: red;">■</span> GEMINI DC+			207,000

# GEMINI DC+

## Performance Comparison

### Application: Core Pins

- Pin material H-13 ORVAR SUPREME
- Hardness 47/ 49 HRC
- Work material R-14 Aluminum
- Temperature 1300<sup>of</sup>
- Lubricant - yes
- Base - no surface treatment
- Goal - reduce soldering
- 9 times improvement over base metal
- Reduction of thermal fatigue



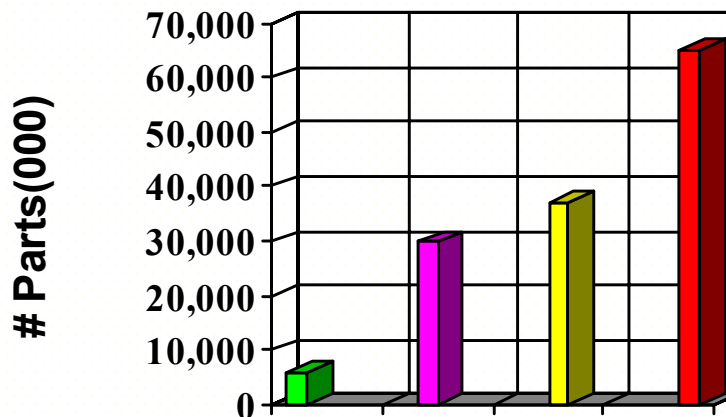
□ Base Metal	5,000			
■ Plasma Nitride		10,000		
■ FUTURA			30,000	
■ GEMINI DC+				45,000



# GEMINI DC+ *Application Report*

## Transmission Hydraulic Actuator

- Alloy - 383
- Tool – *H-13 core*
- Temp *1325 F*
- Failure - *soldering of aluminum*
- Goal - *reduce soldering*
- **RESULT -**  
***IMPROVED SOLDERING RESISTANCE BY 10.8 TIMES vs. Uncoated***



■ Uncoated	6,000			
■ FUTURA		30,000		
■ CrC			37,000	
■ GEMINI DC+				65,000

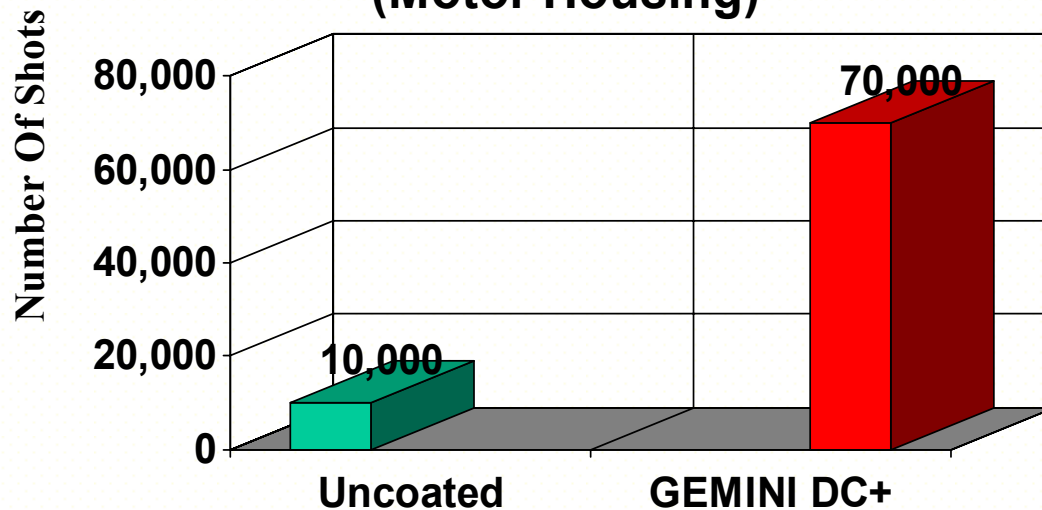


# GEMINI DC+

## Produced 70,000 Shots And Still Running

- ALLOY – 380
- TEMPERATURE 1300F
- TOOL - H13
- BASE - UNCOATED
- FAILURE - HEAT CHECKING
- SOLDERING
- GOAL – REDUCE SOLDERING AND RESISTANCE TO HEAT CHECKING
- RESULT – GEMINI DC IMPROVED DIE LIFE BY 7 TIMES OVER UNCOATED AND REDUCED SCRAP BY 78%.

### Application Report (Motor Housing)





# GEMINI DC+

## Performance - Die Casting (GM Bracket)

- ALLOY – 380
- TEMPERATURE 1300F
- TOOL - H13
- BASE – NO TREATMENT
- FAILURE – SOLDERING  
(Maintenance Required Every 8hrs)
- GOAL - INCREASE RESISTANCE TO SOLDERING
- RESULT - GEMINI DC INCREASED RESISTANCE TO SOLDERING BY 81 TIMES
- SCRAPE RATE WAS SIGNIFICANTLY REDUCED

## Application Report

