



**RICHTER PRECISION, INC.**

## Comparison of Coating Process Characteristics

<b>Process Characteristics</b>	<b>PVD</b> Physical Vapor Deposition	<b>CVD</b> Chemical Vapor Deposition	<b>TD or TRD</b> Thermoreactive Diffusion	<b>DCD</b> Dynamic Compound Deposition
<b>Method</b>	Processed in a vacuum chamber ( $10^{-2}$ to $10^{-4}$ Torr)	Processed in atmospheric or vacuum reactor	Processed in an elemental salt bath	Processed in a proprietary vessel
<b>Temperature</b>	Low process temperature (320° to 800° F)	High standard process temperature (1925°F)	High temperature process (1650° to 1900°F)	Low temperature process (100° F)
<b>Deposition Limitations</b>	Line of sight process	Coats wherever gases contact the tool surface	Coats wherever reactive bath contacts the substrate	Coats wherever coating media contacts the surface
<b>Bond Type</b>	Physical	Chemical & metallurgical	Diffusion	Mechano-chemical
<b>Average Thickness</b>	1-5 $\mu\text{m}$ , or .00004-.0002"	4-12 $\mu\text{m}$ , or .00016-.00047"	4-12 $\mu\text{m}$ , or .00016-.00047"	0.5-2 $\mu\text{m}$ , or .00002"-.00008"
<b>Material Limitations</b>	Suitable for a wide range of substrates	More limited range of substrates than for PVD	More limited range of than for PVD: less than CVD	Suitable for a wide range of substrates
<b>Tolerances</b>	Ideal for closely toleranced components (+/- .0001)	Requires loose tolerances (ex.: +/- .0005 per 1.0" dia.)	Similar to CVD - some materials more stable	Ideal for closely toleranced components (+/- .0001)
<b>Post-Processing</b>	No heat-treating required after coating	Heat-treating required on steel parts	HT required on HSS; tools steels need to be tempered	No heat-treating required after coating
<b>Edge Build-Up</b>	No excessive coating build-up	Requires hone on edges due to thicker coating	Requires hone on edges due to thicker coating	No excessive coating build-up
<b>Surface Finish</b>	Coating generally replicates existing surface finish	Post-coating polish can achieve good finishes	Post-coating polish can achieve good finishes	Coating may have slight matte effect

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