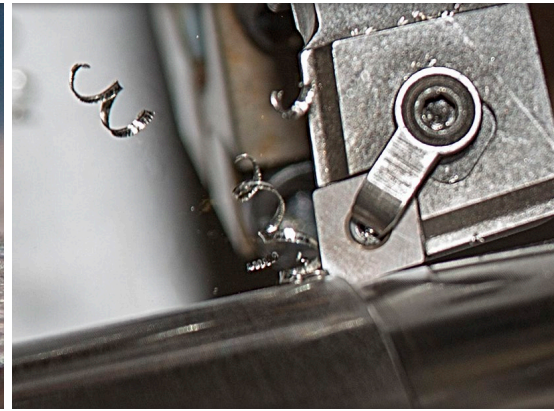
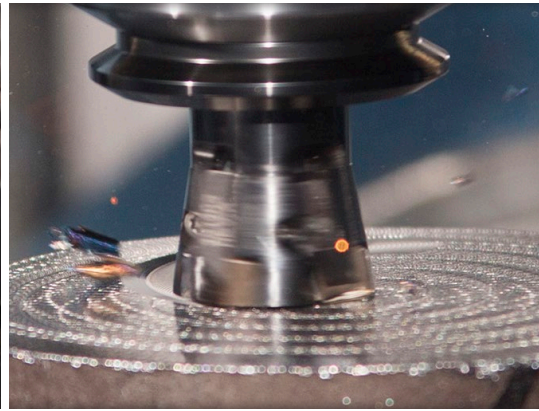
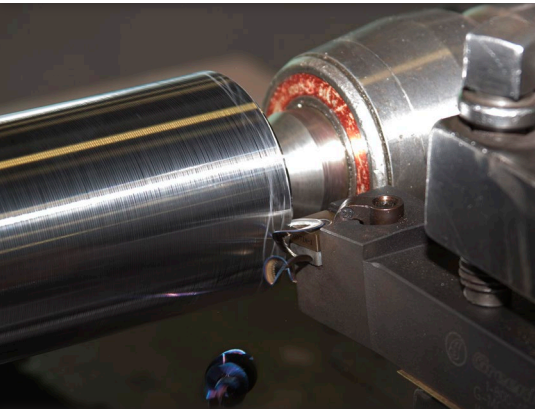




Greenleaf[®]

Tooling Solutions

www.greenleafcorporation.com | www.greenleafglobalsupport.com



XSYTIN-1[®]

PHASE-TOUGHENED

CERAMIC INSERTS

What Are Phase-Toughened Ceramics?

Phase-toughened ceramics are ceramic-composite cutting tools offering almost twice the strength of other commercial ceramic-composite cutting tools. Greenleaf offers XSYTIN®-1 — the first of its kind.



XSYTIN®-1

- XSYTIN®-1 is engineered to provide ultra-high strength and wear resistance for demanding, high-force cuts.
- Applied at extreme feed rates, XSYTIN®-1 has the ability to greatly enhance productivity while providing predictable performance.
- With a wide operating range, XSYTIN®-1 elevates productivity in more materials than any other ceramic cutting tool on the market today.

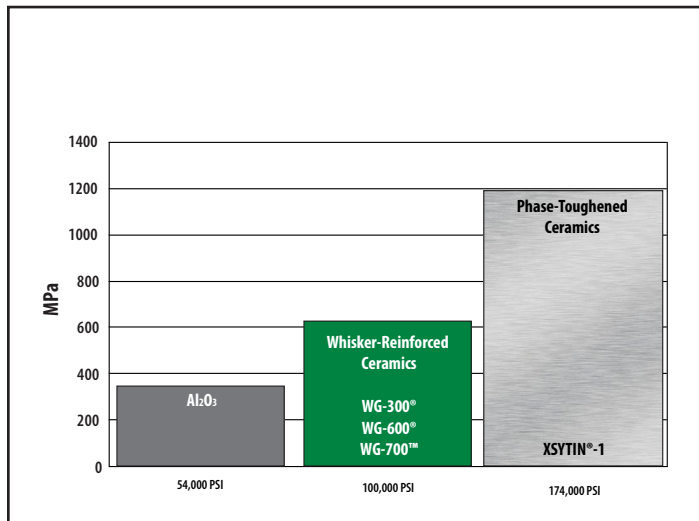


OIL & GAS

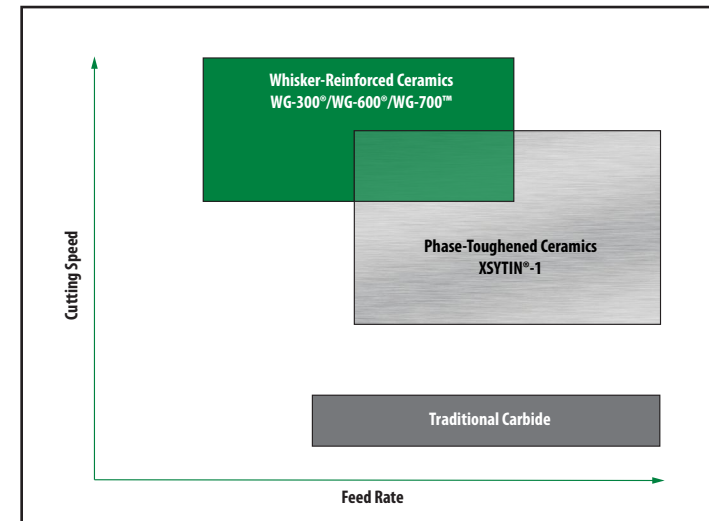
Refine your oil & gas machining.

Explore unparalleled depths of productivity with the versatile XSYTIN®-1, a revolutionary phase-toughened ceramic insert grade.

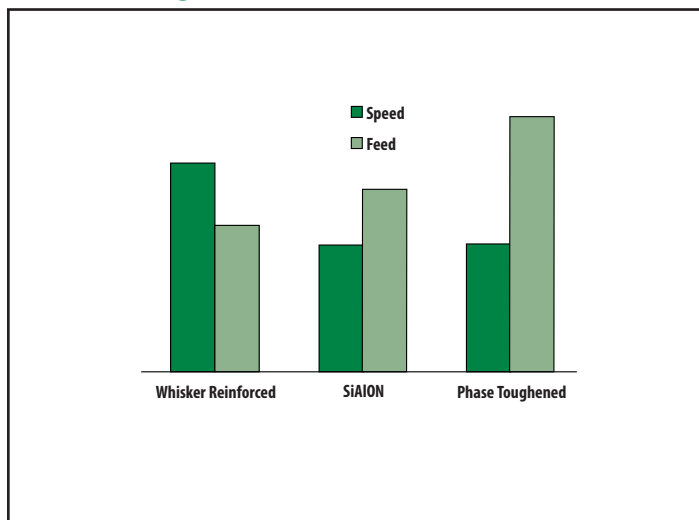
Comparable Strength



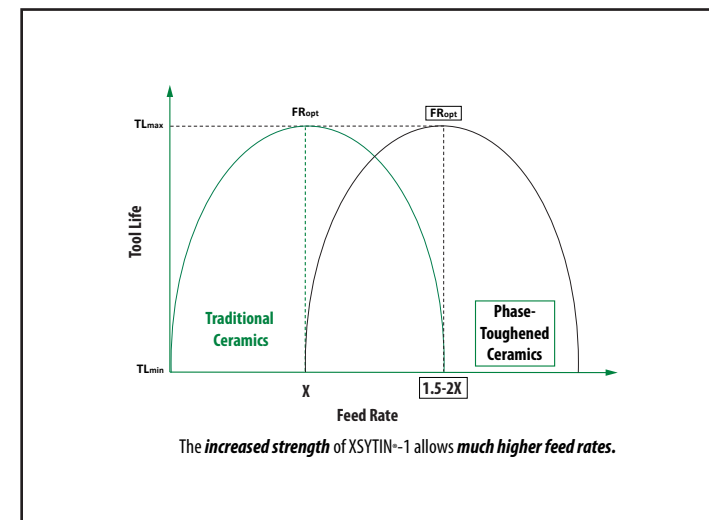
Ceramic vs. Carbide Turning



Phase-Toughened vs. Traditional Ceramics

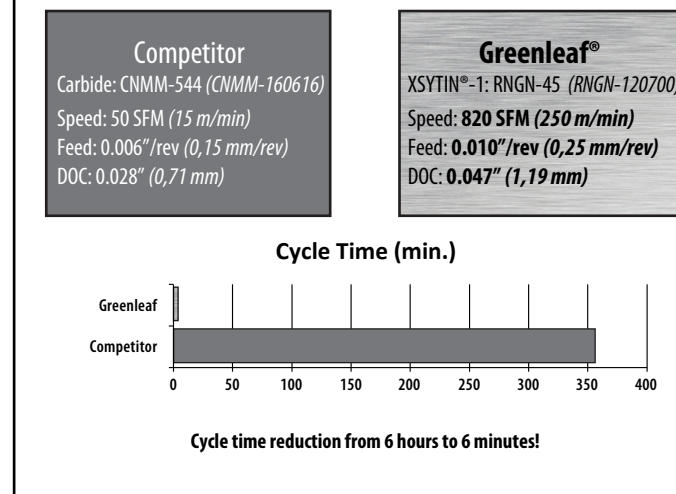


Tool Life vs. Feed Rate

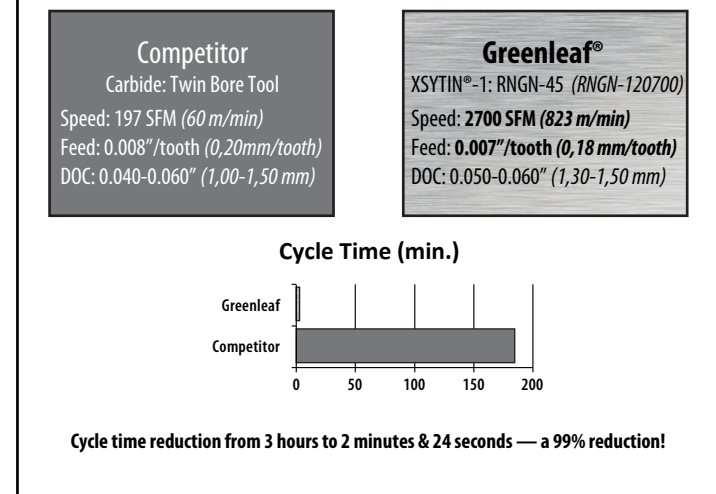


Proven Performance

Stellite 6 Overlay Turning (60-62 HR_c)



Inconel 625 Clad Milling



XSYTIN®-1 starting speeds and feeds for turning and milling

Speed (SFM) (m/min)	200	300	400	500	600	700	800	900	1000	1200	1400	1600	1800	2000	2200	2400	2600	2800	3000	3200	3400	3600	Turning Feed (h _m)	Milling Feed (h _m)
P Carbon/Alloy Steel (up to 45 HR _c)	61	91	122	152	183	213	244	274	305	366	427	488	549	610	671	732	792	853	914	975	1036	1097	0.006 - 0.009" 0,15 - 0,23mm	0.010 - 0.014" 0,25 - 0,36mm
M Stainless Steel 45 HR _c (400 SERIES) 17-4 PH Stainless																							0.006 - 0.009" 0,15 - 0,23mm	0.006 - 0.009" 0,15 - 0,23mm
K Gray Iron Ductile 45 HR _c +																							0.007 - 0.012" 0,18 - 0,30mm	0.008 - 0.012" 0,20 - 0,30mm
S Inconel 625																							0.008 - 0.012" 0,20 - 0,30mm	0.003 - 0.006" 0,08 - 0,15mm

Starting Speed Recommendations



General Recommendations: Combine lower feed-rate recommendations with lower cutting-speed recommendations. When experiencing rapid crater wear on the rake face, reduce cutting speed. When experiencing rapid flank wear, increase feed rate. An increase in feed rate can reduce notching in certain applications. A-hone and T1A are the most common edge preps for XSYTIN®-1 turning. Use T1A for most milling applications. Utilize programming techniques outlined in the Greenleaf Ceramic Productivity Manual for maximum tool life.

AUTOMOTIVE

Kick your automotive machining into overdrive.

Accelerate your performance with the high temperature and abrasion resistance of XSYTIN®-1, a revolutionary phase-toughened ceramic insert grade.

Proven Performance

CGI Milling (Compacted Graphite Iron)

Competitor

Carbide

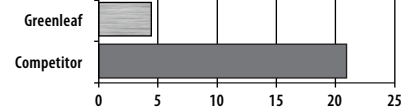
Speed: 500 SFM (152 m/min)
Feed: 0.006"/tooth (0,15 mm/tooth)
DOC: 0.060" (1,50 mm)

Greenleaf®

XSYTIN®-1: SPGN-433 (SPGN-120412)

Speed: **1900 SFM (579 m/min)**
Feed: **0.0085"/tooth (0,22 mm/tooth)**
DOC: 0.060" (1,50 mm)

Cycle Time (min.)



Greatly increased productivity and tool life with XSYTIN®-1!

Class 30 Gray Iron Turning (30 HRc)

Competitor

Carbide: WNMG-433 (WNMG-080412)

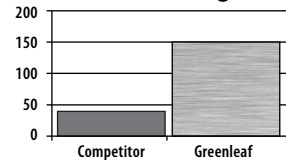
Speed: 1078 SFM (329 m/min)
Feed: 0.0078"/rev (0,20 mm/rev)
DOC: 0.050-0.250" (1,27-6,35 mm)

Greenleaf®

XSYTIN®-1: WNGA-433 (WNGA-080412)

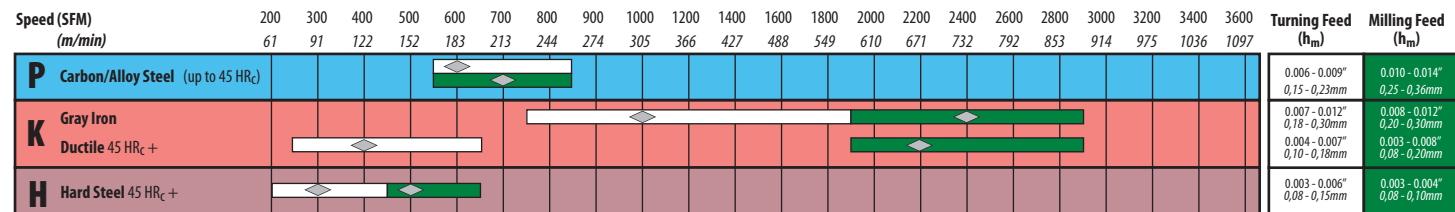
Speed: 1078 SFM (329 m/min)
Feed: 0.0078"/rev (0,20 mm/rev)
DOC: 0.050-0.250" (1,27-6,35 mm)

Parts Per Edge



150 parts per edge vs. 40 parts per edge with competitor!

XSYTIN®-1 starting speeds and feeds for turning and milling



Starting Speed Recommendations



General Recommendations: Combine lower feed-rate recommendations with lower cutting-speed recommendations. When experiencing rapid crater wear on the rake face, reduce cutting speed. When experiencing rapid flank wear, increase feed rate. An increase in feed rate can reduce notching in certain applications. A-hone and T1A are the most common edge preps for XSYTIN®-1 turning. Use T1A for most milling applications. Utilize programming techniques outlined in the Greenleaf Ceramic Productivity Manual for maximum tool life.

AEROSPACE

Take your aerospace machining to new heights.

Elevate your productivity and experience outstanding predictability with XSYTIN®-1, a revolutionary phase-toughened ceramic insert grade.

Proven Performance

Inconel 718 Rough/Semi-Finish (forging scale)

Competitor

Carbide: SNMG-643 (SNMG-190612)

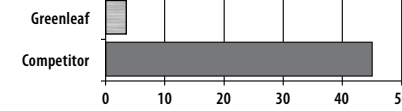
Speed: 90 SFM (27 m/min)
Feed: 0.015"/rev (0,38 mm/rev)
DOC: 0.172" (4,37 mm)

Greenleaf®

XSYTIN®-1: RNGN-45 (RNGN-120700)

Speed: **850 SFM (259 m/min)**
Feed: **0.015"/rev (0,38 mm/rev)**
DOC: 0.100" (2,54 mm)

Cycle Time (min.)



Cycle time reduction of 42 minutes in Inconel 718 forging scale. Productivity elevated!

Rene 88 Rough Turning (~30 HRc)

Competitor

SIAION: RNGN-45 (RNGN-120700)

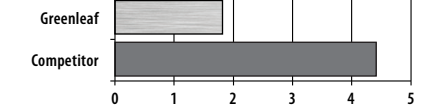
Speed: 650 SFM (198 m/min)
Feed: 0.007"/rev (0,18 mm/rev)
DOC: 0.050" (1,27 mm)

Greenleaf®

XSYTIN®-1: RNGN-45 (RNGN-120700)

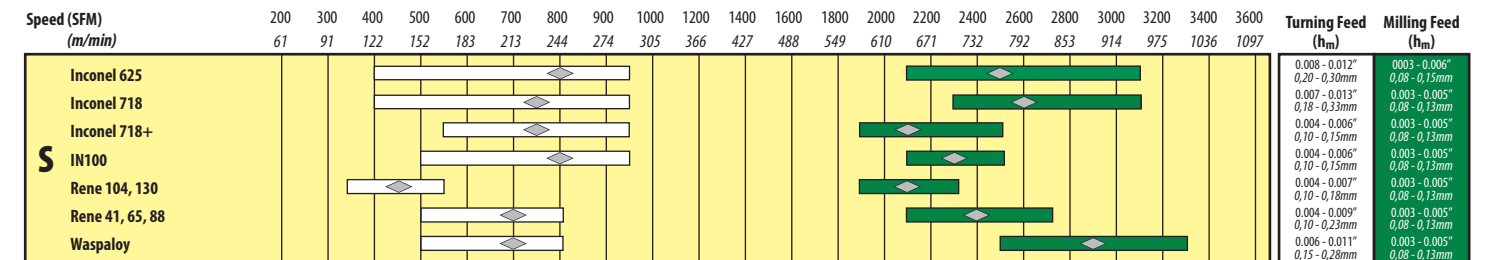
Speed: 650 SFM (198 m/min)
Feed: **0.0144"/rev (0,36 mm/rev)**
DOC: **0.080" (2,00 mm)**

Cycle Time (min.)



60% reduction in cycle time and 1.5 times the tool life!

XSYTIN®-1 starting speeds and feeds for turning and milling



Starting Speed Recommendations

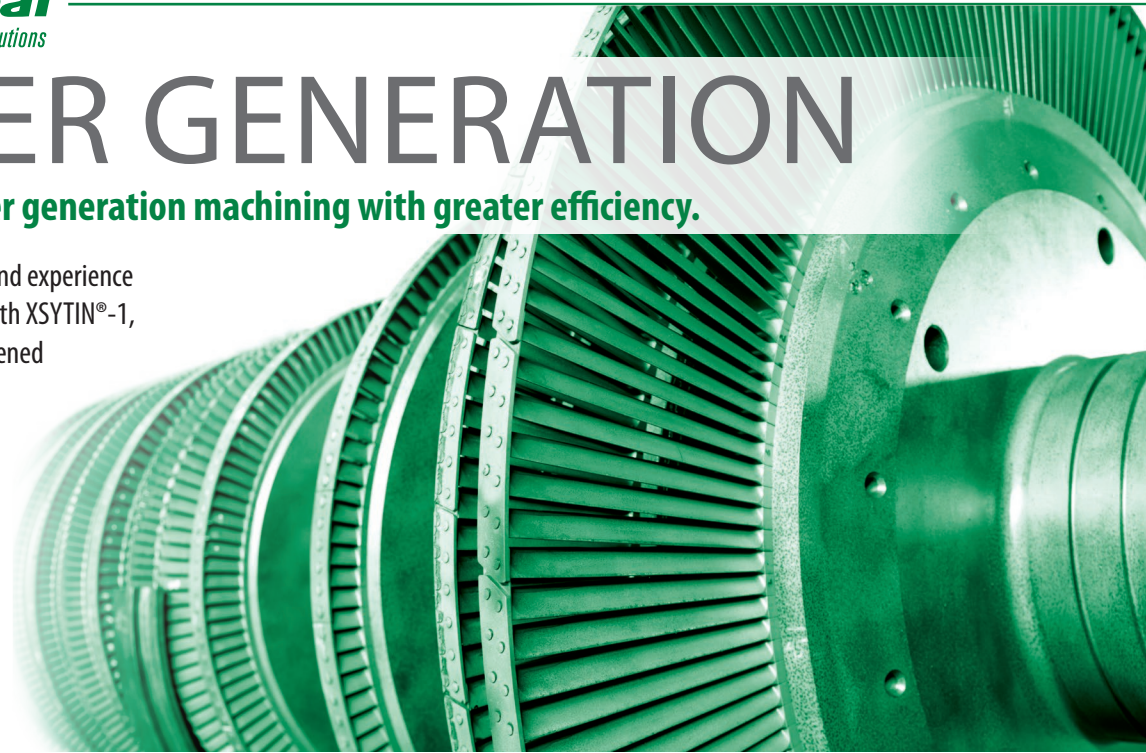


General Recommendations: Combine lower feed-rate recommendations with lower cutting-speed recommendations. When experiencing rapid crater wear on the rake face, reduce cutting speed. When experiencing rapid flank wear, increase feed rate. An increase in feed rate can reduce notching in certain applications. A-hone and T1A are the most common edge preps for XSYTIN®-1 turning. Use T1A for most milling applications. Utilize programming techniques outlined in the Greenleaf Ceramic Productivity Manual for maximum tool life.

POWER GENERATION

Enhance your power generation machining with greater efficiency.

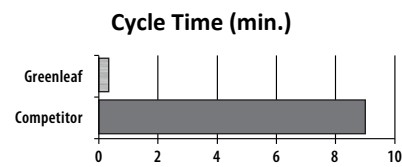
Energize your productivity and experience outstanding predictability with XSYTIN®-1, a revolutionary phase-toughened ceramic insert grade.



Proven Performance

Rene 108 Milling

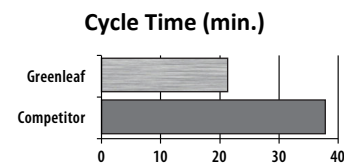
Competitor	Greenleaf®
Solid Carbide End Mill	XSYTIN®-1: SNGN-433 (SNGN-120412)
Speed: 64 SFM (19 m/min)	Speed: 2000 SFM (610 m/min)
Feed: 2.1 IPM (53 mm/min)	Feed: 46 IPM (1168 mm/min)
DOC: 0.060" (1,50 mm)	DOC: 0.060" (1,50 mm)



Cycle time reduction from 8.5 minutes to 22 seconds! 1,607 hours saved per year!

GTD-111 Milling (40-42 HR_c)

Competitor	Greenleaf®
SIAION: RNGN-45 (RNGN-120700)	XSYTIN®-1: RNGN-45 (RNGN-120700)
Speed: 1590 SFM (485 m/min)	Speed: 1590 SFM (485 m/min)
Feed: 24.3 IPM (617 mm/min)	Feed: 45 IPM (1143 mm/min)
DOC: 0.100" (2,50 mm)	DOC: 0.100" (2,50 mm)



45% reduction in cycle time with better tool life!



VERSATILITY

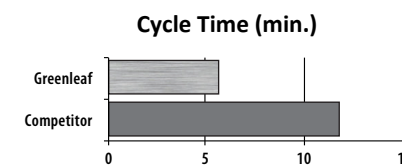
Take ceramics into uncharted territory.

Machine more materials than any other ceramic with the versatile XSYTIN®-1, a revolutionary phase-toughened ceramic insert grade.

Proven Performance

Manganese Steel Milling

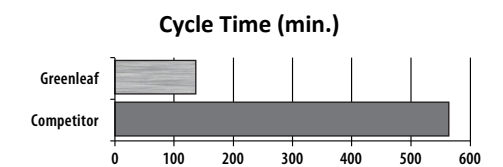
Competitor	Greenleaf®
SIAION: SNGN-644 (SNGN-190616)	XSYTIN®-1: SNGN-644 (SNGN-190616)
Speed: 520 SFM (158 m/min)	Speed: 520 SFM (158 m/min)
Feed: 0.010"/tooth (0,25 mm/tooth)	Feed: 0.018"/tooth (0,46 mm/tooth)
DOC: 0.150" (3,81 mm)	DOC: 0.250" (6,35 mm)



2X tool life with a ~50% reduction in cycle time!

Nodular Iron Turning (42 HR_c)

Competitor	Greenleaf®
SIAION: CCDH-51.5 (C-CDH-51.5)	XSYTIN®-1: CCDH-51.5 (C-CDH-51.5)
Speed: 200 SFM (61 m/min)	Speed: 400 SFM (122 m/min)
Feed: 0.010"/rev (0,25 mm/rev)	Feed: 0.020"/rev (0,51 mm/rev)
DOC: 0.500" (12,70 mm)	DOC: 0.500" (12,70 mm)



4X MRR increase ~424-minute cycle time reduction (75%)!

XSYTIN®-1 starting speeds and feeds for turning and milling

	Speed (SFM)																Turning Feed (in/min)	Milling Feed (in/min)				
	200	300	400	500	600	700	800	900	1000	1200	1400	1600	1800	2000	2200	2400			2600	2800	3000	3200
P Carbon/Alloy Steel (up to 45 HR _c)	[Speed/Feed ranges for Carbon/Alloy Steel]																					
M Stainless Steel 45 HR _c (400 SERIES)	[Speed/Feed ranges for Stainless Steel 45 HR _c]																					
17-4 PH Stainless	[Speed/Feed ranges for 17-4 PH Stainless]																					
S Inconel 625	[Speed/Feed ranges for Inconel 625]																					
Inconel 718	[Speed/Feed ranges for Inconel 718]																					
Inconel 718+	[Speed/Feed ranges for Inconel 718+]																					
IN100	[Speed/Feed ranges for IN100]																					
Rene 104, 130	[Speed/Feed ranges for Rene 104, 130]																					
Rene 41, 65, 88	[Speed/Feed ranges for Rene 41, 65, 88]																					
Waspaloy	[Speed/Feed ranges for Waspaloy]																					

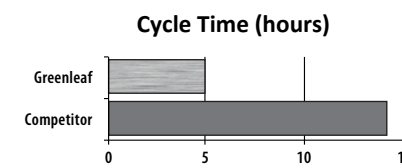
Starting Speed Recommendations



General Recommendations: Combine lower feed-rate recommendations with lower cutting-speed recommendations. When experiencing rapid crater wear on the rake face, reduce cutting speed. When experiencing rapid flank wear, increase feed rate. An increase in feed rate can reduce notching in certain applications. A-hone and T1A are the most common edge preps for XSYTIN®-1 turning. Use T1A for most milling applications. Utilize programming techniques outlined in the Greenleaf Ceramic Productivity Manual for maximum tool life.

P20 Milling (30-32 HR_c)

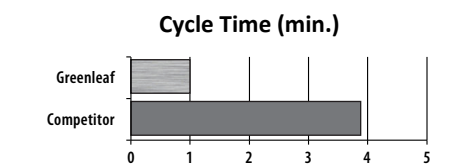
Competitor	Greenleaf®
Carbide: Square	XSYTIN®-1: Square
Speed: 340 SFM (104 m/min)	Speed: 600 SFM (183 m/min)
Feed: 0.0086"/tooth (0,22 mm/tooth)	Feed: 0.013"/tooth (0,33 mm/tooth)
DOC: 0.375" (9,53 mm)	DOC: 0.375" (9,53 mm)



2X parts per edge at 265% increase in productivity!

410 Stainless Steel Turning (35-42 HR_c)

Competitor	Greenleaf®
Carbide: SNGM-643 (SNGM-190612)	XSYTIN®-1: RNGN-45 (RNGN-120700)
Speed: 217 SFM (66 m/min)	Speed: 600 SFM (183 m/min)
Feed: 0.010"/rev (0,25 mm/rev)	Feed: 0.014"/rev (0,36 mm/rev)
DOC: 0.050" (1,27 mm)	DOC: 0.050" (1,27 mm)



75% reduction in cycle time with minimal insert wear!

XYTIN®-1 starting speeds and feeds for turning and milling

Material	Speed (SFM) (m/min)																	Turning Feed (h _m)	Milling Feed (h _m)							
	61	91	122	152	183	213	244	274	305	366	427	488	549	610	671	732	792			853	914	975	1036	1097	3600	
P Carbon/Alloy Steel (up to 45 HR _C)																									0.006 - 0.009" 0,15 - 0,23mm	0.010 - 0.014" 0,25 - 0,36mm
M Stainless Steel 45 HR _C (400 SERIES) 17-4 PH Stainless																									0.006 - 0.009" 0,15 - 0,23mm	0.006 - 0.009" 0,15 - 0,23mm
K Gray Iron Ductile 45 HR _C +																									0.007 - 0.012" 0,18 - 0,30mm	0.008 - 0.012" 0,20 - 0,30mm
S Inconel 625 Inconel 718 Inconel 718+ IN100 Rene 104, 130 Rene 41, 65, 88 Waspaloy																									0.008 - 0.012" 0,20 - 0,30mm	0.003 - 0.006" 0,08 - 0,15mm
H Hard Steel 45 HR _C +																									0.003 - 0.006" 0,08 - 0,15mm	0.003 - 0.004" 0,08 - 0,10mm

Starting Speed Recommendations



General Recommendations: Combine lower feed-rate recommendations with lower cutting-speed recommendations. When experiencing rapid crater wear on the rake face, reduce cutting speed. When experiencing rapid flank wear, increase feed rate. An increase in feed rate can reduce notching in certain applications. A-hone and T1A are the most common edge preps for XYTIN®-1 turning. Use T1A for most milling applications. Utilize programming techniques outlined in the Greenleaf Ceramic Productivity Manual for maximum tool life.



MADE IN THE USA

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