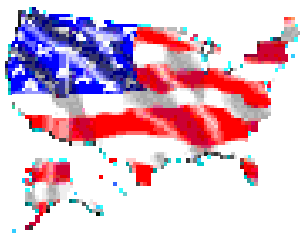




# **FEROCIOUS**

HIGH PERFORMANCE ALUMINUM MILLING



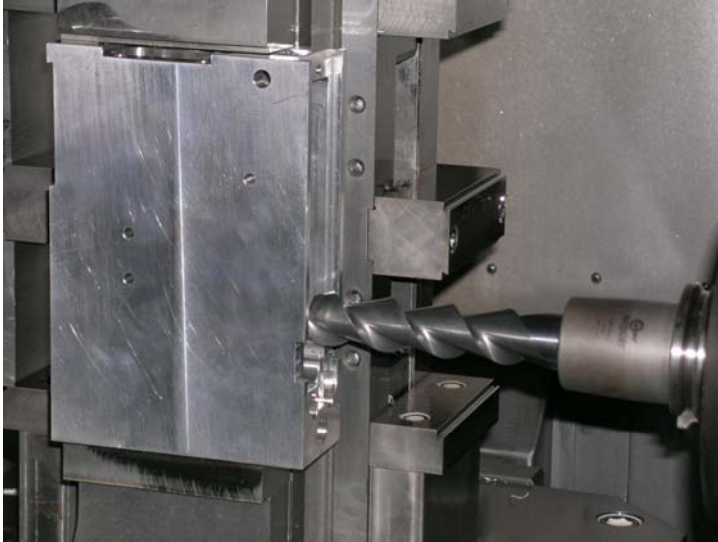
**NEW**  
**STYLES**  
**AND**  
**SIZES**

***Performance Matters***

# ***DON'T JUST TAKE OUR WORD FOR IT...***

Just as an "overnight success" is generally the result of years of effort, a "breakthrough" in part machining productivity usually is the sum of a number of carefully engineered individual improvements.

Zaytran, Inc. used several improvements to reduce machining time from more than 45 minutes to less than 20 for a 6061 aluminum



component that measured 6" x 5" x 2". Zaytran, located in Elyria, Ohio, is a leading producer of precision grippers, actuators and locating pins focusing on producing high-performance products. The component featured a 4.8" deep cavity. The depth of the feature made it difficult to evacuate chips, which resulted in surface finish problems. Machining time was 45 to 48 minutes.

Seeking to speed production, Jerry Williams, Zaytran process engineer, consulted with CGS.

As a solution, CGS produced special versions of its Ferocious 2-flute, 55° high-helix, solid-carbide end mill by adding through-coolant capability. The designs allowed coolant flow through the 3/4" dia. and 1" dia. tools with flute lengths up to 5", to effectively push chips out of the cavity. "There was no other way to get coolant down where the tool was actually cutting," said Steve Maxwell, Zaytran production team leader and programmer. Zaytran was able to square the parts using just the CGS end mills, while other suppliers' end mills, with profiling lengths of 3" to 4", were unsuccessful, thus causing Zaytran to have to apply face mills on two sides. Face milling proved unnecessary when applying CGS end mills in shrink-fit holders. "We could do profile milling, 3-1/2" or 4" deep, and maintain 0.001" or 0.0015" taper over the whole length of the part, eliminating the need for the face mills," Maxwell said.

A large contributor to the decrease in machining time was the end mills' capability to run at high speeds and feeds. The micro grain-carbide tools feature a circular land that facilitates maximum feed rates and cutting speeds, and the tool geometry is engineered to produce efficient sharing action and vertical chip ejection. Williams said the shop typically runs the end mills at feeds of 100 ipm or faster, in contrast to the 40-to-50 ipm feeds employed with previously used end mills.

*Featured in Cutting Tool Engineering's "Productive Times" Dec.2006 issue.*

## ***NOW AVAILABLE IN...***

***BALLNOSE***

***STUB LENGTH***

***CORNER RADIUS***

***STANDARD LENGTH***

***EXTENDED REACH***

***LONG LENGTH***

***METRIC SIZES***

***EXTRA LONG LENGTH***

***DON'T BE TIMID !  
TAKE A FEROCIOUS APPROACH***

***FEROCIOUS -VS- CONVENTIONAL***

<u>USER:</u>	Manufacturer of missile components and aerospace parts.
<u>OPERATION:</u>	Making a 1/2" deep slot in a 6061-T6 aluminum component used on the space shuttle with a 2 flute 1/2" diameter 30 degree helix carbide end mill.
<u>PROBLEM:</u>	Completing the task required by making separate roughing and finishing passes. The end mill's design prevented the proper ejection of chips, which diminished tool life. In addition, because chips blocked the free flow of coolant to the cut point, the tool sometimes welded to the work piece.
<u>SOLUTION:</u>	Ferocious 2-flute, high-helix, solid micro grain carbide end mill from CGS. The CGS tool's geometry was designed specifically for the high-speed milling of aluminum. The Ferocious end mill was run at a speed of 18,000 rpm and a 262-ipm feed leaving a 45 RMS finish.
<u>BENEFITS:</u>	The CGS Ferocious end mill practically eliminated tool deflection, allowing roughing and finishing to be performed in a single pass. The high helix also allows the CGS tool to efficiently eject chips; therefore, re-cutting of chips no longer occurs. Eliminating the roughing operation, the cycle time has been lowered significantly.

## 2000 SERIES

2 FLUTE 55 DEGREE HELIX / SQUARE END

EDP #	DIA	SHANK	LOC	OAL
2001	1/8	1/8	1/2	1-1/2
2002	5/32	5/32	3/4	2
2003	3/16	3/16	5/8	2
2004	3/16	3/16	1	3
2006	1/4	1/4	3/4	2-1/2
2009	1/4	1/4	1-1/4	3
2012	5/16	5/16	1	2-1/2
2015	5/16	5/16	1-3/8	3
2018	3/8	3/8	1	2-1/2
2021	3/8	3/8	1-1/2	3
2024	3/8	3/8	2-1/2	4
2027	7/16	7/16	1	3
2030	1/2	1/2	1	3
2033	1/2	1/2	1-1/4	3
2036	1/2	1/2	1-1/2	3-1/2
2039	1/2	1/2	2	4
2042	1/2	1/2	3	5
2045	9/16	9/16	1-1/4	3-1/2
2048	5/8	5/8	1-1/4	3-1/2
2051	5/8	5/8	1-3/4	4
2054	5/8	5/8	2-1/2	5
2057	3/4	3/4	1-1/2	4
2060	3/4	3/4	2-1/2	5
2063	3/4	3/4	3-1/2	6
2066	1	1	1-1/2	4
2067	1	1	2-1/2	5
2069	1	1	4	7



## METRIC SIZES

### M2100 SERIES

2 FLUTE 55 DEGREE HELIX / SQUARE END

EDP #	DIA	SHANK	LOC	OAL
2101	3	3	10	38
2102	4	4	16	50
2103	5	5	16	50
2106	6	6	19	63
2112	8	8	22	63
2118	10	10	25	63
2130	12	12	25	75
2145	14	14	32	88
2148	16	16	32	88
2155	18	18	38	100
2157	20	20	38	100
2166	25	25	38	100

### LONG AND EXTRA LONG LENGTHS

2206	6	6	32	75
2212	8	8	35	75
2218	10	10	38	75
2220	10	10	63	100
2230	12	12	38	90
2232	12	12	50	100
2234	12	12	75	125
2248	16	16	44	100
2250	16	16	63	125
2257	20	20	63	125
2259	20	20	90	150
2266	25	25	63	125
2268	25	25	102	165



# SQUARE ENDS

\*\*\* ALL ITEMS \*\*\*

ADD THE FOLLOWING AFTER EDP#

-UC = UNCOATED  
-S = COATED

## CR2000 SERIES

2 FLUTE 55 DEGREE HELIX / CORNER RADIUS

EDP #	DIA	SHANK	LOC	OAL	.015	.030	.060	.090	.125
CR2001	1/8	1/8	1/2	1-1/2	.015	.030	-	-	-
CR2003	3/16	3/16	5/8	2	.015	.030	-	-	-
CR2006	1/4	1/4	3/4	2-1/2	.015	.030	.060	-	-
CR2018	3/8	3/8	1	2-1/2	.015	.030	.060	-	-
CR2030	1/2	1/2	1	3	.015	.030	.060	.090	.125
CR2033	1/2	1/2	1-1/4	3	.015	.030	.060	.090	.125
CR2036	1/2	1/2	1-1/2	3-1/2	.015	.030	.060	.090	.125
CR2039	1/2	1/2	2	4	.015	.030	.060	.090	.125
CR2048	5/8	5/8	1-1/4	3-1/2	.015	.030	.060	.090	.125
CR2057	3/4	3/4	1-1/2	4	.015	.030	.060	.090	.125
CR2060	3/4	3/4	2-1/2	5	.015	.030	.060	.090	.125
CR2066	1	1	1-1/2	4	.015	.030	.060	.090	.125
CR2067	1	1	2-1/2	5	.015	.030	.060	.090	.125
CR2069	1	1	4	7	.015	.030	.060	.090	.125

ADD RADIUS EXTENSION AFTER EDP #

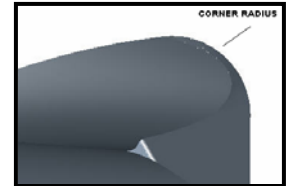
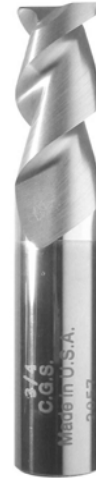
EXAMPLE: CR2030.090

ADD THE FOLLOWING AFTER EDP#

-UC = UNCOATED  
-S = COATED

EXAMPLE: CR2030.090-S (COATED)  
CR2030.090-UC (UNCOATED)

SPECIAL CORNER RADIUS  
AVAILABLE TO SUIT YOUR  
APPLICATIONS  
ASK FOR A QUOTE !



\*\*\* ALL ITEMS \*\*\*

ADD THE FOLLOWING AFTER EDP#

-UC = UNCOATED  
-S = COATED



## 2500 SERIES

2 FLUTE 55 DEGREE HELIX / STUB / EXTENDED REACH  
SQUARE END

EDP #	DIA	SHANK	LOC	OAL
2501	1/8	1/8	3/16	1-1/2
2502	1/8	1/8	1/4	2
2503	3/16	3/16	1/4	2
2504	3/16	3/16	3/8	3
2506	1/4	1/4	3/8	2
2509	1/4	1/4	1/2	3
2512	5/16	5/16	1/2	2
2515	5/16	5/16	1/2	3
2518	3/8	3/8	5/8	2
2524	3/8	3/8	5/8	4
2530	1/2	1/2	5/8	2-1/2
2536	1/2	1/2	5/8	4
2548	5/8	5/8	3/4	3
2557	3/4	3/4	1	3
2563	3/4	3/4	1	6
2566	1	1	1	3
2569	1	1	1	7



## BN2000 SERIES

2 FLUTE 55 DEGREE HELIX / BALLNOSE

EDP #	DIA	SHANK	LOC	OAL
BN2001	1/8	1/8	1/2	1-1/2
BN2003	3/16	3/16	5/8	2
BN2006	1/4	1/4	3/4	2-1/2
BN2009	1/4	1/4	1-1/4	3
BN2012	5/16	5/16	1	2-1/2
BN2018	3/8	3/8	1	2-1/2
BN2021	3/8	3/8	1-1/2	3
BN2030	1/2	1/2	1	3
BN2033	1/2	1/2	1-1/4	3
BN2036	1/2	1/2	1-1/2	3-1/2
BN2039	1/2	1/2	2	4
BN2048	5/8	5/8	1-1/4	3-1/2
BN2057	3/4	3/4	1-1/2	4
BN2060	3/4	3/4	2-1/2	5
BN2066	1	1	1-1/2	4
BN2067	1	1	2-1/2	5
BN2069	1	1	4	7

- STUB LENGTHS
- EXTENDED REACH FOR DEEP POCKETS
- AVAILABLE WITH REDUCED SHANK UNDERCUT FOR CLEARANCE AND SET SCREW FLATS
- ADD A CORNER RADIUS OR BALLNOSE END TO FIT YOUR APPLICATION.



## CONSIDER THESE ADVANTAGES:

- **MAXIMUM SPINDLE SPEEDS POSSIBLE**
- **DRAMATIC FEED RATE INCREASE**
- **BETTER SHEARING ACTION**
- **VERTICAL CHIP EJECTION**
- **QUIET OPERATION**
- **LONGER TOOL LIFE**

<b>SPEEDS AND FEEDS</b>		
TOOL DIAMETER	I.P.T (INCH PER TOOTH)	STARTING RPM
1/8	.001	12,000
3/16	.002	10,000
1/4	.003	10,000
5/16	.004	8,000
3/8	.005	8,000
1/2	.006	8,000
5/8	.007	6,000
3/4	.008	4,000
1	.010	4,000



<b>TEST RESULTS</b>	COMPETITION	<b>FEROCIOUS</b>	COMPETITION	<b>FEROCIOUS</b>	COMPETITION	<b>FEROCIOUS</b>
MATERIAL TYPE	6063-T6	6063-T6	7075-T6	7075-T6	6061-T6	6061-T6
TOOL MATERIAL	CARBIDE	CARBIDE	HSS	CARBIDE	CARBIDE	CARBIDE
NUMBER OF FLUTES	2	2	3	2	2	2
CUTTER SIZE	1/2"	1/2"	3/4"	3/4"	3/8"	3/8"
CUTTER DEPTH	.550	.550	.750	.750	.500	.500
RADIAL DEPTH OF CUT	SLOT	SLOT	.650	.650	SLOT	SLOT
R.P.M.	6500	10,000	3056	10,000	3400	7500
I.P.M.	25	120	28	140	10	75
COATING	NONE	YES	YES	YES	NONE	YES

### **WARNING:**

- TOO LOW OF AN RPM COUPLED WITH TOO MUCH FEED MIGHT CAUSE THE TOOL TO SHATTER
- IF THE CUTTING LENGTH EXCEEDS 1-1/2 TIMES THE DIAMETER SIZE OF THE TOOL, CONVENTIONAL MILLING IS RECOMMENDED.

### **FOR BEST RESULTS:**

- DIRECT MULTIPLE COOLANT NOZZLES AT THE END MILL TO ASSURE CONSTANT COOLING OF THE TOOL AND TO FLUSH CHIPS.
- THESE TOOLS ARE SPECIALLY DESIGNED FOR HI-SPEED MILLING OF ALUMINUM.
- THE FEEDS LISTED ARE STARTING POINTS. VARIATIONS OF THESE WILL DEPEND ON THE RADIAL AND AXIAL DEPTH-OF-CUT AND WORK PIECE CONDITIONS.



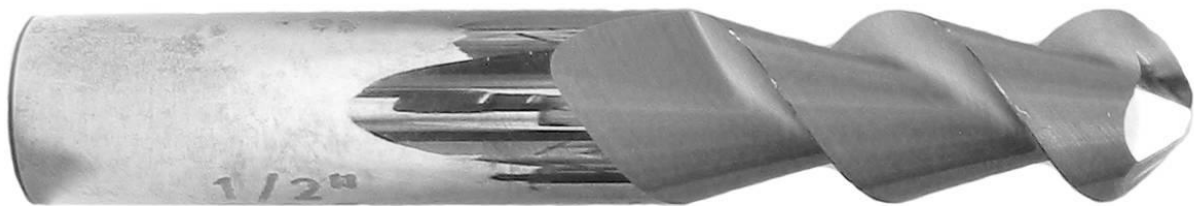
A WORLD LEADER IN THE MANUFACTURING  
OF SOLID CARBIDE ROTARY TOOLS



**FEROCIOUS**

**THE BEST**

**JUST GOT BETTER !**



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MADE EASY**

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