



4303 E. Timbercrest Ct.
Bloomington, IN 47408

RETURN SERVICE REQUESTED

First Class Presort
US Postage PAID
Permit # 267
Bloomington, IN



Components, Inc.

Issue No. 22 September 2011

The Forming Edge

CMT MATERIALS REFINES MACHINING, TURNING GUIDELINES AND CUTTER TOOLS RECOMMENDATIONS

THE ECONOMIC EDGE

BY: IAN MUNNOCH

There has been a lot of talk lately about the decline of the United States of America. We have been the dominate power arguably since the World War II and most certainly since the fall of the Soviet Union. If you step back and look at where we are it looks like an uphill battle, we certainly have problems in our country, but have you looked around the world lately. The Middle East appears to be imploding, Japan is recovering from an earth quake and tsunami, Russia looks like it is reverting to communism again, the Euro is teetering, Portugal, Ireland and Greece (known as PIG in Europe) have caused the Germans and the French to wonder about the benefits of the Euro zone. Yes, we are struggling and we have a lot of work ahead of us, but I am betting on the USA!

Several books have been written recently spurring this conversation. The two that are receiving the lion's share of interest are Fareed Zakaria's (CNN host of GPS) book "The Post-American World" and Harvard historian Niall Ferguson's, "Civilization: The West and the Rest". Zakaria points out that we are losing ground mostly because the "rest" (the rest of world) is catching up. This is the obvious effect of globalization, which is akin to the Bronze Age and the industrial revolution. Those were pivotal points in changing the landscape of the world and we are in another one of those epic moments in history. He cites lots of statistics implying we are losing our edge. There may be some credence to those numbers. He does suggest that in many of these cases this is simply the "rest" catching up with us. In my opinion that's not bad. I would rather the developing nations around the world were living closer to our standard, than poverty. I have seen third world poverty, it's ugly, something no one should have to endure. Since China has developed its manufacturing base, 400 million Chinese people have come out of poverty. Think about

that, 100 million more that our entire population. The argument some will point out is that the "rest" are consuming the resources that had been coming to us. Remember that with 6% of the world population we consume about 25% of the resources. China and India are now purchasing consumer and industrial goods, making up for lost time. China will purchase about 8 million cars this year. India's Tata, their GM, recently introduced the Nano at \$2500, think they might sell a few of those? Indian's will purchase approximately 1.8 million cars this year and growing 16% per year in a slow world economy. Between the two countries that alone is a lot of additional oil purchased on the world market, causing everyone to pay more. You can't blame the Chinese or the Indians for inadvertently increasing the cost of oil, they have been watching our TV programs for years and they want part of the American dream. Isn't that capitalism?

Zakaria's conclusion is a tougher road ahead for the USA. He's probably right to some extent, but I am not counting us out yet. Yes we have our problems, I don't need to go over them. But the USA has the "can do spirit", we have survived a Civil War, a Great Depression, two world wars and a multitude of lesser internal social issues. We are a unique people's, in my view the cream of the crop of the world. Remember in 1850's whale blubber was about to run out, the headlines were, "Lights Out", and there were dire predictions of dramatic lifestyle changes. We made it through that one and a multitude of others, I am pretty sure we will make it through this one. If however you are one of those that think the world is ending on December 21, 2012 then reading this was a waste of your time, I suggest that you mortgage the house travel as much as you can and hope that you are right. Personally I will be working with the rest of you to get us back on track.

In our May FormingEdge you will remember that CMT Materials released machining guidelines for the syntactic foam plug materials. Terry Woldorf (CMT Materials, GM) has been working for months with thermoformers, machinists, and cutting tool experts to provide the best information on how to achieve the very best surface finish. This issue is devoted to that goal. Terry great job! CMT Materials can now provide the information you need to get the very best finish for your plugs.

Pages 2 through 6 are machining guidelines for milling and turning HYTAC-W, HYTAC-WF, HYTAC-WFT, HYTAC-

B1X, HYTAC-FLX, and HYTAC-FLXT.

These new guidelines are updated with recent cutting speeds and feed rates for both , machining and turning. The finish quality we have achieved using these guidelines is excellent.

In addition you will find a list of cutters that are now available for sale through CMT. Please give Paula or John a call and they can help you get these coming to you to test out.

It's Show Time

BY: IAN MUNNOCH

Another summer is slipping away and with fall approaching it's time for the 20th Annual SPE Thermoforming Conference. This year the conference and trade show will be held at the Renaissance Hotel and Conference center in Schaumburg, IL, September 17th – September 20th. To register go on-line at <http://thermoformingdivision.com/SPE-conference/index.html>. If you are new to Thermoforming or have new employees, the workshops on Roll-Fed (Ian & Mark Strachan) and Sheet-Fed (Robert Browning & Don Hylton) thermoforming are a great way to get an excellent technical overview on Saturday. There are also technical sessions Sunday and Monday on a variety of subjects important to the industry, look the schedule

over and make up your attendance list. Also don't miss the plant tours scheduled for Tuesday, 2 tours are planned. Consult the web for details on each.

In addition to the technical sessions, take some time to wander the show floor to meet and greet old friends, catch up on the latest industry gossip and you will surely learn something new about the industry. Be sure to stop by the CMT Materials booth, # 622 with a new show look, so come by to admire our new booth and say hello to the crew. We look forward to catching up with you.



THE EDITORS

EDITOR-IN-CHIEF
IAN MUNNOCH

CONTRIBUTING AUTHOR
TERRY WOLDORF

All photos included in this newsletter are obtained with permission by MSA Components, Inc. Copyright 2011 www.msacomponents.com

HYTAC SYNTACTIC FOAM TURNING GUIDE

HYTAC materials are generally easy to work with. Following the guidelines listed below will improve surface quality of the finished plug and ensure consistency in plug performance.

Cutter type and geometry is critical to producing a smooth, consistent surface when turning any syntactic foam. Recommendations;

Cutter Type and Geometry	Positive edge geometry, carbide non-coated insert. Must be sharp. Dull cutters will result in poor surface quality. Use of separate cutter for finishing is recommended. Positive rake geometry. Recommended tooling (available from Kennametal www.kennametal.com) Holder: Catalog # CCLPR124B, Part # 1096903 (right hand) or: Catalog # CCLPL124B, Part # 1096898 (left hand) Insert: Catalog # CPG422 Grade K313, Part # 1183422
Cutting Speeds	400 - 1500 ft/min (120 - 450 m/min)
Roughing: Feed Rate*	0.007 - 0.014 in/rev (0.18 - 36 mm/rev)
Radial Depth of Cut	0.070 - 0.100" (1.8 – 2.5 mm)
Finishing: Feed Rate*	0.0025 - 0.007 in/rev (0.06 - 0.18 mm/rev)
radial Depth of Cut	0.030 - 0.050" (0.8 – 1.3 mm)
Coolant	None, or air
Personal Protection	For HYTAC-B1X, FLX, FLXT, A or B: Safety Goggles For HYTAC-W, WF, WFT or Rx Series: Enclose chip space, dust extraction, safety goggles, dust mask, protective gloves

* Too low a feed rate will lead to premature wear of tool and poor surface finish.

If chatter or pick-out of material is observed, try reducing RPM.

Experiment with settings above to achieve best surface finish based on your plug design and HYTAC material selection. In most cases, proper settings will result in a plug surface finish that requires no additional polishing.

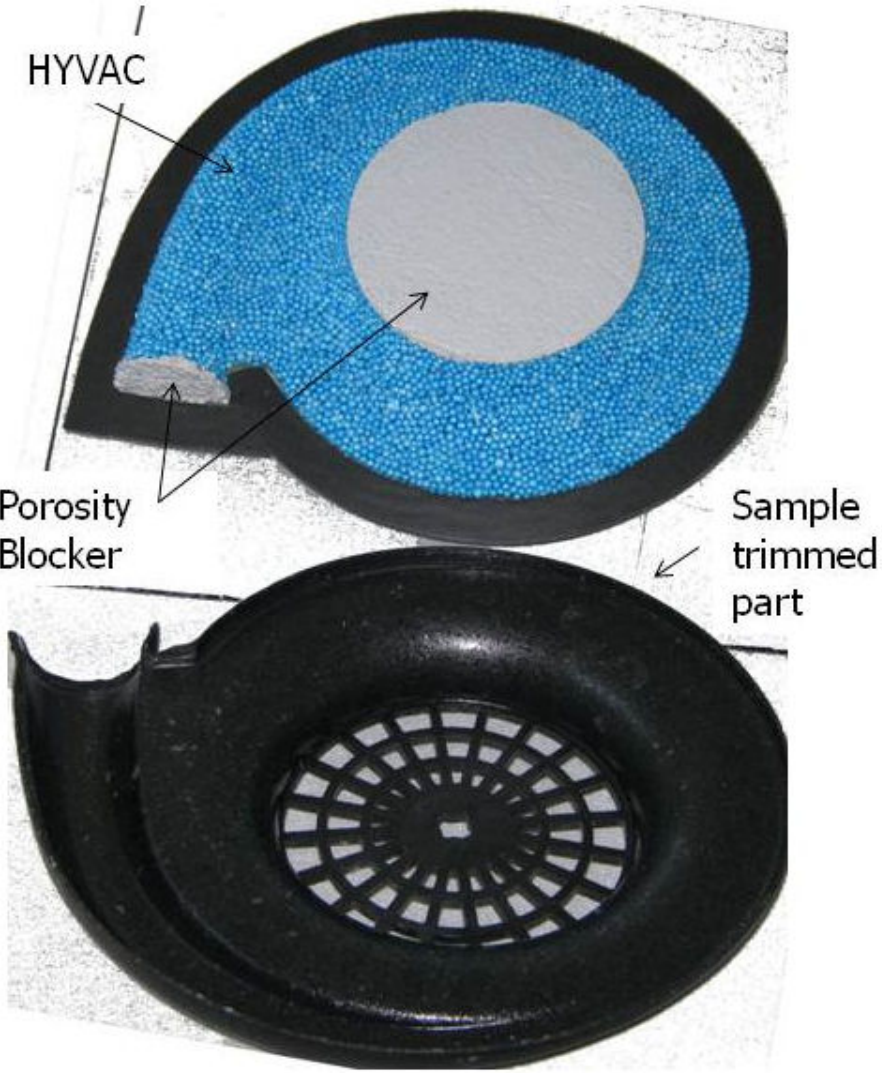
HYVAC® Form-in-place Fixture Material

Custom creation of vacuum holding fixtures is low cost, quick and easy with HYVAC from CMT. The material is supplied in loose bead form, with a special 2-component adhesive system that is mixed and added to the beads immediately prior to use. The adhesive and beads are mixed inside a mixing bag (included in the kit), then poured into a formed part. A backing plate with a single hole is attached to the mixture and the assembly is allowed to cure at room temperature overnight. The result is a durable, perfectly formed fixture that allows all-around vacuum to hold parts during a trimming or value-added assembly stage. No machining is required. The simplicity of the system has even found use for QC “go/no-go” checks.


Customers with complex trim operations requiring large cutouts from a part may add a thin coating of urethane or epoxy to block vacuum flow in areas where plastic will be removed. This ensures vacuum flow remains constant and secure by holding all solid areas of a part.

HYVAC is supplied in convenient 0.5 cu ft kits. (Approximately 3.8 US Gallons.)

It is a stock product from CMT and may be shipped anywhere in the world.



HYTAC SYNTACTIC FOAM MACHINING TOOLS

Tapered Ball Nose – Solid Carbide									
Available with a variety of taper angles and optimized geometry to produce a good edge finish. Contact CMT Materials for price and availability. Other sizes may be available upon request.									
Part #	Cutting Diameter	Flute Length	Shank Diameter	Overall Length	Flutes	Angle per Side	Radius	Slotting Parameters RDOC ⁱ = 100%	Profiling Parameters RDOC ⁱ = 100%
								Chip load	Chip load
77-102	1/8"	1-1/2"	1/4"	3"	3	1 ⁰	1/16"	.002 - .0035"	.003"
77-104	1/8"	1"	1/4"	3"	3	3 ⁰	1/16"	.003 - .004	.005
77-112	1/4"	2"	1/2"	4"	2	3 ⁰	1/8"	.003 - .004	.005
77-114	1/4"	1-3/8"	1/2"	4"	2	5 ⁰	1/8"	.004 - .005	.006
77-102M	3mm	39mm	6mm	76mm	3	1 ⁰	1.6mm	.05 - .09mm	.07mm
77-104M	3mm	25mm	6mm	76mm	3	3 ⁰	1.6mm	.07 - .10	.25
77-112M	6mm	50mm	12mm	100mm	2	3 ⁰	3.2mm	.07 - .10	.13
77-114M	6mm	35mm	12mm	100mm	2	5 ⁰	3.2mm	.10 - .13	.15

ⁱ RDOC: Radial Depth of Cut – the depth of the tool along its radius in the work piece as it makes its cut. Parameters referenced as a percentage (%) mean the tool should engage an amount of material equal to the % specified of the tool diameter. Areas referenced with a specific dimension should engage the dimension listed.

ⁱⁱ ADOC: Axial Depth of Cut – the depth of the tool along its axis in the work piece as it makes its cut. Parameters referenced as a percentage (%) mean the amount of material surface cut away will equal the cutting tool diameter at the % specified. Areas referenced with a specific dimension should cut the depth material at the depth dimension listed.

ⁱⁱⁱ D: Cutting Diameter of Tool.

Parameters developed in conjunction, and photos used with permission of Onsrud Cutter

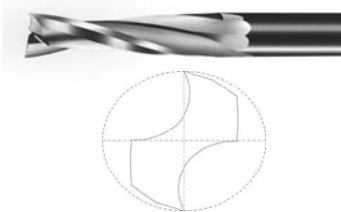
HYTAC SYNTACTIC FOAM MACHINING GUIDE

Innovative Tooling Materials for Thermoforming

HYTAC materials are generally easy to machine, frequently requiring no extra polish or surface preparation. Following the guidelines listed below will improve surface quality of the finished plug and ensure consistency in plug performance.

Cutter Type	<ul style="list-style-type: none">• Solid Carbide.• 2 Flute, Plastic Cutting Tools• SHARP TOOLS are required. Syntactic foams are abrasive. Check cutting edges and monitor plug surface for evidence of dull tooling.																																																																																																						
Speed and Feed	<ul style="list-style-type: none">• Varies by tool geometry and size.• Use “Chip Load” (the measurement of thickness of material removed by each cutting edge during a cut) from tooling manufacturer to develop feed rate.• Calculate Feed Rate (inches/minute) using the formula: Feed Rate = Chip Load x Spindle RPM x # of flutes.• For CMT supplied tools from this guide, the following feed rate calculations apply: <p>Number shown in bold is feed rate in inches/minute. Use formula above for metric tool calculations.</p> <table><tr><td colspan="2"></td><th colspan="8">Spindle RPM</th></tr><tr><td colspan="2"></td><th>2500</th><th>5000</th><th>7500</th><th>10000</th><th>12,500</th><th>15000</th><th>17,500</th><th>20,000</th></tr><tr><td rowspan="9">Chip Load</td><td>0.002</td><td>10</td><td>20</td><td>30</td><td>40</td><td>50</td><td>60</td><td>70</td><td>80</td></tr><tr><td>0.003</td><td>15</td><td>30</td><td>45</td><td>60</td><td>75</td><td>90</td><td>105</td><td>120</td></tr><tr><td>0.0035</td><td>18</td><td>35</td><td>53</td><td>70</td><td>88</td><td>105</td><td>123</td><td>140</td></tr><tr><td>0.004</td><td>20</td><td>40</td><td>60</td><td>80</td><td>100</td><td>120</td><td>140</td><td>160</td></tr><tr><td>0.005</td><td>25</td><td>50</td><td>75</td><td>100</td><td>125</td><td>150</td><td>175</td><td>200</td></tr><tr><td>0.006</td><td>30</td><td>60</td><td>90</td><td>120</td><td>150</td><td>180</td><td>210</td><td>240</td></tr><tr><td>0.007</td><td>35</td><td>70</td><td>105</td><td>140</td><td>175</td><td>210</td><td>245</td><td>280</td></tr><tr><td>0.009</td><td>45</td><td>90</td><td>135</td><td>180</td><td>225</td><td>270</td><td>315</td><td>360</td></tr><tr><td>0.01</td><td>50</td><td>100</td><td>150</td><td>200</td><td>250</td><td>300</td><td>350</td><td>400</td></tr></table>			Spindle RPM										2500	5000	7500	10000	12,500	15000	17,500	20,000	Chip Load	0.002	10	20	30	40	50	60	70	80	0.003	15	30	45	60	75	90	105	120	0.0035	18	35	53	70	88	105	123	140	0.004	20	40	60	80	100	120	140	160	0.005	25	50	75	100	125	150	175	200	0.006	30	60	90	120	150	180	210	240	0.007	35	70	105	140	175	210	245	280	0.009	45	90	135	180	225	270	315	360	0.01	50	100	150	200	250	300	350	400
		Spindle RPM																																																																																																					
		2500	5000	7500	10000	12,500	15000	17,500	20,000																																																																																														
Chip Load	0.002	10	20	30	40	50	60	70	80																																																																																														
	0.003	15	30	45	60	75	90	105	120																																																																																														
	0.0035	18	35	53	70	88	105	123	140																																																																																														
	0.004	20	40	60	80	100	120	140	160																																																																																														
	0.005	25	50	75	100	125	150	175	200																																																																																														
	0.006	30	60	90	120	150	180	210	240																																																																																														
	0.007	35	70	105	140	175	210	245	280																																																																																														
	0.009	45	90	135	180	225	270	315	360																																																																																														
	0.01	50	100	150	200	250	300	350	400																																																																																														
Optimization techniques	<ol style="list-style-type: none">1. Experiment with the maximum possible chip size. Use feed rate as determined from the chip load rating and your machine RPM.2. Increase feed rate until the part finish begins to deteriorate. Decrease feed rate 10%.3. Decrease RPM by some set increment until surface finish begins to deteriorate. Once this happens, increase RPM until finish is again acceptable. Speed and feed are now optimized in your process.4. Usage of separate tools for roughing and finishing allows rotation of finish tool into roughing position when part finish deteriorates.5. Clear removed chips to prevent premature tool wear. <p>NOTE: Too low a feed rate will generate excess heat and reduce tool life. Proper settings will result in a tool operating at or near room temperature. Too high a feed rate will cause poor surface finish or part movement during machining.</p>																																																																																																						
Coolant	<ul style="list-style-type: none">• None, or air																																																																																																						
Protection	<ul style="list-style-type: none">• For HYTAC-B1X, FLX, FLXT, A or B: Safety Goggles• For HYTAC-W, WF, WFT or Rx Series: Enclose chip space, dust extraction, safety goggles, dust mask, protective gloves																																																																																																						

HYTAC SYNTACTIC FOAM MACHINING TOOLS

Double Flute Upcut Spiral - Solid Carbide										
High helix geometry with a special point for upward chip flow, <u>smooth sidewall and improved bottom finish.</u>										
Conventional cutting for roughing and finishing is recommended with these tools.										
Contact CMT Materials for price and availability. Other sizes may be available upon request.										
Part #	Cutting Diameter	Flute Length	Shank Diameter	Overall Length	Roughing Parameters		Finishing Parameters			
					Slotting RDOC= 100% ADOC= up to 1xD	Profiling RDOC ⁱ = 100% ADOC ⁱⁱ = up to 1xD ⁱⁱⁱ	Walls RDOC ⁱ = below ADOC ⁱⁱ = up to 4xD ⁱⁱⁱ		Floors RDOC ⁱ = 40-65% ADOC ⁱⁱ = below	
					Chip load	Chip load	Chip load	RDOC ⁱ	Chip load	ADOC ⁱⁱ
52-703	1/8"	1/2"	1/4"	2"	.002 - .003"	.002 - .004"	.002"	.01"	.002"	.005"
52-707	1/4"	7/8"	1/4"	3"	.003 - .004	.003 - .005	.003	.02	.003	.01
52-710	3/16"	5/8"	1/4"	2-1/2"	.003 - .004	.003 - .005	.003	.01	.003	.005
52-709	3/8"	1"	3/8"	3"	.003 - .005	.003 - .007	.004	.03	.004	.01
52-702	1/2"	1-1/4"	1/2"	4"	.004 - .007	.004 - .009	.004	.04	.004	.015
52-706	1/2"	2-1/8"	1/2"	4"	.004 - .007	.004 - .009	.004	.04	.004	.015
52-712	5/8"	1-3/4"	5/8"	5"	.004 - .008	.004 - .010	.004	.04	.004	.02
52-724	3/4"	2-1/2"	3/4"	5"	.004 - .008	.004 - .010	.005	.05	.005	.02
52-742	12mm	35mm	12mm	100mm	.10 - .18mm	.10 - .23mm	.10mm	1mm	.10mm	.4mm
52-744	12mm	45mm	12mm	100mm	.10 - .18	.10 - .23	.10	1	.10	.4
52-746	12mm	55mm	12mm	100mm	.10 - .18	.10 - .23	.10	1	.10	.4
52-752	16mm	45mm	16mm	120mm	.10 - .20	.10 - .25	.10	1	.10	.5
52-754	16mm	55mm	16mm	120mm	.10 - .20	.10 - .25	.10	1	.10	.5
52-764	20mm	65mm	20mm	125mm	.10 - .20	.10 - .25	.13	1.3	.13	.5


HYTAC SYNTACTIC FOAM MACHINING TOOLS

High Finish Ball Nose – Solid Carbide

3D contouring of HYTAC materials. Unique geometry and highly polished surface result in a smooth surface without tool marks.

Conventional cutting is recommended for roughing and finishing with these tools.

Contact CMT Materials for price and availability. Other sizes may be available upon request.



Part #	Cutting Diameter	Flute Length	Shank Diameter	Overall Length	Roughing Parameters RDOC ⁱ = 33% ADOC ⁱⁱ = up to 2xD ⁱⁱⁱ	Finishing Parameters		
					Chip load	Chip load	RDOC ⁱ	ADOC ⁱⁱ
65-210B	1/8"	1/2"	1/8"	2-1/2"	.002 - .004"	.002"	.002 - .003"	.005"
65-225B	1/4"	1-1/8"	1/4"	3"	.003 -.005	.003	.002-.003	.01
65-215B	3/16"	1/2"	1/4"	2-1/2"	.003 -.005	.003	.002-.003	.005
65-250B	3/8"	1-1/8"	3/8"	3"	.003 -.007	.004	.004-.006	.01
65-280B	3mm	12mm	3mm	64mm	.05 - .10mm	.05mm	.05-.07mm	.13mm
65-285B	6mm	20mm	6mm	76mm	.07 - .13	.07	.05 - .09	.25
65-290B	8mm	25mm	8mm	76mm	.07 - .15	.10	.01 - .15	.25
65-295B	10mm	30mm	10mm	76mm	.07 - .18	.10	.10 - .15	.38