Random Orbital Sanding Disc Review

12 Discs Tested

Nearly every woodworker, professional to amateur, owns and relies on a random orbital sander to bring surfaces to finish readiness. Random orbital sanding can be tedious but is a necessary step that can make or break a project. Using good quality discs can speed up or slow down this process. Determining the best disc to buy can be a challenge with all the different manufacturers and brands available. To determine which single random orbital disc was the best overall performer an objective, side-by-side comparison was completed. To date, several reviews have been done (Fine Woodworking 2014, Fine Home Building 2011 and Wood Magazine), but none included the best performing disc from each major manufacturer. The goal of this review was to complete an objective side-by-side test of the single best random orbital sanding disc offered by each leading abrasive manufacturer. The following questions were addressed: 1) Which sanding disc is the most aggressive at stock removal, 2) Which sanding disc has the best endurance or lasts the longest 3) Which sanding disc is the best value taking into account price, stock removal and endurance.

The test was narrowed down to the single best model sanding disc each leading abrasive manufacturer had to offer. Only major recognized brands were assessed, and no aftermarket discs were included. Only those models available to the average consumer were included. The following abrasive manufacturers were contacted and asked for their recommendation as to their most aggressive and longest lasting random orbital sanding disc: 3M™, Festool™, Freud™ Klingspore™, Mirka™, Norton™ and Sia™. These specific recommendations were included in the current test. Bosch™, Dewalt™t, Gator™, Makita™and Shopsmith™only offered one type of disc, so this was included in the test. The test included the following discs from the following manufacturers: 3M™ Cubitron II™ 775L, Bosch™ Basic, Dewalt™ Basic, Festool™ Granat™, Freud™ Diablo Sandnet™, Gator™ Red, Kingspore™ Stearate PS33, Mirka™ Iridium™ Norton™ Pro Sand Multi-Air™ , Shopsmith G2™ and Sia™ Siaspeed™ .

Each sanding disc underwent the exact same objective testing. The test included only 5” diameter, open coat, hook and loop discs in 120 grit. 120 grit was chosen as it was a middle-of-the-road grit, but still with an aggressive stock removal rate. The assumption was the more wood removed per test the more clearly would be the difference between brands. The 5” diameter hook and loop was chosen as it is the most common size and attachment type disc used by consumers. All sanding was performed on a single board of White Ash measuring 12” x 18”. Ash hardwood was chosen as it would more aggressively tax the abrasive material on each disc, further discriminating stock removal rates. When setting up the test protocol, the approximate downward pressure applied to a random orbital sander was

One very-smooth 12" x 18" Ash board

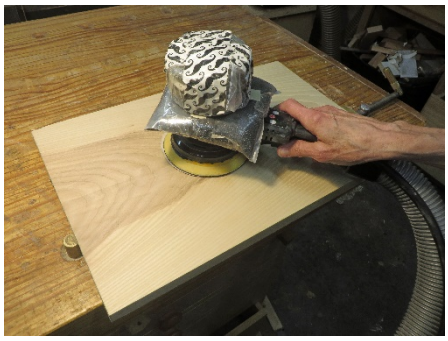
determined. The weight of the Mirka testing sander alone was 2 pounds. The weight of the sander and the operator's limp arm was 6.5 pounds. The total weight when moderate downward pressure was applied was 11 pounds. A weight was fabricated from lead shot and small free weights weighing 8.89 pounds designed to stay in place on top of the rotating sander. This weight was placed on top of the testing sander (Mirka™ CERO S550 120 volt) making the combined weight 11 pounds 1 ounce. This weight was placed on top of the random orbital sander for the duration of each test. The Ash board was then sanded with each disc for 5 minutes moving the sander about the entire board in an

Measuring Downward Pressure


Lead Weight

Weight and Sander

even and uniform fashion only pushing the sander from the side to keep it moving, and never applying downward pressure. The random orbital sander speed was set to the highest setting of 10,000 RPM. The sander never bogged down with any of the discs tested. The sander pad was always kept flat on the board. Dust collection was performed for all tests via a central dust collector. Before and at the conclusion of each 5- minute interval, the board was weighed to determine exactly how much wood had been removed. Each pre and post weight was done using a scale that weighed to thousandths of a pound, i.e., 0.001 pounds. Each weight was then converted into grams. The test was repeated 5 times for each disc for a total sanding time of 25 minutes. Material removed following each 5-minute interval was recorded. See below spreadsheet and graphs for data on each disc.


Sander in Action

Note: Surface quality was not part of this assessment as the medium 120 grit paper would leave significant surface scratches. This aspect of surface quality had been addressed earlier in the Nov/Dec 2011 Fine Woodworking article #222, "Tool Test: Sanding Disks. Which brand cuts fastest, lasts longest, and leaves the best surface?" In this review all 9 discs reviewed produced a similar and acceptable surface quality with a sanding progression down to 220 grit. In terms of surface quality, the author concluded, "With a careful sanding technique and a steady progression through the grits, all these products will work well." In this test, surface quality of the best performing disc (3M™ Cubitron II™) was assessed by sanding a 15" x 24" piece of birch plywood to 220 grit and then staining with dark Minwax ™ Red Mahogany stain. No visible scratch marks were noted.

Discussion:

There was a wide gap between brands in terms of stock removal and endurance. Discs with ceramic abrasive material, in general, were the most aggressive in stock removal and had the best endurance. To date, sanding disc assessments did not include discs with ceramic abrasives, except for the Norton ™ ProSand Multiair ™ discs included in the 2014 Fine Woodworking and 2011 Fine Homebuilding reviews. In this test, four discs had ceramic abrasives (Norton ™, Sia ™, 3M ™ and Mirka ™). Discs with film backing (3M™, Shopsmith™, Norton™, and Mirka™) outperformed paper backed discs. Some less expensive discs (cont' on next page)

(Klingspore™ at $0.32/each) well outpaced much more expensive discs (Norton™ at $1.19/each). Discs contained two main types of dust collection holes, the 8-hole design (Klingspore™, Shopsmith™, Gator™, Dewalt™, Makita™ and Bosch™) and various multi-hole designs (Norton™, Sia™, Festool™, 3M™ and Mirka™). The Freud™ had a mesh backing with very open dust collection. No difference in dust extraction was noted between these different dust extraction hole configurations.

Stock removal:

The disc with the best stock removal for the initial 5 minutes interval was far and away the 3M™ Cubitron II™ 775L with 24.04 grams removed. The next best were the Shopsmith ™, Sia™ and Mirka™ removing 15.42, 14.06 and 14.06 grams respectively. The worst performer was the Bosch™, only removing 4.08 grams or just 16% of the best performing 3M™ disc.

Endurance:

Each disc had a predictable decline in stock removal rate as the abrasive dulled. The 3M™ Cubitron II™ won the endurance test taking off a total of 94.9 grams in 25 minutes of testing with the next best disc being the Mirka™ Iridium™ removing 57.61 grams or just 60% of the 3M Cubitron II™. The worst overall performer was the Bosch™ removing a total of 9.07 grams in 25 minutes. The difference between the 1st and 5th test, or overall stock reduction was the least with the Mirka™ Iridium™ with a difference of just 32%. The 3M™ Cubitron II™ had the second smallest reduction rate of 39%. The largest stock reduction rate was the Bosch™ at 77%. The 3M™ Cubitron II™ disc actually removed more material in its 5th 5 minute interval than all discs except the Shopsmith ™ in their 1st 5 minute interval when each disc was brand new out of the box.

Value:

Value was broken down into two categories: cost and speed. Cost was calculated as the price to remove one gram of material (the cost of a single disc divided by the grams removed) averaged over 5 trials. The lowest cost disc was the 3M™ Cubitron II™ at $.052 per gram, with the Klingspore™ PS33 coming in second at $.058 and the Sia Abrasives™ Siaspeed™ coming in third at $.064. The highest cost disc was the Makita™, costing an average of $1.12 to remove one gram of wood.

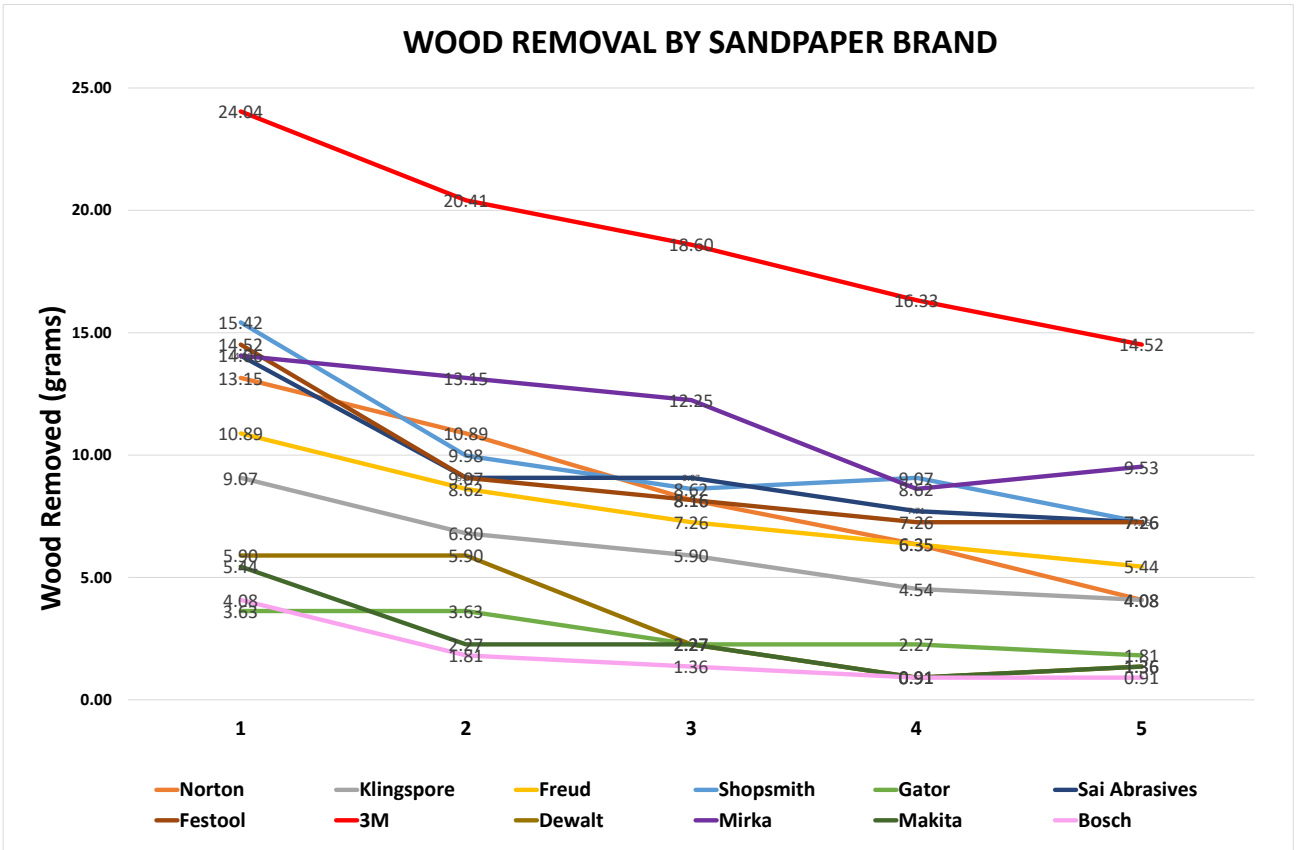
Whether working as a hobbyist or a professional, time is money. Reducing overall sanding time translates to lower costs. Speed was defined as the total amount of wood removed over the 5 trials in 25 minutes. The 3M™ Cubitron II™ removed a total of 93.89 grams in 25 minutes. Mirka™ Iridium™ and Shopsmith™ placed second and third removing 57.61 and 50.35 grams respectively. The slowest sanding speed was the Bosch™ , removing just 9.07 grams. In sum, sanding speed for the Cubitron II™ was 39% faster than the second place Mirka™ and 46% faster than the third place Shopsmith™. In the area of value (the cost to remove one gram of wood, and sanding speed), the 3M™ Cubitron II™ was the clear winner.

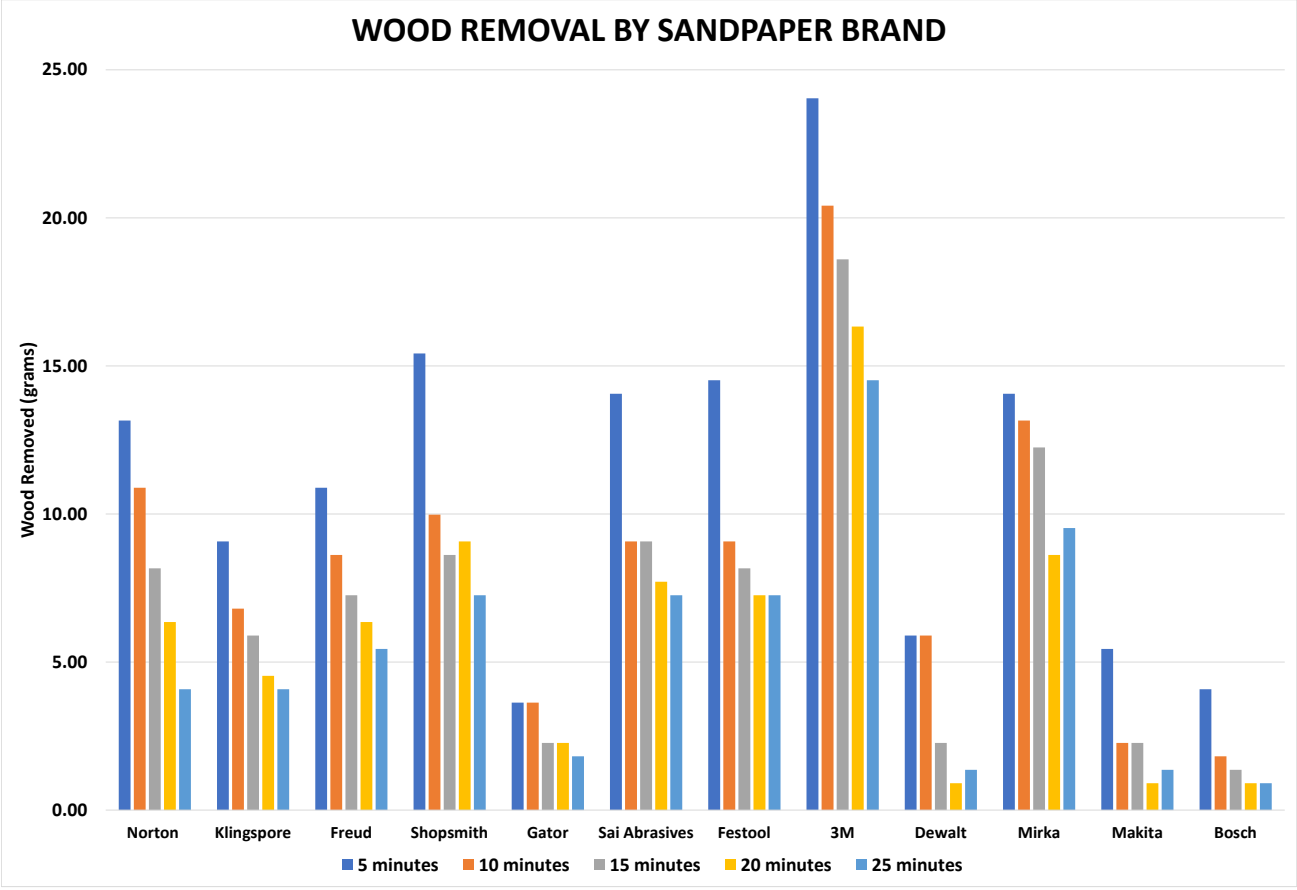
Backing

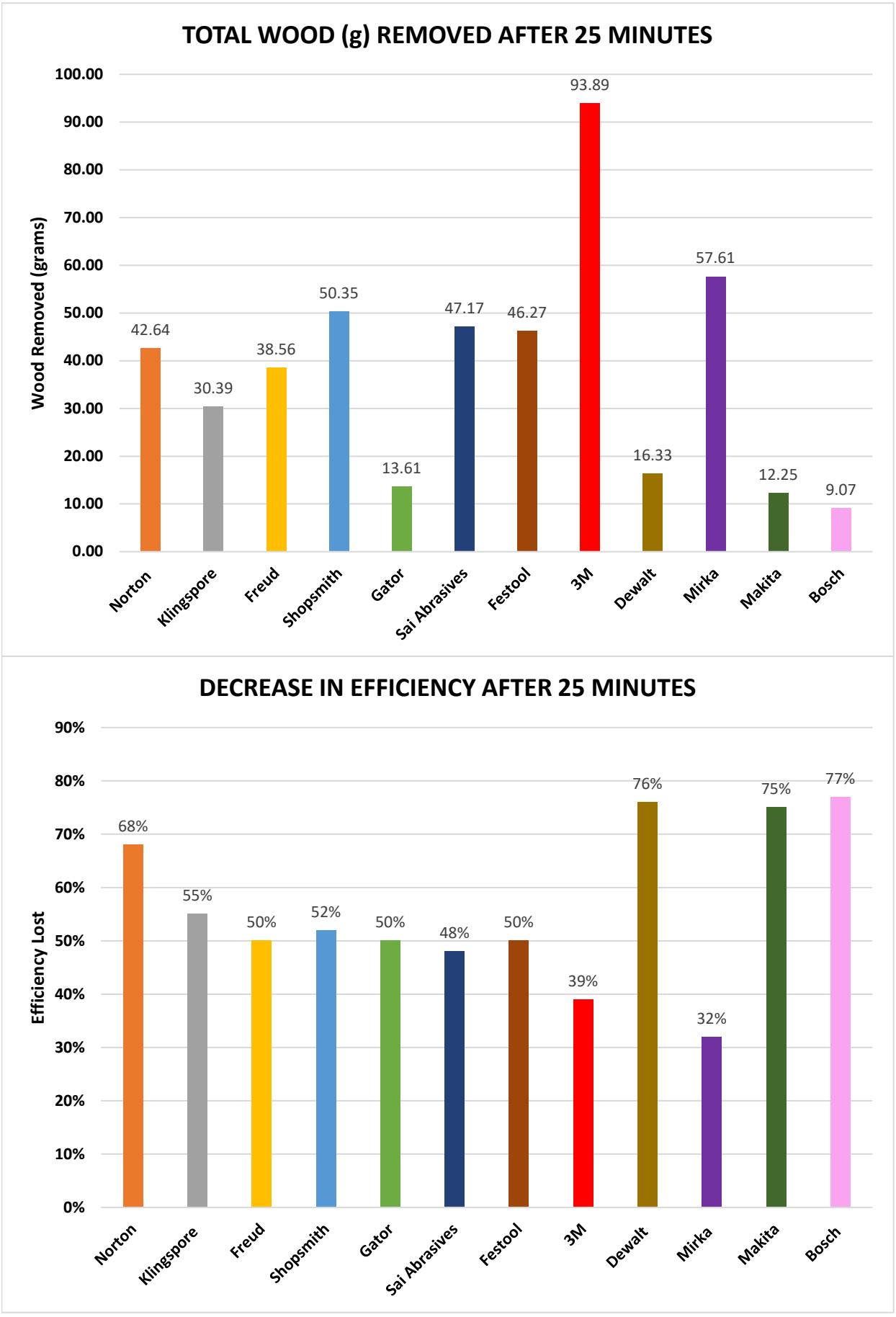
Several discs had either a paper or mesh backing (Klingspore™, Freud™, Gator™, Sia™, Festool™, Dewalt™, Bosch™, and Makita™). Both these backing types were easy to crease, bend or tear. Four discs (Norton™, Shopsmith™, 3M™ and Mirka™) has a film or fiber backing that was quite tear resisitant. In general, discs with film backing had greatly prolonged life as the backing did not tear or crease before the disc wore out.

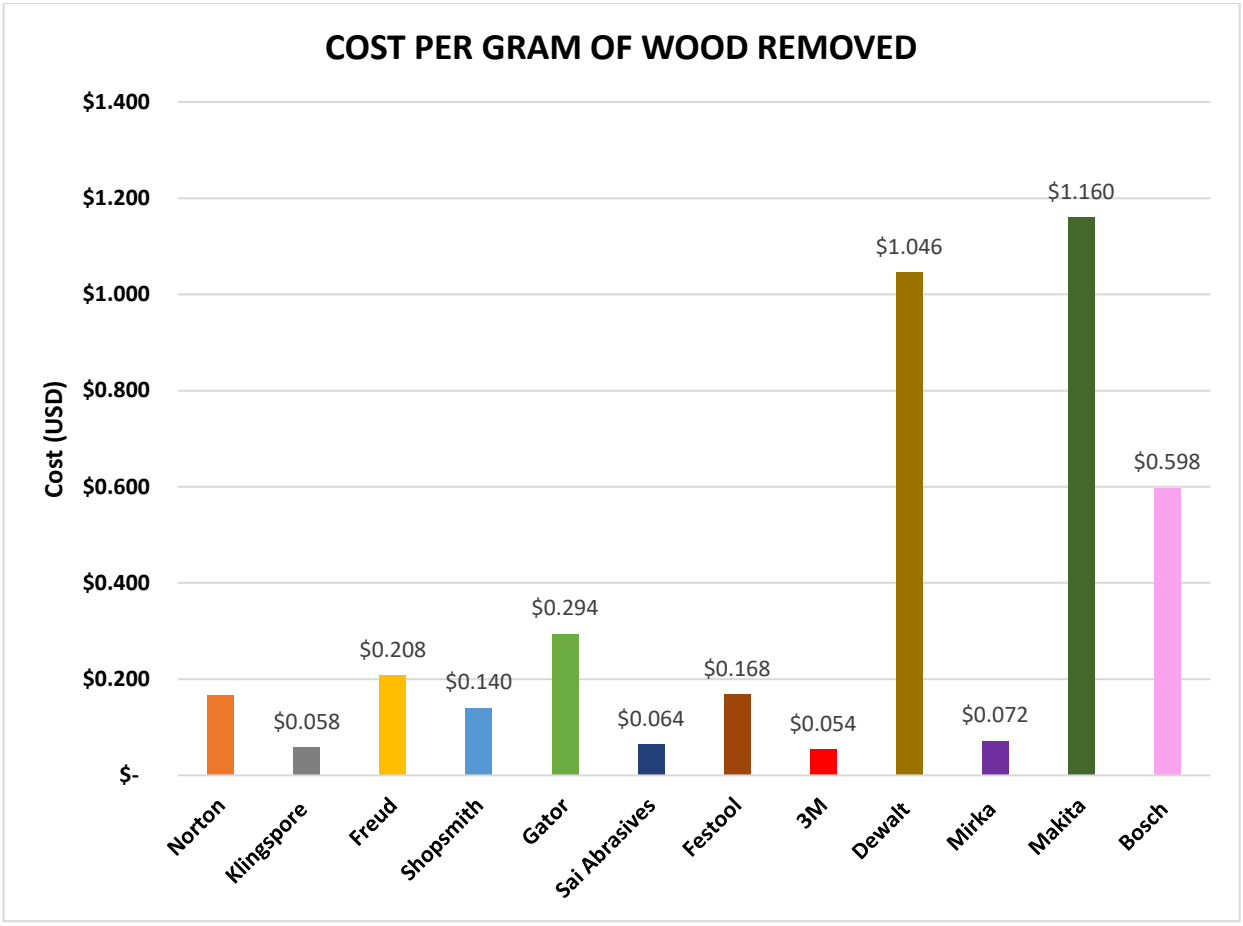
Conclusion:

The clear winner in this test is the 3M™ Cubitron II™ as it excelled at stock removal, endurance, value, dust extraction and film backing material.








COST PER GRAM OF WOOD REMOVED
Cost (USD)
$1.400
$1.200
$1.000
$0.800
$0.600
$0.400
$0.200
$-
$0.058
$0.208
$0.140
$0.294
$0.064
$0.168
$0.054
$1.046
$0.072
$1.160
$0.598
Norton
Klingspore
Freud
Shopsmith
Gator
Sai Abrasives
Festool
3M
Dewalt
Mirka
Makita
Bosch

Data

Manufacturer	Model		Trial	Pre/Post Weight Diffrence in Grams	Stock Removal Rate Decline Test #1 to #5	Country	Cost per Disc	Pack Size	Cost to Remove One Gram
Norton	ProSand Multi-Air	Ceramic Alumina	#1	13.15		Canada	1.19	10	$ 0.09
			#2	10.89			1.19	10	$ 0.11
			#3	8.16			1.19	10	$ 0.15
			#4	6.35			1.19	10	$ 0.19
			#5	4.08	68% loss		1.19	10	$ 0.29
Klingspore	PS33	Aluminum Oxide w/ Sterrate	#1	9.07		Poland	0.32	50	$ 0.04
			#2	6.80			0.32	50	$ 0.05
			#3	5.90			0.32	50	$ 0.05
			#4	4.54			0.32	50	$ 0.07
			#5	4.08	55% loss		0.32	50	$ 0.08
Freud	Diablo SandNet	Premimum Aluminum Oxide	#1	10.89		Switz/USA	1.50	10	$ 0.14
			#2	8.62			1.50	10	$ 0.17
			#3	7.26			1.50	10	$ 0.21
			#4	6.35			1.50	10	$ 0.24
			#5	5.44	50% loss		1.50	10	$ 0.28
Shopsmith™	Shopsmith G2™	Aluminum Oxide w/ Stearate	#1	15.42		Sou Kor	1.33	6	$ 0.09
			#2	9.98			1.33	6	$ 0.13
			#3	8.62			1.33	6	$ 0.15
			#4	9.07			1.33	6	$ 0.15
			#5	7.26	52% loss		1.33	6	$ 0.18
Gator™	Red Resin	Aluminum Oxide	#1	3.63		USA	0.74	15	$ 0.20
			#2	3.63			0.74	15	$ 0.20
			#3	2.27			0.74	15	$ 0.33
			#4	2.27			0.74	15	$ 0.33
			#5	1.81	50% loss		0.74	15	$ 0.41
Sai Abrasives™	Siaspeed™	Mixed Grit with Ceramic Content	#1	14.06		Switz	0.58	100	$ 0.04
			#2	9.07			0.58	100	$ 0.06
			#3	9.07			0.58	100	$ 0.06
			#4	7.71			0.58	100	$ 0.08
			#5	7.26	48% loss		0.58	100	$ 0.08
Festool™	Granat™	Ceramic-Grain Coated Abrasive	#1	14.52		Czech	1.47	10	$ 0.10
			#2	9.07			1.47	10	$ 0.16
			#3	8.16			1.47	10	$ 0.18
			#4	7.26			1.47	10	$ 0.20
			#5	7.26	50% loss		1.47	10	$ 0.20
3M™	Cubitron II™	Cubitron II™ Ceramic	#1	24.04		USA	1.00	50	$ 0.04
			#2	20.41			1.00	50	$ 0.05
			#3	18.60			1.00	50	$ 0.05
			#4	16.33			1.00	50	$ 0.06
			#5	14.52	39% loss		1.00	50	$ 0.07
Dewalt™	Basic	Aluminum Oxide	#1	5.90		Poland	2.00	5	$ 0.34
			#2	5.90			2.00	5	$ 0.34
			#3	2.27			2.00	5	$ 0.88
			#4	0.91			2.00	5	$ 2.20
			#5	1.36	76% loss		2.00	5	$ 1.47
Mirka™	Iridium™	Ceramic Blend	#1	14.06		Finland	0.80	50	$ 0.06
			#2	13.15			0.80	50	$ 0.06
			#3	12.25			0.80	50	$ 0.07
			#4	8.62			0.80	50	$ 0.09
			#5	9.53	32% loss		0.80	50	$ 0.08
Makita™	Basic™	Aluminum Oxide	#1	5.44		Italy	2.00	5	$ 0.37
			#2	2.27			2.00	5	$ 0.88
			#3	2.27			2.00	5	$ 0.88
			#4	0.91			2.00	5	$ 2.20
			#5	1.36	75% loss		2.00	5	$ 1.47
Bosch™	Basic	Aluminum Oxide	#1	4.08		Turkey	0.80	5	$ 0.20
			#2	1.81			0.80	5	$ 0.44
			#3	1.36			0.80	5	$ 0.59
			#4	0.91			0.80	5	$ 0.88
			#5	0.91	77% loss		0.80	5	$ 0.88