

Regarding Which Graphite to Use for Decarb/Scale Protection

I continue to receive inquiries and comments regarding graphite for decarb protection. Mostly, I get “I can’t find the high-temp graphite.”, or “How many knives can I coat per can?”, or “I can’t find the brands you mentioned.” or variations on this theme. All are valid concerns and I never promoted a specific type of graphite spray, I just showed what I and others used and our results. So, I decided to try several brands and test for decarb/scale, hardness and finally toughness. I also considered cost per knife based on square inches of surface area, coverage and cost. The following are brands I selected for comparison testing:



My goal was to determine if there is a better or worse spray graphite or if they work about the same. So, I selected one with a low operating temperature of 400° F max. (Slip Plate). I also selected one with a very high operating temperature of 3000° F max. (DGF). The other two were within the 700—900° F range. I did this because I don’t believe that the operating temperature for providing lubrication has much to do with performance of a protective coating that bonds to the surface at higher temperatures. As long as it protects the surface under extreme heat, it doesn’t matter.

Since we only make throwing knives, we only have two considerations: Rockwell hardness (testing through the graphite layer and after removing it) and toughness, using our standard 50 hits from a 4 lb sledge hammer to measure deflection. The test pieces used are the same 0.25” x 0.75” x 6” that we used in the original hardness and toughness tests with “Blaster” spray graphite. “Blaster” will be my baseline for comparison.

I have also developed a simple spreadsheet to determine the number of knives per can and cost per knife. I added a cost per knife calculator for stainless steel foil as a comparison. This [spreadsheet](#) will be posted in the papers section of our web site.

I evaluated each type for spray graphite for coverage, flow and decarb/scale protection, based on hardness.



Coverage:

I used one of my standard Darts (approx. 25 Sq inches of surface area) to determine how well each graphite spray covered and how much was needed per Dart. The amount per Dart was determined by first weighing a can, then applying a good coat to the Dart and weighing again. The table below (from my cost comparison spreadsheet) shows an average of 10 grams per Dart. The size of the spray can provided the approx. number of knives per can with 25 sq inches of surface area.

Testing Approximate Number of Knives per Can of Graphite Spray for a 25 Sq inch Knife (Dart)					
Graphite Brand	Stated Graphite wgt	Spray Can Wgt	Wgt after one application	Delta	Knives/Spray Can
DGF	9 oz. (252 grams)	362 grams	354 grams	8 grams	41
Spayon	10 oz. (280 grams)	387 grams	375 grams	12 grams	29
Slip Plate	12 oz. (336 grams)	433 grams	424 grams	9 grams	43
Blaster	5.5 oz. (154 grams)	238 grams	228 grams	10 grams	21

Assumptions for above chart:

Approx. 25 sq inches of surface area (my Darts)
Assumes 10% waste from overspray and over-application

Average: 10 grams for 25 sq inches of surface area

Average grams per sq inch: 0.39 grams per square inch

Flow:

While spraying, I observed each spray pattern. I performed this twice per spray can. My observations:

Blaster: Reasonable flow rate and good coverage. I'm used to this stuff.

DGF: Has a very smooth flow rate and excellent coverage. This was the best of the group.

Slip Plate: Smooth, even flow with good coverage. I am interested in its performance due to low temp limit.

Spray on: Heavy flow rate causing heavy areas and runs—had to back-off spray distance to get an even flow. This increased the amount of spray per piece.

Decarb/Scale Protection:

To perform this test, I made up some coupons (test pieces) shown below before heat treat. Each measured 6" x 0.75" x 0.25" (approx. 12.38 sq inches). I stamped each piece based on the spray applied. Once coated, I heat-treated them in the usual way. Afterwards, I tested for hardness.

Average hardness over multiple locations:

Blast: HRC 51.0

DGF: HRC 49.8

Slip Plate: HRC 50.8

Spray on: HRC 50.5

Since the target hardness for our throwing knives is HRC 50 ± 1, I am satisfied that all of the sprays performed well.

Remember, this is not about whether or not graphite is effective for decarb/scale protection. This is about a comparison among multiple brands.

Also, we may be testing toughness later this year, so stay tuned.

