The Problem with Gas Forges for Hardening Throwing Knives

When we started making our own throwing knives a little more than a year ago, we used a small propane forge (made with fire bricks) for the hardening process and a small kiln for the tempering part. It was fun. We watched videos on how to harden knives using said gas (propane) forge. They were consistent regarding the heating of the blade to proper color and checking with a magnet before quenching. They also showed only the blade being heated to a non-magnetic state.

We followed the instructions and we had knives with a hardened blade, but a soft handle. This would become obvious when knife-on-knife action would occasionally form burrs on the handles that ripped flesh upon release—ouch! It became common practice to remove burrs in the middle of a throwing session. So refurbishing the knives (shown below) every few thousand throws was not only cosmetic, but defensive.

There came a time when we realized that using a gas forge for hardening throwing knives that would suffer constant abuse, due to poor throwing skills and practices, may not be such a hot (pun intended) idea. That is why I built an electric forge. That is also why I threw together this paper.

You can see from the pictures below that the handles of these older Bellablades Darts are indeed soft. So what!

We will address this issue in the following pages.

Comparing Gas Forge to the Electric Forge (oven) for Knife Hardening (1)

The Improved Dart was my throwing knife of choice for about a year. When I finally broke 50 throws in a row at 3 meters—big whoop—I promised myself a new set. Over the course of that year other problems arose, such as handle burrs that slashed fingers, bending at the handle/blade interface and finally breaking. We made a lot of bad throws—slapping sideways on the edge of the target, hitting a knife that is stuck mostly sideways in the target! I believe that they would still be in good shape if not for lousy throwing skills and throwing one knife per target.

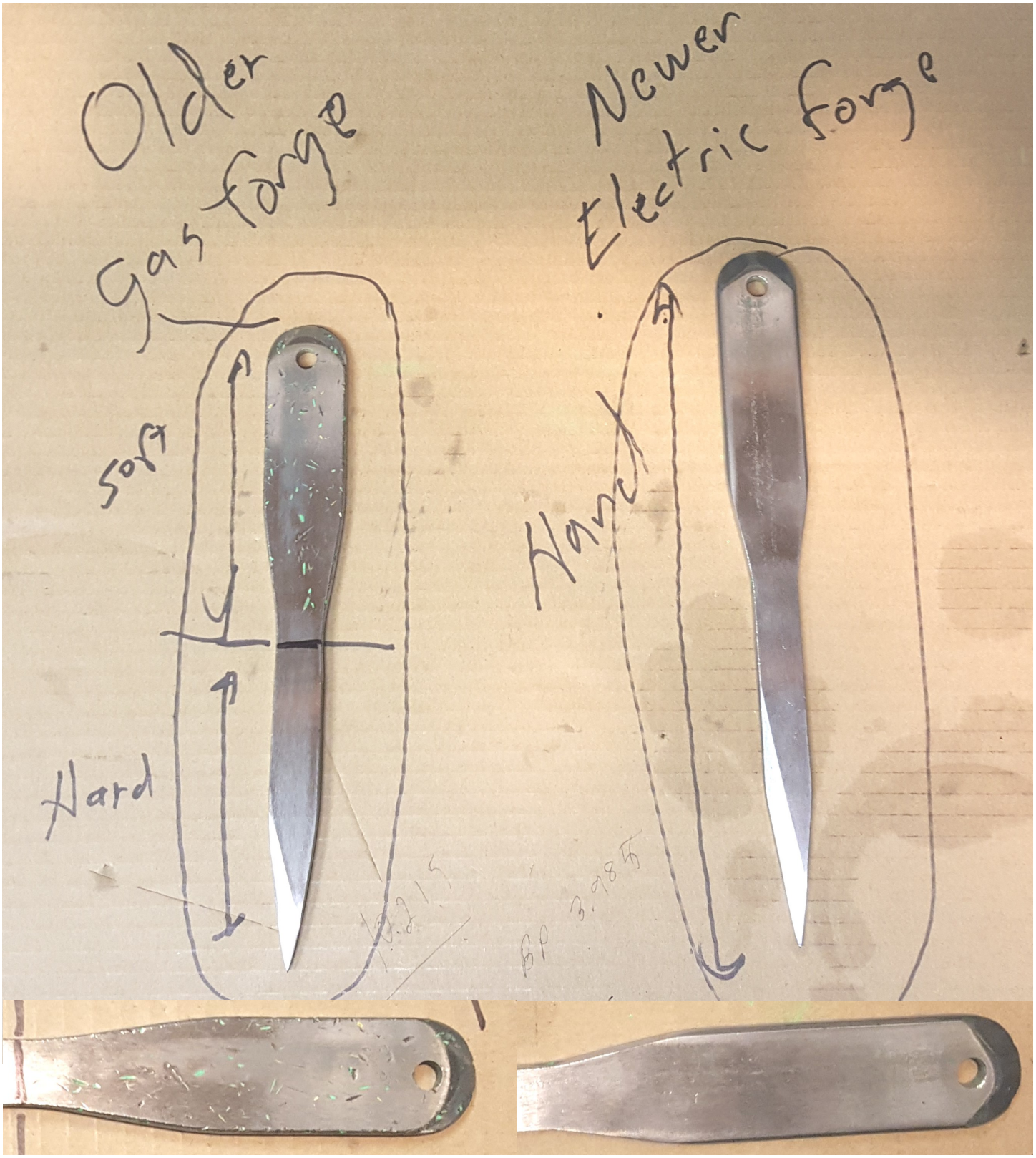
I made my new knives ~ 1/2" longer and heat treated them using my electric forge (kiln, oven, furnace, whatever). I continue to test and abuse these knives as well.

Illustration:
The amount of abuse from other knives, appears to be the same for both knives shown below, but there is a large difference—the one on the right was hardened over its entire length before tempering. When the powder coat is removed, the problem becomes obvious.

Comparing Gas Forge to the Electric Forge (oven) for Knife Hardening (2)

Illustration:
After removing the powder coat and belt sanding the entire length of both knives, it becomes obvious that the one on the left (older) only has a heat treated blade, while the one on the right is heat treated over its entire length. Notice the difference in handle scarring.

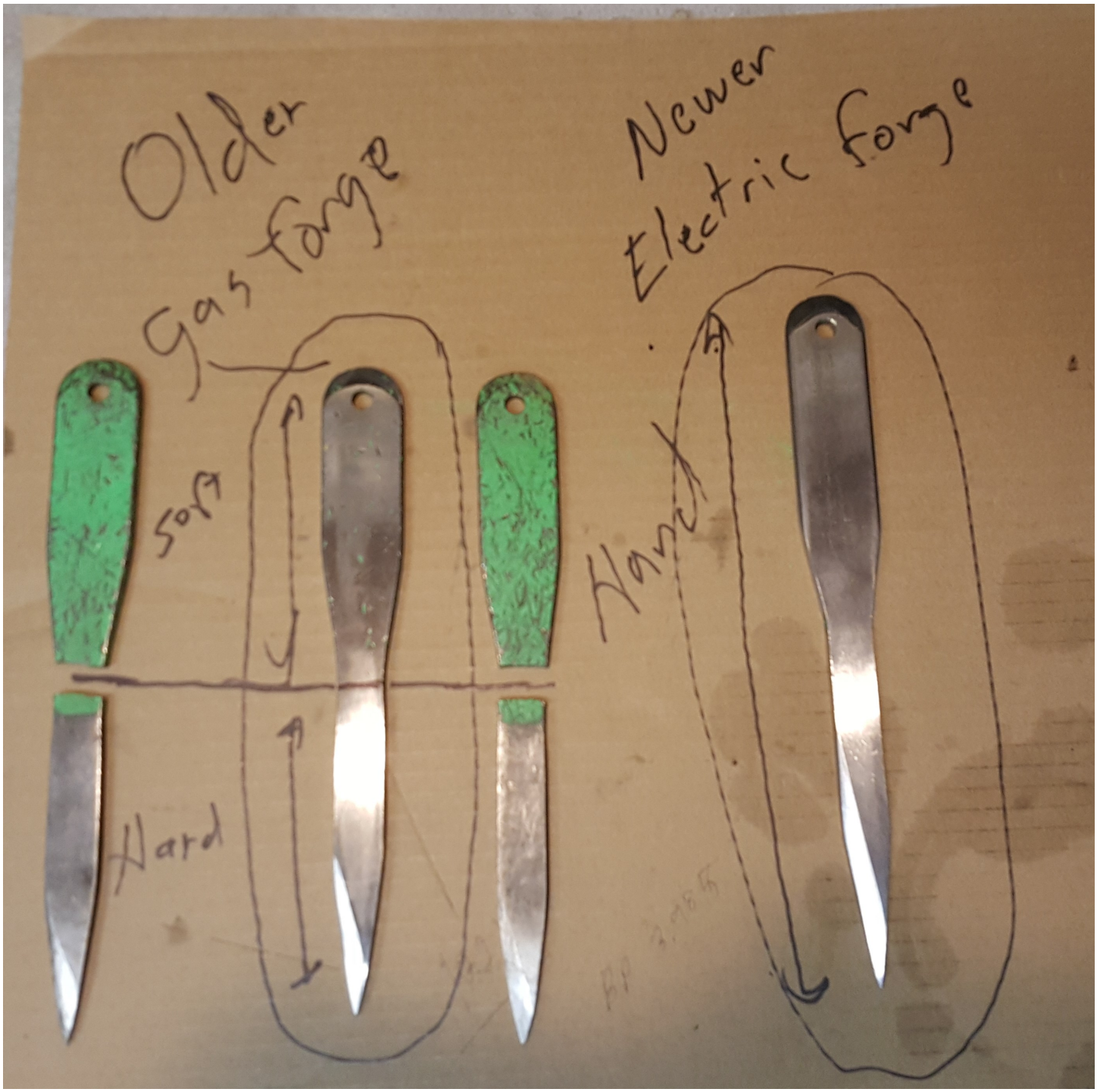
But wait, there's more!



Comparing Gas Forge to the Electric Forge (oven) for Knife Hardening (3)

Even though the older knives were O1 tool steel and the newer knives were 5160 spring steel, the transition between hard and soft appears to be the primary cause of failure. While some of our other original knives were hardened using the propane forge, they have not been thrown nearly as much as my old Darts and most of them are semi-retired, like me. Our newer thrower designs are based on fine tuning variables of the originals—weight, length, balance, tip angle, shape and bevel. All of these newer knives have been heat treated using the electric forge (kiln, oven, etc.).

Illustration:
Even though the two broken knives were tempered immediately after quenching, as always, over time and a great many really bad throws, they finally snapped at the knife-handle transition within a month of each other.



Refurbing my newer Darts (1)

Even though the powder coat looked just as scarred as the older knives, the new knives clean up with no visible signs of gouging or other abuse. While older Darts lost ~1/4" of length over time, the lengths of the newer refurbed Darts are approximately as the same as original lengths. I assume that the rounded tip shape and reduction in flat side hits is partially responsible . I'm sure that over time, we will lose some length due to chipping, but not yet!

It should be noted that the powder coat is extremely durable and only knife-on-knife action is responsible for all of the deterioration observed over time. I guess that if I didn't make them myself, I'd take better care of them, but where's the fun in that?

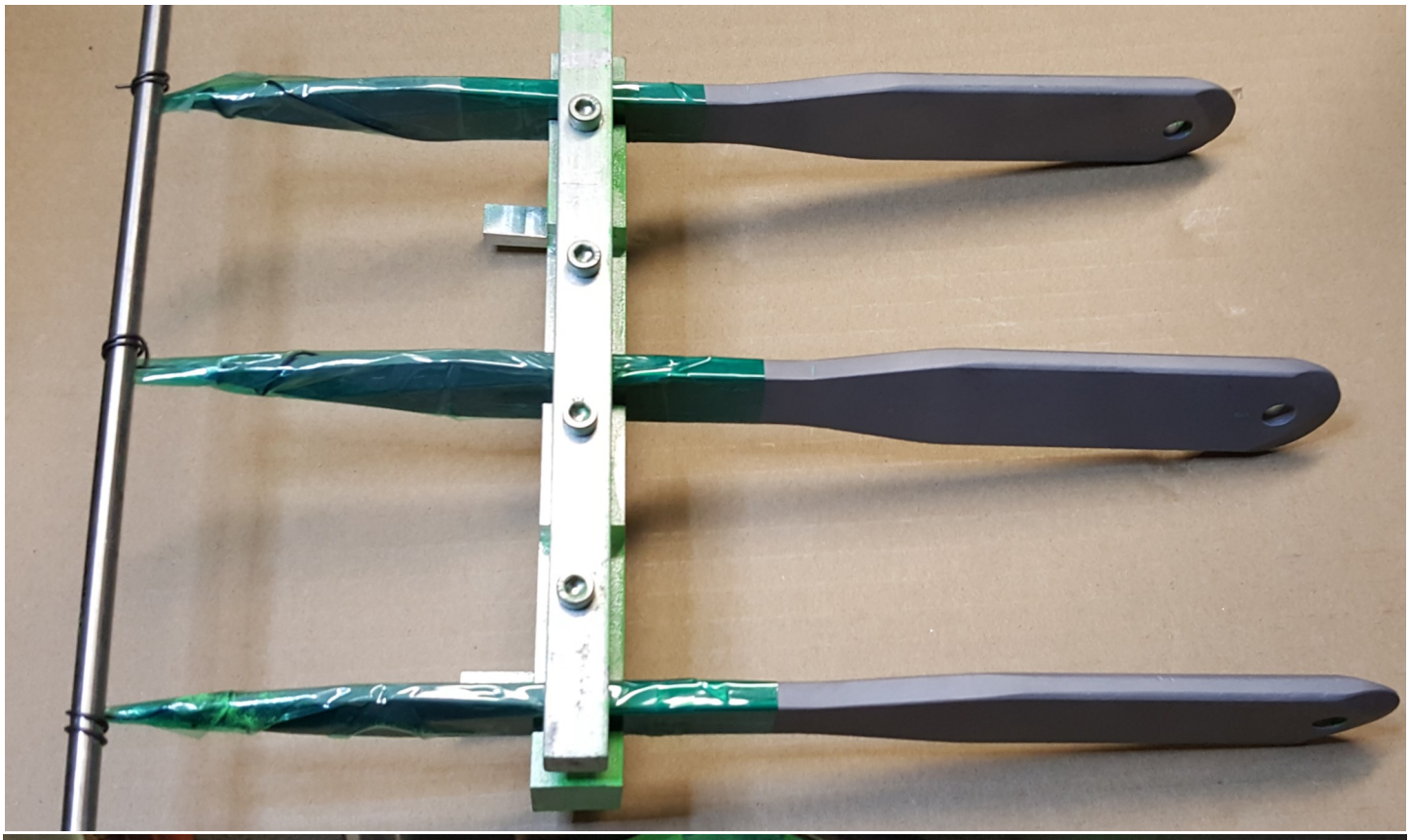
Illustration:

After using a 120 grit belt to clean off the powder coat for inspection, before sand blasting and powder coating, none of the knives show any signs of abuse. Believe me, I've been throwing them for about three months and there was abuse!

Refurbing my newer Darts (2)

Illustrations:

1. Darts are prepped and ready for powder coating.
2. Refurbed Darts after powder coat and baking in the oven.



Refurbing my newer Darts (3)

Illustration:
After blackening they look brand new. I look forward to providing more abuse and continuing the refurb process going forward. Since it took 15 to 20 thousand throws for the older knives to finally break, it may take some time to verify our assumptions regarding reasons for breakage. Meanwhile, we continue our destructive testing program.