

Rocky Forge News

Volume 8, issue 3 – March, 2009

Last Meeting

February 14th was St Valentine's Day so the group concentrated on making hearts from metal. We saw some creativity that Saturday; some very nice hearts were made. A young man who appeared to be about 14 years old, Zach C., spent the whole day forging hearts. He had a lot of help from members and took 5 finished hearts home. We always enjoy seeing the young aspiring smiths at work. Shane S. also made a nice piece for his wife. Dominick forge welded a bundle of 18 pieces of welding wire (maybe 3/32" diameter) at one end, then bent the loose ends around to form a 3 dimensional heart with one wire remaining to use as a hanger. Real nice piece that he may, with some encouragement, put on his website for all to see.

Our meeting was well attended (over 20) with several guests. One of the guests is a coppersmith that makes items for the rendezvoused and old Williamsburg. He spread out a display of his wares and it was impressive to say the least. Several of his pieces went home with some of the members.

We all had a good time even if Mother Nature did throw about an inch of snow our way the night before. Carol, as usual, served a good meal with the carry-in dishes brought by the members. Chicken and noodle Alfredo, fresh sliced ham, baked beans and many covered dishes made an after lunch nap more appealing than getting back to work.

Next Meeting

Dominick volunteered to host the next meeting March 14th. He is located in West Lafayette just off highway 52. Feel free to call or email for directions to his heated shop. Shane has agreed to do a demo in the morning with members to repeat Shane's work after lunch. Lunch will be at a local restaurant near Dominick's home.

Please put the April 18th IBA meeting on your calendars, Nathan Allen will demonstrate blacksmithing on the anvil compared to using a power hammer. (Just as a heads up Nathan, Clifton said he is going to try to be here.)

I wish to thank all you for your prayers, phone calls and cards after my recent heart attack. Our blacksmithing community is a very caring and sensitive group that Carol and I are proud to be a part of. I am currently doing very well and have been doing rehab and some work in the shop.

Ted Stout

Tom Clark Memorial Gate

BAM member Walt Hull is designing a gate to be built by several BAM members in memory of Tom Clark. The design will incorporate a tree to which we hope all of Tom's blacksmithing friends will contribute a leaf. The gate will be completed at the BAM Conference in Sedalia, MO on May 1-3, 2009, and will be placed in Thelma Clark's garden in Potosi, MO.

If you would like to make a leaf for the tree please make it to fit into either a 3 and ½ inch square or a rectangle 2 inches by 6 inches. The stem should be about 3 inches from it's end to the leaf and 5/16 round at the end to make attachment easy!

If you plan to attend the Conference please bring it with you. If you will not be at the conference please send your leaf, to arrive no later than April 25, to:

Kate Dinneen
1582 N 1500 Rd
Lawrence, KS 66046

Thank you.

Smoke and Noise

Articles from e-mail and the Internet

Compiled by David Childress

Forge Welding A36

From: Paul N
Date: Feb 11, 2009 1:07 PM
Subject: [TheForge] A36 vs 1018

OK, I've been reading that PDF that Frosty posted a couple weeks ago, and I'm about halfway through my first pass at it. (It will likely require more than 1 to understand it) (It was this one:

<http://www.feine-klingen.de/PDFs/verhoeven.pdf>
And many thanks for posting that. It's just the kind of description I had been looking for.

We should probably start "Frosty's Book Club" discussions, as I'm sure that there are things I think I understand, but that I've mis-interpreted. But that's a different story. I'm finding the "book" very enlightening, and not horribly difficult to read. (Although anything even approaching an hour at a time seems to stimulate the auto-nap response) I had taken a metallurgy class in college over 30 years ago, but studying to pass a class is totally different from studying to LEARN. So while I've been exposed to this stuff before, this time is different and enlightening.

OK, now for my real question:

I've occasionally been stymied while trying to forge weld with hot rolled A-36 steel, and since it occurred last night while I was demonstrating how to make a basket handle (using 6 pcs of 1/4" round A36) I thought maybe it's time to ask. I've made dozens of these, so it's not exactly a new process for me.

My problem last night was that the person that asked for the demo had a pretty hollow (coal) fire, but I thought that I'm finally getting pretty good at this, so why not go ahead with it as is. The first weld, with all the pieces kind of loose, went off without a hitch. Welded nicely on the step of the anvil. But when I went to the other side, which I've always found easier as it's more stable, it didn't take. That's not really a problem in itself. I've been here plenty of times.

What became an issue is, now even after correcting the fire, I can't get it to weld. After about 4 attempts, the ends are now hopelessly distorted and difficult to repair and I abandoned my demo in frustration. BTW, I was using straight 20-mule team borax as a flux.

So, what happens to the metal? Does it pick up contaminants? Did it de-carbonize (there was a little sparking, but not what I'd consider significant, and even if it did, wouldn't the lower carbon level make it easier to weld?)

In the past, when I've had a failure like this with A-36, usually end up cutting back the ends to get a

successful weld, so I'm expecting that there has been some metallurgical transformation here. So I'm wondering if anyone knows what that change might be.

Since I'm feeling a little more knowledgeable now, I've looked at the chemical compositions of 1018 and A-36, and aside from the slightly higher carbon content of A-36 (about 0.25% C vs 0.18% C) there isn't all that much difference, chemically. Perhaps it's the inherent grain size, and with a little annealing the A-36 would behave better?

(Using references from:

<http://www.benjaminsteel.com/Technical%20Data/A-36-properties.htm> and:

<http://www.geocities.com/haimanaua/htdocs/steels/1018.html>)

So, can anyone explain the differences in behavior in A-36 and 1018 when it comes to forge welding?

Thanks,

**pn

From: David Childress

Date: Feb 11, 2009 3:10 PM

Subject: Re: [TheForge] A36 vs 1018

In our group there is much debate about A-36. I know from job experience (engineer in a tool & die shop) something about A36. The fact is that A36 is made from scrap and is junk. Most of the specs are max without min. or min. without max., and there are many metals that are not mentioned at all that may or may not be present. Our forgemaster really dislikes A36, but when a found a distributor that was willing to sell 1018 to us at his cost the cost still freaked most of us out (about 185% of A36 cost).

I have been told that the lead and copper in A36 is what makes it hard to forge weld. These are allowed for ease of machining, but due to the processing of A36 they are not necessarily evenly distributed. So some places will forge weld and maybe 6" down the bar it will not weld at all.

I had a die maker tell me that once they got a piece of A36 that he could not drill a hole thru. Some other Die maker cut the piece up and found a piece of coil spring that had never melted at the end of the attempted hole. As another example my daughter

made her first knife (letter opener) out of A36. Being impatient as she always is (13 yrs old) when she got it shaped she threw it in the quench tank.

We could not sharpen it (Hrc 68).

A36 is just like that. It is good enough for most structural uses, but you can never tell what it will be like.

David Childress

From: Peter Fels & Phoebe Palmer
Date: Feb 13, 2009 12:48 AM
Subject: Re: [TheForge] A36 vs 1018

With A 36, I imagine we are back in the position of smiths of yore where each piece of material varies from the last in unknown ways.

From: Andrew Vida
Date: Feb 11, 2009 10:39 PM
Subject: Re: [TheForge] A36 vs 1018

I've had very little trouble welding A36, but one thing I discovered was that once you bugger up a weld with it, it is very difficult to get things back to a state where welding will happen for the piece in question. I have no idea why this would be so, but so it seems to be the case in my experience.

I agree with the opinion that advocates buying decent materials like 1018 in the first place. In the end it costs you less in both money and stomach lining.

From: Robert Ehrenberger
Subject: Re: [TheForge] A36 vs 1018

Around here unless you want to get tool steel you have two choices, hot rolled A36 or cold rolled A36. I ask for hot rolled because it is cheaper and I'm going to heat it up any way. About half the time they send cold rolled because that is all they have in stock.

As far as welding goes, I figure that I might as well figure out how to weld A36 because that is what I have to deal with. It's mostly in the temp, if the steel is clean and the right temp it will weld, even A36. 10 years ago I took a Bob Patrick welding class and it changed my life. I just take it for granted that most of my welds will be good. Before the class maybe half if I was lucky.

From: Chuck Robinson

Date: Feb 14, 2009 3:01 PM
Subject: Re: [TheForge] A36 vs 1018

When Bob Patrick worked as a restoration smith, he averaged about 120 forge welds per day. Practice makes perfect.

He also told me that the Borax corp. won't own up to it, but he finally found a chemist at Borax that told him they add an anticaking ingredient to 20 mule team Borax. It tends to inhibit the weld because it melts at a higher temperature than the borax and impedes the welding process.

Chuck

From: Paul N
Date: Feb 12, 2009 8:48 AM
Subject: Re: [TheForge] A36 vs 1018

Thanks to all that are participating. I was about to give up on forge welding with it "forever" until I found some words of encouragement :-)

I'd have to say that when I've had success forge welding A36, it's generally been on "the first attempt". I've made some really nice welds with it. Sometime so nicely, that I've been proud to hand over to someone, even someone who understands the craft and ask them if they can find the weld point.

And I'd also agree with "once you bugger it up, it seems impossible". And this is what confounds me. I don't really know if I bugged it up or if the reason the first weld missed was because there was a problem with the steel in the first place.

With different concoctions of alloys, I'm going to guess that it's probably pointless to attempt to determine if the problem is too much heat, too little heat, soaked too long/not long enough, etc., as the cause may vary from sample to sample. Any comments on what others may have noticed when their welds failed to take with A36?

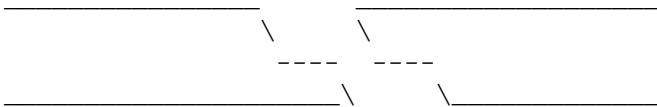
I've heard people mention that the metal can be "too hot", but if that's the case, unless some transformation takes place, I would expect it to become suitable for a weld as it cools through the proper temperature. This doesn't seem to happen. (So my assumption is that it either was never suitable, or it substantively changed.)

What I have learned it the importance of my scarfs. I need to keep a "horizontal flat" in the so the pieces don't slide off of each other. The A36 seems to tend toward being more "slippery". That is, rarely do I touch 2 pieces of A36 together at the anvil and have them immediately fuse. So having a flat allows a couple tacking hammer blows to get the pieces to join.

The "Bad example" would be something like:



Where the "good one" was more like: (The tapers wouldn't be as steep, but I hope I expressed the idea)



What I found so frustrating, and prompted my initial question is that the weld was a true "faggot weld" of a "bundle" of rods. No scarfing necessary. Just heat 'em up and tack them together. In fact, aside from the very first time I did this, I don't think I ever had such an epic failure welding a basket handle together.

Lots of good information being discussed,
thanks, pn

From: Allen Ortery
Date: Feb 16, 2009 8:08 PM
Subject: [TheForge] forge welding

It is kind of strange having people ask me questions; I am by no means a pro in my mind. But here goes what I think. First you really need to keep your fire in good shape, watch your temp when welding. Most of my trouble welding comes from having my head some where else. Trying to weld too hot or too cold, or sometimes trying to get that last weld for the day and the fire is just too dirty. I have used 20 mule team borax and am now using red iron oxide and boric acid 50/50. If you don't get the weld the first time take a moment to think about what you just did, maybe clean the fire, or make sure you do not have the metal too deep in

the fire. I have thrown the two pieces on the floor and then welded them the next day in a new clean fire, bring them back to heat clean well with a brush and reshape the scarfs and had them go right together. So most of welding is attitude and the other 10% is having your fire right. Seems to work when I help others who are having problems, tell them that the more they think they can do it and the less they fret over it and just do it the more likely the weld will happen. Mostly we all, myself included, worry the weld to death and by the time we get everything lined up "just right" it is to late and the weld will never happen. If the weld does not take the best thing to do is clean and reshape the scarfs as needed. That is the best advice I can give others may have more to add, but I often have first time people make a fire poker and so far none has failed to make the weld. The joy of people who don't have any ideas about welding, you just tell them it is easy, show them and they do it.

I spent 9 months in the shop at the JCCFS so saw many instructors, the welding class I took was with Charlie Orlando. Charlie only uses a gas forge welds in it all the time. He also does his scarfs differently. I thought there was a class listed but do not see it in the new catalog. Most any class, other than Jerry Darnell, would be more than happy to get you welding better, and Jerry would help you get it down better also. When I took his lighting class we did 10 or 12 welds in the week. I just would not take his class unless I already had a good bit of welding under me first.

Hope that helps, Allen Ortery

From: Mike Spencer
Date: Feb 16, 2009 12:48 AM
Subject: [TheForge] Borax (Was: A36 vs 1018)

I don't do a lot of forge welding but when I do, I use home-made anhydrous borax: Melt it in a ladle (PITA), pour out on a steel plate where it becomes a blackish/greenish, brittle, glassy sheet. Break it up with a hammer and run it through an old meat grinder.

Off the shelf borax is around 40% to 50% water by weight. All that foaming, twisting action when you put it into the fire drives me nuts. Two thirds of it falls off into the fire to become clinker. My melted

and ground-up stuff just sticks to the hot iron and flows like it's s'posed to.

FWIW, Mike

From: Allen Ortery
Date: Feb 16, 2009 10:50 AM
Subject: [TheForge] classes and welding

I have been going through the many mailings and maybe I am just lucky. I don't seem to have any trouble welding A36, not after that two day class on forge welding anyway. As for Jerry's class, I have taken his class three times, missed it last year, and have learned more and am trying to go back and redo everything from those classes. He is a great instructor and he will have 5 projects for the week.

Jerry has gotten a little bit more relaxed because he is getting more people who can't keep up the pace, but I would say that you will not regret taking his class.

If you can make it to the 27th Annual New Salem Hammer In on April 18 and 19 we will have a free class from the New England School of Metalwork up for auction on Saturday night at the dinner. Many thanks to them if they are looking on. For more information contact me at:

bluestoneforge@gmail.com

Allen Ortery

From: Paul N
Date: Feb 16, 2009 11:40 AM
Subject: Re: [TheForge] classes and welding

All these comments that people CAN weld A36 has me convinced to keep on trying to master it.

I'll revisit my flux formulation. This last failure was with straight 20 Mule Team. In the past I had tried a mix of 50/50 (By weight) of Red Iron Oxide and Boric Acid. I know fluxes have been discussed in detail here in the past, and I just dug out my "Practical Blacksmithing" and reviewed once again the examples of fluxes in there. Then after visiting the pottery websites, I found a little more detail about some of the materials, and will try some of those.

I think I'll get together some black iron oxide, which is listed as a larger partial size than the red I was using, along with some feldspar and copperas

and try a few different mixtures with anhydrous borax and boric acid. If I find the time to do it "scientifically" I'll post my results. But don't expect it too soon.

Allen, do you have any advice to pass on of particular things to watch for from your 2-day class (along with who taught it)?

And if you've had any experience with recovering from a failure, I'd appreciate that too. After all, I've learned that we all fail on occasion, and the real difference between "amateur and pro" is often how to recover from the mistakes, not just avoiding them.

thanks, pn

From: Andrew Vida
Date: Mon, Feb 16, 2009 at 9:21 AM
Subject: Re: [TheForge] Borax (Was: A36 vs 1018)

Chuck Robinson wrote:

Mike, I used to do the same thing and grind it up in a blender. I've also thought of welding a rectangular metal trough to the top of my horizontal gas forge and filling it with borax. The heat escaping from the forge shell should keep it in a semi molten state, drive off all the water of crystallization. and allow you to dip your billet into it for a thin coating.

I'm not sure how safe this procedure would be.

Potentially VERY dangerous. It is one thing to sprinkle borax on a work piece, whether hot or cold - quite another to dip a cold piece into molten material. If there is any water on it, the resulting steam explosion is nothing you will want to be within a mile of.

You may say "I'll only put in hot iron". Fine, if you never get tired or rushed or just absent-mindedly dip a cold, moist piece of steel into the pot. Do as you feel best for you, but be very careful. Even .experienced smiths make errors (remember Paw Paw and the zinc episode?). I'm sure I speak for everyone here when I say that nobody wants to read about how your face winged away on the fiery breath of the flux dragon. OK?

From: Bruce Freeman
Date: Feb 16, 2009 11:09 AM
Subject: Re: [TheForge] Borax (Was: A36 vs 1018)

Not only could it be dangerous, as Andy says, it's totally unnecessary. (Unlike molten metal + water explosions, a molten borax + water explosion MIGHT be less vociferous because the water may attach itself to the molten anhydrous borax without expanding to the gas phase. I wouldn't bet my eyesight on it, though. If any of you explosion lovers care to test this thesis, be my guest.)

I've tried a few times to thwart this tendency folks have of "using a bigger hammer" when it comes to drying borax.

It is not necessary to melt borax in order to dry it. In fact, commercially it is often melted during drying, but that is because of the fluffing that occurs at lower temperatures, which may not be desirable in the commercial product. Once melted, the product must be ground to pulverize it.

Instead, just use temperatures below the melting point. For full dehydration, a temperature of 300 C (~570 F) may be needed, but really we don't care about full dehydration. Partial dehydration can be achieved at temperatures hardly over the boiling point of water, namely 100 C (212 F). This is the common practice for drying materials in a chemistry lab - use of temperatures hardly higher than the BP of water. The higher the temperature, the faster drying may occur, but who's in a rush?

-Bruce

From: Chuck Robinson
Date: Feb 16, 2009 5:07 PM
Subject: Re: [TheForge] Borax (Was: A36 vs 1018)

Hey Bruce and Andy,

It's apparent to me that you folks are not knife smiths.

I routinely heat treat my knives in molten salt at around 1500 F. I did, one time, submerge a cold blade in the molten salt. If I hadn't been wearing protective gear the resulting explosion would have ruined my year. It was a lesson I won't forget.

The Borax on the other hand is never put on the blade till it reaches red heat. That is when scaling becomes a problem. By then all the moisture and other volatiles are long gone.

When forging Damascus billets, it really helps to be born with 4 hands. As you notch and fold the billet, wire brush the scale off the welding surfaces and try to place granular or powdered borax in the folded surfaces, it is a very time critical awkward procedure. Sometimes not all the surface to be welded gets completely covered, and you end up with an internal void that has to be re-welded.

That is the reason behind my idea, to simply dip the billet in the molten flux, and get instant full coverage.

I believe you would also use less borax that otherwise ends up as clinker.

I'm certainly not suggesting this as a general procedure for other smiths, and I said that in my initial email

Chuck

From: Lynn and Susan Lang
Date: Feb 25, 2009 8:25 PM
Subject: [TheForge] Forge Welding

Allen Ortery mentioned welding to hot or to cold, Yesterday I was not able to weld....late in the day. I had cleaned the fire, cleaned, and fluxed the scarf, all the things you are suppose to do. Still not a day to weld....

The next morning with a clean fire I was successful.

My observations were that the first sign of sticking is when the adhesion was the greatest, as the temperature rose the sticking was not as great. The previous welds were attempted just as sparks were emitted. The successful welding occurred just as the stickiness was noticed.

My question: Was it dumb luck or can you get the metal too hot to weld and is the lower sticking temperature the right situation for success?

Thank you,

Lynn

From: Mike Linn
Date: Feb 25, 2009 10:38 PM
Subject: Re: [TheForge] Forge Welding

I would suggest too much O2 later in the process...

When things are sticky in the fire is when you have a right neutral atmosphere.

Later the coke has burned off a bit and you are getting too much O2 ... not too hot...

It's a very fine line when welding in the fire.

Mike

From: Andrew Vida
Date: Feb 26, 2009 7:23 PM
Subject: Re: [TheForge] Forge Welding

If the metal is actively burning, usually the flux has also burned off and you have lots of oxides, which naturally do not like to weld. So yes, you can get your metal too hot.

The perfect welding temperature for, say, wrought iron, is that bright yellow, greasy- drippy-looking heat. When you have that, welds should come off quite nicely, all else equal. Carbon and alloy steels often weld at much lower heats. Just make sure the metal is clean, the fire is clean, the atmosphere is reducing, and you have good flux.

As a final little bit from your editor: Next time you are inattentive enough that you get sparklers in the fire, look at what was burning as soon as the fireworks subside. That is what you should see when a weld is ready to be made. You could even flux to give you a really accurate image.

If your flux is doing its job their can be no burning because the air is sealed out. Weld can be made without flux but then your fire control has to be near perfect. A flux should give you a larger range of temperature for successful welds. Get the look right and use good flux and the weld should hold.

Bending\curving steel plate

From: Mark Novak
Date: Feb 23, 2009 5:47 PM
Subject: [TheForge] Bending steel

I'm attempting to bend large, irregular strips of 1/8" mild steel into a shape suggesting a globe. Any thoughts on method and tools to do this bending/curving?

From: Bob Ehrenberger
Date: Feb 24, 2009 9:31 AM
Subject: Re: [TheForge] Bending steel

Mark,

I make 18" bowls out of 16ga steel. Which is about half what you are looking to do. The first one took over 5 hours and about killed me, but now I can do one in under an hour.

My method is a bit crude but effective. I use a truck tire rim as a sinking form. I get the steel hot in the forge lay it over the rim and wale at it with a sledge hammer until it starts to develop wrinkles. I then take it to the swage block and hammer out the wrinkles with a rounding hammer. I get it hot and repeat until it gets deep enough to where the handle on the sledge hits the rim of the bowl, at that point I switch to a heavy sinking hammer that will reach into the deep bowl. The deeper the bowl gets the less it tends to wrinkle.

For something as big as you want, you may need to make a sinking hammer out of one of those spike driving hammers you see at flea markets every now and then. It would have the weight and the reach needed for a big bowl/sphere.

PS: My portable forge is made from the end of a large LP tank which is a 2' diameter sphere. It would make a nice form if you can find one.

From: Peter Fels & Phoebe Palmer
Date: Feb 24, 2009 12:37 PM
Subject: Re: [TheForge] Bending steel

Just for color, let me throw in old Dr Tinkerpaw's (RIP) method.

First anneal the metal and remove sharp edges. Then dig a hole in leather hard clay soil of a slightly smaller diameter and greater depth than required. Place metal over hole. Next load up your truck and drive back and forth over the piece annealing as necessary. pf

Announcements

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