intro: Fuse

This instructable describes how to build a simple fuser to quickly and efficiently make hundreds of feet of pyrotechnic fuse. It requires very basic materials and construction skills, and the entire process only takes a matter of hours to get hundreds of feet of fuse. I would like to give credit to both united nuclear and pyro universe, because this design improves on and modifies both of their ideas and techniques. This project will have much use in my other projects requiring fuse, and as every pyrotechnic knows you can never have enough fuse.

This fuse burns at appx. 1 in. / sec

step 1: Parts list

The parts for this project should be relatively cheap because most of the items can probably be found around your house. The black powder (gunpowder) is the only thing you might have a problem getting your hands on, but it shouldn't be too hard if you know where to look.

Parts:

1. Old tupperware container (medium sized)
2. Black powder (Can either be bought at gun stores, with proper id, or made in my tutorial [http://www.instructables.com/id/EEXOON4E1HEPA8KQNM/]
3. 1/4" Wooden dowel at least 2 feet in length
4. Dextrin, A powdered pyrotechnic glue (Can either be bought on e-bay, or made, I've never made it but the good folks at pyro universe say "To make dextrin, spread an entire box of corn starch out on a cookie sheet and cook it in the oven at 400° for about 2 hours, stirring it every 20 minutes or so with a spatula to keep it from burning. When it's done, it will be light yellow/gold in color.")
5. Scale
6. Rubbing Alcohol
7. Devcon weld it all purpose glue
8. 1/4" and assorted smaller drill bits and a drill
9. Old clothes (or some type of overcoat), latex gloves, and eye protection (Optional) (This project is messy)
10. (2) Spools of cotton twine, make sure it has nothing else in it wax, etc. (to do this take a sample 3 in. piece of it and burn it, if it contains wax or something else it will drip, if it doesn't drip when burned it is good)
11. Old scrap wood, a 3 foot long 2x4 would be good enough
12. Saw
13. Hammer and nails

http://www.instructables.com/id/Fuse/
step 2: Building the fuser

This project uses the fuser to hold the 2 spools, coat the strings with black powder, and combine them to form a fuse. The steps do not need to be followed exactly, as long as you end up with something that looks like what is in the picture, and its sturdy, it will work.

Steps:

1. Take the scrap wood and cut it so you have a one piece about a foot in length, and another about 7” in length.
2. Hammer the 7 in piece perpendicularly on top of the foot long piece with 3 nails. (Refer to the photos because they will probably help more then my worded instructions)
3. Drill (2) 1/4” holes through the 7” piece of wood a few inches from the center. However, do not drill all the way through the wood, drill 3/4ths of the way down, the dowels will be sturdier this way.
4. Cut the dowel into three segments, 2 of those segments will be the same length and should be at least 4 inches long (to hold the cotton spools) The third segment will be inserted in the tupperware container (To hold the cotton string under the gunpowder)
5. Drip some weldit glue (wood glue could be used instead here) into each of the 2 holes and on the bases of the 2 equally lengthed dowel segments, then push each segment into their holes (if you cant push them in all the way try using a rubber mallet to gently hammer them farther in)
6. Use the 1/4” drill bit to drill 2 holes in the tupperware container. These holes should be no more then a two centimeters from the bottom and on exact opposite sides of the container. A method I used was I drilled a hole on one side, then pushed the 3rd segment of dowel into the container. I then marked off the other side where the dowel hit, and then drilled through there. Push the dowel through the second hole and seal off around both holes with the all purpose glue (Both of the holes need to be waterproof)
7. Take this container and line it up on the foot long piece of wood so that the dowel running through it is parallel to the 7 in. piece. Take a magic marker and dot off two holes near the top of the container (this is where the cotton string from each separate spool will enter), and mark one hole on the exact opposite of the container (this is where the fuse will exit).
8. Find a drill bit about the size of a piece of string and use it to drill through the 2 marker dots on the side where the cotton string will enter. Take a drill bit the next size up from the one you just used, and drill one hole on the other side of the container where you marked off. The hole where the fuse will exit is the important one, if it is too big then it will not clean and even off the fuse, and if it is too small it will not be big enough to fit 2 strings through it.
9. Using the weldit glue fix the tupperware container at the end of the 2x4, so the two holes face the side where the cotton spools will go. Wait for it to dry and you are finished.

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**step 3: Preparing the fuser and the place to hang the fuse**

I strongly advise you to do this outdoors on a nice sunny day. However, it was very damp and rainy the day I took these photos so I set up the rig in my basement, and it would be hypocritical for me to tell people not to do this. So instead I will give a WARNING, IF YOU MUST DO THIS INDOORS MAKE SURE THERE IS NO SOURCE OF IGNITION ANYWHERE NEAR THE DRYING FUSE, also its very messy so be prepared for to clean up if you do it indoors.

With that being said its time for preparation.

If you do this outdoors the only thing you will need is somewhere to hang the string. the best method uses a clothes line and clothes pins to hold the string on it, however you can also wrap it around fence posts or even trees ( just remember that it will leave marks so if you have a nice white fence I wouldent advise wrapping fuse around it)

If you do this indoors you will need 2 or more surfaces to "web" the fuse back and fourth between. I used a tv tray holder and one of the support posts to the main house crossbeam in my basement. I covered the surfaces that would come in contact with the fuse in the brown paper used to wrap school books, you could use bags, old newspapers, etc. I then taped them with electrical tape to hold the paper on. Cover the area underneath where the fuse will hang with newspapers or paper towels because it will drip.

To set up the fuser put the 2 spools of cotton string on the 2 dowels, feed the strings through each of their holes, underneath the horozintal dowel in the tupperware, and out the exit hole. Once the strings are out of the tupperware container tie them together with a small knot. You are now ready to mix the chemicals.
**step 4: Mixing the black powder paste**

You can do this in either a separate container and pour it in, or just do this in the container with the string. I prefer a separate container because it is easier to stir and get to a smoother consistency, which results in a higher quality fuse.

For each batch I make I use about 90 grams of black powder and 9 grams of dextrin. You can increase or decrease this amount as needed, just remember for every 10 grams of black powder use 1 gram of dextrin.

To make the liquid solution mix 1 tablespoon rubbing alcohol and 3 tablespoons warm water in a separate cup. Mix the contents of the cup and then slowly pour it into the container with the black powder and dextrin. You will probably not use all of the liquid in the cup, so pour slowly and stop every few seconds to stir the mixture. Once the consistency is similar to white glue stop adding the water/alcohol mix. Before you pour this mixture into the rig, take the string coming out of the front of the container and tie it to one of the supports you choose to "web" the fuse from.

If you haven't already put on your latex gloves and dirty clothes. Pour the mixture into the tupperware with the string and go to the next step.

**step 5: "Webbing" the fuse**

So now you should have the string tied off to one of the posts, have the tupperware container filled with a black goo, and be ready to start making fuse.

**Steps:**

1. Walk slowly (with the fuser in your hands) from the post where you tied off the string (As you can see in the picture I put a tool box on the feet of the tv tray holder so it doesn't tip over), to the other post, making sure that all the string is completely coated with the black sludge. Also make sure that the two strings are sticking together when they exit the tupperware, if not run your fingers over them trying to press them together again. If they still do not stick then you probably did not add enough dextrin to your mix and you should stir some more into it.

2. Wrap the fuse around the post, as shown in the pictures, and walk back to the other post. If the fuse starts to fall from the post use some tape to hold it up.

Repeat those steps until you either run out of either string, black powder paste, or room to hang more fuse.

When you are finished cut the string from where it is attaches to the spools and pull the remaining string through the fuser. Take the end of the fuse and tie a knot it, and then tie it to one of your posts.

As you can see in the picture use a piece of paper towel to separate 2 sections of fuse if they are touching otherwise when they dry they will be stuck together. Give it 24 hours to dry, longer if it is humid.

http://www.instructables.com/id/Fuse/
step 6: Cutting and storing the fuse, and clean up

Once the fuse is dried you should probably cut it, cutting it into 8 in. segments makes it easy to store and convenient to use. You can either cut it while it is still hanging, or take it down and cut it, whichever is easier. Not all of the fuse is going to be perfect so you will have to inspect it as you go along making sure to cut out any parts that aren't coated enough, or where the strings didn't stay stuck together.

Once you have the 8 inch segments you can store them in a plastic ziplock bag for future use. Make sure the bag is airtight though so the fuse doesn't absorb any moisture from the air.

Cleanup:
When you are done making your fuse you should be left with a bunch of paper with black dots of gunpowder on it. The safest way to dispose of this is probably by crumpling everything up into a big ball and stuffing it in a plastic food shopping bag, taking it outside, soaking it with your hose, and then throwing it in the garbage. (Or if you have a fireplace I suppose you could burn stuff a little at a time)

As you can see in the photo those paper towels sacrificed themselves for the greater good of protecting my town map rug... I don't know what I would do without that rug.
Image Notes
1. Sometimes in the middle of the night I wake up in a cold sweat, wondering if my rug is ok.

Image Notes
1. Told you it would be messy.

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