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Volume 3, Issue 4

Build This...

8" Brocade Crysanthemum

Slow Gold formula shown here.

Summary:
An 8" ball shell is really no more work to build than a 6" ball shell, as they both take about the same amount of time to paste in. The break charge can be a cheap and easy to produce coating of black powder over cotton seeds. So roll up your sleeves and make that crowd pleaser you have been thinking about!

This article shows the assembly of an 8" single petal ball shell and the trick to coating cotton seeds with meal powder.

Prerequisite: 6" Ball Shell

Formulas: Blonde Streamer or Lancaster Yellow Glitter or Slow Gold or Fe/Ti Gold

Materials:

- (2) 7" I.D. hemispheres
- (38) 2" wide x 36" long 70lb virgin kraft strips
- (1) 1/4" Chinese time fuse, 2" between centers
- (1) 3/8" I.D. x 3.5" long thin wall pipe
- (3) 12" square sheets of tissue paper
- (1) plastic sandwich bag
- 3 cups wheat paste
- 120g 2FA lift charge
- 4.5 foot long quickmatch leader

Tools:

- hot glue gun
- cross match punch
- Plastic bucket

April, 2003 Issue

Where's the May Issue?

Build This:
8" Brocade Crysanthemum

Gallery:
Lily Fireworks Factory, Malta

Technique:
Casting Ball Mill Media

Tool Tip:
Making Ball Mill Jars

Autopsy:
4" Falling Leaves Shell

Unmeasured Materials:
cotton seeds, meal powder, 3/4" stars, cross match, 2" wide masking tape, foil tape, string

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8" Brocade Crysanthemum Shell

Figure 1: Cotton seeds in a mixing bucket.

Figure 2: Cotton seeds dampened with water, but not soaked.

Figure 3: Adding meal powder to the damp seeds.

Introduction:
As spherical shells increase in size, the internal volume to be filled with burst charge increases by a power of three. However, the amount of powder required to break these larger shells does not increase by a factor of three, thus a way is needed to reduce the amount of actual burst charge while still filling a large volume. This is commonly done by the use of "filler," which is any material that is coated with the burst charge in order to increase its volume without increasing the actual amount of burst charge.

The larger a shell gets, the larger the filler needs to be. While rice hulls work for smaller shells, something with more volume is desireable for bigger shells. This can be seeds, pieces of cork, beans, popped pop corn or any similar sized light weight material that powder can be made to stick to.

For this single petal 8" shell, either cotton seeds or puffed rice cereal are coated with ball milled meal powder to make the burst charge.

Cotton Seed Break Charge:
Cotton seeds make an ideal choice for burst charge filler for larger shells. They are a good size, cheap, light weight and they have a fuzzy coating that easily picks up the meal powder. The only drawback is they are not exactly easy to come by. There are no suppliers that sell them in hobbyist quantities that I know of, which means you have to be resourceful in finding them. This means you have to get on the internet and search for farming companies that sell cotton seeds, then convince one of them to sell or give you a "sample."

While cotton seeds sell at a very low price per pound, the companies that sell them have minimum container sizes that are prohibitively large for the hobbyist. Even a small scale supplier wishing to resell cotton seeds would have a difficult time storing a 40 foot trailer full of cotton seeds, which is a typical minimum order size.

Obtaining a sample from a supplier may get you 100 pounds of cotton seeds at no cost at all. Cotton seeds can actually go bad in storage by sprouting, which is caused when the seeds have too much moisture. It is important to find out how long the seeds have been stored before getting any large quantity. If your supplier has had them around for a year or more, then you don't have to worry about sprouting. Otherwise you will have to dry your seeds in an oven to remove any moisture.

Coating Cotton Seeds:
There are a few methods I have heard of for coating cotton seeds. One method involves making a meal slurry and then pouring it onto the cotton seeds and stirring it around. Some builders report that this method can result in a big glob of entangled seeds if you are not careful. A similar method with similar complaints involves adding the dry cotton seeds into a tub of meal

Figure 4: Mixing in the meal by hand.

Figure 5: Finished cotton seeds are completely coated with meal.

slurry.

Because the cotton hairs on the seeds tend to get matted down and entangled with each other, the ideal process allows the seeds to be coated while also keeping them separated. This is better achieved by first wetting the cotton seeds and then introducing dry powder to them and stirring them around.

Figure 1 shows a large plastic bucket filled with dry cotton seeds to be coated. Start by spraying the seeds with water containing 14% alcohol, stirring them as you spray. You don't want to soak the seeds in a bucket of water because then they will be overly soaked and stick together. By spraying them you will be able to control the amount of starting dampness, which will be the point when the cotton is saturated and the seeds just start sticking to the bucket walls and your hands (see Figure 2).

Once the seeds are dampened, introduce the dry meal powder containing 5% dextrin as shown in Figure 3. Incorporate the powder by stirring with your hands, then keep adding more until the seeds stop picking up the dry powder.

The powder is not added onto the seeds in any particular ratio as it is for other burst charge types. It is added until the seeds are completely covered so that no white spots are visible, as shown in Figure 5. If the seeds stop picking up powder before they are fully coated, it may be necessary to spray them again before adding more powder.

Another method for coating the seeds is to use a star roller to keep from having to stir them by hand. The seeds are tumbled in the roller and alternately hit with water spray and powder.

Once the seeds are coated, lay them out to dry on sheets of newspaper or screens.

More...

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8" Crown Crysanthemum Shell

Figure 6: Tissue liner positioned over loaded stars.

Figure 7: Cotton seed burst loaded in place.

Figure 8: Sheet of tissue used to prevent spills when one shell half is inverted onto the other.

Building the Shell:

A chrysanthemum style break is defined by long streamer stars that branch out from the center, as opposed to single colored points of light that define a peony style break. A brocade chrysanthemum further defines the effect to be gold streamer stars. Any of the four formulas on the title page will produce an effect that fits this description.

While 8" shells are no more difficult or time consuming to build than a 6" shell, they do consume considerably more star composition. The stars for this shell should be rolled up to at least 3/4" diameter. If you wanted a "crown" chrysanthemum style break, you would need to roll the stars even larger in order to get the defining drooping effect caused by long burning stars. When rolling larger stars like this, it is best to dry them at intervals of 1/4", 3/8", 1/2" and finally 3/4". Rolling them up to a full 3/4" from the start would result in excessively long drying times. Rolling too much composition onto a star in one sitting can also cause the stars to break during the rolling process. This results in chunks of damp star comp breaking away from the dry core underneath, causing flat spots on the star and leaving irregular chunks of material rolling around with the other stars.

As for mixing the four compositions given here, I have found that simply screening them together gives the best streamer effect and gives a star that rolls easier and dries faster. Ball milling the nitrate, charcoal and sulfur components together before adding the remaining ingredients tends to speed up the burn rate, shortens the tail length, causes spiking when rolling the stars and increases drying times considerably. However, ball milling does achieve a finer grained tail with an almost soft, fuzzy appearance if that is the effect you want. Sometimes I will ball mill with only half the charcoal added, then add the other half after milling to try and achieve both effects.

The hemispheres used here are the vacu-form type, which can be made as described here. Figure 9 shows how round these home-made hemispheres can be produced. A 12 gallon tub of mulch will produce about three or four sets of these. Any type of hemisphere can be used however, since it is the paste layer that provides the actual containment.

The time fuse is cut to give a four second delay between cross match holes. This should be a distance of about 2" between the holes. The time fuse is cross-matched on the inside end and inserted into a hole in one hemi, such that about one inch of fuse protrudes on the outside of the shell. Hot glue is used to seal around the base both inside and outside the shell to help prevent lift gases from leaking in. A 3.5" long pipette is placed over the time fuse and cross match on the inside and pushed into the hot glue around the base while before it solidifies. I prefer to stuff this tube with scraps of black match to help insure a good blast of fire out the pipette when the time fuse burns through.

Figure 9: Halves brought together by tapping with a stick, then held with tape.

Figure 10: Alternating long and short paste strips.

Figure 11: 120g lift bag positioned over cross-matched time fuse.

Figure 12: Foil tape used to secure and protect the lift charge.

The hemispheres are now placed on some round collars to hold them while being loaded. Line the walls with your stars until almost at the top, then place a piece of tissue over them to act as the liner between the burst charge and the stars (see Figure 6). This liner helps prevent stars from shifting into the burst charge during loading and handling.

The meal coated cotton seed is now used to fill the tissue liner until it is level with the top of the shell. The remaining round stars are now pushed in around the edge of the shell until the stars are flush with the edge of the shell. There will always be some stars a little over and some a little under, but they will settle when the shell is closed. Figure 7 shows what both halves should look like prior to closing.

This shell is still small enough to get away with using a sheet of tissue to hold the contents from falling out when inverting one half of the shell over onto the other half, as seen in Figure 8. The shell halves are settled together by rapping the outside with a dowel rod while pushing down from above. The excess tissue is torn away and the seam is held closed using masking tape. If you are using vacu-form hemispheres, then the entire shell must be covered in masking tape to protect the sponge-like nature of the paper mulch from getting soggy and caving in during pasting.

This shell is pasted in using 2" wide strips of 70lb virgin kraft. This is not a good place to skimp by using grocery bag paper. High strength paper is the key to good ball shells, and also reduces the number of paste layers required. Only six or seven layers are needed to paste in this shell, with each layer consuming about five to six 36" long strips of 2" wide paper.

I prefer the pasting procedure shown here, which works just as well for one shell being pasted by one person as it does for the many shells shown in the article. Prepare three stacks of 5 or 6 strips as shown, then apply three layers to the shell. Let the shell completely dry, then come back and do three or four more layers. Pasting all the layers at once will result in a shell that takes forever to dry and is quite mushy after pasting.

After completing the last paste layer, use three layers of pasted strip scraps to hold down a doubled up loop of cotton twine on top of the shell, which you will need when lowering this shell into the mortar. Do not try and load this shell into the gun using the shell leader to lower it down the pipe!

Figures 11 and 12 shows a simple way to lift and leader the shell. A plastic sandwich bag is filled with 120g of 2FA, then the lift bag is tapped closed around the end of a 4ft long leader. Taping the leader into the bag is preferred over tying it in, since tying tends to pinch off the gap around the black match and can cause a hang fire.

The lift bag is simply placed over the cross matched time fuse and held down with four pieces of foil tape. I prefer to use foil tape for the fire protection it provides, especially when building shells that will be hand fired from hot guns that may have smoldering pieces of paper in the bottom of them. 🔥