PROTOCOL FOR SMALL-LOT TRADITIONAL METHOD SPARKLING WINEMAKING

1. GRAPES
   Start with clean grapes free of mold and bacterial infection.
   The potential alcohol should be 10.5-11.5% with high acid (pH between 3.0-3.2) for lively character, minimized need for bentonite, and inhibition of MLF (if desired).

2. BASE WINE
   Press grapes very gently to avoid extraction of harsh or unwanted compounds that will be magnified by the bubbles.
   Before starting the press fractions below, dispose of the first 13 gallons of juice per ton. This "washes" the grapes and removes dirt, dust, etc.
   Traditionally, the pressing is divided into *vin de cuvee* (free run, 120 gallons/T), *vin de taille* (subsequent cuts at low pressure, 26 G/T for first cut and 14 G/T for second cut), and *vin de presse* (extraction at high pressure, usually disposed of). Higher pressure extracts more phenolics and color. Fractions will vary depending on region and variety.
   Settle for 12 hours. Enzymes might be necessary to speed settling.
   Keep turbidity at approximately 2% (unless grapes have mold) to aid fermentation.
   Add SO_2 only after pressing to avoid extracting unwanted phenolic compounds from grapes.
   Make sure yeast has sufficient nutrients (YAN ≥150 ppm) and avoid any stress on the yeast which might cause off-sulfur compounds or VA.
   The finished base wine:
      Free SO_2 needs to be <15 ppm; the YAN needs to be ≥100 ppm (use Phosphates Titres, which adds both DAP and thiamin).
      The pH should be between 3.0-3.2.
      The wine should be stabilized and clarified quickly. Isinglass or a gentle bentonite counterfined with gelatin may be used for clarity.
      Overuse of bentonite can hurt the integrity of the bubbles by removing too many proteins.
      Tartaric stability is vital or the crystals will cause the wine to foam and go flat.
      Sterile filter the base wine, especially if using alginate-encapsulated yeast beads.
      Use a membrane filter, not cellulose, since any cellulose fibers in the wine could cause gushing.
      [MLF should be considered if sterile filtration is not possible to reduce the possibility of bacterial infection or MLF in the bottle.]

3. PREPARATION OF YEAST FOR SECOND FERMENTATION
   If using yeast encapsulated in alginate beads, skip to #4. Also, see "ProElif User's Guide." The beads consist of double layers of alginate encapsulating live yeast cells. The wine/sugar solution can pass through them, but the yeast cannot escape. They are preconditioned to the wine, so preparation of a yeast culture and riddling are both unnecessary. The base wine must be sterile filtered in this case.

Below is the protocol for building a yeast culture from **L. Mawby Winery**, Leelenau Peninsula, MI, which has been successfully producing traditional method sparkling wine for more than 30 years. This is for a 500 gallon batch of wine, but the protocol may be easily altered to accommodate smaller lots:

A. Dissolve 10 lbs. of sugar in a 15-gallon mix of ½ base wine and ½ water.
B. Rehydrate 200 grams of a strong yeast (e.g., DV10 or EC1118) according to manufacturer's instructions.
C. Add rehydrated yeast to the sugar/wine solution. Make sure the temperature difference is less than 10°C.
D. After 2 days, double the volume with an addition of 15 gallons of wine and 10 lbs. of sugar and wait 2 more days.
E. On day 5, add the yeast/sugar solution to the remaining 477.5 gallons of base wine prior to bottling and mix thoroughly. Make sure the specific gravity of the inoculum is roughly equal to the specific gravity of the base wine (see #4).

There are other techniques for building a yeast culture, but no matter which method is used, the wine going into the bottles should have a viable cell count of 1-2 million cells/ml.

4. BASE WINE/SUGAR PREPARATION

Dissolve 24 grams sugar/liter (2.4%) in the base wine (if the wine is dry; if not dry, adjust sugar addition down accordingly) prior to yeast addition.

[If using alginate beads, skip to #5]

Add yeast suspension to the base wine, making sure that the temperature difference is no greater than 10°C.

Adjuvants (riddling aids, such as Phosphates Mazure, Clarifiant S or BK) may be added to help the yeasts stick together and facilitate their removal after the second fermentation.

L. Mawby will also add 200 ppm Fermaid O at this point (instead of Phosphates Titres). Fermaid O cannot be used if using alginate beads.

5. BOTTLING

If using alginate beads, add 1.2-1.5 grams of beads/bottle prior to filling.

Fill the bottles to 2-2 ¼ inches from the top (no higher). If using loose yeast, keep the wine in the tank agitated to keep the yeast in suspension.

A small plastic cup called a "bidule" may be inserted in the bottle prior to capping. This helps prevent the yeast sticking in the neck during disgorging.

Cap with a heavy-duty crown capper. Size the caps to the bottles. American bottles may take a 26mm cap, while French bottles take a 29mm cap.

6. SECOND FERMENTATION

This will take 5-6 weeks at a temperature ≥12°C.

Keep the bottles on their sides to get better yeast exposure.

7. RIDDLING

If using alginate beads, skip to #8.

If using loose yeast, this is necessary to move the yeast cells into the neck of the bottle prior to removal.

The bottles are agitated vigorously to break the yeast away from the side of the bottle.
The bottles fit horizontally into an A-frame rack.
Once the yeast settles, the bottles are turned a fraction of a turn each day while being slowly moved into the upside-down position until the yeast sediment has spiraled into the bottle neck.
By hand, this usually takes 2-3 weeks.

8. DISGORGING

The bottles are set to rest for at least 8 days prior to disgorging, and they are well-chilled to minimize loss of pressure and wine.
The necks of the bottles are submerged in a freezing solution deep enough and cold enough to freeze the sediment into a solid plug.
Each bottle is rinsed off and placed at a 45° angle with the air bubble behind the frozen plug of sediment.
The crown cap is pried off and the pressure blows out the bidule and frozen sediment.
In disgorging without freezing, the cap is pried off while the bottle is upside-down but starting to move upright. As soon as the sediment is blown out, the thumb covers the mouth of the bottle to prevent further wine loss.
WARNING: The wine at this point contains approximately 6 atmospheres of pressure, enough to blow a cork out at over 60 mph. When disgorging, aim the bottle away from individuals and use protective eyewear.

9. DOSAGE

The dosage is a sugar solution (liqueur) mixed with SO_2. It adjusts the final sugar to balance the acidity and is where the final SO_2 addition is made. It can also be used to alter the flavor (e.g., using wood-aged wine or cognac as the dosage base).
In traditional champagne making, Brut is dry with a dosage resulting in 0.5-1.5% sugar. The progressively sweeter levels are Extra-Dry, Dry, Demi-Sec and Doux (5% sugar or higher).
Make a sugar syrup by dissolving 650-750 g/liter sugar in hot water. Once it has cooled, slowly add SO_2 (either as solution or KMBS) until the desired concentration is reached.
SO_2 concentration is variable, depending on the pH, existing SO_2 level, and sugar concentration of the dosage. .
According to P.Y. Bournerias of the IOC, the SO_2 addition must not exceed 30 ppm.
Example:

A finished sugar level of 10 g/liter (1%) is determined to be best, and the dosage liqueur is 700 g/liter (70% solution). A 10 g/liter sugar addition would be 7.5 g/750 ml bottle. 7.5 grams is 1.07% of 700 grams. Therefore, the dosage needs to be 1.07% of 1 liter, or 10.7 ml. If the calculations show that a 20 mg/liter (20 ppm) addition of SO_2 is necessary, that is the same as 15 mg/750 ml bottle. The 10.7 ml dosage addition needs to contain 15 mg of SO_2. That translates into an SO_2 concentration in the dosage liqueur of 1400 ppm. The SO_2, no matter what form, needs to be added slowly to the dosage liqueur.

Formula for sugar addition:

$$\frac{\text{Desired sugar (grams/liter)} \times 750}{\text{Dosage concentration (g/liter)}} = \text{ml of dosage/bottle}$$

Formula for SO_2 addition:

$$\frac{\text{Desired } SO_2 \text{ addition (mg/liter)} \times 750}{\text{Dosage addition (ml/bottle)}} = SO_2 \text{ concentration of liqueur}$$

In France, small producers often use concentrated grape must with SO_2 for the dosage.

10. TOPPING

Following the dosage, the bottles should be topped to the same level using the same wine that was just disgorged.

11. CORKING

Champagne corks are considerably larger than still wine corks. Stronger jaws are needed to compress them. Unlike still wine corks, they are only driven in halfway and secured with a wire hood. Some semi-automatic corkers can be converted to handle champagne corks.

Simpler alternatives are crown caps or plastic stoppers, the latter limited in the time that they can hold the bubbles intact.

12. AGEING

The bottles should be given at least three months age prior to opening for the dosage to fully integrate in the wine.