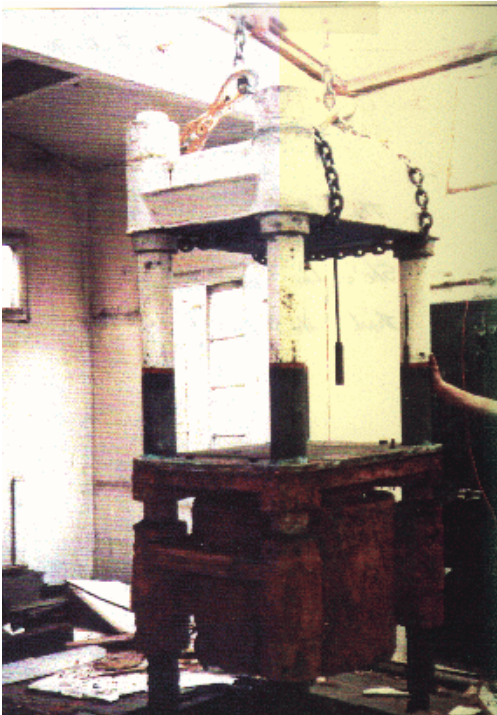


Pressing powder.

Following the wheel-milling of the powder it must be pressed in some type of a powder press. Black powder, directly from the wheel mill, has some limited use as meal powder in fireworks applications but must be pressed for other applications.

In the powder press, the powder is being compacted. There are presently three different types of presses in use to press black powder.



This is a vertical powder press being removed from an idled black powder plant in Australia.

In the pressing of a black powder the mass of powder from the wheel mill is laid up on metal plates in thin layers. The press is then slowly closed. In the case of this powder press the amount of compacting of the powder was determined by the percentage loss in original volume. The loss in volume being about 40% of the original volume. This 40% volume reduction may be judged by the two different colors seen on the four upright posts that support the top of the press. The dark portions show the length of the stroke of the press which is about 40% of the total length of the exposed portions of the posts.

Some of these vertical powder presses used a bell to tell the operator when the right amount of compacting had been achieved.

Figure 39. Vertical powder press.

Some sources on black powder manufacturing will give powder press hydraulic line pressures as a guide in this powder pressing operation. This would of course vary from one press to another. Using the percentage of compacting of the mass is a more accurate method of judging if the powder has been pressed to a desired density.

The maximum possible percentage of compacting would be about 50% of the original volume which yields what is known as a “dead pressed” powder.



Figure 40. Press and press room.

This is a photo of the vertical powder press in the press room at the S/A Pernambuco Powder Factory in Brazil.

In this press room the powder from the wheel mill is laid up on plates that are then stacked in the press. Once the pressing is completed the press is opened and the stack removed. The slabs of pressed powder are then removed and allowed to “cure”. Once the slabs are cured they are manually broken up into pieces and bagged for transport to the corning mill.



Figure 41. Horizontal powder press.

This is a horizontal powder press that has been restored and on display at Hagley Museum And Library near Wilmington, DE.

This press design is such that it is very cost effective in terms of pounds per man hour. Originally designed by Du Pont during the latter half of the 19th century.

In this type of press the plates are held in a vertical position rather than horizontally as in vertical type powder press.

A third type of powder press is a roller press. The only one of these type presently in operation is in a black powder plant in Switzerland. The press using a large round drum that uses two hydraulic cylinders to force the drum down onto a “web” of mill cake moving slowly under the drum on a wide belt. The roller press is an adaptation of machines that have been used to laminate veneers of wood, printed paper or plastic films onto flake board. The action of the roller press might be likened to a very old method of placing the wheel cake on a marble slab and pressing it using a rolling pin as if it were pastry dough.

When the black powder leaves the powder press it is compacted but not truly consolidated. That is to say that it lacks the required degree of mechanical strength needed to keep it from crumbling when handled roughly.

When the slabs of black powder are removed from the press they are usually leaned up against a wall of the press house to “cure”. This curing process is actually an exposure to air where some of the moisture present during the pressing operation will evaporate from the surfaces of the slabs.

The powder from the wheel mill consists of the ingredients ground to a fine particle size and will be distributed uniformly throughout the mass. The mass is 75% potassium nitrate as very fine crystals. The surfaces of these crystals will be covered with a thin film of water that is actually a solution of potassium nitrate and some of the mineral matter found in the charcoal ingredient. As water evaporates from the slabs of pressed powder there will be a fusion of the areas of contact between the crystals of potassium nitrate. It is this bonding of the contacting surfaces that imparts mechanical strength to the powder.

If one were to press the powder at a very low moisture content the finished powder would be rather friable and prone to dust formation or a breaking up of the grains with rough handling.

After the slabs, from the powder press, are “cured” they are mechanically broken up into pieces prior to transporting the powder to the corning mill for “graining”.

The powder press used at the Pouderie D’ Aubonne S.A. black powder plant in Switzerland is something of a unique one of a kind design roller press. Powder from the wheel mill is laid onto a moving belt in a uniform thickness and then passed under a roller that compacts the mass. Vertical and horizontal powder presses are batch type presses whereas this roller design is a continuous process. Pressure is applied downward on the roller.

When the powder passes under the roller the edges of the compacted mass are trimmed and passed back to the feed side of the press. The edges of the rolled powder cake being of lower density than the center of the mass. In order to produce a press product of uniform density it is necessary to trim the edges of the sheet of powder cake exiting the roller section.



Figure 42. Feed end of press.

Broken down mill cake is placed in the green box above the belt where it is then laid up on the moving belt in a uniform thickness before passing under the roller.



Figure 43. Product end of the press.



Figure 44. Pressed powder cake from the press.

The cakes of pressed powder, after aging, are sent to the corning mill.