

History of Black Powder

The following is adapted from
"A chronology of Black Powder" by Richard D Frantz

(Reference: http://footguards.tripod.com/06ARTICLES/ART28_blackpowder.htm)

About Black Powder

Black Powder is a mixture of three components:

Potassium Nitrate (KNO_3 or saltpeter/saltpetre, or nitre/niter).

Sulphur/sulphur.

Charcoal.

Ignition brings about a rapid reaction in which a group of gases is generated, and energy, in the form of heat, is liberated. The heating causes the gases to expand rapidly, producing an explosive force, especially if confined. The faster the reaction, the more powerful is the effectiveness. If this process is fully enclosed, we have a bomb. When the internal pressure exceeds the container's ability to contain it, we have an explosion.

If the container has a vent, such as the open end of a gun barrel, the expanding gases may be used to propel a missile up its length. The length of barrel allows the process to sustain a major portion of the initial pressure, while the inertia of the missile is continually overcome. The missile continues to accelerate until it leaves the barrel, at which time, the effects of air resistance, and to a smaller effect, gravity, cause it to decelerate at predictable rates.

Black Powder is classified as an explosive. This is because its actions after ignition meet some arbitrary criteria that takes it beyond the sense of "burning" - a slower reaction such as the burning of wood. Black Powder will indeed explode with considerable force if ignited when uncontained. In mining, it was often poured down cracks or into drilled holes to blast apart rock. In light of this, when you see reference to burning rate of Black Powder, the reference is to the speed of passage of the flame front that brings ignition through the mass of powder, not the speed of the reaction of the ignited powder itself.

The term "Black Powder" is relatively modern. It stems from the fact that the first Smokeless Powder was a lighter color, a gray, in comparison to the commonly dark black of the propellant it would largely supplant. Prior to that time, Black Powder was commonly called Gun Powder, or in larger granulations, Blasting Powder, or Cannon Powder. The dates of the application of these terms, and even its earliest name remains uncertain.

The Chronology

c.1200, Middle East

DEVELOPMENT OF FLASHING POWDER

Saltpetre, the principal ingredient of Black Powder first appears in the writings of Arabian, Abd Allah, in 1200.

Descriptions of fireworks, "Roman Candles", and flash powder are brought from China to the West by traders. The first to do so was not Marco Polo, since he did not return to Venice until 1299. As well, it would not have been his father nor uncle, whose voyage to the orient preceded his. They did not return from Cathay, after failing to gain an audience with the ruler, until 1269.

At the time of the Polos' journeys, China's ruler, was the Mongol, Kublai's Khan. His brother, Hugu, was the ruler of Persia, the eastern extent of the Mongol empire. The trade route between these

points, both by land and sea, was already soundly in place by the time of the Polos. Across this route, and between the courts of its rulers continual government and diplomatic exchange took place.

Thus an EXCHANGE of technical information was entirely possible, and to the purpose of maintaining that empire, far exceeding just probable. Whether such technology originated in China, or in the Middle East, is still open to some question.

The fact that no "arms", nor high power explosives were mentioned by the Polos as late as 1299, yet Arabic works exist describing Black Powder prior to their journeys, strongly suggests that Black Powder was of Arabic and not Chinese invention.

c.1250, Middle East

DESCRIPTION OF BLACK POWDER BY MARCUS GRAECUS

In Liber Ignium (The Book of Fire), Marcus Graecus describes Saltpeter and gun powder (but not by that name). Liber Ignium mentions both propulsive uses, as in rockets, and explosive uses, as in guns.

This work is probably a translation, or more properly, and adaptation of an Arabic work of the time that made its way into the "Roman" world via Constantinople.

Remember, this is the time of Richard I of England, and the Third Crusade. Many material objects that were "liberated" from the Moslem held Holy Lands, returned with the warriors to their home lands, or fell into the hands of The Church. The Church, or those connected with it, was nearly the sole source of written material in the Western world at this time.

By one of these routes the knowledge of Black Powder, or this particular work, became available to both Roger Bacon and Albertus Magnus.

1268, England

DESCRIPTION BY ROGER BACON

In Opus Majus, Sir Francis Bacon described the explosion of Black Powder. Scientist that he was, he was undoubtedly describing the stuff he had made himself. However, it wasn't until a few years later that later he specifically listed the composition 7/5/5 of KNO₃/S/C.

1350, England

CHANGE IN STANDARD COMPOSITION

England standardized on 6/1/2 of KNO₃/S/C. This varied considerably from the German standard of 4/1/1.

This news coming to us in 1350 points to two outstanding facts. First, as listed in the companion chronologies, the battles of Crecy and Agincourt are where the first use of firearms is mentioned. They took place about 1312. In forty short years, the differing effectiveness of Black Powder had been discovered, and sufficient arms were present that varied compositions by differing units of an army, or in fact individual gun crews posed some kind of a problem that required standardization. Second, both the English and the Germans are mentioned - the French it can be assumed we also using Black Powder. Thus we can assume its general proliferation in arms across the European continent.

A corollary is of course available: It took from 1250 to 1312, sixty years, for arms somewhat competent to the European battlefields to be developed and deployed.

Reversing the view yet again: In the next 40 years, the arms, and by inference, the propellant, has increased in competency to the point of standardization being required. Folks were very busy experimenting with Black Powder and using the arms it fueled.

c.1429, Europe

DEVELOPMENT OF CORNED POWDER

The mechanical mixture of the ingredients was changed to a form in which the elements would not separate. This was accomplished by mixing the ingredients as uniformly as possible, and then wetting it into clumps. These clumps were then mechanically broken up (a dangerous task) into kernels. Hence the term CORNING.

Prior to this time, a simple, sifted, mechanical mixture of the ingredients was used. With rough handling of the powder containers, as was common to travel in solid wheel wagons over the primitive roads of the time, the smaller ingredients would settle to the whatever part of the container that was the bottom during transport. This produced great differences in samples vended from the container, and consequent variation in the force of propulsion.

By more closely, and certainly more consistently approaching the optimum mixture in every sample, corned powder developed higher average breech pressures. This made it unsuitable for most of the current arms. Because of the longer life span and higher cost of cannons, small arms of new manufacture adopted the new powder first. Cannons followed several decades later.

Today, Black Powder is corned, but not referred to as such. The ingredients are formed into cakes with water and alcohol. The cakes are dried to a specific water content, and then crumbled. The kernels are then glazed with graphite, and graded by passage, or failure to pass, through successively smaller size screens. (FFG, FFFG etc)

c.1675, UNITED STATES, FIRST KNOWN DOMESTIC POWDER PRODUCTION

Manufacture of Black Powder takes place in a facility called a mill. The mill, much like that used to produce flour from grain, is used to crush or crumble the caked mixture into granules. These are selected for various purposes or returned to the batch for reprocessing.

The first recorded powder mill was, Milton (mill-town) Massachusetts. Today, Milton is but a short drive from Boston, but at the time, Milton was considered to be way out in the country, a safe distance away from Boston in the case of a mishap, and located on the Neponset river which supplied water power to the mills.

Fifty short years after the founding of the Massachusetts Bay Company, and the arrival of the Puritans, the settlers have moved out into the woods and secured it sufficiently to look toward reducing their reliance on supplies of Black Powder from the mother country. Black Powder is what kept the settlers alive on the frontier some fifty to a hundred miles from their primary settlements. Vital to their life, Black Powder was instrumental in providing the game they ate, in warding off the ever-increasing number of savage attacks, and even to start the life saving fire of the wet woods traveler. In another hundred years it would become vital to the final security of the new homeland within the boundaries of their frontiers.

Across this hundred years, few such mills were built. The British restricted manufacture, and controlled the importation of powder by the Colonies. With the increases in tension of the 1770's, government authorities restricted the amount of available powder to the minimum they thought the Colonist required for survival.

The 19 April 1775 march by Crown Forces troops on Lexington and Concord had as its purpose to confiscate unauthorized supplies of powder, ball, and arms, and to arrest Adams and Hancock.

c.1800, General

CHANGE IN STANDARD COMPOSITION

Generally, around the world, Black Powder came to be standardized at 15/2/3 or 15/3/2 of KNO₃/S/C, both to the same effect. This allowed for more standardization of arms chamber strength, and the opportunity to use powder from various sources - hopefully your

enemy's.

It is in this period that sound ballistic experiments are undertaken, the results of which prevail to this day. Closed bomb pressure measurement comes into use. Pendulum measurement of rifle ball effects are refined. We are learning what really happens inside firearms, rather than relying upon guess and superstition.

World standardization, or nearly so, would lead to the easy use of foreign powders by the Confederate States in their War of Secession.

Standardized powder would allow mass produced adjustable sights to be fitted to rifles. Since the force of every cartridge will be nearly identical, the sights can be closely regulated at the factory for differing ranges.

1804, United States

DUPONT POWDER MILL ESTABLISHED

DuPont established his first powder mill on Brandywine Creek, near Wilmington DE. The creek provided the power source, and cooling water for the mill.

DuPont's product was effective, but not the ultimate available. Most shooters preferred the "English Powder" still imported after the successful American Revolution.

In these times, "gunpowder" was just gunpowder. The granulation varieties we know today were not available as known classes of performance. One bought Joe's powder or Jim's powder because it worked better in ones particular arm. Governments bought a given powder because of its price and availability, or possibly the favor involved.

Among civilians, this Ford vs. Chevy fashion of thought persisted until recent times. Some individuals were very certain in espousing that Remington ammunition was far, far superior to that produced by Winchester, and vice versa.

DuPont, seeking success through broad acceptance by the public, worked diligently to formulate and then manufacture a powder superior to the competition. Did he succeed? Read on.

1810, United States

DUPONT BECOMES AMERICA'S LARGEST POWDER PRODUCER

What can you say about the world's leader in the products derived from applied chemistry? In six short years they ascended to the pinnacle of Black Powder production. As they entered the age of smokeless powder, they capitalized upon their chemical discoveries with that same skill and drive.

1825, Europe

DEVELOPMENT OF GRANULATIONS FOR SPECIFIC PURPOSES

With more accurate testing methods, it was discovered that different granulations of corned powder were appropriate to different applications. This ultimated in today's grading system using the letters "F" and "g". The little "g" stands for Granulation, while the F stands for the size of screen mesh the granule will pass through.

The smallest granulation commonly available is FFFFg (spoken: "4F"). It is used principally in the priming pan of flintlocks, but has some application in strong but small chambered revolvers of .22 to .32 caliber.

FFFg ("3F") is usually recommended for muzzleloading rifles of .50 caliber or less. FFg is used in larger rifles, whether cartridge loaded or not. It also performs well in target class loads in cartridge pistols when the smaller internal dimensioned modern cartridge case is used.

Large granulation is termed Fg and is used principally in cannons, though it is applicable to large bore (10 gauge and up) shotguns and double rifles of 8, 6, and 4 bore.

Cannon powder was commonly of an even larger granulation. Somewhat later, cannon powder was pressed into prisms, or sized to specifically fit the varying bores. Eventually "Brown" powder was standardized for in cannons until the end of 1800's. The brown color arose from incorporating charcoal that was only partially carbonized.

c.1860, United States

DOMINANT SUPPLIERS TO THE UNION FORCES

The North had plenty of powder during the Civil War. The principal suppliers DuPont, Lafflin & Rand, and Hazzard made millions of dollars, which allowed them to persist in the business beyond the turn of the century. Of these DuPont, while no longer engaged in the manufacture of Black Powder, persists through today.

c.1862, United States

SUPPLIERS TO THE CONFEDERATE FORCES

The Sycamore Powder Mills, Nashville, TN produced the largest amount for the Confederate need. This plant was taken over by DuPont at war's end and remained in production until World War I. The Confederate Gun Powder Factory was established and operated by West Point graduate George W. Rains at Augusta, GA.

c. 1864, United States

WESTERN US POWDER PRODUCTION

The California Powder Works produced its first powder in 1864. Economic production through the use of Chinese labor made their product a viable adjunct to eastern sources for the Union. Saltpeter from Eastern sources was somewhat in short supply. Its initial and transportation costs would have been prohibitive. This was overcome by its importation from India.

It is interesting to note that CPW later became first supplier of "smokeless" powder to the US government. Developed by WC Peyton, "Peyton" powder was composed of nitroglycerin, nitrocellulose, ammonium picrate.

Smokeless powder is never fully without smoke. Evolution moved through "semi-smokeless" and various mixtures of black and the current smokeless. This was not done so much to reduce the visible smoke, but to reduce the amount of deposits left in the bore after firing, and the corrosive nature of them.

The deposits filled in the rifling and reduced accuracy. If left for a time, it was difficult to remove. As well, arms need to be cleaned soon after firing or corrosion began. Airborne moisture combines with the residue compounds to form sulfuric acid and other nasty stuff.

1894, United States

MILITARY DROPS BLACK POWDER AS PRINCIPAL SMALL ARMS PROPELLANT

With the adoption of the Krag-Jorgensen rifle, chambered for .30-40 smokeless powder, jacketed bullet round, both Black Powder and naked lead bullets began to step aside as the dominant propellant and projectile for this country's military arms. This was brought about mostly by the mechanical advances driving the development and improvement of the magazine-fed rifle, and the machine gun.

The military was striving to multiply the effectiveness of each fighting man by increasing the rate of fire that could be laid on the target, and by increasing the range at which that fire could be delivered. The latter required higher velocities, which called for smaller diameter projectiles. Since Black Powder residue fouled bores, and was more pronounced about doing so in smaller bores, few shots could be fired before cleaning the bore was required. The change to the lesser fouling, emerging smokeless powder was inevitable.

The recoil driven mechanisms of both the machine gun and the newly developed auto-loading pistols could not long tolerate the continual build-up of residue. As well, the new technology of gas operated semi-automatic and fully automatic arms didn't tolerate the residue in their more delicate mechanisms at all.

Black powder continued to be used in military revolver cartridges for quite some time, as there were great stocks of these. Black Powder rifle ammunitions, and the arms that used them were diverted to the country's National Guard units. These arms saw their last use when these units

were pressed into service in the Spanish-American War of 1898-1900. Artillery of all forms continued to use Black Powder as a propellant into the 1970's and 1980's, when supplanted by newer propellants not accurately classified as either black nor smokeless.

American civilian use continued Black Powder production at quite high levels for some time. Civilian life cycle for an individual arm far exceeded that of the innovative military. Many superb, or at least fully serviceable older arms were used on both the hunting and target fields. Because of either the materials or construction involved in their manufacture, these arms could not safely, either acutely or chronically endure the increased chamber pressures of the modern smokeless powder cartridges. Ammunition companies continued to produce Black Powder loadings well into the 1950's, and possibly beyond.

Muzzleloading long arms, requiring Black Powder, never left the scene. To this day, new manufacture Trade Rifles are sold all over the world, particularly in more primitive, and poor regions. These arms are identical in pattern to those offered by the French and British fur trading firms of the 1600's, like The Hudson Bay Company. Black Powder just won't go away!

c.1970, United States **PYRODEX BLACK POWDER SUBSTITUTE DEVELOPED**

Dan Pawlak, in conjunction with Hornady Bullet Co. produced a viable substitute for black powder. While still smoking, and somewhat hygroscopic (moisture absorbing), it produces less fouling, and is NOT classified as an explosive by U. S. government. This latter is important concerning restrictions, and cost of shipping.

Pyrodex requires considerable compression to burn effectively. Consequently it is not recommended for use in the pan of flintlocks, where the priming powder is loosely scattered. This is a property also present in later attempts to "replicate" Black Powder without its negative attributes, but while maintaining its positive characteristics.

c.1975, United States **GEARHART-OWENS BEGINS BLACK POWDER PRODUCTION**

In the early 1970's, DuPont's plant was destroyed by an explosion and fire. While uncommon with modern safety systems in modern times, such events were quite common in years past. DuPont rebuilt its production facilities, but decided to concentrate its attention on more modern chemistry. In 1975 it sold these facilities and operations to the Gearhart-Owens company. More recently, DuPont also divested itself of its smokeless powder operations. These were sold to the IMR powder company, which continues to offer the entire former line as well as additions to it. Interestingly, DuPont's neighbor in Wilmington, Hercules Powder Company also experienced a catastrophic fire in their smokeless powder facility. They too rebuilt some of their facilities. Like DuPont, they too decided to divest themselves of their small arms propellant division which has been sold to the Alliant company.

The Present, Global **DEVELOPMENT OF BLACK POWDER STILL HAS NOT CEASED!**

Driven by resurgent interest in American History, firms around the world are producing replica, copy, and style-copy arms of the entire period of American growth. Sportsmen have contributed astonishing amounts of capital and personal effort to increase the health and population of game animals across the Americas. Black Powder Only hunts in many states have extended the hunting season for those who will embrace this classic propellant. Companies strive to gain the favor of modern shooters by improving the characteristics of their products, whether those shooters utilize earlier or modern designs.

Though moribund for a time, Black Powder production and development flourishes today.