THE MARY ARM MULTI-DISTANCE SHOTSHELL PRODUCT RANGE, WITH PAPER AND PLASTIC CASES (FRANCE).

WHY DO SOME 1oz LOADS PATTERN MORE TIGHTLY THAN OTHERS WITH THE SAME DEGREE OF CHOKE?

BY TIM WOODHOUSE

The trouble with having blind faith in the ability of a designated choke to perform as marked, is that more often than not, a rather different pattern will result than the one expected. The problem is, that unless you take the time and trouble to pattern your gun with a specific type of cartridge and shot size, the true level of performance will not be apparent.

However, this aside, there are certain construction traits of a cartridge that will tend to point towards a generally expected degree of pattern performance. The main areas of performance differential for FITASC sporting with 28gram loads are to be found within the choice of components that, together, reflect in the production of varying types of pattern.

With this in mind, it is interesting to note that there are some enterprising European manufacturers – such as Mary Arm – that have launched a multi-faceted range of shells, with variable loadings specifically for long, medium and close range targets. This somewhat enlightened approach takes advantage of the clear variables introduced by differing wads, shot and powder choices. Indeed, if the velocities can be kept on a more or less parallel course throughout the cartridge range then this can be a very good idea indeed. The main exception would be for a maximum range load containing 2.5mm pellets, where a lower velocity than maximum can often produce a better killing pattern at 60yards or so.

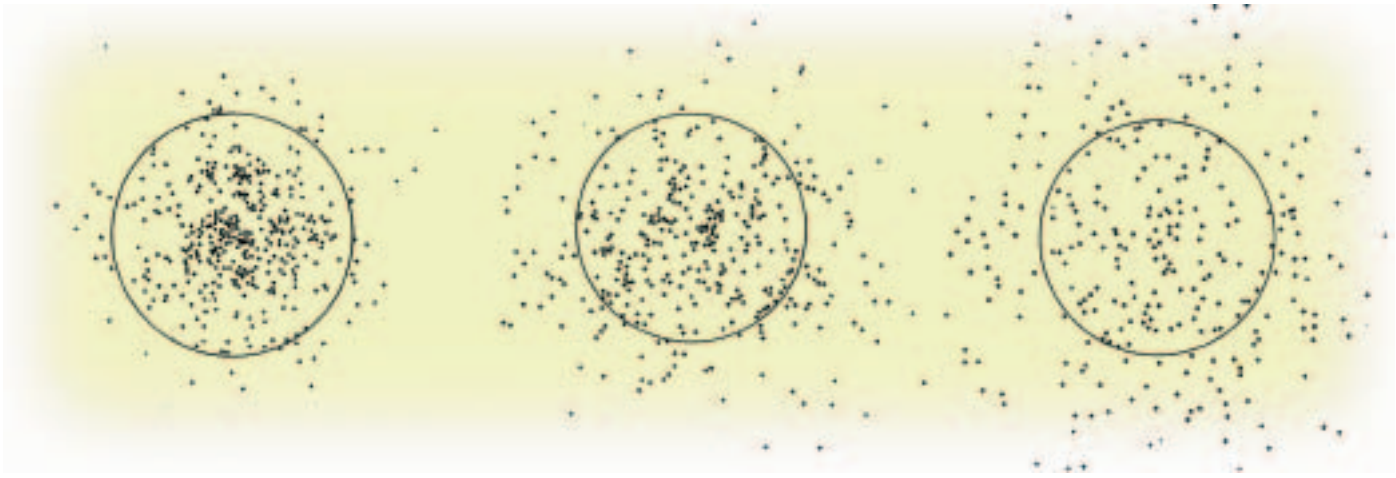
The closer range shell utilizes the reversible type of plastic wad, which is identical end to end, having just a gas seal. This introduces barrel wall friction that does not protect the shot charge for its high speed passage. The net effect of this is to produce a wider pattern spread for the same choke and type of shot – usually with a 2-3% antimony content (the equivalent of US chilled shot) and sized similar to US#8.5s and #9s.

For medium range, a more conventional plastic cup wad is used together with a different powder, to pull things together more than before, by virtue of protection from barrel wall erosion and better shot cushioning from the harsh acceleration of firing 'set back' forces. This tightens up the pattern and is generally loaded with the equivalent of US#8 or #8.5 shot for maximum effect – but with 3% antimony hardened shot (US top grade chilled shot).

To tackle the longest targets, a full cup plastic wad is used, but with additional cushioning devices such as a cork insert in the shot cup. The shot used is of the top roundness grading, together with relatively high antimony content of 5-7% (US Magnum shot equivalent). Sometimes it is also washed with an aluminum or golden finish to reduce pellet sticking to an absolute minimum. With all of these additional refinements the load can then be fired at a higher velocity, without compromising the pellet integrity and still throw an exceptional pattern downrange with 2.5mm (US#7) shot.

THE DIFFICULTIES OF ACHIEVING EVEN PELLET DISTRIBUTION WITH INCREASING DEGREES OF CHOKE USING CHILLED SHOT (2% ANTIMONY CONTENT).

PATTERN IMAGE #1
TIGHT, MEDIUM AND OPEN PATTERNS AT 40YARDS THROWN WITH 1OZ (28GRAMS) OF US#7 (2.5MM SHOT), USING COMBINATIONS OF CHOKE SUPER FULL, MODIFIED AND SKEET, THAT HAVE VARYING CONTROL OVER PATTERN PERCENTAGE, SPREAD AND DENSITY, USING 2% HARDENED ANTIMONY (CHILLED) SHOT. THE SHELLS USED WERE LOADED WITH 1OZ OF CHILLED (2% ANTIMONY) 2.5MM SHOT (US#7), RELATIVELY HARD FIBER WADDING AND FAIRLY FAST BURNING TRAP/SKEET POWDER WITH A 3FT VELOCITY OF 1180 FEET PER SECOND.



THE LEFT SUPER FULL CHOKE PATTERN: With 75% of the pellets in the 30 inch circle this is a good example of over centralized pellet concentration with the use of overly tight chokes (Super Full) and relatively soft chilled lead shot (2% antimony content).

Although from a possible 315 pellets we have 75% of them (236) in the pattern, there are still gaps thru which the odd clay target can escape unscathed, depending on the orientation of its trajectory. There are also clumps of pellets that may well have been cold welded due to set-back forces at the moment of firing, but subsequently broke up when passing thru the tight choke constriction. Conversely, overly tight chokes can actually create 'stuck' as well as distortion-damaged pellets at the choke constriction that would have flown in better shape and individually from a more open choke. The tell tale signs are overly close strings and concentrations of pellets

THE CENTRAL MODIFIED CHOKE PATTERN: In all probability this has at least as much chance of breaking the target as the left pattern; the overly tight central concentration has been reduced, together with a wider overall spread. Even with the lower numbers of pellets (195) at 62% in the 30 inch circle there is a more even distribution and reflects the more generalized usage of the modified choke, even with this type of load. There is still evidence of 'clumped pellets' but to a lesser extent; it would appear that pellet damage at the choke is playing havoc with the patterning of this load down range. This will also affect the consistency, to the detriment of the shooter.

THE RIGHT SKEET CHOKE PATTERN: This has very few signs of 'clumping', tending to reinforce the theory that although set back forces are playing their part, the main villain with this load seems to be its vulnerability to damage at the choke. With the very open skeet choke used (about 1.5-2 thou constriction) damage at this area has been virtually eliminated. Indeed, its 42% pattern (132 pellets) is what would be expected using this combination at 40 yards. The main problem is in the choice of #7 shot (2.5mm), as the pattern density has clearly failed, with numerous chances of escape for the clay target. A better choice for sporting clays with this combination would have been US#8.5 with 480 pellets to the ounce instead of 315. With a 42% pattern this will put 189 pellets into the circle, together with a more even distribution than the central modified pattern.

THERE ARE STILL GAPS THRU WHICH THE ODD CLAY TARGET CAN ESCAPE UNSCATHED, DEPENDING ON THE ORIENTATION OF ITS TRAJECTORY. THERE ARE ALSO CLUMPS OF PELLETS THAT MAY WELL HAVE BEEN COLD WELDED DUE TO SET-BACK FORCES AT THE MOMENT OF FIRING, BUT SUBSEQUENTLY BROKE UP WHEN PASSING THRU THE TIGHT CHOKE CONSTRICTION...

WHAT ARE THE ATTRIBUTES OF A SHELL SPECIFICATION THAT REGULATES THE ULTIMATE PATTERN SPREAD TOGETHER WITH EVEN PELLET DISTRIBUTION AT THE REQUIRED RANGE?

When shooting FITASC sporting targets my gun of choice has fixed chokes – light modified (13 thou) and a tight side modified at 19 thou. The ammunition is selected from a variety of perhaps three different types, depending on what I am trying to achieve with the pattern for a particular target.

Fiber Skeet #9s with chilled shot do well for difficult closer range targets, especially from the modified tube, filling out the pattern and maximizing the total area of spread. The close range Euro-loads with their reversible same end plastic wads and chilled

shot equivalent will also provide a similar effect here, but can be had with a shot size similar to US#8.5 as well.

The standard shot cup plastic wadded shells with 3% antimony (top end chilled shot) work well when a pattern percentage close to what would be expected from the actual boring of the gun ID required. US #8.5 and #8 shot are the best sizes to use, as 9s are going to be marginal for 40yard edge on targets, even with relatively tight patterns.

Next up are the Euro 28gram trap loads that launch the equivalent of US#8 or #7.5 shot at around 1170fps at 3 feet. They tend to be loaded with 5% antimony shot (US Magnum shot), are soft on the shoulder, but produce devastating patterns for edge on crossing targets from both light modified and modified chokes. They work well out to 50-55yards on the majority of targets.

Finally, we have the distance kings: sometimes labeled Extreme or FITASC loads, sometimes not. The very best of them have full plastic wads with a shock absorption leg section with an additional cork-cushioning insert in the bottom of the shot cup. The shot is pretty tricky too, invariably at 2.5mm US#7 in size with around 7% antimony content and treatments to prevent pellet sticking. While testing one particular Gallic brand of shell, it consistently broke skeet type edge on targets at a distance of 64yards from the flight line (measured with an accurate range finder) using only modified choke. Indeed, the best of these loads do not respond well to excessive choking; the very hard shot used is far less tolerant of being squashed at the choke and tends to suffer from 'Bounce Out' if this is overdone.

SHOT SHELL LOADING IMPLICATIONS: SOFT SHOT AND PLASTIC/FIBER WAD SPREAD FACTORS.

As a charge of shot enters the choke area it is subjected to various changes in cross sectional area. If the shot has settled down in the bore beforehand, then it will be severely rattled at the choke, being squeezed into a new diameter.

Lead shot, especially the softer kind, will adjust and leave the barrel as a longer shot string and at a slightly reduced velocity than with no choke at all. This initial braking effect will be very quickly made up and will then overtake the shot from the un-choked barrel due to greatly reduced resistance of the air to the narrower string from the choke. This braking effect will also play a part in slowing the wad just before barrel exit, tending to reduce the battering ram effect of the wad into the rear pellets. This will have an effect on the spread of the charge, especially with a traditional nitro card fiber wad column.

The faster burning powders will exaggerate this effect, as their residual pressures will be lower at the muzzle than the slower burning varieties. Bluntly put, the higher the pressure at muzzle exit, the more likely it is that the wad will intrude unduly into the shot charge as it exits the muzzle. With the nitro card fiber arrangement this will be more of a problem with open skeet-type chokes.

The biggest potential spread with a chilled shot fiber wadded shell will be with the use of an unduly slow burning powder, loaded to a very high velocity (1300feet per second plus at 3 feet) with maximum battering-ram effect by the wad into the shot as it leaves the muzzle, together with the use of relatively short barrels; 25-26inches long with skeet chokes of 0-3 thou constriction (or even less with 'negative' larger than the bore diameter skeet choking).

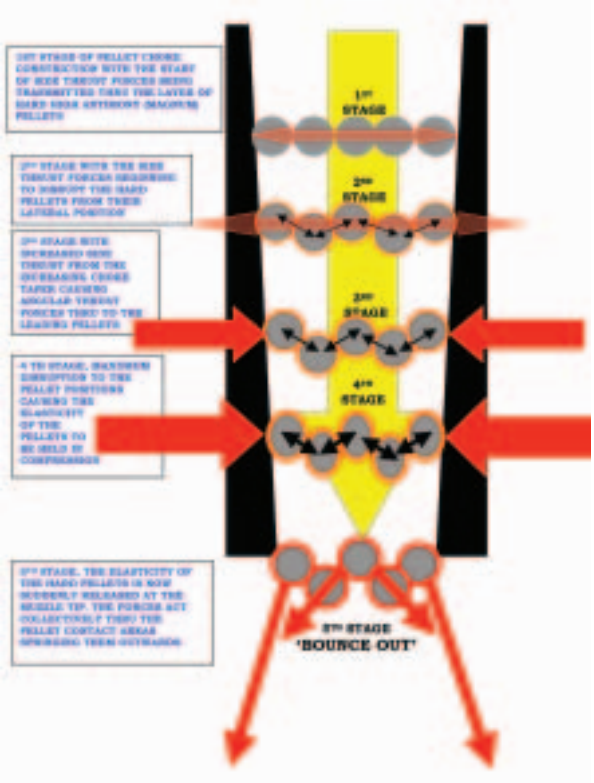
The reversible or same ended cupless plastic wads will play a similar part here, as they lack the retention of the shot just after muzzle exit and then the air braking effect of the wad petals of the full length cup wad after their traversal of several feet downrange.

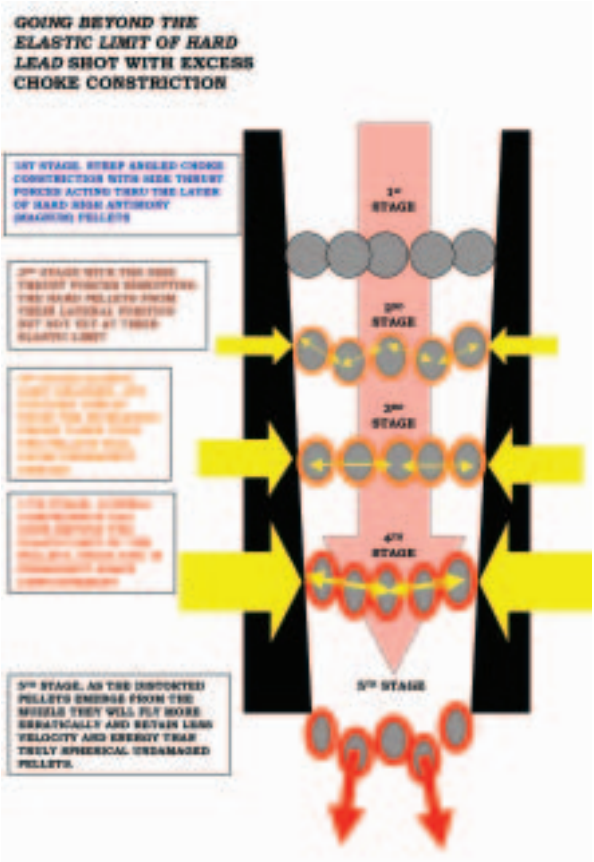
Faster burning powders generally build their pressure peaks faster than the slower varieties; this can be an advantage at the choke due to the reduced residual pressure, but if taken too far, will damage the shot pellets to a greater extent due to higher set back forces at the instant of ignition, especially with fiber wad columns and some plastic wads with little shot cushioning potential.

The net result of this is to induce a greater spread due to the lack of sphericity of the pellets, even though the muzzle exit residual gas pressure is lower, reducing the battering-ram effect of the fiber wad. Higher velocities here, can and will, open up the pattern to the shooter's disadvantage for a chosen degree

AN EXAMPLE OF SET BACK FORCES CAUSING DAMAGE TO THE LOWER PELLETS.

THE BOUNCE OUT EFFECT





of choke. Indeed, second barrel trap loads have always had a lower 3 foot velocity of around 1145fps, tightening up the pattern for the longest possible reach. Their combination of hard shot, full cup plastic wad with compression cushion section and relatively fast burning powder, retain the greatest control over pattern development. Their excellent pellet distribution for sporting clays targets thru skeet or improved cylinder chokes wins out in a lot of cases against the reduced overall spread of tighter chokes with more conventional shell choices.

WHAT IS 'BOUNCE OUT'?

This is an interesting phenomenon due to the physical properties of very hard lead and all types of non-toxic shot so far produced. This happy state of affairs unfortunately does not exist with shot loads containing a high percentage of antimony.

A good example would be to drop two pellets of the same weight onto a hard surface from an equal distance, one being soft lead and the other say soft iron (steel shot is really soft iron). The soft lead pellet does not bounce, but the iron one will react differently.

The harder the construction of a pellet, the greater will be its propensity to the 'Bounce Out' effect. This is a fundamental reason for the failure of over-choke with non-toxic shot. Steel shot has a half choke maximum advisory limit imposed by the UK proof house for safety reasons, due to its virtually incompressible traits when compared to lead. Incidentally, the use of relatively thick-walled plastic wads that totally encapsulate the shot is an absolute necessity with steel, the cushioning effect of the plastic at the choke being the only respite for the muzzle end of the barrel.

THE ELASTIC LIMIT

So with hard lead shot (top grade magnum shot), the equality of pellet distribution within the 30 inch circle is affected by the degree of choke used. It is all very well to assume that 'the way to go' is to place as many pellets as possible within the circle, but at some point, the degree of choke used will push the pellets beyond their 'elastic' limit.

Damaged pellets however hard, will not pattern as regularly as round ones. Unlike 'steel' pellets, the hard lead magnum shot will eventually reach 'the point of no return' as regards their ultimate shape upon muzzle exit. Even the extra compressibility of the plastic wad cup between the shot and internal choke wall will not prevent this pellet distortion damage with excessive choke constriction for the load. The result may still have a high percentage of pellets in the 30 inch circle but at the expense of well-placed distribution within it.

The best pellet distribution with very hard magnum shot loads will be with the degree of choke that falls just below the level that induces 'Bounce Out'; this seems to be somewhere around modified to improved modified depending on the actual type of wad used. Pellet 'Bounce Out' will increase overall peripheral spread in the outer ring and reduce pattern efficiency and density at the inner core. Beyond this point with excessive choke for this type of load, outright pellet damage will occur turning the pattern quality, density and distribution into something of a lottery. Back bored guns handle these types of loads better, as the shot column in their wider bores is shorter than in a standard bore 12 gauge; the shorter shot column will need less ultimate choke constriction to produce a tighter pattern that also retains good pellet distribution within it (see 'Why do lighter loads work so well' in the November/December 2005 issue of ClayShooting USA). ■

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