



Understanding bullet obturation

There has been much discussion recently about bullet obturation and specifically at what pressure the Laser-Cast silver bullet obturates (therefore sealing the barrel from gas blow-by and gas cutting). We asked our resident consulting ballistic metallurgist, Dennis Marshall, to help explain this condition. Here is what he had to say:

The ordnance definition of **obturation** is the expansion of a cartridge case or projectile to seal off the breech portion of a firearm and prevent escape of combustion gases. While case obturation to seal the rear of the breach seems to be readily understood, there exists some confusion regarding the nature of bullet obturation.

If a cast bullet is placed on an anvil and struck sharply with a hammer, it will be shorted and its diameter will increase. Similarly, when chamber pressure “strikes” a bullet base, it attempts to shorten and expand (obturate) the bullet. Unlike the hammer blow, bullet expansion is constrained by the barrel. Further, since pressure is applied to the base only, obturation begins at the base, overtaking more (but not all) of the bullet as chamber pressure increases.

It is frequently asked, “How much pressure is required to cause obturation?” The most significant portion of obturation (that of permanent bullet deformation) begins as the chamber pressure approaches the bullet alloy’s yield strength as measured in pounds per square inch. For lead alloys, yield strength has been defined by scientific research as 480 times the Brinell Harness Number (BHN). For example, a bullet with a BHN of 22 will have a yield strength of about

10,600 pst. Hence, the bullet's base will be the first portion to obturate at a chamber pressure of 10,600 psi. As chamber pressure continues to rise, pressure inside the bullet will similarly rise, overtaking more of the bullet from base toward the nose. Any portion of the bullet which is not in close contact with some portion of the chamber or barrel, and which sees the 10,600 psi pressure level, will begin expanding in an attempt to seal the breach.

Since the Laser-Cast silver bullet has a hardness of 24 BHN, it begins obturating at 11,500 psi. By our calculations, the entire base portion of the bullet is fully obturated at 13,000 psi. As you can see, the shooter need not worry about obturation when shooting the Laser-Cast silver bullet at standard velocities.

— *Dennis Marshall,*
Resident Consulting Ballistic Metallurgist

