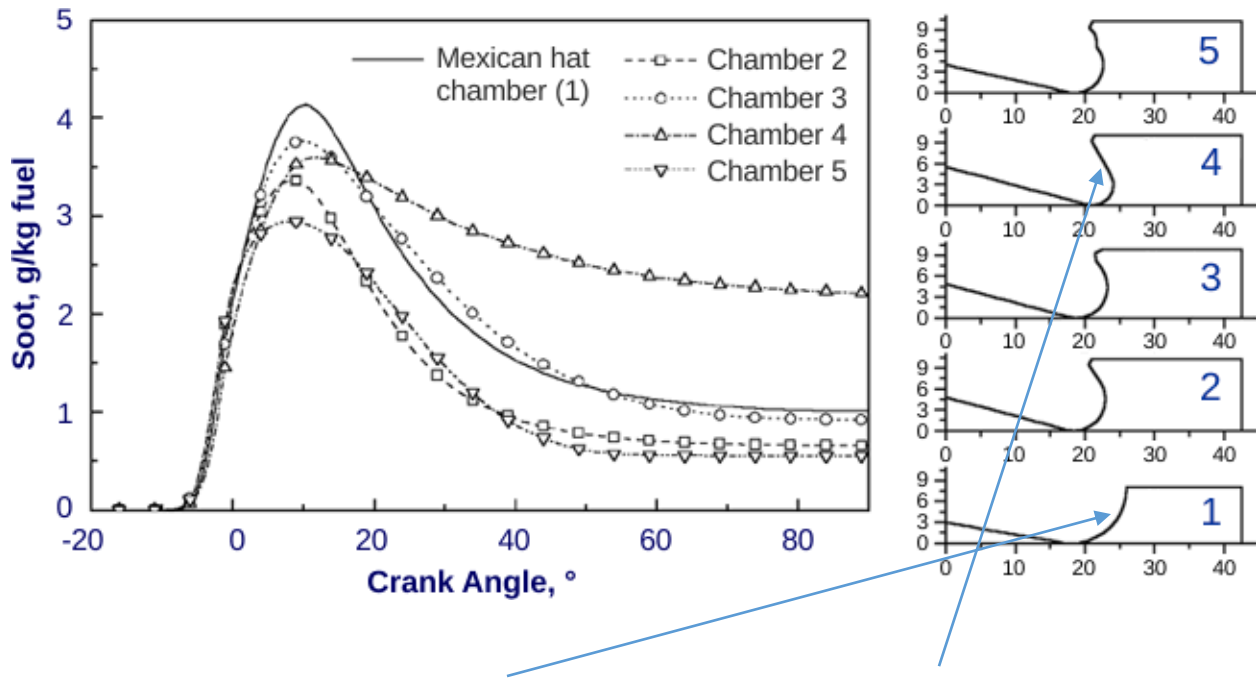


# BLACKWATER E N G I N E S



#1 Mexican Hat chamber design

#4 Re-entrant bowl design

Pistons 1-5 are a cross section representation of various bowl designs used in diesel engines over the last 100 years.

Picture #4 is a cross section representation of the OE 6.4 Powerstroke re-entrant piston bowl design. Note the aggressive re-entrant bowl design with negative bowl wall angles. Although beneficial in many ways, this design has been known to fail under severe duty usage. The bowl is exposed to flame travel and exhaust gas temperatures on three sides. This has led to piston overheating and metal fatigue issues, that cause catastrophic engine failure.

Picture #1 is a cross section representation of the optional 6.4 Powerstroke Mahle Mexican hat chamber design that was widely used in all diesel engines up until the 1990's. Note the horizontal bowl wall, with no negative overhang. This design has made a comeback and is used in the 5.9 & 6.7 Cummins common Rail engines, along with various other diesel engines, after piston failure issues with the re-entrant bowl design through the 1990's and 2000's.

A reduction in the static compression ratio from the stock OE Powerstroke piston at an 18-1 ratio, down to the optional piston design at a 16.5-1 ratio will be realized. The result will be an estimated 3% to 5% reduction in cylinder pressure also.