

2/22/08 – Author: Chris Long, AKA TechShooter

Adjusting the Powder Burn rate Factor and the Bullet Weight to Help Match QL to Range Chronograph Data:

Getting QL to match your actual, range measured load performance is the very best way to ensure that you have reached the OBT desired. Once the QL simulation results in terms of predicted muzzle velocity track range data over a reasonable range of power charge weights, you can then set QL to calculate that actual charge weight that will produce an OBT load.

There are two primary methods of adjusting QL to achieve this goal: Modifying the power burn rate factor, and slightly adjusting the bullet weight.

The power burn rate factor in QL is an approximate value, derived by the author of QL from lab measurements on actual samples of each powder. Since powders vary significantly from lot to lot, this QL default parameter can be off as much as +/- 10% from your real powder characteristics. By adjusting this parameter in QL you can “tune” QL to match measured chronograph data over a range of charge weights. This allows you to then predict the muzzle velocity, and therefore the barrel exit time, very accurately in QL. In other words, QL now models the actual powder, barrel, bullet, etc. combination very closely, and help in achieving an OBT load, determining the sensitivity to load variations, temperature, etc.

Sometimes changing just the burn rate is not enough to get QL to accurately match the measured data. In this case, it has been observed that this is likely due to a very tight (or loose) barrel, heavy fouling, or even different land configurations. In other words, bullet friction is a large variable, and if it is abnormally high (or low), the powder burn characteristics will differ greatly from the nominal predictions used in QL.

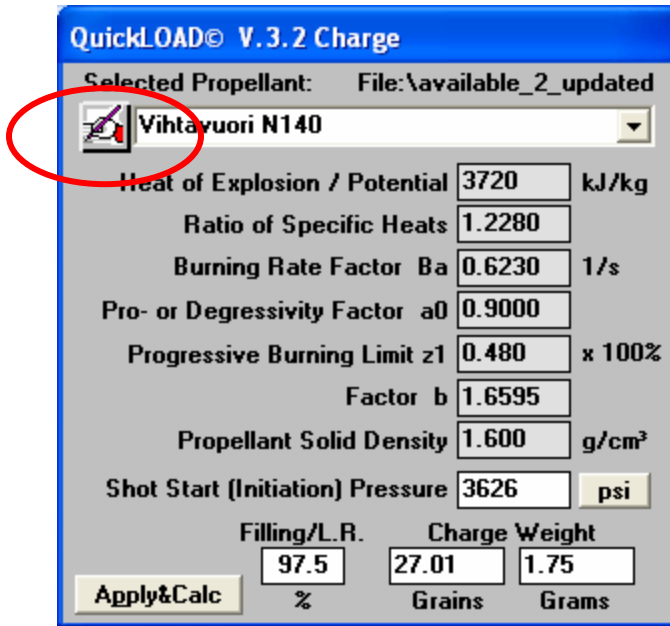
The best way to compensate for these variations is to slightly (and this means only a grain or two for a 100 grain bullet) “fudge” the bullet weight value in QL, usually in combination with the powder burn rate, until the QL predictions match the measured data of the charge range in question.

The next sections will describe how to make these adjustments in QL. The last sections tell how you can use a measured value for your actual fired case volume, a critical parameter to getting good QL performance, as well as how you can create a custom powder database file, for easier load searches.

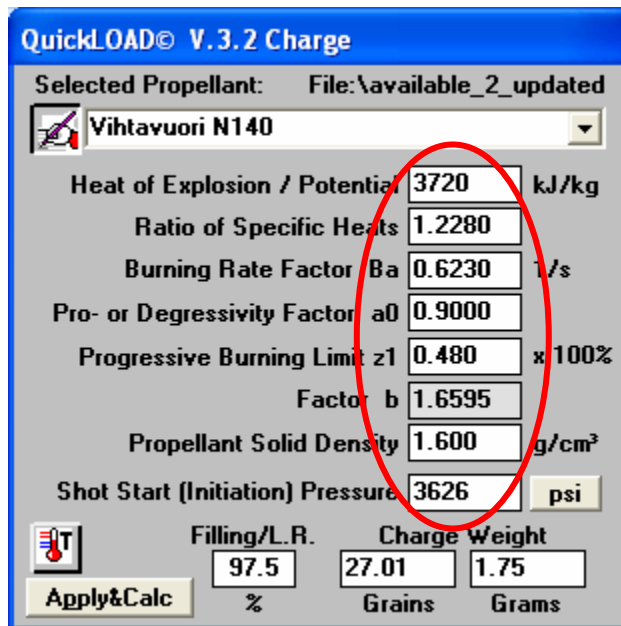
QuickLoad Powder Burn Rate Adjustment – Temporary Method:

As for changing the burn rate in QL, try these steps:

- 1) On the QL charge window (where you enter in the charge weight), just under the words “*Selected Propellant:*” at the top left is an icon showing a hand with a pencil. Clicking this allows you to change (temporarily) the normally grayed-out powder parameters in this window:



- 2) Click the icon, and the powder parameter fields will change to a field with a white background. You can now change them:



- 3) Look at the parameter “*Burning Rate Factor Ba*”. This is the one that addresses the powder burn rate in the QL model. You can change this to be a bit bigger or lower, with higher numbers making the powder model burn

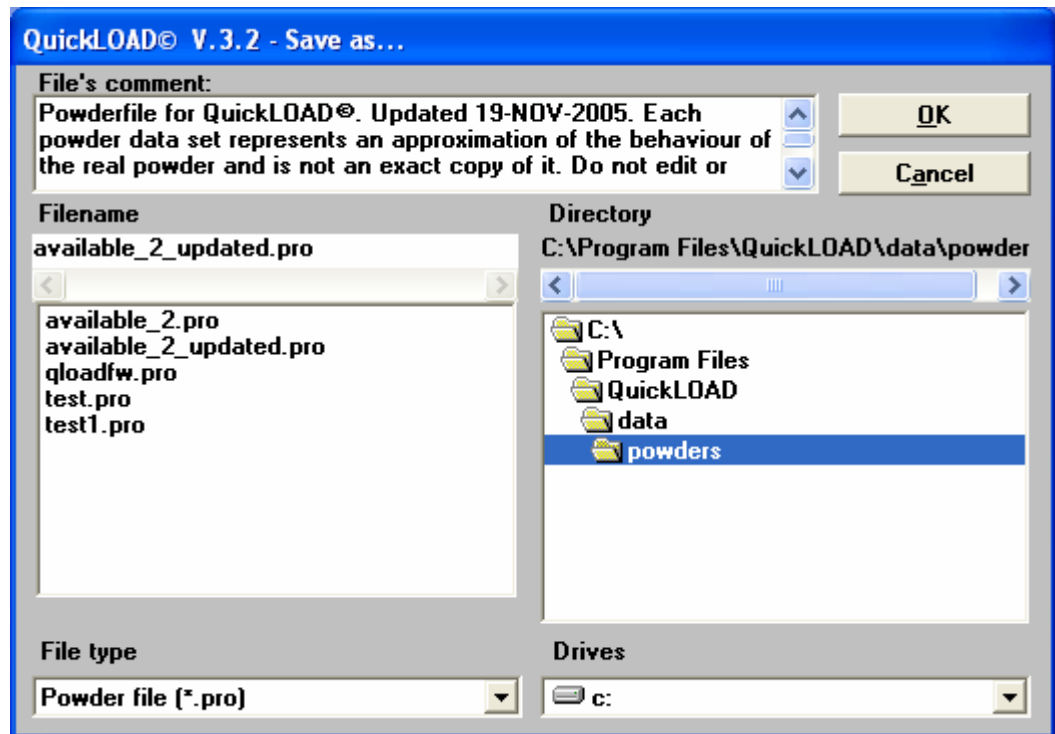
faster, and vice versa for lower values. It has been observed that even a 1% change can make a big difference in the load results.

- 4) Don't worry about changing the QL powder database permanently - just click the "hand-pencil" icon again, and the fields will gray out again, but the now changed Ba value will stay the same. Now, select another powder, or even the same powder from the pull down list, and voila! – The old numbers are back. You have to go through a separate procedure to permanently change the values.

QuickLoad Powder Burn Rate Adjustment – Permanent Method:

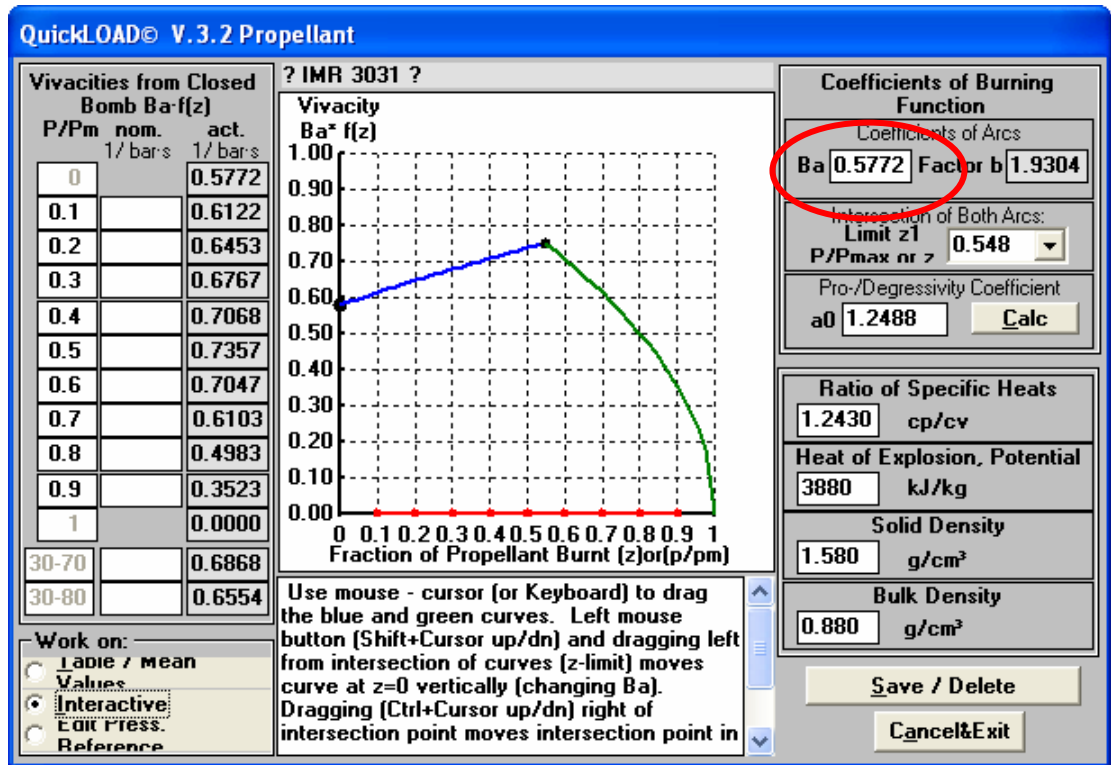
If you want to permanently change the values, it is suggested that you follow the following procedure:

- 1) On the QL main menu, navigate to "Data: Add, Change, Load, Save -> Propellant Data -> Save Active Powder File As", and save the current powder database file as a name of your choosing:



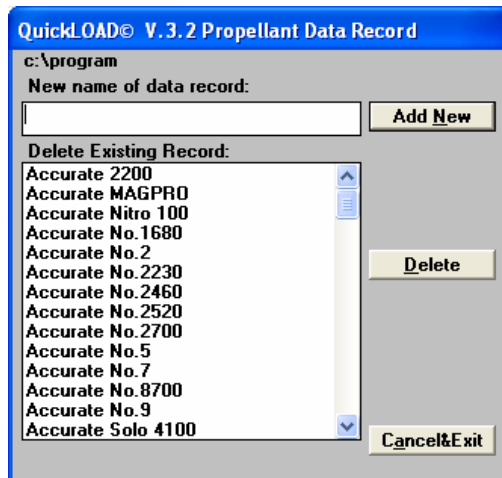
This way you can experiment to your hearts delight without messing up the QL database. This new file name is now the active powder file in QL. You can change back at any time to the original file by using the command "Data: Add, Change, Load, Save -> Propellant Data -> Load a Powder File" and selecting the original file.

- Now, with this new file in play, select the powder that you want to change/edit.
- Next, navigate to “Data: Add, Change, Load, Save -> Propellant Data -> Change data records in active file”. This will bring up a window that has the detailed model parameters:



Make the desired parameter changes (burn rate, for example).

- In the window at the bottom is a button labeled “Save / Delete”. Hit this, enter in the new name (or the same if you want to overwrite the original record), and hit “Add New”:



Adjusting The Bullet Weight to Help Match QL to Range Chronograph Data:

In the “*Cartridge Dimensions*” window, there is a field called “*Bullet Weight*”:

QuickLOAD© V.3.2 Cartridge Dimensions

Selected Bullet: File:\264 Selected Cartridge: File:\qlloadfw
.224, 75, HDY A-MAX 22792 .223 Rem Al

Lead/Case Shaped Friction-proofed

	Inches	mm
Seating Depth	0.304	7.72
Shank Seat Depth	0.124	3.15
Bullet Length	1.070	27.18
Bullet Diameter	0.224	5.69
Cartridge Length	2.525	64.14
Case Length	1.759	44.68
Groove Caliber	0.224	5.69
Barrel Length	30.0	762.0
Bullet Travel	28.545	725.04

	psi	bar
Pmax (MAP)	62366	4300.0
Meas. Method	Piezo CIP	
Bullet Weight	75.0 Grains	1.86 Grams
	Sq. inches	mm ²
Cross-sectional Bore Area	.038797	25.03
Maximum Case Capacity, overflow	33.30 Grains H2O	2.162 cm ³
Volume Occupied by Seated Bullet	2.672	0.173
Useable Case Capacity	30.626	1.989
Weighting Factor	0.6	

Apply&Calc

Changing this weight, even by as little as one or two grains for a 100 grain bullet, can make a significant difference in the QL predicted performance of a load. The logic of this change is that excessive bore friction acts as a steady retarding force against the gas pressure forces, in exactly the same way that the bullet mass resists any change in velocity ($F=MA$ for you physics types). Therefore, adding a bit of weight to the QL bullet simulates, apparently very accurately based on the authors experience, the unmeasurable effects of different bores and bullet bearing lengths.

Adjusting the bullet weight in conjunction with the powder burn rate is a powerful way to get often near perfect correspondence between QL predictions and measured load performance.

Case Volume Measurement Technique:

Using an accurate number for the case capacity (volume) in terms of grains of water full to the top of the neck is critical to getting good correlation between QL and real load performance. The technique that the author uses to measure the case capacity in grains H2O is as follows:

Get a small syringe or eyedropper, a small paper cup with about an ounce of water with a drop of dish detergent or a few drops of rubbing alcohol added. This addition serves to reduce the surface tension of the water, making it easier to get the case filled without air bubbles inside.

Use a fired case, not sized, with old primer still in place. It is the best fit to the chamber, and the old primer plugs the flash hole. Calibrate your digital scale, and weigh the fired (dry) case, and record the weight. Then carefully add the water solution a drop at a time until the case is filled right to the top of the neck. The water surface should be perfectly flat. Re-weigh the filled case, and subtract the empty weight from the full weight. The difference is the case capacity in grains H₂O. You can do this a few times and take an average to get a better number, but it is most likely that after the first couple of times you will know when you get it right. Remember to weigh the empty case in the dry state. Blow the case out with compressed air, or use a heat gun to dry it out if it has been filled before.

Making a new Power Database File:

Another little trick in QL is that all these files are in ASCII, and can be easily edited in Notepad or Word. Select the default "qloadfw.pro" powder database file(found in the directory "*c:\Program Files\QuickLOAD\data\powders*" directory on my machine), and copy it to a new file called "available.pro". Then, using Word, edit out all the lines that describe the powders that you simply cannot ever buy, leaving you with a file of just the powders available. You will probably use this reduced file almost all the time, as it makes the results of a charge or exit time search much easier to analyze, as you then do not have to pass over all the "foreign" (unavailable / foreign) powders to look for the ones that you can get.