

The second phase required a convenient method to make routine calculations to determine gasket stress, bolt stress, bolt load, torque, percent of yield, root stress, elongation and degrees of turn of the nut. Hooke's Law provides the relationship of stress, elongation, turn of nut and percent of yield. The mechanical engineer's "short formula" was selected as the most convenient for torque and bolt load. The "short formula" for this purpose is as follows:

$$T = K \times L \times D / 12$$

Where T = torque in foot-pounds

K = nut factor

L = bolt load in pounds

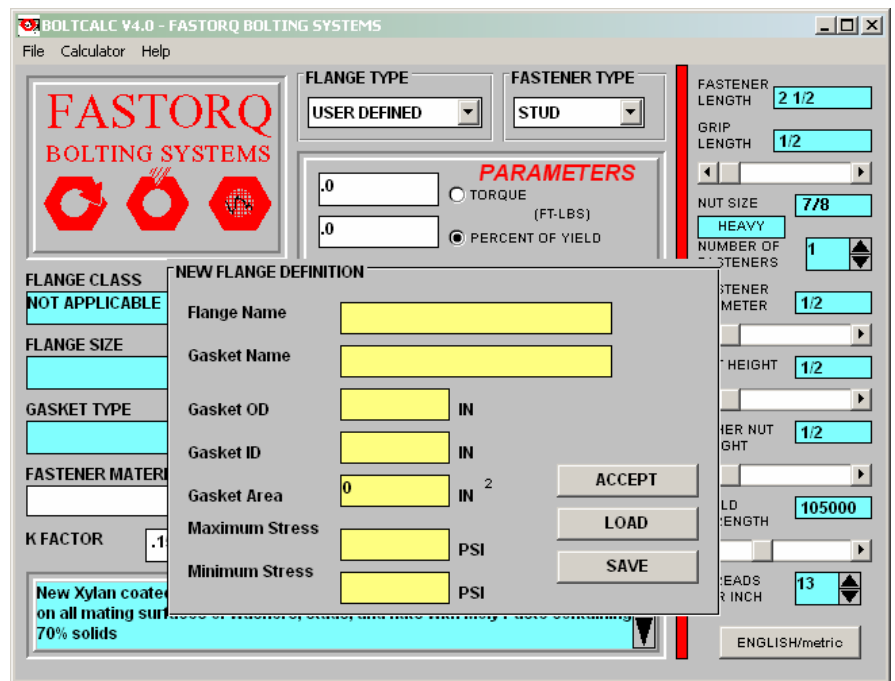
D = bolt diameter in inches

A very user friendly interface was created as the most important stage of development. To use BoltCalc™, simply specify the bolting application and the program will calculate the eight critical parameters of a bolted joint. The program operates on one screen, **Figure 1**, so the information needed is displayed at all times. A toggle allows the operator to switch between imperial and metric units with one click of the mouse.

Enter what you know about your application on the left side of the screen; [flange type, flange class, flange size, gasket type, fastener material, and "K" factor] and BoltCalc displays the specifications of standard API or ANSI flanges on the right side of the screen. These specifications include bolt diameter, length, grip length, number of fasteners in the flange, nut height, yield strength and threads per inch.

Next, choose one parameter from the eight shown in the center section of the screen. Enter a value for that parameter and BoltCalc calculates the other seven.

Applications on other than ANSI and API flanges may be covered by selecting "User Defined" under "Flange Type" which pulls down a screen as shown in **Figure 2**. The operator may define a bolted joint including joint name, gasket O.D., gasket I.D., number of bolts, bolt diameter, yield strength etc. This information may be saved and recalled when required. This allows the user to analyze a bolted joint and substitute design parameters to achieve the desired result.



The program provides warnings if a design parameter is chosen which causes the yield strength of the fastener to be exceeded or the gasket stress to be either higher or lower than recommended. New data is added to the data base on a regular basis to continue to update and improve the program.

George A. Sturdevant
President