Cerberus FEA Engine

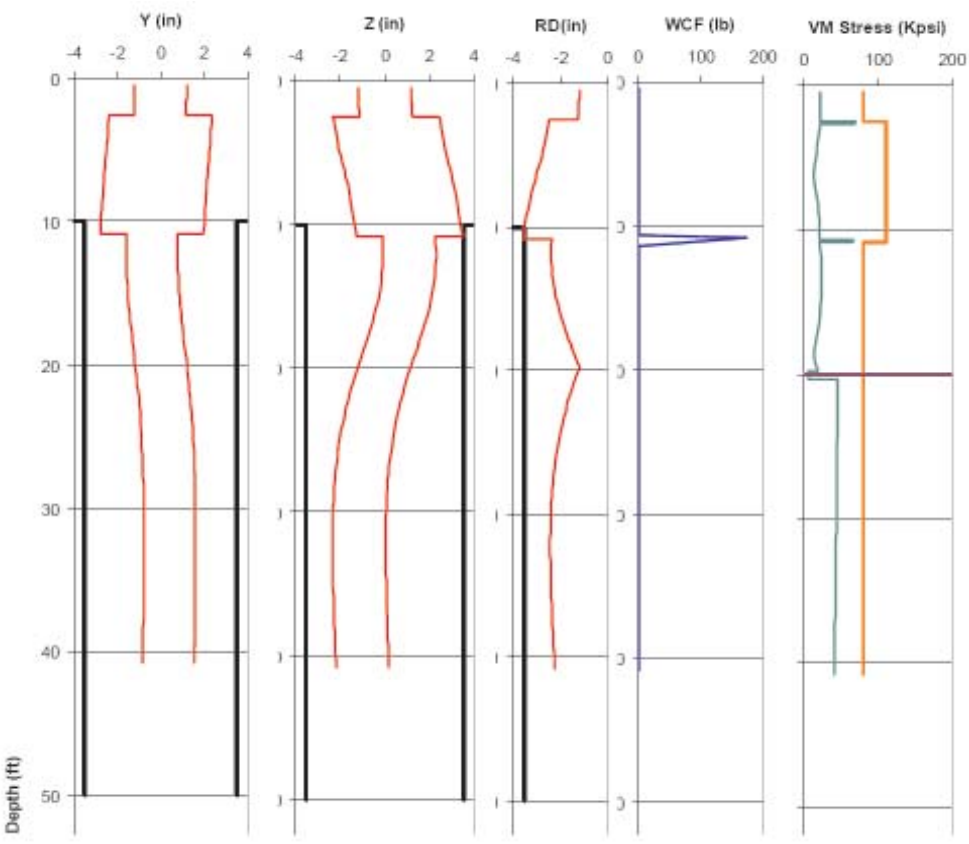
Snubbing Buckling Software

The Cerberus FEA Engine is a highly flexible engineering tool for performing various types of buckling calculations. For example, the Cerberus FEA Engine can calculate buckling situations involving pipe inside a wellbore or a pressure control stack where the BHA is moving through the stripper element. Users can define their specific wellsite conditions and perform buckling calculations based on those conditions.*

The example on the right demonstrates the capability of the software. 2-3/8" tubing with a 4-3/4" packer is being snubbed into a well through a stripper. The stripper appears as a purple horizontal line. The pressure below the stripper is 5,000 PSI, and there is 4,400 lbs of stripper friction. At the top and bottom of the packer there is a thread relief, causing higher stresses in these areas. As the BHA moves downward it buckles until the packer contacts the 7-1/16" ID lubricator. There is a significant wall contact force (WCF) at the point the packer touches the lubricator.

Views A and B show the string (red) inside the well control stack (black), viewing it from the Y and Z directions. Note that the vertical direction is X. Also note that the scale length of 50' in the X direction and ±4" in the Y and Z directions causes the string to appear distorted.

View C shows the maximum radial displacement (RD) along the length of the string. This RD may be at any rotational orientation. View D shows the wall contact forces. There is a spike in the wall contact force where the packer touches the lubricator. View E shows the maximum Von Mises stress and the yield stress. In this case there is a point at about 14' in which the Von Mises stress exceeds the yield stress, and thus the string would likely bend.



View A View B View C View D View E

* This software is intended for engineers, and uses Excel® as the user interface. A user must have an engineering background and a working knowledge of Excel to use the software.

The model can also output values versus time, as shown in the following figures.

The maximum Von Mises stress along the entire length of the BHA is shown versus time. The buckling continued for the first 5 seconds but then stopped as the packer approached the stripper. The sharp increase in compressive force and Von Mises stress near the end of the simulation occurred as the bottom of the packer was pushed into the stripper. The following figure shows the corresponding displacement and compressive force.