Frequently asked Questions

What is the maximum lateral length a given wireline can be used in well with a kickoff point at 7,500 ft. before exceeding its working tension?

March 2013

A

As wells get deeper and longer, more and more weight due to the wireline itself has to be taken into consideration. When a wireline is lowered into a well, it must be able to not only support the weight of any tool string attached to it but also the inherent weight of the wireline itself must be supported. At some point the added weight of the steel armor wire will exceed the ability for the wireline to support itself and can cause damage or even break it.

There are many factors that attribute to the pullout force necessary to retrieve a wireline and the attached tool string. Fluid in the well, wellbore geometry, tool string weight, friction, and debris in the well all contribute to this force and these factors cannot be accounted for in a simple equation. Using well modeling software like Cerebus is a much more accurate way to determine the actual pullout for any given scenario. For this discussion we will be using general assumptions based on perfect well conditions. The following information should only be used as an example and not an actual formula to determine pullout.

In a typical vertical oil or gas well, the cable is free hanging and the full weight of the cable is experienced at the wireline truck. In unconventional wells, like horizontal completions, wellbore geometry including laterals, doglegs, and wellbore azimuth help support the weight of the cable and therefore decrease the weight experienced at the wireline truck. Therefore, it would be possible to extend the length of wireline deployed in a given well in a horizontal section as compared to a vertical well before exceeding the working load of the wireline. In order to calculate the maximum length of horizontal section a wireline can be deployed into we will use a horizontal weight factor of .33 which will assume that the weight realized at the wireline truck by a section of wireline being supported in a horizontal leg of a well will only be one third the weight experienced of that same wireline in a vertical section of a well. Using this general factor, we can estimate the pull out force of a new wireline and tool string in a wellbore under ideal conditions.

For the below example we will be using the specifications for a Camesa 9/32" or 1N29PTZ wireline with a published working tension of 5,100 lbs. with a 200 lb. tool string in a well containing a 7,500 ft. vertical section and a 10,000 ft. horizontal section.

The first step is to account for the weight of the cable suspended in the 7,500 ft. of vertical section of the well **("A" Fig. 1)**. We will take the published weight of the desired wireline, weight in water assuming there is well fluid present, and multiply by the length of the vertical section.

Vertical Section A: $(130 \frac{lbs}{Kft})(\frac{7{,}500\ ft}{1000}) = 975\ lbs$

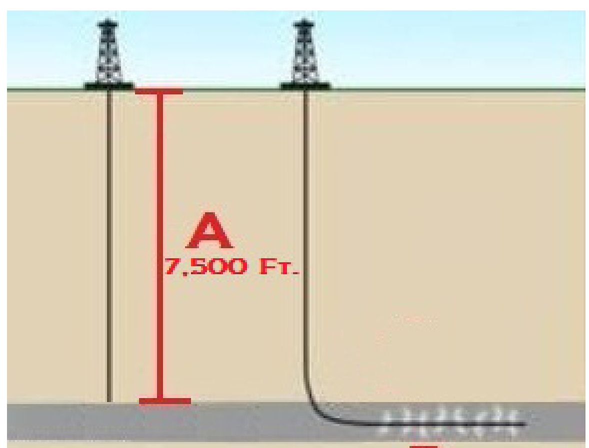

Fig. 1

camesa®

A WireCo® WorldGroup Brand

12200 NW Ambassador Drive, Kansas City, MO 64163 | 816.270.4700 | www.WirelineWorks.com

Next, we will determine the weight of the wireline in the horizontal section **("B" Fig. 1)** by multiplying the cable weight per ft. by the length of the horizontal section and add the weight of the tool string and divide by our estimated weight of cable in horizontal factor.

Horizontal Section B: $\left((130\ \frac{lbs}{Kft})\ (\frac{10{,}000\ ft}{1000}) + 200\ lbs\right)(.33) = 495\ lbs$

The sum of these two sections gives us the total expected weight of the wireline or 1,470 lbs. Given that the working load of this cable is 5,100 lbs. there is still an additional 3,630 lbs. before reaching the published operational limits of the wireline.

With the above information we can now determine the maximum horizontal section of the wellbore we can safely pull our wireline with a 7,500 ft. vertical depth. If we take the remaining allowable weight and divide it by the weight per foot of the cable we will find the remaining maximum length of cable in a vertical section, 27,923 ft. The remaining maximum length is then divided by our estimated weight of cable in horizontal factor and added to the 10,000 ft. of well we've already calculated, we will find the maximum length of cable we can safely pull in a horizontal section before exceeding the working load to be 94,615 ft. If we would like to determine the maximum horizontal necessary to reach the breaking strength of the cable, 10,200 lbs., we can multiply working load maximum horizontal footage by the cable's specification factor of 2. So, for a horizontally drilled well with a kickoff point at 7,500 ft. we can estimate that a 9/32" cable with a 200 lb. tool string would exceed the breaking strength of the cable at a total depth of approximately 189,230 ft. or 35 miles.

Working Load Maximum Horizontal
(3,360 lbs.)/((130 lbs/Kft)/1000) = 27,923 ft
(27,923 ft)/.33 + 10,000 ft = **94,615 ft**

B***reaking Point Horizontal Length***
(94,615 ft)(2) = **189,230 ft**

Contact **Dustin Dunning** for more information or suggestions for Camesa monthly Q/A.
DustinDunning@WireCoWorldGroup.com