

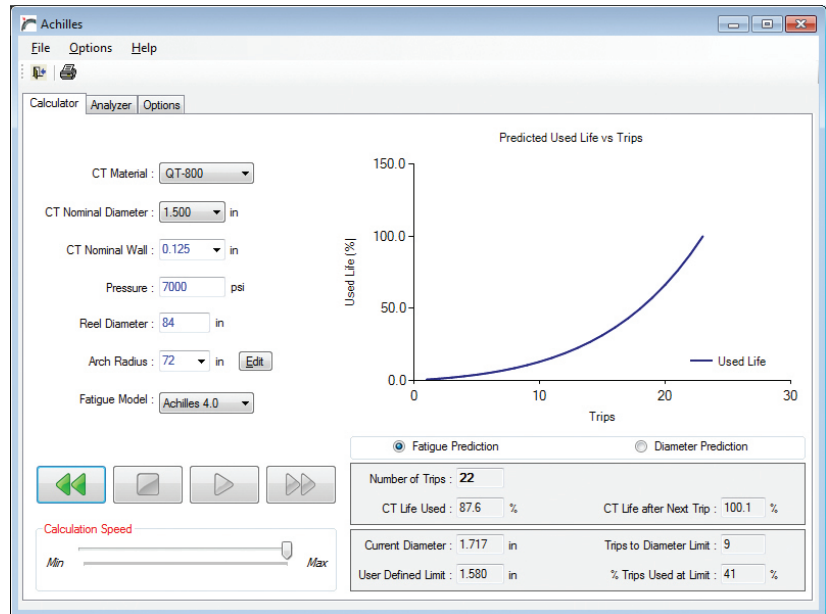
Cerberus™ for Coiled Tubing

Modeling software designed to meet today's coiled tubing job design and monitoring challenges

Cerberus for coiled tubing is the leading commercial modeling software for planning and performing coiled tubing operations. Since 1995, numerous service companies and operators worldwide have relied — and continue to rely — on Cerberus. Cerberus models provide advanced calculations for fatigue life (Achilles™ and Orion™), tubing forces (Orpheus™) and hydraulics (Hydra™).

Cerberus for coiled tubing can be utilized for:

- BHA configuration
- Fatigue life tracking
- Hydraulics simulator
- Job design tools
- Real-time job monitoring
- String design and selection
- Tubing forces model
- Tubing stress limits



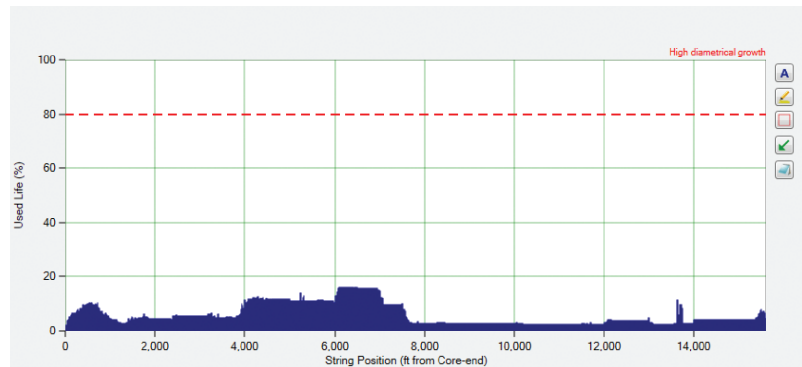
Typical Achilles display

Fatigue

Achilles

Since its debut in 1995, this model has remained the industry standard for coiled tubing life monitoring. Today's complex applications, including drilling and fracturing as well as more conventional workover operations like nitrogen lift and fill removal, require the pipe to be cycled more often and at higher pressures. This makes it critical to track the fatigue life and diameter growth to avoid an expensive and potentially dangerous failure at the wellsite.

Coiled tubing fatigue is caused by plastic bending of the pipe as it is spooled off the reel and over the gooseneck into the well and then back again, during a job. The cumulative fatigue is tracked along the length of the tubing in small increments, taking into account the movement of the tubing and the internal pressure at the moment of bending. Enormous cost savings, both in terms of pipe utilization and reduced wellsite failures, can be achieved compared with older methods (such as running feet).



coiled tubing fatigue as graphically displayed in Cerberus

Orion

The best results are obtained when fatigue life monitoring is performed in conjunction with a data acquisition (DAS) system, such as Orion. Specifically designed to interface with Cerberus, Orion records all data needed for fatigue calculations. It can be run either after the job is complete or in real time at the wellsite, for critical applications like drilling or fracturing.

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Cerberus™ for Coiled Tubing

Forces

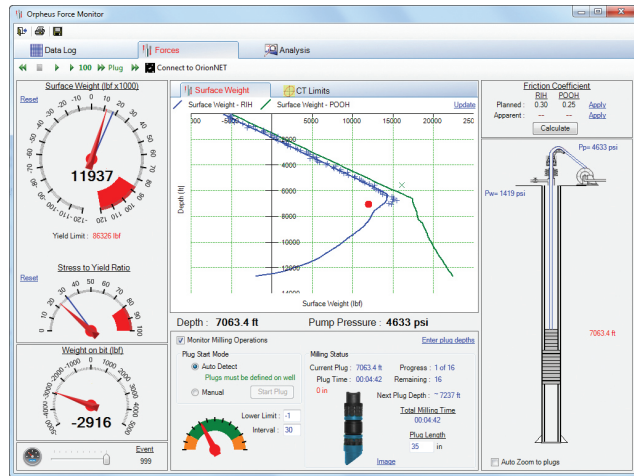
Orpheus

Orpheus, the tubing forces model, calculates the cumulative forces acting on the coiled tubing, taking into account effects such as drag, helical buckling and hydraulics effects, in order to determine the feasibility of the job and anticipate possible problems with lock-up or pipe yield.

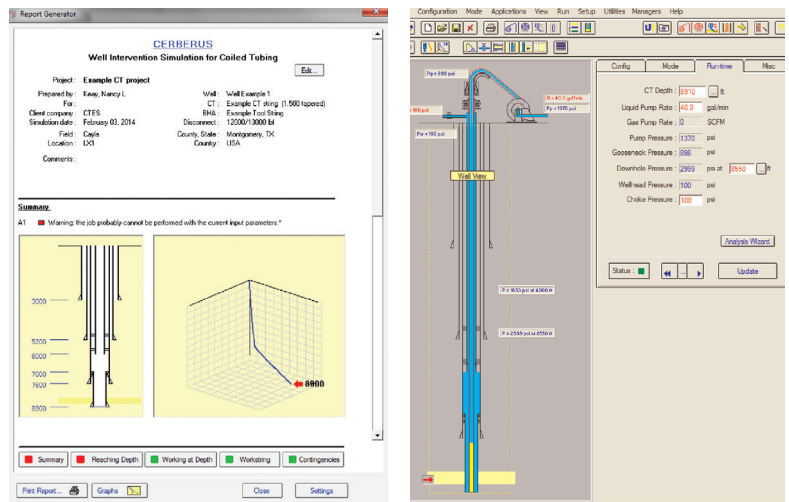
Orpheus can model bottom hole assemblies (BHAs) with features that include knuckle joints, centralizers and rollers. The Toolfit Wizard uses advanced modeling, developed by CTES, to help you design a toolstring capable of navigating highly deviated wellbores or other obstacles.

Orpheus can analyze and model the friction reduction achievable by the use of a pulsation tool. Orpheus' pre-job analysis provides an estimate of the additional coiled tubing penetration depth that can be achieved as a result of the friction reduction provided by the use of the pulsation tool.

The Orpheus Forces Monitor displays real-time weight on bit during a milling operation. It can be used to analyze the surface weights acquired during a job, and this data can be used to identify the friction experienced during the job and help predict the appropriate friction factor to be used in future modeling projects. This analysis corrects for many issues that commonly cause problems when manually performing friction analysis, such as wellhead pressure (WHP) effects, surface friction and weight calibration.



The Orpheus Forces Monitor



Orpheus Report Generator

Hydra supports a wide range of fluid types and models including gases, foams and multi-phase fluids.

Hydraulics

Hydra

The Hydra wellbore module provides a large number of tools to help you design coiled tubing pumping operations. Options range from basic "snapshot" calculations, to more complex simulations where conditions change with time. Extensive use of wizards walk you through the often complex process of choosing fluids and specifying volumes and flow rates, to design a successful workover or drilling program.

Features include:

- Power law, Bingham plastic and Newtonian fluid models
- Foam, gas and multi-phase fluid models
- Well unloading and gas lift design wizards
- Fill removal wizard for sand cleanouts
- Velocity string design wizard

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