

## Coiled Tubing Data Acquisition System

### BASIC DAS Configuration Includes:

#### DAS Hardware

- Rugged construction
- Mounted in a NEMA 4X environmentally sealed enclosure
- Operating temp -40 to +60 C
- Web accessible
- USB memory stick for data transfer and additional data storage
- Up to 5 million data points stored in secure, non-volatile internal memory
- 15 Configurable analog/frequency sensor inputs
- 12 digital channels
- Ethernet / USB / RS232 / RS485 / Modem support
- 15v DC power supply
- 15" LCD / high bright / resistive touch screen complete



## CT Operators Panel Mount Display

- Operator information
- Input calibration factors (encoders / pumps)
- Ruggedized and easy to use
- Zero sensors
- Input pipe offset (CT tools)

### Standard Coiled Tubing Inputs

- Well Head Pressure
- Circulating Pressure
- Tubing Depth (Ability to monitor 2 Encoders to account for slippage)
- Tubing Speed
- Tubing Weight
- Fluid Rate/Total
- N2 Rate/Total

### Available Monitored Inputs

- In-hole tension Pressure
- Out-hole tension Pressure
- System charge Pressure  
\*Helpful for determining Calculated String Weight



Screen shot of Coiled Tubing DAS Operator Interface



Screen shot of Coiled Tubing DAS Charting Interface

## Ruggedized PC with Charting & Analysis Software Pre-Installed

### PC Hardware

- Ruggedized PC for mobile applications
- No moving parts
- Small footprint
- Windows XP embedded
- Solid state 4GB CF Drive Internal (Expandable to 16GB internally, 250 GB externally)
- Wide operational temperature range -40C to +60C
- Supports Multiple Monitors, comes standard with 19" resistive touch panel LCD



### PC Software Graphical Reporting Software

- Windows XP embedded (for ruggedized long-lasting operating system)
- Digital and graphical displays for charting and trending data real time
- Designed for operators (easy to use)
- Updates once a second
- Replay jobs



## Optional Software

**Fatigue Analysis for Coiled Tubing (FACT)** is a management tool that can be used to maximize the safe use of coiled tubing strings. The **Fatigue Analysis**, tracks life consumption of individual coiled tubing strings and parts of the strings subject to jobs carried out in wells or in the yard, and showing life consumption per job.

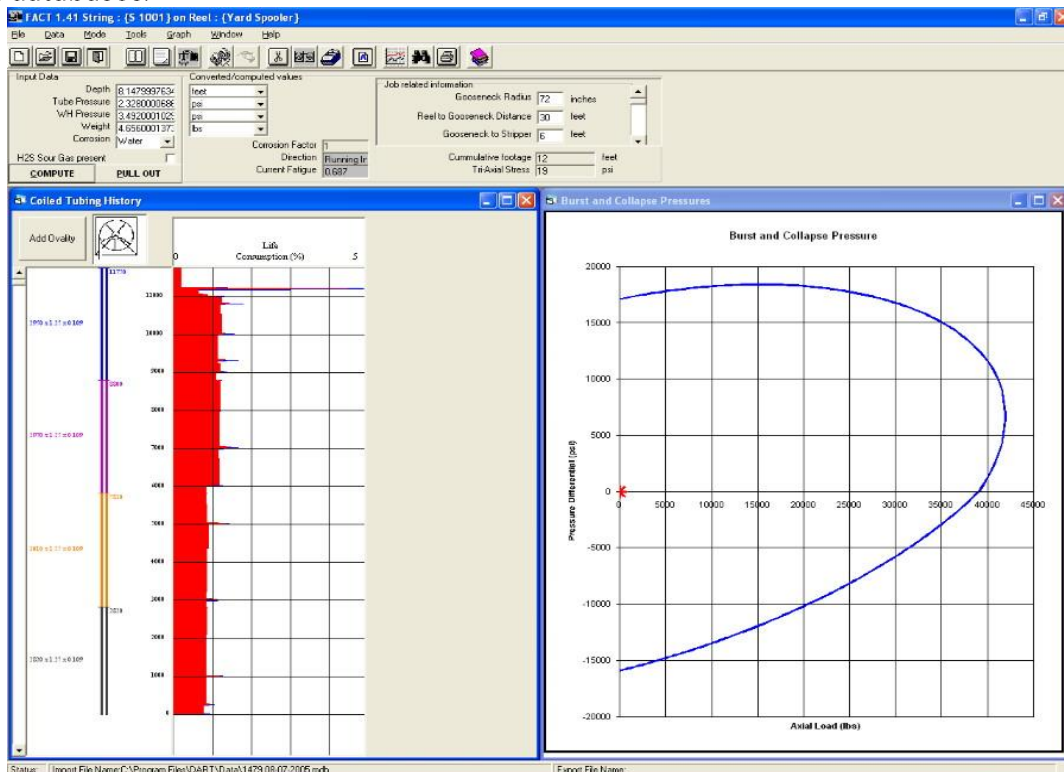
In addition, the module gives the user the option of finding the maximum number of cycles to fatigue failure, with or without internal pressure and subject to user specified geometry of the goose-neck and the reel.

In all the computations of this module, corrosion factors (due to acid, cement, etc.) and stress concentration factors (due to welds) are taken into account.

There are two modes of operation of the program, as a stand-alone program where data can be entered manually, or can be used in real-time reading data directly from the Supreme Electrical Services, Inc. Charting & Analysis Software producing up-to-date state of the pipe as well as the real-time tri-axial stresses.

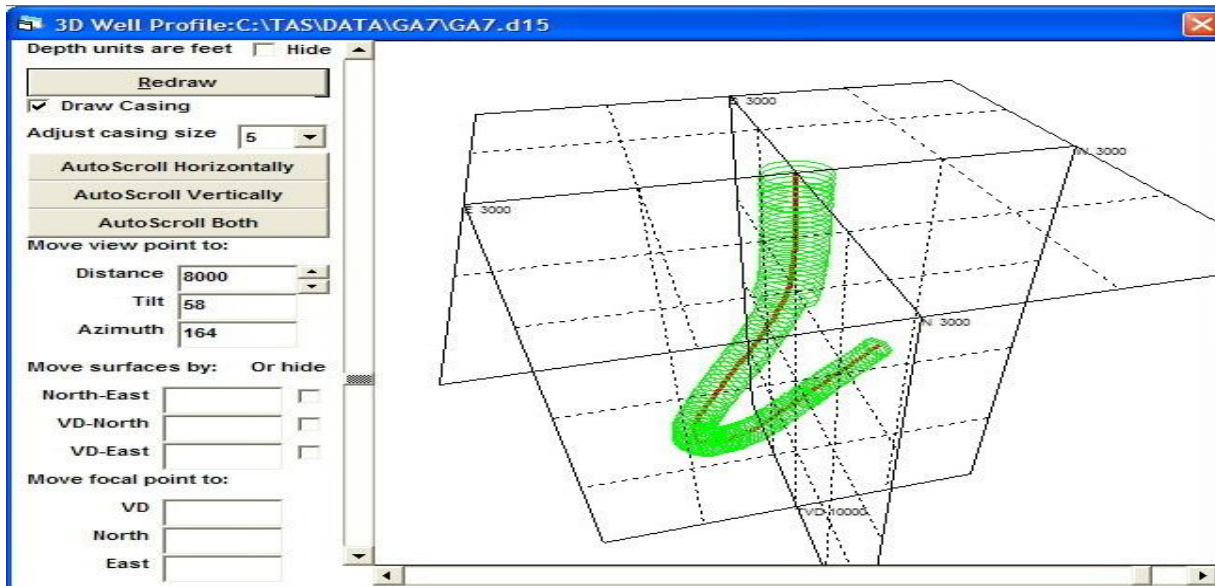
At any time, the user can view the current status of the coiled tubing or can review the history of the string.

A database of the most common coiled tubing sizes and materials currently produced by the manufacturers is included. In addition, a database of most common corrosion factors and stress concentrations due to welds are also included. The user is also able to add new records to the supplied databases.



**Tubing Analysis System (TAS)** is a computer program designed to perform various calculations and simulations often needed in tubular applications. TAS functions as a coiled tubing job simulator that facilitates designing velocity strings, drill pipe applications, under-balanced drilling, as well as cementing, and wire line simulations. TAS is an integrated modular program incorporating **Force and Stress Analysis, Fluid Circulation, and Transient Simulator**, in addition to numerous quick calculator applications that speed up making tubular computations.

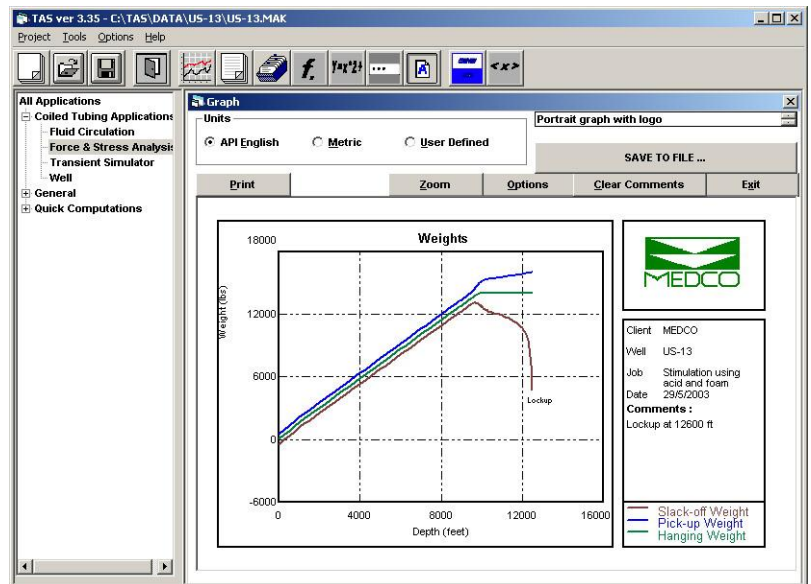
The system runs on any IBM compatible PC using Windows 95 or above. The first release of TAS was in November 1992 and since then, TAS has become a market leading tubular simulation package.



### Force and Stress Analysis Module

The computations in this module include the effects of weight, friction, buoyancy, well head pressure, pressure drop through down hole tools, dog-leg severity, and extra friction (in buckling modes, i.e. sinusoidal and helical.)

The module will automatically detect critical conditions such as lockup and severe dog-legs. Furthermore, several options are available for simulating different scenarios such as applying weight-on-bit, bottom-hole pull, changing well conditions to account for fluid circulation effects, predicting maximum pull, and predicting maximum push to lockup.



## Fluid Circulation Module

This is made up of two models, one for single phase flows and the other for multi-phase.

### Single Phase Model:

- Any one of three models may be used to describe the rheological behavior of liquids as Newtonian, Power-Law or Bingham Plastic.
- The single phase fluids can be compressible (as in the case of gas.)
- Foam is treated as a single phase Bingham Plastic fluid where the rheological properties are a function of the foam quality and the shear rate. Foam is a compressible fluid.

### Multi Phase Model:

User can choose between computations based on:

- Duns and Ros algorithm
- Beggs and Brill algorithm
- Hagedorn and Brown algorithms.

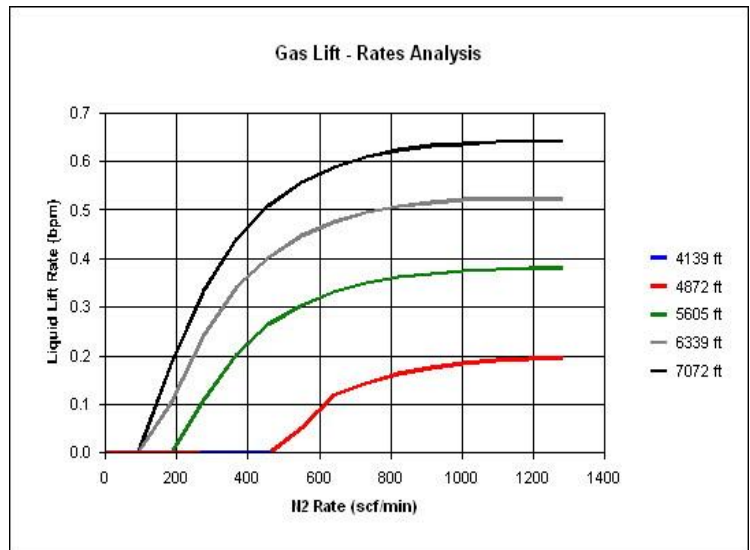
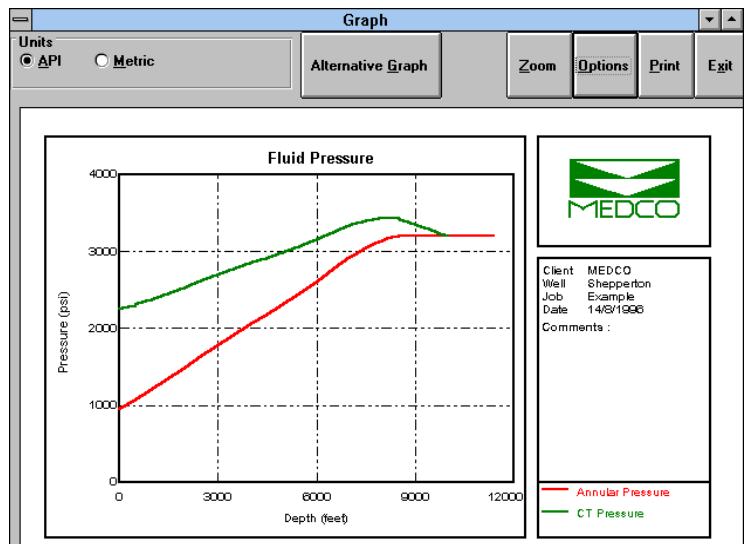
### Other Features include:

- Velocity string designs
- Sand/cuttings cleanout
- Gas lift mandrels
- Sensitivity analysis

### Unload Kill Fluids

This simulator is for designing and optimizing unloading kill fluids using N<sub>2</sub> through coiled tubing.

The module performs a series of scenarios and reports a table of predicted liquid lift rates versus N<sub>2</sub> flow rates at various depths. Total N<sub>2</sub> and time required are also reported.



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