



# Insite<sup>®</sup> for Well Intervention (IWI<sup>™</sup> software)

Job design and real-time monitoring for hydraulic workover and snubbing



# Hydraulic workover and snubbing workstring design software

## Overview

The Halliburton InSite® for Well Intervention (IWI™) software provides robust modeling that helps create customized solutions for specific intervention challenges. In collaboration with Halliburton technical advisors, customers can simulate operating scenarios to investigate anticipated working conditions.

This in-depth insight into the job design and collaborative modeling can help align operational expectations and execution strategies between the operator and service provider. This approach supports the development of tailored intervention solutions for hydraulic workover and helps improve planning for the proposed operation.

Built and refined over many years, Halliburton IWI software allows users to accurately model various types of jointed pipe operations before mobilization. Design files export directly the real-time mode of the operation to help maintain continuity of wellbore information. Users may save and export entire model files or specific components to support comparison and analysis across teams. This process helps teams create accurate models and execute operational plans with clarity and consistency. This real-time capability connects with the Halliburton hydraulic workover (HWO) data acquisition system (DAS) on location. This connection streams real-time data to a real-time observation (RTO) center to support timely analysis.

### IWI™ Software Features

- In-depth modeling and design software for well intervention
- Modes for coiled tubing, jointed pipe, and wireline
- Force and limit models
- Hydraulic models
- Pipe fatigue models
- Drag and reach analysis
- Solids removal analysis
- Workstring design
- Depth or time-based plotting
- Detailed job analysis and comparative review
- Shareable models and components
- Collaborative planning for job optimization





### How it works

IWI™ design software operates as a desktop or web-based application. Users access the web based version without installing program files or configuring internal network systems. They log in with a license ID through a secure network connection to use the intervention design tool. Users access the web-based without installing program files or configuring internal network systems.

Users create, edit, and share job design files as needed. These files are compatible with the web-based design program and the full InSite® computer software program used by Halliburton engineers. Access to the IWI design software is granted on a license basis.



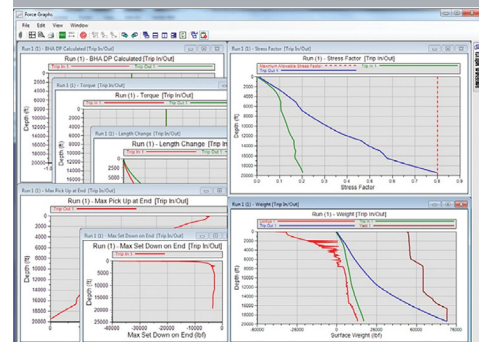
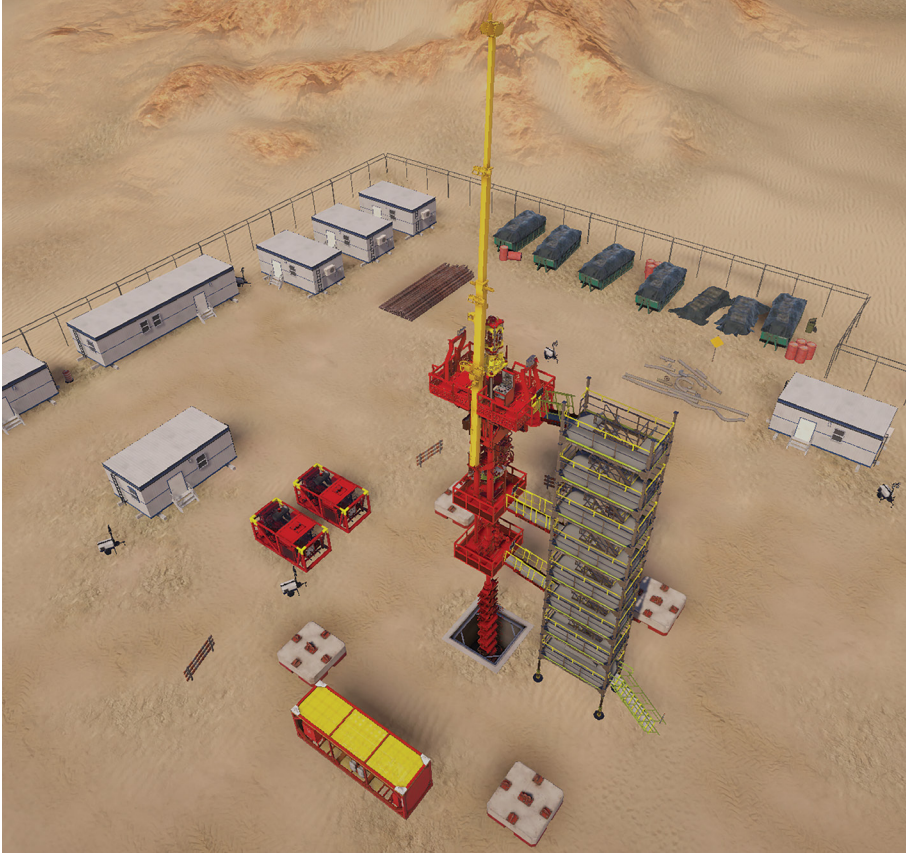


FIGURE 1

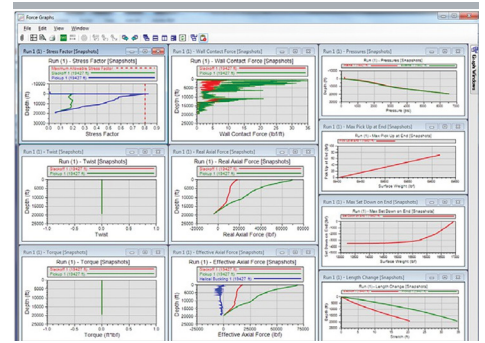


FIGURE 2

» **FIGURE 1** - The IWI design software manager is used to build a detailed wellbore model to be integrated into the other design modules to provide more accurate analysis.

» **FIGURE 2** - An extensive array of job aspects can be reviewed in the job model, including a thorough selection of force and stress limit parameters.

### HWO/Snubbing job design using IWI™ software

As wells extend deeper, exhibit higher deviation, and increase in overall complexity, accurate workstring design and analysis becomes essential. The IWI™ software supports detailed evaluation of hydraulics and mechanical forces before an operation to help determine feasibility and plan for expected conditions.

#### Forces and stress

The IWI™ software design forces module models HWO workstring deployment with or without tools by using an accurate representation of the wellbore. The program analyzes the cumulative forces within each stage of the operation and determines whether the workstring can reach target depth, complete required tasks, and return equipment to surface. This module supports simulations for HWO/snubbing operations, including workover, drilling, and extended-reach plug-milling applications.

The drag model estimates parameters such as maximum reach, with and without lubricants or mechanical aids, as well as lock-up depth. It also provides estimates of forces such as the available push force on the end of tubing at various depths and maximum pull forces for a wide range of well conditions relative to workstring yield limits.

The software produces design outputs quickly to support analysis of forces encountered during a HWO/Snubbing operation.

## Multiple case comparisons

The IWITM software includes an advanced feature that allows users to compare several cases within a single design. This capability helps determine which jointed pipe workstring is most suitable for a specific application. Users may view multiple runs on a single output graph to support efficient evaluation. Comparisons can be based on any selected input parameter.

Force Hydraulic Stage Table															
Graph	Direction	Start Depth	End Depth	BHA	Nozzle Mode	Override BHA DP	BHA DP	Stripper Force	Initial Fluid Position Profile	IFP	Name of Fluid in JP	Density of Fluid in JP	Name of Fluid in Annulus	Density of Fluid in Annulus	JP Flow Path
		ft	ft				psi	lbf				lb/gal		lb/gal	
Snapshot: Trip In/Out															
+ Calc	Calc			Run 1 (RIH & POOH W Production String) - Type: "Standard" Well: "IWI-HWO" Friction Profile: "[Default Coefficients]" JP String: "ADNOC -DY-046 Production string"											
+ Calc	Calc			Run 2 (RIH & POOH W Cleanout BHA 30RPM) - Type: "Standard" Well: "IWI-HWO" Friction Profile: "OH Reaming FF" JP String: "DY-005 - 4in Drill Pipe XT39 15.7#"											
+ Calc	Calc			Run 3 (RIH & POOH W Cleanout BHA 45RPM) - Type: "Standard" Well: "IWI-HWO" Friction Profile: "OH Reaming FF" JP String: "DY-005 - 4in Drill Pipe XT39 15.7#"											
- Calc	Calc			Run 4 (RIH & POOH With Production String) - Type: "Standard" Well: "IWI-HWO" Friction Profile: "[Default Coefficients]" JP String: "ADNOC -DY-046 Production string"											
4-1	RIH	0.0	12118.0		Jet			500	[Use Single Fluids]		Brine NAACL 8.8 PPG	8.80	Brine NAACL 8.8 PPG	8.80	In
4-2	None	12118.0	12118.0				0	500	[Use Single Fluids]		Brine NAACL 8.8 PPG	8.80	Brine NAACL 8.8 PPG	8.80	In
4-3	POOH	12118.0	0.0		Jet			500	[Use Single Fluids]		Brine NAACL 8.8 PPG	8.80	Brine NAACL 8.8 PPG	8.80	In
NEW															
- Calc	Calc			Run 5 (RIH & POOH With 3.5inch DP) - Type: "Standard" Well: "IWI-HWO" Friction Profile: "OH Reaming FF" JP String: "DY-46 3.5" 15.5#"											
5-1	RIH	0.0	12160.0	Scrapper BHA- ADNOC NEB	Jet			500	[Use Single Fluids]		Brine NAACL 8.8 PPG	8.80	Brine NAACL 8.8 PPG	8.80	In
5-2	RIH	12160.0	16162.0	Scrapper BHA- ADNOC NEB	Jet			500	[Use Single Fluids]		Brine NAACL 8.8 PPG	8.80	Brine NAACL 8.8 PPG	8.80	In
5-3	None	16162.0	16162.0	Scrapper BHA- ADNOC NEB	Jet		28	500	[Use Single Fluids]		Brine NAACL 8.8 PPG	8.80	Brine NAACL 8.8 PPG	8.80	In
5-4	POOH	16162.0	12160.0	Scrapper BHA- ADNOC NEB	Jet			500	[Use Single Fluids]		Brine NAACL 8.8 PPG	8.80	Brine NAACL 8.8 PPG	8.80	In
5-5	POOH	12160.0	0.0	Scrapper BHA- ADNOC NEB	Jet			500	[Use Single Fluids]		Brine NAACL 8.8 PPG	8.80	Brine NAACL 8.8 PPG	8.80	In
NEW															
- Calc	Calc			Run 6 (RIH & POOH With 4 inch DP_1) - Type: "Standard" Well: "IWI-HWO" Friction Profile: "OH Reaming FF" JP String: "DY-46 4" 15.7#"											
6-1	RIH	0.0	12160.0	Scrapper BHA- ADNOC NEB	Jet			500	[Use Single Fluids]		Brine NAACL 8.8 PPG	8.80	Brine NAACL 8.8 PPG	8.80	In
6-2	RIH	12160.0	16162.0	Scrapper BHA- ADNOC NEB	Jet			500	[Use Single Fluids]		Brine NAACL 8.8 PPG	8.80	Brine NAACL 8.8 PPG	8.80	In
6-3	None	16162.0	16162.0	Scrapper BHA- ADNOC NEB	Jet		28	500	[Use Single Fluids]		Brine NAACL 8.8 PPG	8.80	Brine NAACL 8.8 PPG	8.80	In
6-4	POOH	16162.0	12160.0	Scrapper BHA- ADNOC NEB	Jet			500	[Use Single Fluids]		Brine NAACL 8.8 PPG	8.80	Brine NAACL 8.8 PPG	8.80	In
6-5	POOH	12160.0	0.0	Scrapper BHA- ADNOC NEB	Jet			500	[Use Single Fluids]		Brine NAACL 8.8 PPG	8.80	Brine NAACL 8.8 PPG	8.80	In
NEW															

FIGURE 3

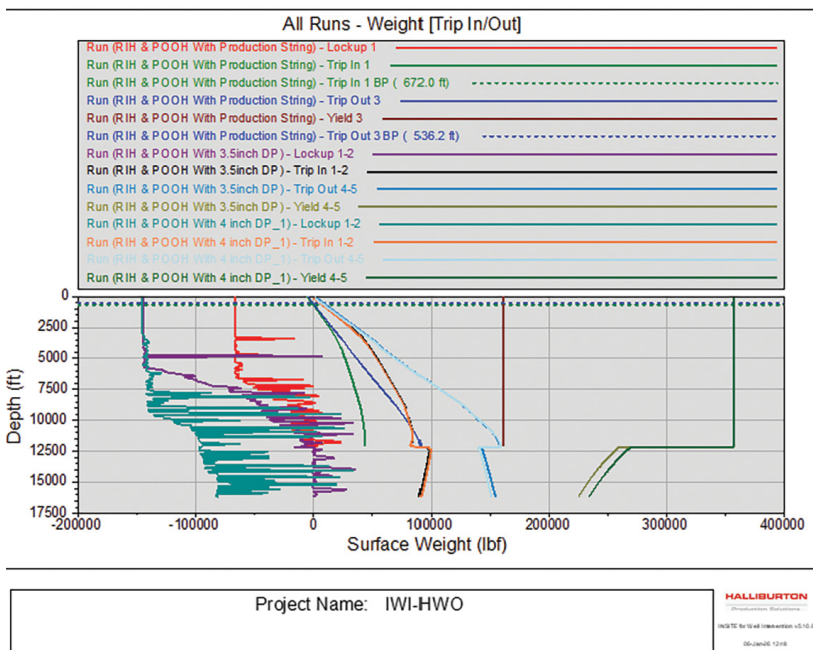


FIGURE 4

» FIGURE 3 - IWI design software supports multiple job scenarios within a single model to review the impact of minor adjustments or significant changes.

» FIGURE 4 - Analysis of multiple job scenarios can be compared side-by-side to help optimize a target job design.

## Well hydraulics

IWI™ design software models fluid hydraulics in the workstring and wellbore with accuracy based on established parameters. Fluid flow is influenced by several conditions, including string and wellbore geometry, fluid properties, pump rate, measured depth, choke pressure, and reservoir properties. Slight changes can have a minimal or significant influence on the potential success of a job.

Hydraulics simulations in IWI software use empirical data supported by Halliburton's experience in drilling fluids, cementing, stimulation, and fracturing. Extensive testing using fluids and proppants in tubing has also been performed to complement this experience.

The model applies advanced energy-balance calculations, which include frictional heating attributed to fluid flow, heat transfer between formation and wellbore, heat transfer

between annulus and tubing, and heat transfer within the tubing and annulus along the flow path. Pressure and temperature values appear throughout the system as fluids move through the wellbore.

The hydraulics design module combines hydraulic calculations with a powerful graphical interface that helps users predict flow rates and pressure at any stage during an HWO/Snubbing pumping operation. As with the forces model, users may evaluate different pump-rate inputs within a single job to support efficient decision-making.

Practical applications include modeling scenarios for fluid displacement, fill removal, and plug milling, where parameters such as annular velocity and friction pressure might be of design interest.

» FIGURE 5 - IWI design software provides a thorough hydraulics analysis for review of flow and pressure parameters expected during an operation.

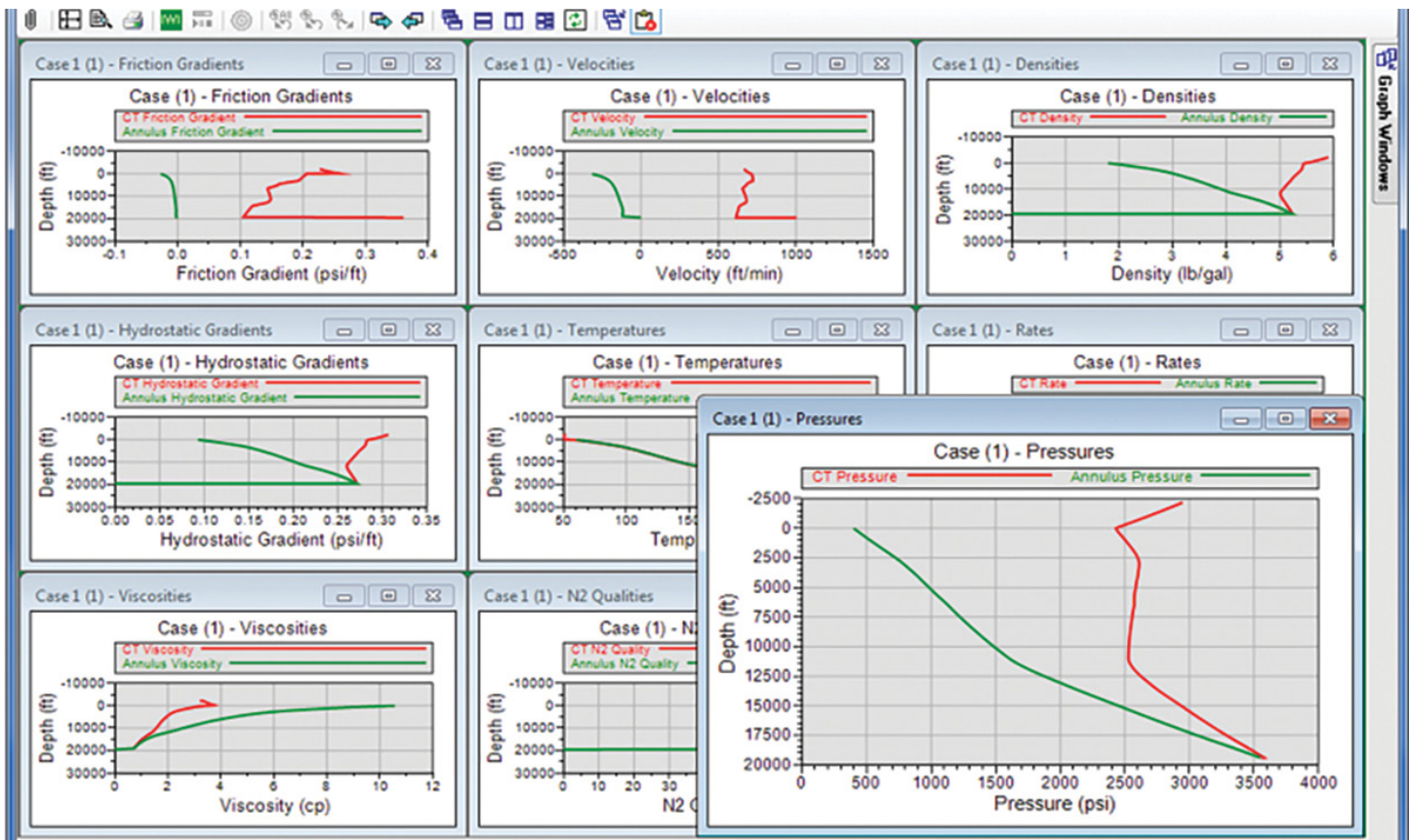


FIGURE 5

## Stage table design

The IWITM design software includes a feature that incorporates the dimension of time into analysis. This capability calculates hydraulics and mechanics across the full operation and charts any selected parameter against time. With this functionality, users can view maximum workstring and tubing stresses on surface and downhole throughout the operation. These calculations update as hydraulics change based on user defined inputs. Pressure can be calculated at locations such as the choke or reservoir, and input values can be adjusted to optimize job performance. Volumes and times for different operations are calculated automatically to aid job planning.



FIGURE 6

Depth-based plotting provides a graphical view of the entire operation from start to finish. This representation tracks fluid positions, temperature profiles, force and stress in the wellbore throughout the simulated operation.

» **FIGURE 6** - The Stage Table mode supports more complex job designs to be reviewed with the capability to simulate an operation in step-by-step detail.

» **FIGURE 7** - The depth-based plotting feature provides an animated graphic representation of the job model as it moves through the operating sequence and charts selected parameters along the way.

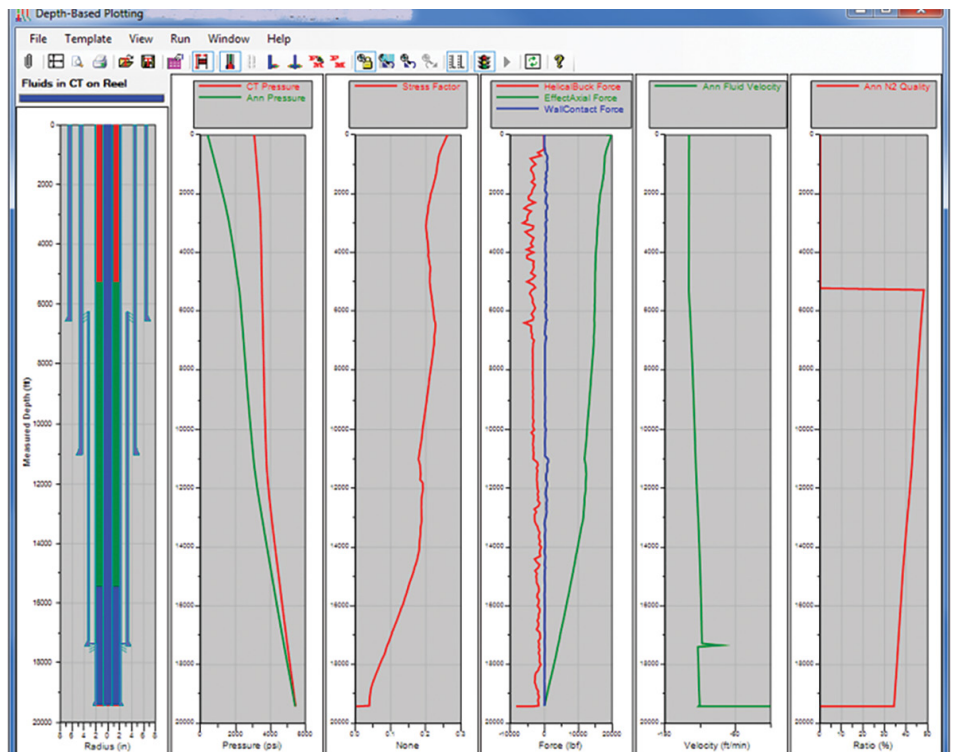
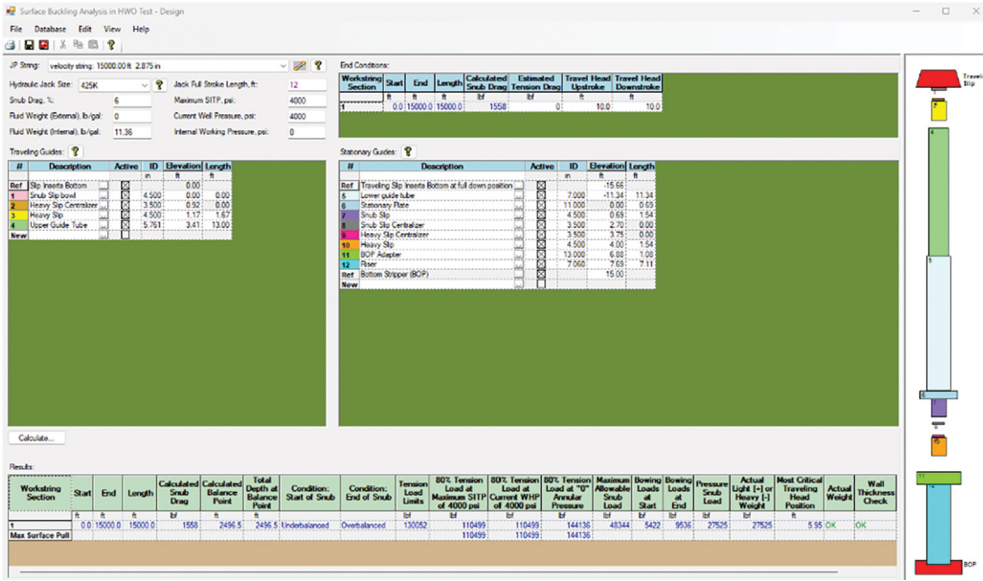


FIGURE 7



» FIGURE 8 - The surface buckling feature allows the design of component deployment through the HWO unit and BOP stack.

» FIGURE 9 - The plot shows (top) the pipe limits under API and (bottom) combined with the Von Mises stress factor.

FIGURE 8

### Surface buckling

A critical part of any HWO operation is the snubbing of the workstring and BHA through the jack and strippers within the surface rig-up.

The Halliburton surface buckling application provides a view of maximum stress during this critical point in the operation. The software supports evaluation of centralizing guide element placement within the HWO unit and helps determine the maximum allowable jack stroke length needed to avoid buckling.

### Pipe limits

The jointed pipe limits calculator evaluates how different factors influence burst and collapse pressure, as well as maximum tensile and compressive axial loads on tubing and drill pipe. Understanding pipe limits applied to snub forces is critical for planning HWO operations. IWITM software provides analysis under three scenarios: (1) Halliburton stress factor, (2) Von Mises, or (3) API 5C3. These options support validation under multiple engineering principles.

### Drill pipe limits

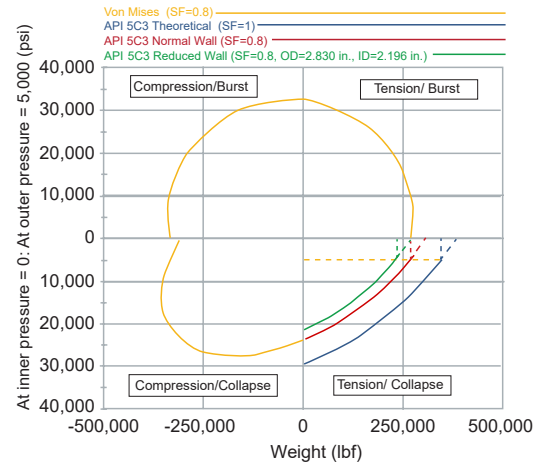
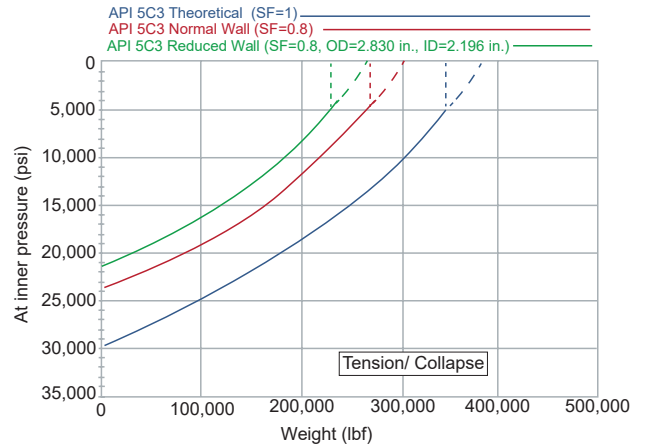


FIGURE 9

## BHA design

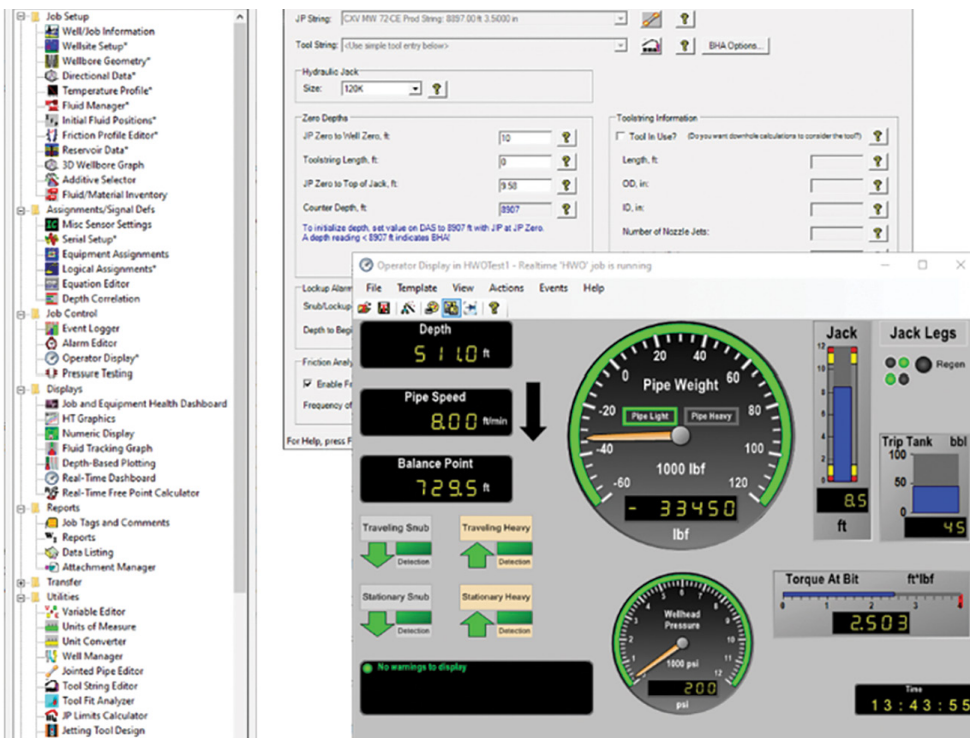
The IWI™ software bottomhole assembly (BHA) module supports the design of various downhole tool assemblies to better simulate the planned operation. The model evaluates factors such as maximum rigid length to assess tool-string length relative to well trajectory and dogleg severity (DLS). It also simulates the expected pressure drop in the BHA for various fluids and pump rates and the corresponding impact on surface pressures and potential pipe fatigue.

## HWO DAS and Real-Time (RT) IWI™ Software

An HWO-specific DAS designed for full integration with the IWI™ software platform is available

## Job tracker

The IWI software job tracker allows post-job data to be uploaded to a central database for remote interpretation and analysis by Halliburton HWO subject matter experts.



Through the PLC-based DAS, job data is continuously collected from more than 35 sensors on unit, including:

- Optional operator HMI at the workbasket
- Architecture that supports additional inputs
- Continuous data monitoring of well parameters
- Pumping and fluid system monitoring
- Real-time depth tally
- Gas sensors in critical areas
- Alerts and alarms
- Event logging

The HWO DAS connects to the IWI software on location in real time to provide:

- Real-time friction matching to change parameters on-the-fly
- Data output to the customer's office
- Data transfer through WITSML

FIGURE 10

» FIGURE 10 - HWO DAS RT IWI software output

» FIGURE 11 - IWI software job tracker database

The screenshot shows the Halliburton Job Tracker interface. It features a search bar with 'Job Count: (948 jobs found)'. Below the search bar are filters for 'Category: Measured Data' and 'Parameter: Max Depth Reached'. The main area displays a table with columns: S.No., Region, Country/State, Info Order, Job, Thread/Well, Rig Name, Rig Type, Is Offshore Well?, Max Well Depth (ft), Max Well Depth (m), and Job ID. The table contains 30 rows of data for various regions including Argentina, Egypt, India, and Indonesia.

S.No.	Region	Country/State	Info Order	Job	Thread/Well	Rig Name	Rig Type	Is Offshore Well?	Max Well Depth (ft)	Max Well Depth (m)	Job ID
28	Latin America Summary	Argentina	NR201327	Prevent	CA20-55	Rig Type	No	91.6	2792	201	
29	Latin America Summary	Argentina	NR201327	Prevent	CA20-55	Rig Type	No	91.6	2792	100	
30	Middle East North Africa Summary	Egypt Area	NR201328	Prevent		Rig Type	No	22.6	6962	124	
31	Middle East North Africa Summary	Egypt Area	NR201328	Prevent		Rig Type	No	22.6	6962	124	
32	Asia Pacific Summary	India Area	NR201329	Prevent		Rig Type	No	60.6	1846	2	
33	Asia Pacific Summary	India Area	NR201329	Prevent		Rig Type	No	60.6	1846	2	
34	Asia Pacific Summary	India Area	NR201329	Prevent		Rig Type	No	60.6	1846	2	
35	Asia Pacific Summary	India Area	NR201329	Prevent		Rig Type	No	60.6	1846	2	
36	Asia Pacific Summary	India Area	NR201329	Prevent		Rig Type	No	60.6	1846	2	
37	Asia Pacific Summary	India Area	NR201329	Prevent		Rig Type	No	60.6	1846	2	
38	Asia Pacific Summary	India Area	NR201329	Prevent		Rig Type	No	60.6	1846	2	
39	Asia Pacific Summary	India Area	NR201329	Prevent		Rig Type	No	60.6	1846	2	
40	Asia Pacific Summary	India Area	NR201329	Prevent		Rig Type	No	60.6	1846	2	
41	Asia Pacific Summary	India Area	NR201329	Prevent		Rig Type	No	60.6	1846	2	
42	Asia Pacific Summary	India Area	NR201329	Prevent		Rig Type	No	60.6	1846	2	
43	Asia Pacific Summary	Indonesia	NR201330	Prevent		Rig Type	No	1.7	4294	6	
44	Latin America Summary	Argentina	NR201331	Prevent	OTG-1001	Rig Type	No	24.1	7349	9	
45	Latin America Summary	Argentina	NR201331	Prevent	OTG-1001	Rig Type	No	24.1	7349	9	
46	Latin America Summary	Argentina	NR201331	Prevent	OTG-1001	Rig Type	No	24.1	7349	9	
47	Asia Pacific Summary	Indonesia	NR201332	Prevent	OTG-1001	Rig Type	No	24.1	7349	9	
48	Asia Pacific Summary	Indonesia	NR201332	Prevent	OTG-1001	Rig Type	No	24.1	7349	9	
49	Asia Pacific Summary	Indonesia	NR201332	Prevent	OTG-1001	Rig Type	No	24.1	7349	9	
50	Asia Pacific Summary	Indonesia	NR201332	Prevent	OTG-1001	Rig Type	No	24.1	7349	9	
51	Latin America Summary	Argentina	NR201333	Prevent	OTG-1001	Rig Type	No	24.1	7349	9	
52	Latin America Summary	Argentina	NR201333	Prevent	OTG-1001	Rig Type	No	24.1	7349	9	
53	Latin America Summary	Argentina	NR201333	Prevent	OTG-1001	Rig Type	No	24.1	7349	9	
54	Middle East North Africa Summary	Saudi Arabia	NR201334	Prevent	OTG-1001	Rig Type	No	24.1	7349	9	
55	Middle East North Africa Summary	Saudi Arabia	NR201334	Prevent	OTG-1001	Rig Type	No	24.1	7349	9	

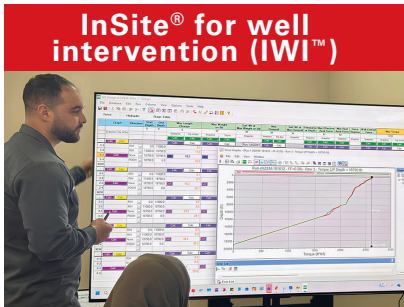
FIGURE 11







## Remote job monitoring

The Halliburton InSite Anywhere service provides secure access to real-time information from ongoing operations. Users can remain connected to operational data through a computer or mobile device.

The IWI™ software for HWO and snubbing integrates with Halliburton DS365™ remote monitoring capabilities to support real-time observation and data continuity across locations.



**InSite® for well intervention (IWI™)**

-   
Real-time data historian
-   
Remote customer data center
-   
DSRT 365 desktop/mobile
-   
Halliburton RTO or office

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