

SS3D™ ShockSim 3D Model With HPET™ Validation

PREDICTING AND VALIDATING JOB DESIGNS PROVIDE ASSURANCE OF SUCCESS

Not running an assurance model can cost USD 100 million or your deepwater well. Predicting and understanding the dynamic shock-loading response of the completion and perforating gun strings can deliver the assurance and peace of mind to know you will be successful.

OVERVIEW

Operators and service providers have begun to recognize wells are pushing the limits of design, and a new level of capability is necessary to truly understand and predict dynamic events. This risk of the unknown has driven the industry to look for ways to quantify dynamic effects at zones of interest during the perforation event.

Understanding the dynamic shock loading response of the completion and perforating gun strings during detonation is critical to the development of better completion systems and optimal job designs with maximum reliability.

To this end, Halliburton has developed the SS3D™ ShockSim 3D model with the ability to provide advanced downhole modeling and gun dynamic response predictions, which are fully validated with the use of the HPET™ Halliburton Perforating Evaluation Tool. With this advanced modeling capability, Halliburton is able to conduct unique and complex failure analyses of perforating operations undertaken with high confidence for success.

The modeling software package was developed to simulate the 3D transient shock response of the bottomhole assembly (BHA) and wellbore to perforating gun detonation. The front end of the package consists of a proprietary graphical user interface (GUI) and model preprocessor.

Understanding the stress-strain relationships yields a more accurate characterization of downhole events than those that only consider the pressure responses. This is accomplished with the HPET tool's unique ability to be placed directly in the perforating gun string at multiple points, rather than only above or below the perforated interval like the industry standard fast gauges.

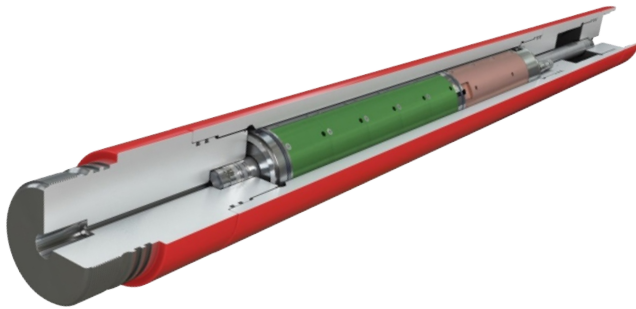
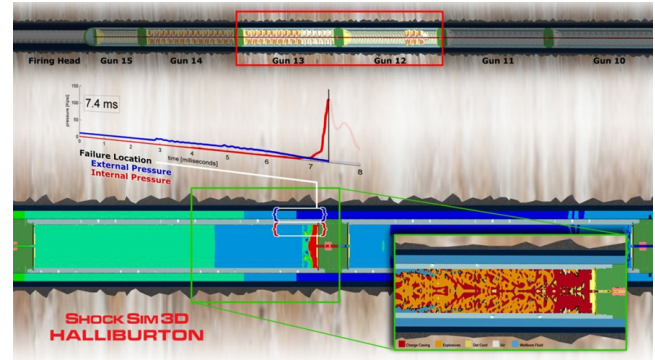
SS3D BENEFITS

- » Can be run anywhere in the world due to its centralized processing facility
- » Uses a 3D model instead of a 1D model, which improves shock prediction and impact on BHAs
- » The proprietary GUI provides the user a uniquely customized interface for efficiently defining the BHA, wellbore geometry, fluids, initial and boundary conditions, and other simulation parameters.
- » 3D interactive visual representations during the perforation event that are an intuitive visualization of results



FEATURES

- » Combinability with the Halliburton Advanced Perforating Flow Lab to verify the shock loading model's predictions prior to deployment.
- » Multifaceted gun string failure investigation
- » SS3D modeling is a 3D structural and 2D fluid code
- » Parameter sensitivity studies enabled refinement and validation of fluid model approach



HPET Halliburton Perforating Evaluation Tool

HPET BENEFITS

The HPET tool can be placed anywhere in the perforating assembly for prediction, collections, and validation.

- » More data available for job verification, post-job analysis, and model validation
- » 12 active channels for high-speed recording
 - Tool string acceleration, mechanical strain/stress in the tool string, dynamic wellbore pressure, and static pressure/temperature
 - Each channel provides 100,000 data samples
- » Captures stress and strain, which yields a more accurate characterization of downhole events
- » Enables life-of-well, time-lapsed reservoir monitoring capabilities for proactive asset management



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