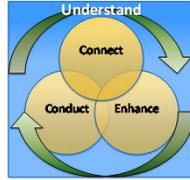
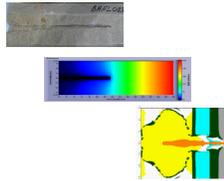


## Philosophy of Completions



Every part of the Payzone process can be seen in the process of applying Payzone perforating solutions.

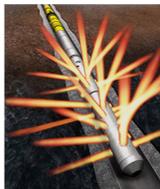
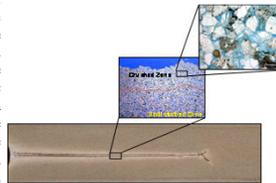
**Understand the reservoir:** Perforating Science projects have produced advanced testing for perforating at reservoir conditions coupled with dynamic event modeling software to fully understand the optimum perforating method and then integrate the results with BHI's full reservoir modeling capabilities. These advances serve to create optimum technical offerings initially, then to subsequently select the best method for a specific well from those offerings, and further to customize the application of that method for specific reservoir conditions.



**Connect to the reservoir:** Gun systems, including the explosive shaped charges and mechanical components, are designed to provide the optimum connection between the wellbore and the reservoir at downhole conditions.

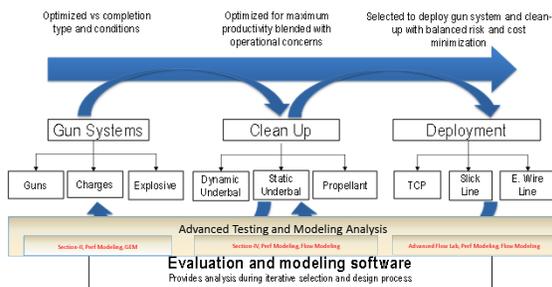
This optimum connection is selected based on the reservoir and completion conditions. Guns systems have been optimized for conditions that include some of the harshest environments seen in the ultra HPHT and deepwater markets.

**Enhance:** Perforation clean-up is an important part of reservoir enhancement. While the gun system generally controls the size, shape, number and orientation of the perforations, the perforation clean-up method significantly impacts the effectiveness of those perf tunnels. Methods such as static underbalance, dynamic underbalance, or a combined underbalance effect to clean the tunnel, or using propellant systems to create fractures and stimulate the reservoir, customized solution by using advanced hardware combined with high-powered modeling software to optimize the process and insure the best results for specific reservoir conditions.



**Conduct:** Conveyance Systems are designed for compatibility with overall methods to conduct hydrocarbons. The overall completion design can include various isolation, control and lift systems. Proper conveyance systems account for safe detonation, reduced formation damage, and often combine multiple operations to reduce cost, time, and risk during installation.

## Perforation Design Process



## Advanced Laboratory Testing

• **Flow laboratory:** Clear vehicle to design, evaluate and optimize perforator performance.

• **Measurements from a Section-IV test:**

- Pre- and post-flow permeability
- Core flow efficiency
- Productivity
- Dynamic high-speed pressure



• **Advanced Analysis and Capabilities**

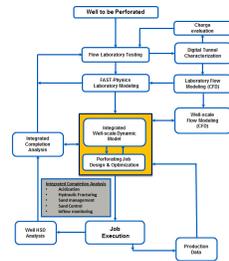
- Improve tunnel clean-up thru underbalance optimization (SPE 170259-MS)
- Computational modeling to complement laboratory testing
- Detailed tunnel characterization using advanced scanning and core analysis techniques.
- Effects of Drilling Damage on Shaped Charge Performance
- Influence of different wellbore fluids/acids on clean up and productivity
- Advanced core analysis including mechanical Properties, mineralogy, CT scanning, SEM, Particle Size Analysis etc.
- Quick turn Section-II testing capabilities (8 shots per day) for characterization of shaped charge performance in downhole conditions



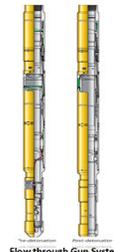
## Robust Computational Models

Modeling tools for Design and Optimization of Perforated Completions

- Dynamic Event Modeling
- Lab-to-Field Scale Predictions using FAST-Computational Models
- Computational Fluid Dynamics
- Gun Performance Calculators
- Inflow Nodal and Completion Analysis



## Customized Products



## Summary

Integrated Perforating Solutions for Optimal Well Completions: Providing a perforating solution that is truly optimized for the reservoir is challenging, requiring advanced laboratory testing capabilities, reservoir specific products and systems, robust analysis and modeling tools, and a thorough process to insure solutions are designed, executed, and reviewed for continuous improvement and optimization.

Laboratory testing, integrated modeling and analysis tools, customized products and services, and above all, a disciplined system-level process culminate into a workflow, which helps operators achieve an optimized perforated completion.

This unique perforating philosophy is also aimed towards integration with other completion methods like hydraulic fracturing & stimulation, sand control and management and above all, enhancing reservoir productivity.

## Contact

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