

Security DBS

INTRODUCES ADVANCED HYDRAULICS

TECHNOLOGY FROM

Vortexx™

Security DBS

N

OW AVAILABLE IN PDC BITS FROM

SECURITY DBS IS THE LEADING EDGE HYDRAULICS

TECHNOLOGY OF THE VORTEX GROUP INCORPO-

RATED, DEVELOPED IN PART BY SECURITY DBS.

THE VORTEX TECHNOLOGY EFFECTIVELY CREATES

AN UNDERBALANCE ENVIRONMENT AT THE

CUTTER/ROCK INTERFACE, INCREASING TURBULENCE

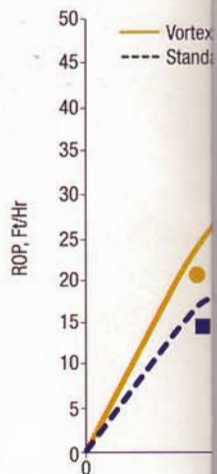
AND PROVIDES SUPERIOR CLEANING OF THE BIT.

B25-4 ROP Frequency Distribution Versus Normal Distribution



Laboratory Test Data Courtesy of Amoco Drilling Research Center, Tulsa, Oklahoma.

6-1/2" PDC Bit Catoosa Shale



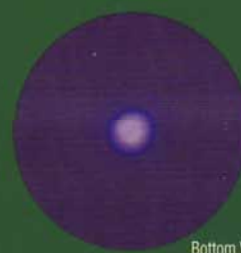
VORTEX TECHNOLOGY

Vortex Technology provides superior cleaning of the bit, and significantly improves cutting efficiencies. Because they were designed for the oilfield, the Vortex nozzles are superior to others currently available. The Vortex Group Incorporated chose a different approach to other multi-port and moving component designs and developed a unique internal geometric transition shape. This unique shape creates a negative impingement pressure at the formation interface and increases turbulence under the bit. The negative impingement pressure effectively creates an underbalance situation at the cutter/rock interface and the increased turbulence improves cleaning.

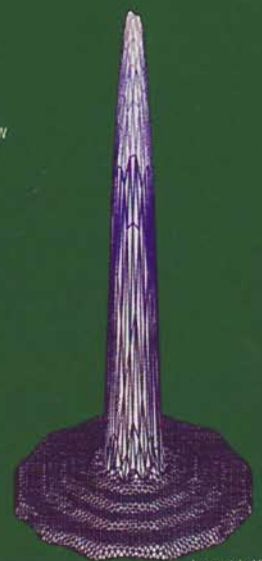
The diagrams to the right are surface pressure measurements for flow from a conventional round nozzle and that of a Vortex nozzle relative to the hydrostatic head.

Conventional Round Orifice

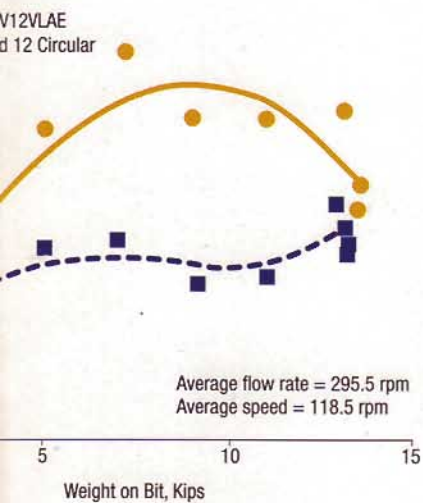
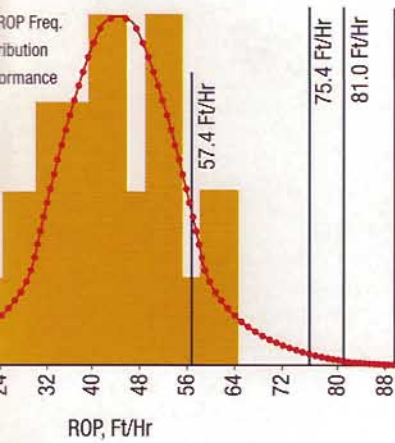
Circular jets cause a positive increase in pressure.



Bottom View



Isometric View



ORIENTATION

Precise orientation markers and a proprietary retention system allow for installation in the field by Security DBS service representatives.

STATISTICAL ANALYSIS OF FIELD PERFORMANCE

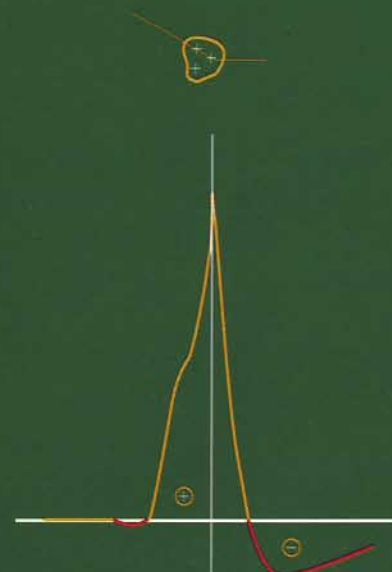
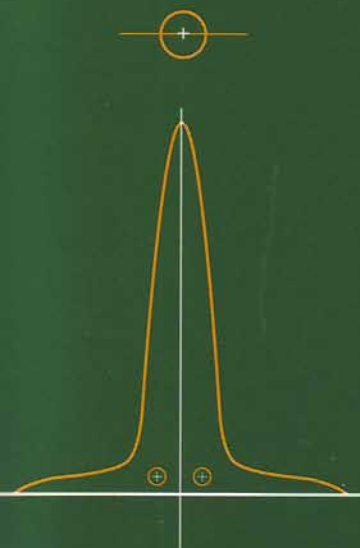
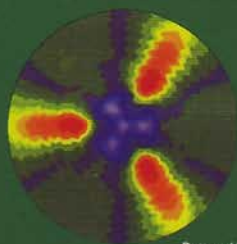
During the period of 1993–1996, more than twenty wells were drilled in the Brazos County, Texas area using Security DBS PDC bits equipped with Vortexx nozzles. A large historic database of offsets was used for performance analysis. The range of true vertical depth (TVD) was from 9,700 ft. to over 18,000 ft. Most of the runs were in the TVD range of 11,000 to 13,000 ft. The best comparative data came from a group of 23 wells that were comparable to three Vortexx test wells. Drilling data showed an average 22% increase in ROP including the outlier data, and over a 40% increase excluding the outliers.

LABORATORY TESTING

Independent laboratory tests at Amoco's facility in Tulsa, Oklahoma and TerraTek in Salt Lake City, Utah confirm increases in ROP consistent with field performance studies. In all tests the only variable was the Vortexx nozzle.

Vortexx Nozzle

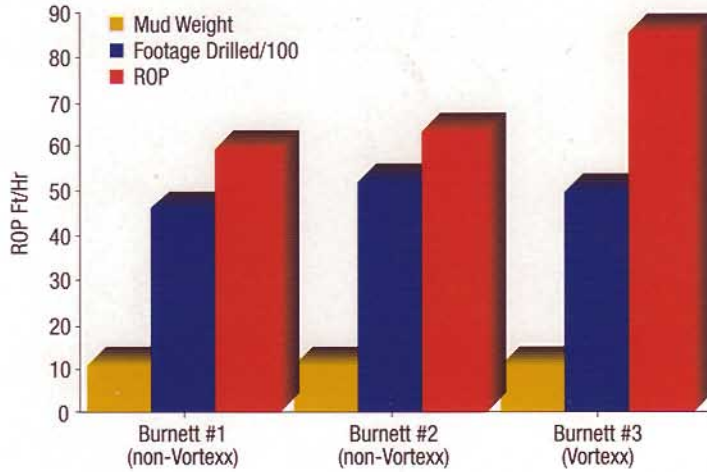
Vortexx jet flow pattern creates a new negative pressure area at the formation impingement surface, that is, below the hydrostatic head.



FIELD PERFORMANCE

Shown below is sample group data where formation tops, footage drilled, mud weight, weight on bit, mud system, and rig are constant. The only identifiable variable is the change in hydraulics due to Vortexx nozzles.

Security DBS 7-7/8
FM2745, Carthage
Field, Texas



Courtesy of Enron.

Data presented represents eight separate sample groups having near perfect offset wells. Each group has a minimum of two offsets with standard hydraulics.

28% Increase In ROP
Over 72 Well Data
Sample

