

# PRODUCT CATALOGUE

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2021

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# Industry Beneficial Partnership

**NewTech Services (NewTech Services Holding Limited) is an international oil-field services company founded in 2009. NewTech Services Holding Limited supplies superior yet cost-effective technology products and best-in-class services to the oil and gas exploration and production industry to optimize customer's performance across the whole E&P lifecycle.**

**Founded in 1947, Varel Energy Solutions (VES) is one of the world's largest independent manufacturer and suppliers of downhole drilling and completions products to the energy sector. VES services oil & gas, renewable energy, and industrial markets with its comprehensive suite of roller cone and fixed cutter drill bits as well as a complete portfolio of primary cementing equipment.**

Headquartered in Moscow, Russia and Houston, USA, NewTech Services Holding Limited supplies technology products and services to the oil and gas exploration and production industry in Russia and CIS countries, Europe, North and South America, Middle East.

NewTech Services develops technology and expertise across the whole Exploration & Production lifecycle within 4 Business Divisions: Drilling Services, Completion Systems, Integrated Project Management, Capital Equipment. Research, development & manufacturing of its own technology products is the basis of the company's competitive advantage.

The company develops dynamically through both organic and inorganic growth. By new merges, acquisitions and partnerships, the company meets oilfield services demands and creates a synergy of operational best practices and superior technology products and services.

Varel NTS Plant, a joint venture with Varel Energy Solutions, pioneered PDC drill bit manufacturing in Russia in 2012 and still claims to be a leading manufacturer of matrix and steel body PDC drill bits in Russia and CIS. The plant is a full production cycle facility equipped with the state-of-the-art machinery and ISO and API certified to produce premium quality matrix and steel-body polycrystalline diamond compact (PDC) drill bits. NewTech Services is also a leading drill bit service provider in Russia and CIS.

Backed by the best-in-class service provision, efficient manufacturing and global presence, NewTech Services is uniquely positioned to provide superior yet cost-effective technology products and best-in-class services for its customers through its beneficial partnerships such as Varel NTS Plant in Kurgan, Russia.

Headquartered in Houston, the company has manufacturing facilities in Matamoros, Mexico, Aberdeen, Scotland, Ibos, France, Dammam, Saudi Arabia, Kurgan, Russia, Houston, TX (starting 2021) as well as sales offices throughout the world.

VES's proprietary design capabilities, efficient manufacturing, and global sales force uniquely position the company to provide high-quality downhole solutions delivering reliable performance and a superior customer experience.

Varel uses a suite of a proprietary software to design fast and long-lasting fixed-cutter and roller-cone drill bits. Cutting structure design, body materials, and gauge projection are engineered specifically for each drilling application. Varel in-house technology center carefully tests and compares PDC and tungsten carbide cutters to maximize the bit's rate of penetration and durability. Varel bits range in diameter from 2 ¼ inches to 45 inches, largest in the industry.

With the expertly trained personnel and the latest CNC technology and heat treatment machinery, Varel is continuously improving the manufacturing cycle to provide consistent product and premium performance. Quality and safety come first, which is why all Varel manufacturing plants are API, ISO 9001, and 14001 certified.

Backed by the proprietary design capabilities, efficient manufacturing and global presence, Varel is uniquely positioned to provide reliable drilling solutions for its customers through its beneficial partnerships such as Varel NTS Plant in Kurgan, Russia.



# PDC Bits Manufacturing Facility



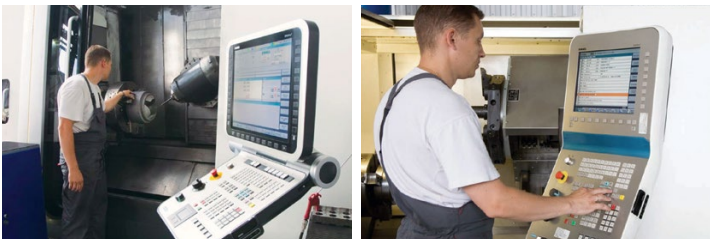
In 2012 NewTech Services and Varel Energy Solutions (Varel International) established a manufacturing plant to produce premium matrix and steel body PDC drill bits in Kurgan, Russia.



By combining Varel's global technologies, its engineering and design capabilities, and extensive international experience with NewTech Services' deep understanding of the local market, strong customer relations, and a reputation as a reliable and high-quality oilfield services provider, Varel NTS Plant pioneered and continues to lead matrix and steel body PDC drill bits manufacturing in Russia and CIS.

The plant uses state-of-the-art production technologies, advanced machinery, and quality management systems to produce premium PDC drill bits. With the expertly trained personnel and the latest CNC technology and heat treatment machinery, Varel NTS is continuously improving the manufacturing cycle to provide consistent product and premium performance. The Varel NTS manufacturing plant is API, ISO 9001, and 14001 certified.

Located in Kurgan, in the middle of Russia, close to the main oil and gas provinces and regional markets, the plant ensures rapid production lead time, customized approach, and application-specific designs.



# PDC Drill Bits by Varel NTS



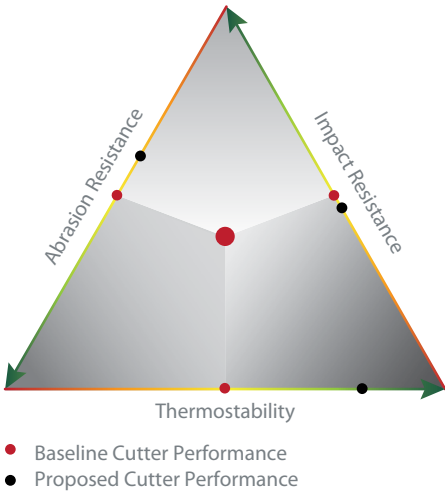
Today's drilling challenges the cutter's toughness and abrasion resistance. High energy drilling environments often require thermostability and toughness.

By the high quality assessment of cutters offered by different manufacturing, we ensure the following:

- Better selection of bits
- Access to technologies offered by different manufacturers
- Qualitative and quantitative evaluation of cutters performance.

We operate in close relationship with suppliers of high quality cutters, universities and field engineers for the target specific development and selection of cutters for premium PDC bits. Varel team developed and implemented innovative procedures and instruments for the improved and optimized selection of cutters properties and technologies for their end use in bits. Varel's dedicated cutter team has recently developed and deployed new and innovative tools that enhance and improve the development and selection of the best cutter technology for the application.

Focus on the selection of cutter shape and type that are the most suitable for the actual drilling conditions, is ensured by Force3® technology.





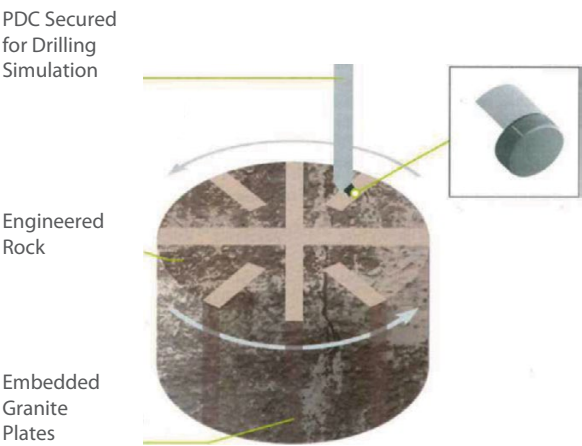
# Force3<sup>®</sup> Cutter Technology

Abrasion Resistance

## Force3<sup>™</sup> Cutter TECHNOLOGY

Abrasion resistance stands for the capability of cutters to keep the cutting edge sharp during the drilling process.

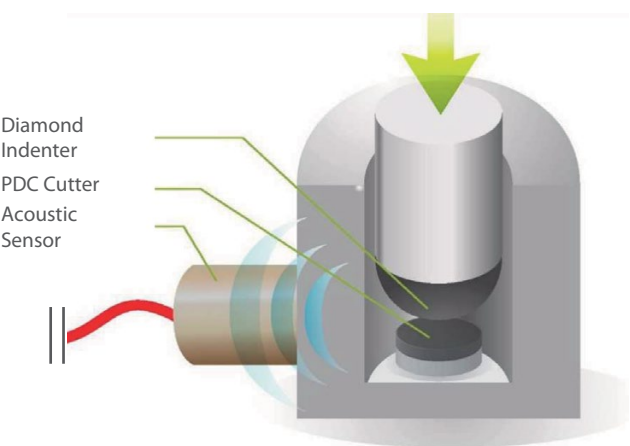
### Bimodal Abrasive Rock Test



Cutter toughness is the ability to withstand the effects of drilling dynamics. Toughness is related to the strength of the diamond-to-diamond bonding created during the High Pressure High Temperature (HPHT) sintering of the PDC cutter. Historically, test methods in the industry have been qualitative and have fallen short of providing effective data for field cutter selection.

The patented **Bimodal Abrasive Rock Test (BART)**, is a laboratory abrasion resistance test that employs two drastically different rock samples. The two rock samples create a load/unload cycle to simulate interbedded formations and formation transitions. By recreating this environment, **BART** provides a more suitable measurement of abrasion resistance correlating to field performance.

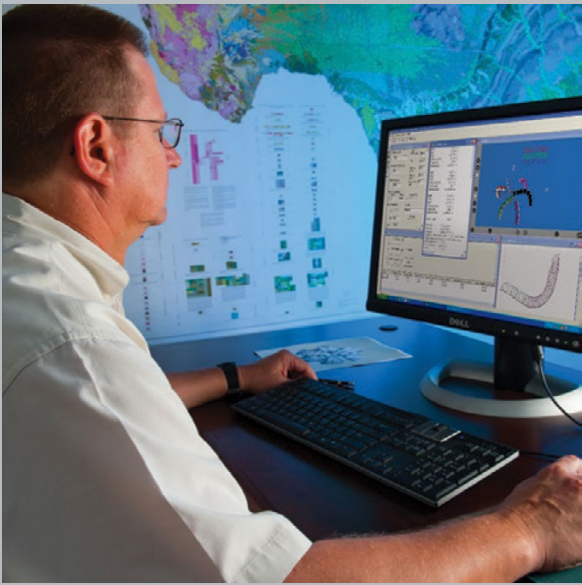
### Cutters Strength – Acoustic Emission Test



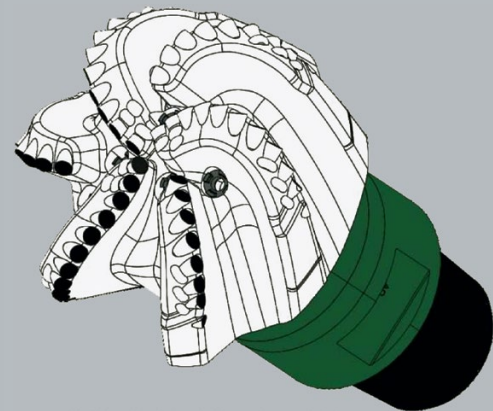
To better measure cutter toughness, Varel has developed its patent-pending **Acoustical Emissions Toughness Test (AETT)**. **AETT** quantitatively assesses the strength of the diamond-to-diamond bonding. With this test, a load is applied to the cutters and increased at a constant rate while recording the acoustic emissions from microcracking in the diamond table. Measuring the energy released during microcracking yields a concrete assessment of the PDC toughness.

# SDN<sup>™</sup> Bits Engineering

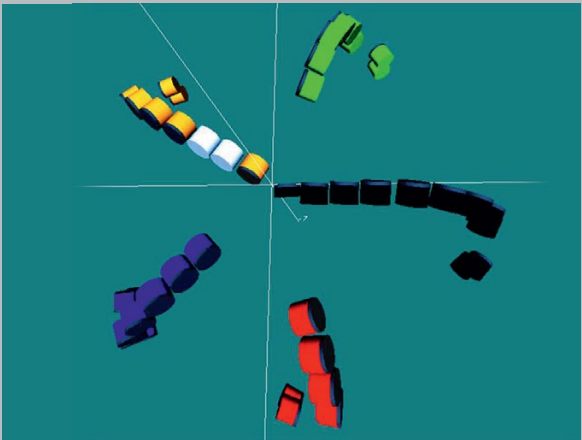
Advanced Tools



Bit engineering software is constantly improving. **SPOT-DN** software package allows the designer to optimize the cutting structure for the most efficient operation in the specified engineering and geological conditions.



Results of cutting structure engineering in SPOT are imported to CAD for the bit design finalization.

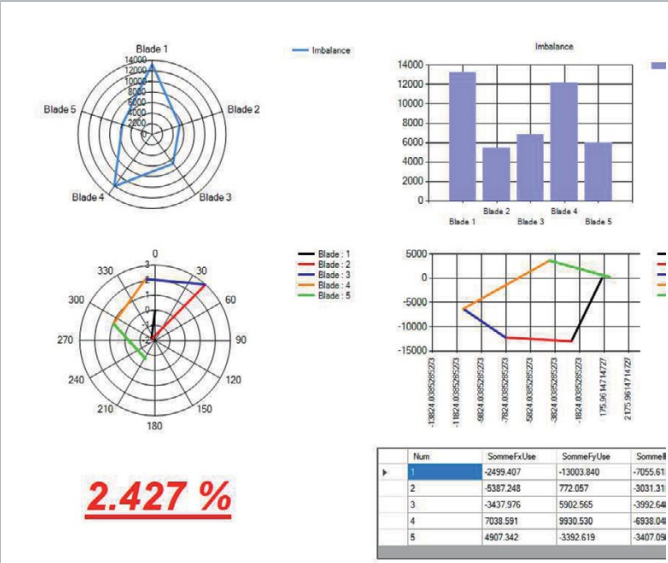


SPOT helps the designer in creating a 3D model of cutting structure for the given conditions, including:

- Rock strength properties
- Drilling parameters
- Cutter type: properties of the diamond layer and TC substrate

By simulating different scenarios of bit application in the specified conditions, engineers may precisely forecast the results of such application and bit behavior in the given conditions, including the following:

- Endurance
- ROP at definite drilling parameters
- Aggressiveness
- Lateral stability at the bottomhole



GeoScience<sup>™</sup> tool is used for the import of processed logging data obtained during surveys of wells drilled before. It allows for the evaluation of bit behavior along the whole well section being drilled.



# Voyager® Series

Directional and Horizontal Drilling

## VOYAGER®

**Voyager technology is based on results of extensive lab tests included into algorithms of powerful analytical software tools GeoScience and SPOT-DN comprising an analytical system for cutting structure design and well drilling process simulation.**

Voyager® line of PDC bits, has developed bit that delivers smooth torque, advanced directional control, excellent well bore quality, and dynamic stability. Advanced modeling determines which gauge design optimizes the ability to deliver the required directional objectives.

The bit behavior is not controlled using cutting structure design alone. Instead, through fine-tuning back rake, siderake, and torque limitation, we engineer a system within the Voyager design that controls bit behavior by making more effective use of torque. Voyager bits are compatible with multiple directional drive systems. Varel's focus on matching gauge configuration with drive system enables solutions to be continually developed for all offerings in the market.

The gauge section of a PDC bit must be matched to the cutting structure to achieve the desired steering response. More than 25 different gauge configurations has been tested to validate and advance the gauge design used to match a specific Voyager bit to rock formation, well design, and steering system. The three resulting gauge designs provide a balance of directional responsiveness, stability, and efficiency to affect specific bit behavior based on drive type.

### ◀ Gauge Bench Testing



## Recommended Gauge Configurations

Three final gauge designs that are shown below, provide the necessary balance between bit stability, steerability and efficiency.

### G1



#### STEP GAUGE

The (G1) Step Gauge is designed for use with both PDM and point-the-bit RSS drilling assemblies, providing flexibility for a range of directional drilling applications.

The design is engineered to allow bit pivot, or tilt, in order to affect orientation of the cutting structure to achieve optimum directional requirements. In addition, the undercut can be varied based on mud type for use with specific drive systems..

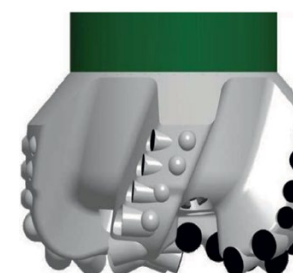
### G2



#### RELIEF GAUGE

For all push-the-bit RSS systems, the undercut (G2) Relief Gauge pad is based on the concept of increasing lateral displacement, maintaining gauge stabilization, and can eliminate the need for full active gauge designs in many applications. Rather than a fixed undercut based on bit size, Voyager's undercut selection is based on formation hardness and directional requirements..

### G3



#### ACTIVE GAUGE

The (G3) Active Gauge for push-the-bit systems is designed principally for high DLS/3D sidetrack drilling applications where a very high level of side-cutting action is the prime requirement. The (G3) gauge provides an extremely aggressive cutting action to optimize lateral drillability, generating higher levels of reactive torque at the bit/rock interface. The very short gauge length, with increased point-loading of gauge pad cutters that have engineered exposure, provides the aggressive lateral cutting action..

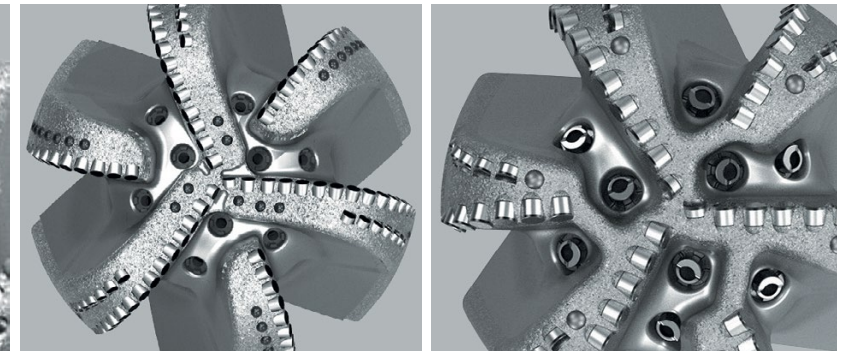


# Raider® Series

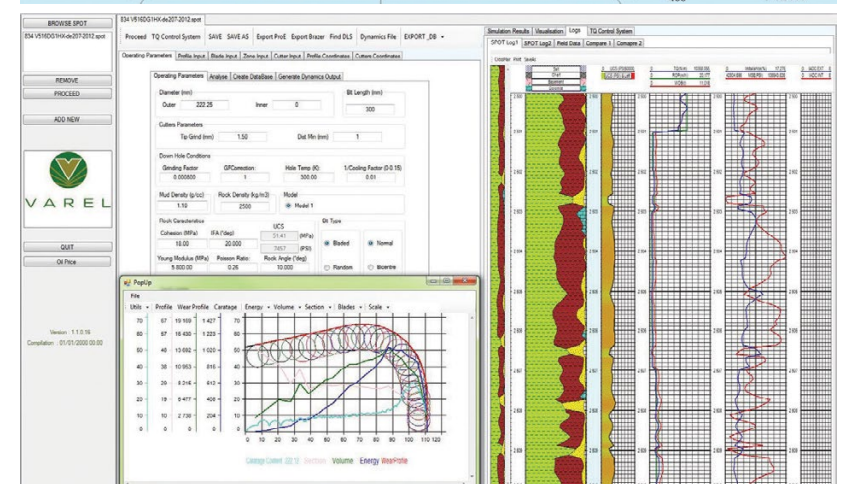
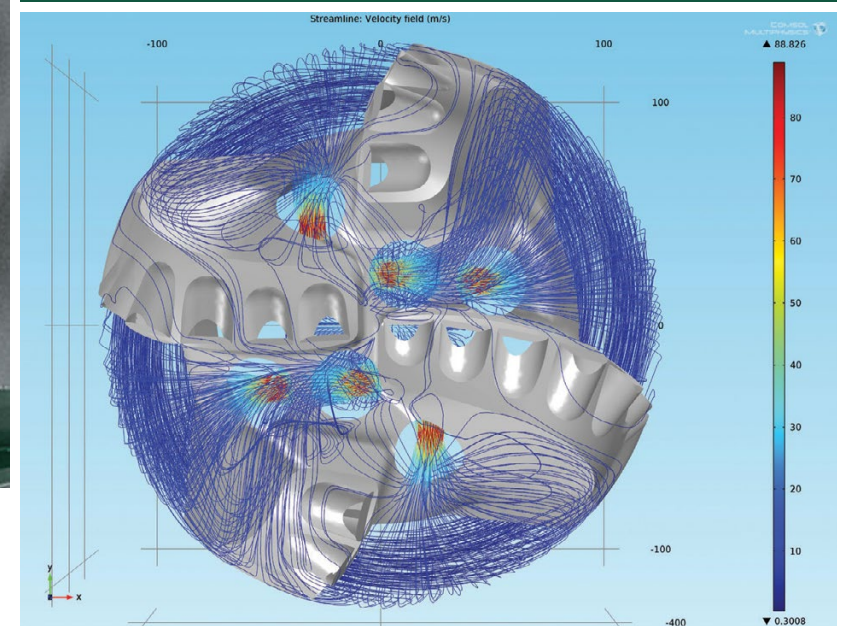
## RAIDER®

Increased WOB. Higher RPMs. Operating parameters have driven changes in PDC bit design to accommodate improved torque output of latest-generation motors and increased horsepower requirements of the BHA equipment. Raider® bits are purpose-built for drilling to total depth through the interbedded soft and hard formations of transition zones. Balanced bit design is the key factor.

While back rake was the primary mode of balancing the bit in the past, Raider bit designs start with an aggressive cone, then progress to the nose, shoulder, and a more tapered gauge. The cone has been toughened, and the nose and shoulder strengthened, resulting in an inherently more balanced design capable of withstanding the demands of transitional drilling



Raider bit designs may incorporate one or even two extra rows of cutters per blade to increase diamond density and durability. High-density arrangement enhances bit life when drilling a variety of rock types without sacrificing ROP. The cutting structure provides extra exposure and cutter density on critical areas of the bit, so Raider bits can now achieve maximum ROP through interbedded formations without excessive wear or damage.

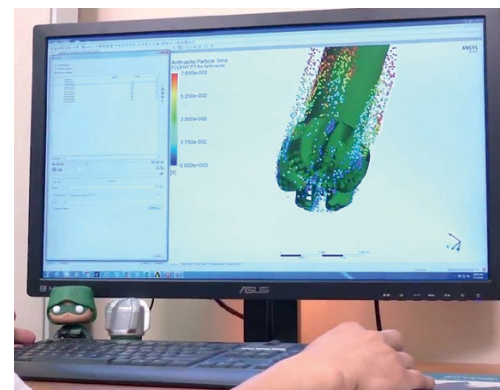




# Hydra™ Series

## HYDRA™

HYDRA™ series is a new approach to optimizing bit hydraulic efficiency.



A key design feature of HYDRA™ series is the forced separation of mud flows due to webbed blades, curved nozzles and engineered junk slot designs.. Nozzles location and orientation are selected with the use of advanced digital modeling tools CFD and SDN.



## Application

- Vertical, Directional, Horizontal, and Tangent wells
- For soft to hard formation applications
- For all rotary, directional motor, and RSS applications

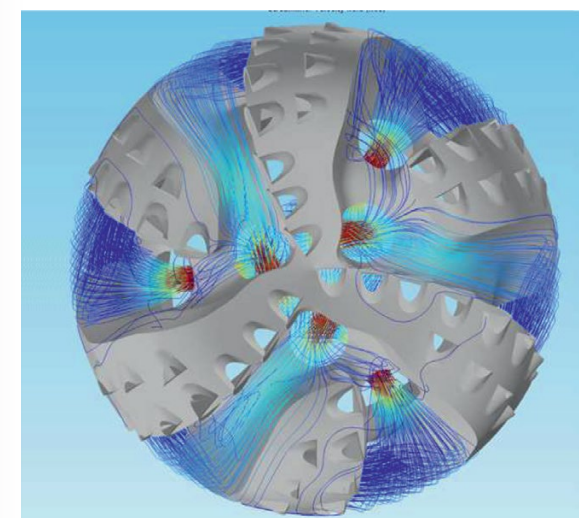
## Main Benefits

- Curved nozzles reduce the stream impact to the formation eliminating erosion and increasing bit stability in soft to medium formations
- Webbed blades reduce cuttings recirculation to other junk slot areas, eliminating the regrinding of cuttings
- Application specific cutting structures and bit blade/ junk slot designs to match formation requirements for cuttings removal and ROP

## Curved Nozzles

Allow to orient them properly on each and every application. This improves bit performance as the nozzles reduce the hydraulic impact on bottom directing fluid where it is needed most, along the bit face for cleaning. This will increase formation stability in soft directional applications. ►

## CFD-analysis of bit hydraulics with conventional nozzles



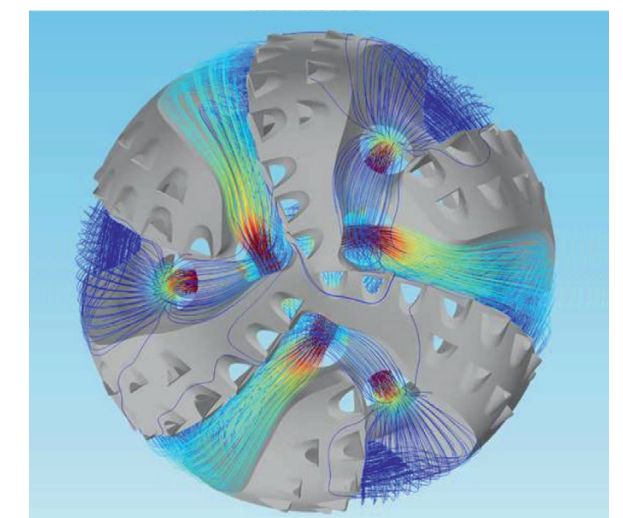
Combining the two technologies CFD and cutting structure design has led to breakthrough designs for the industry that are original and ideal for sticky formation applications.

## Web Blade Design

This feature reduces the amount of recirculation on bottom helping to eliminate re-cutting of grindings. This also improves bit face cleaning, cutter cooling, and reduces the chances of bit balling. Hydraulic flow is directed to the critical areas of the bit for better bit life and performance.



## CFD-analysis for the same bit with curved nozzles





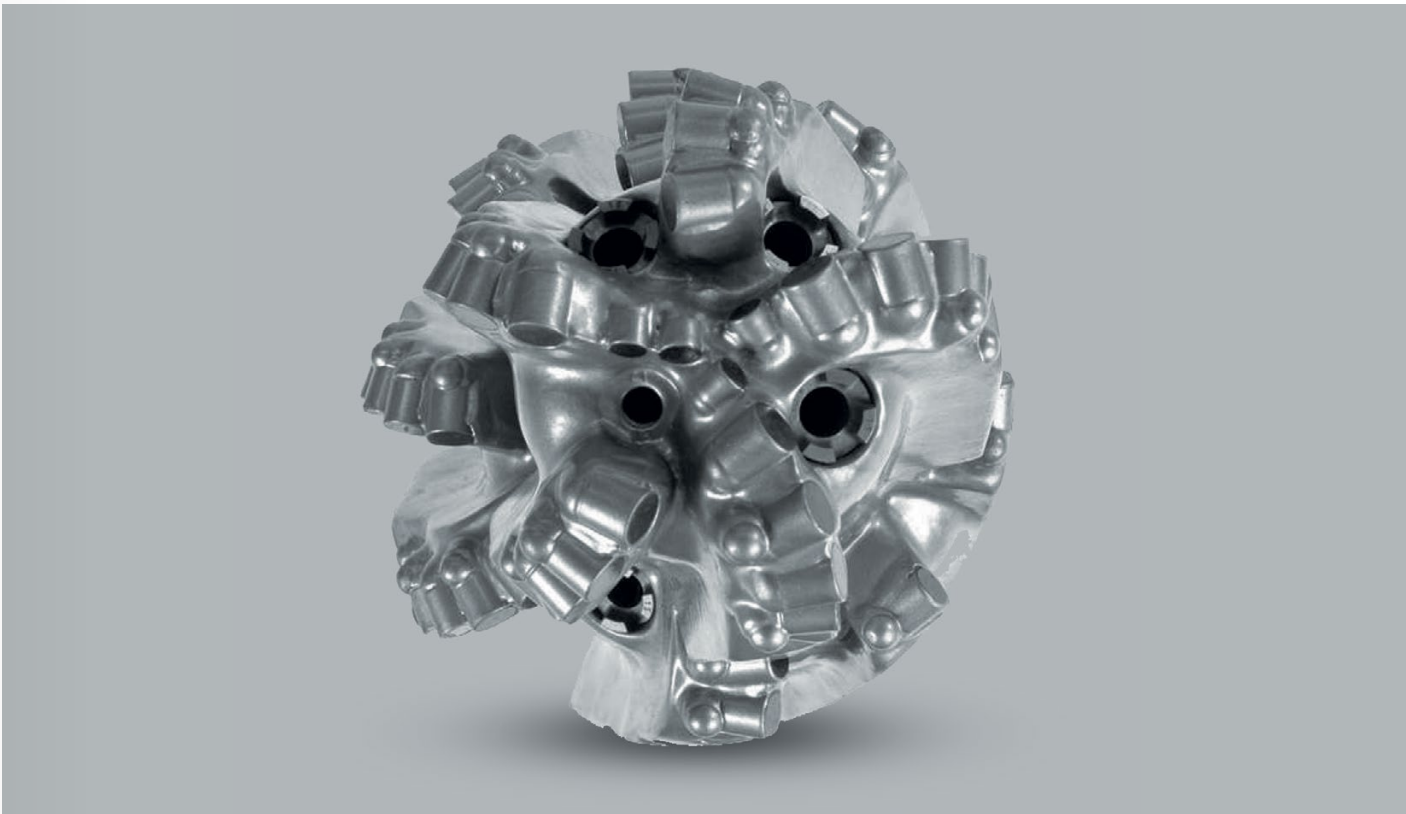
# Bi-Center Bits



Bi-center bits are designed for the drilling of wellbores with hole size over the size of surface equipment and/or casing, that was previously run.

Bicenter bits are designed to enlarge the wellbore, by drilling 15 to 25 percent larger than the pass through wellbore in all types of PDC drillable formations. The bicenter bits are used to increase lateral diameter, to replace under reaming, to help control trouble zones, and for expandable tubulars. The matrix material construction resists erosion and abrasion found when drilling oilfield applications. The one-piece design shortens the overall bit length for better directional control. Varel bicenter bits also have an innovative force balanced cutting structure that minimizes cutter and casing damage when drilling out. Additionally, Varel's unique design minimizes bit vibrations often experienced with conventional hole opening tools, thereby resulting in longer downhole tool life and reduced drilling costs.

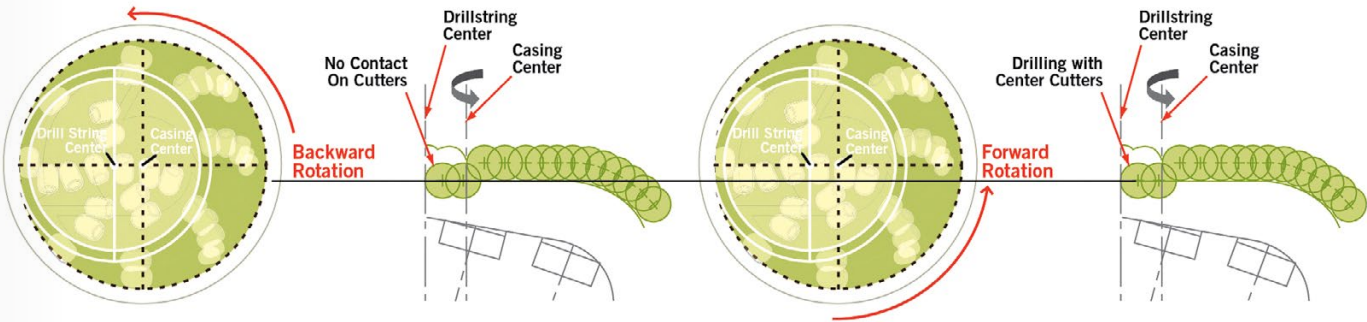
- **One-Piece Construction** Unique design shortens the overall bit length for better directional control and eliminates the need to have a connection and weld between the pilot bit and the reamer section of the bicenter. The one-piece construction also allows for optimal hydraulic configuration with pilot and reamer blade alignment, optimizing cuttings removal and improving ROP
- Risks related to the use of pilot bit with underreamers are eliminated
- Options are available in both matrix body design for the better resistance in abrasive rock and steel body design for the maximum ROP
- **Spiraled Blades** The proposed bicenter bits are designed with spiral blades to provide better contact with the casing during drill out. Spiral blades stabilize the bit ensuring less damage to the casing and resulting in better wellbore quality.
- Nozzle placement, pilot bit and reamer blade alignment provide a direct flow path to the annulus. The junk slot areas maintained or increased, resulting in no decrease in fluid velocity and improved cuttings removal between the pilot and reamer



## Pilot Design, Spiral Blades, Contact Free Location of Gauge Cutters

Casing Saver Design cutting structure feature provides a reliable drill out mode while protecting the cutting structure inside the casing. Because of the bicenter bit's unique application, the bit design is not symmetrical. When drilling out from casing, the bit rotates on the casing centerline and not the bit centerline. This off-center rotation of conventional bits can cause damage to cutters located near the center of the pilot bit. This cutter damage is due to backward rotation of cutters located between the bit centerline and the casing centerline in the pilot bit. However, Varel has repositioned cutters between the two centerlines in the nose of the pilot bit. Our design

minimizes the possibility of cutter damage while inside the casing in drill-out mode. As the bit transitions to formation drilling, the cutters begin to rotate normally about the bit centerline and cut the formation. This small but unique design philosophy prevents cutter damage when drilling out, allowing efficient rock-cutter interaction during formation drill. During the design process, the pilot and reamer cutting structure are force balanced as a single unit. This provides increased drilling efficiencies in both vertical and deviated wells. Improved ROP, increased durability and better directional control are all benefits of force balancing.



Bicenter drilling cement inside the casing

Bicenter in the formation



# Fusion® Impregnated Diamond Bit

**FUSION®**

## Application

- High abrasive rock (high quartz content)
- ROP up to 5 m/h at optimized drilling parameters for roller cone and PDC bit
- High cost of DS round-trips

## Conditions

- High (~500...1500 min<sup>-1</sup>) RPM in operating mode
- Maximum hydraulic power (high flow and DP at PDM)

## Features

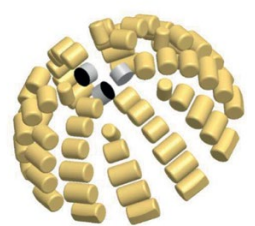
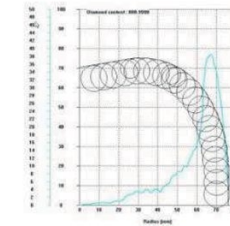
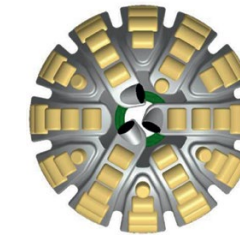
- Diamond Impregnated Blades with HIP segments
- Reinforced TSP Gauge
- CFD-Optimized Waterways



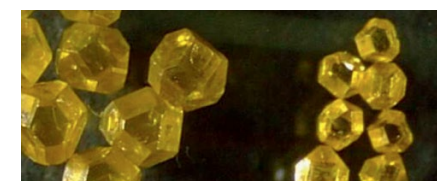
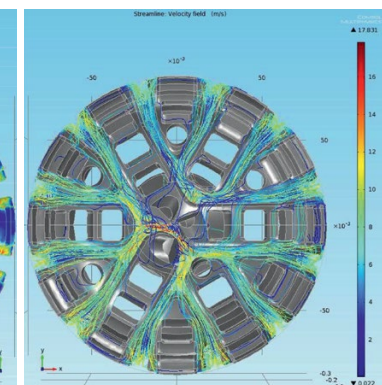
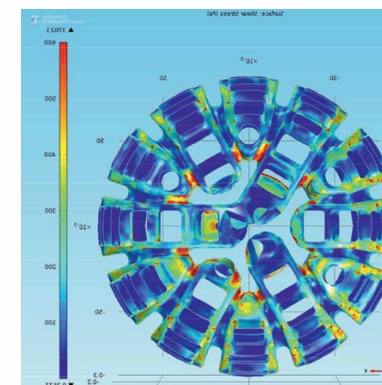
Hot isostatic pressed (HIP) segments tailored to the formation. The finished HIP segments are positioned in the bit blades in specific patterns determined by SPOT-DN™ bit design program.

## Fusion® Technology Benefits

SPOT-DN engineering, virtual simulation of behavior, selection of the best cutting structure balance

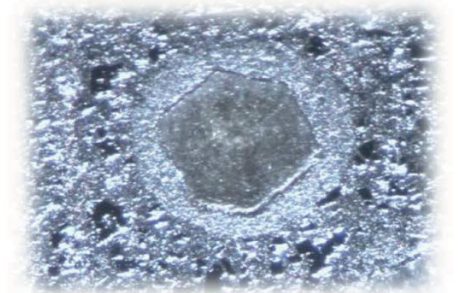
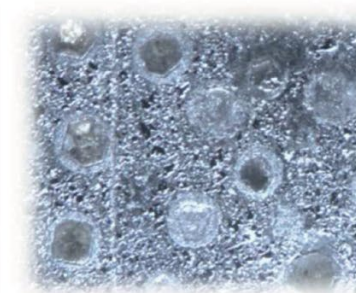
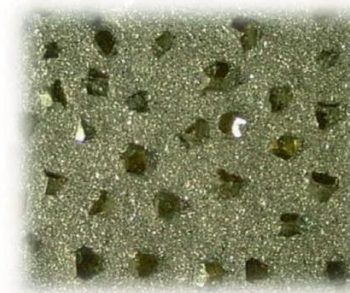


## CFD-analysis, stringent bit hydraulics analysis



Diamonds are sorted accurately by shape, size and quality and distributed in the outer layer of the hard faced bit body

## Preliminary graining, i.e. hard facing of diamond grains

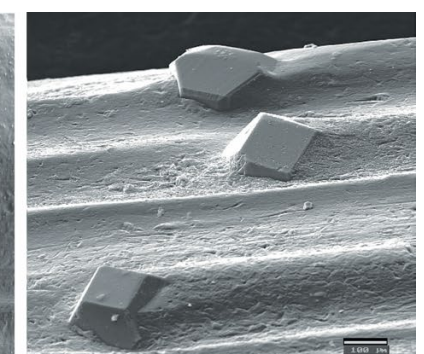
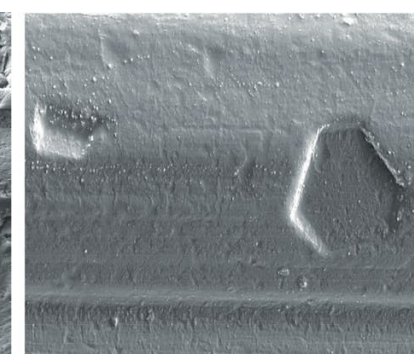
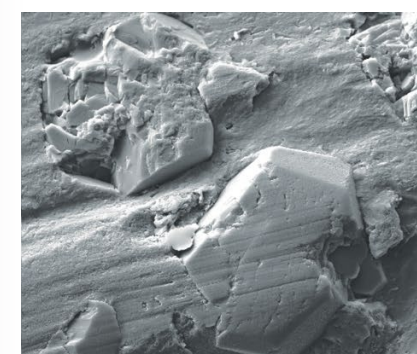


## Efficient selection of hard faced matrix properties for the actual application:

Diamond stone overheating and rounding results in too hard matrix

Proper matrix formulation selection suitable for the application

Rapid loosening and disengagement of diamonds due to soft matrix





# Special Downhole Tools



## Core Bits

New product line of Varel NTS LLC – PDC core bits.

Cutting structure design depends on drilling conditions and tool design will vary depending on core catcher and core barrels connections. Therefore, when placing an order for core bits, certain technical properties may need to be specified by the Customer. You will be offered a tool with an optimized hydraulics and ideally balanced cutting structure for the highest ROP and coring performance



## Sidetracking Bits

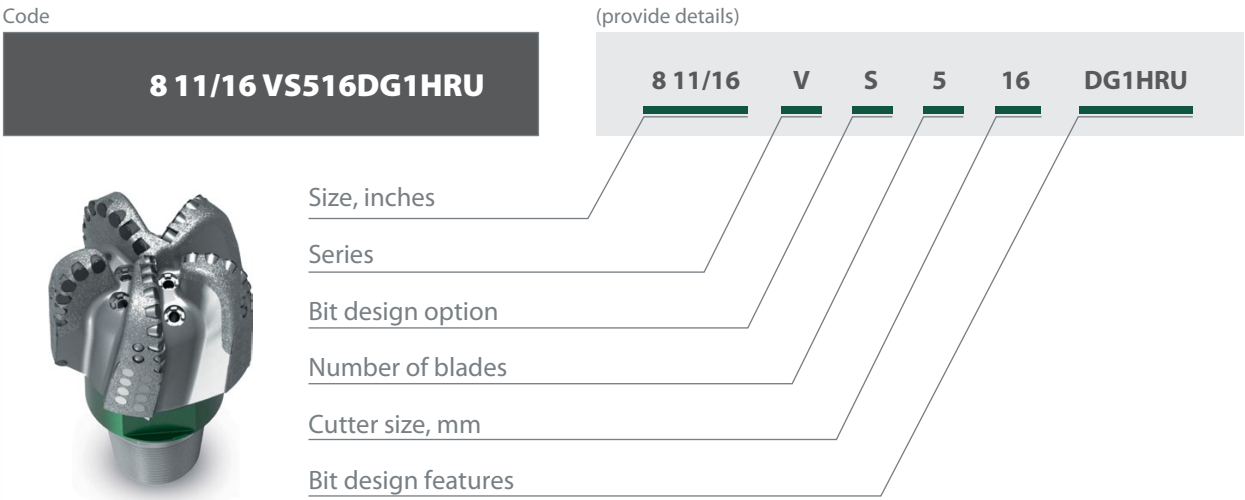
Sidetracking bit is a tool with advanced lateral aggressiveness. It ensures reliable side tracking from the cement plug or in open hole. These bits are applicable in areas, where the maximum intensity of wellbore trajectory control is needed.



## Hole Conditioning Bits

Special tool designed for the conditioning the pre-drilled wellbore. Hyperbolic bit profile minimizes slack offs during tool running into the hole and steps generation in the wellbore for the easy passing of the casing during running. They are applicable to other activities not related to well deepening: Cement plugs setting, circulation, etc.

# Varel NTS Product Nomenclature



## Bit Series

Voyager Bit	Raider Bit	Hole Conditioning Bit	Bi-Center Bit	Core Bit	Bit For Drilling-on-Casing
V	R	VR	VH	C	CB

## Design Options

Matrix Hard Alloyed Body	Steel Body	Pdc Bit
— (no)	S	Y



# Varel NTS Product Nomenclature

Bit design features

**B** Box bit connection



**T** Turbine sleeve

**C** Protective caps are brazed to cutters for casing protection during RIH and drill out of cement



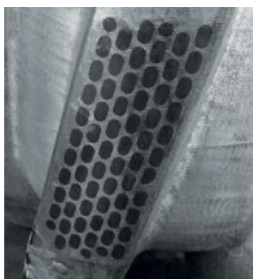
**D** Drop-in gage PDC-cutters



**F** Cutters of non-cylindrical shape



**G** Full size gauge



**G1**

**G2** Step gauge (see page 7)

**G3**

**H** Less nozzles than blades



**N** More nozzles than blades



**P** Double-row power cutters on each bit blade

**P2** Same on certain blades

**PP** Triple -row power cutters

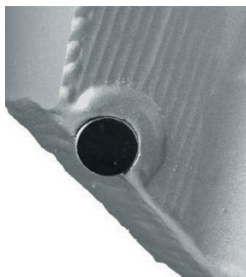


**R** Diamond or hard alloy stabilizing inserts



**X** Diamond or hard alloy bumper inserts

**U** Upream cutters on the blade's top

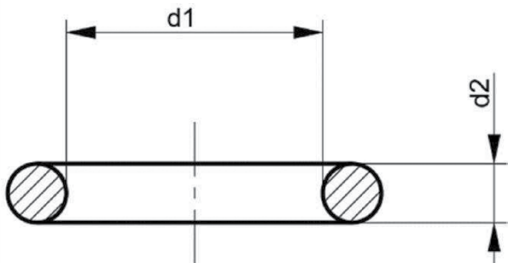


# Reference Information

Varel NTS PDC Bits – Nozzles

Diameter		Series			Curved	
in	mm	S50	S55	S65	S55	S65
9/32"	7,14	*	*	*	*	*
10/32"	7,94	*	*	*	*	*
11/32"	8,73	*	*	*	*	*
12/32"	9,53	*	*	*	*	*
13/32"	10,32	*	*	*	*	*
14/32"	11,11	*	*	*	*	*
15/32"	11,91	*	*	*	*	*
16/32"	12,70	*	*	*	*	*
17/32"	13,49		*	*		*
18/32"	14,29		*	*		*
19/32"	15,08			*		*
20/32"	15,88			*		*
21/32	16,67			*		
22/32	17,40			*		

## O-Ring Sizes - Nozzle Sections



Nozzle series	d1 Inner size, mm	d2 Cross-section DIA, mm
50	15,54	2,62
55	15,47	3,53
65	18,72	2,62



# ABOUT NEWTECH SERVICES HOLDING LIMITED

NewTech Services (NewTech Services Holding Limited) is an international oilfield services company founded in 2009.

NewTech Services Holding Limited supplies technology products and services to the oil and gas exploration and production industry in Russia and CIS countries, Europe, North and South America, Middle East.

NewTech Services develops technology and expertise within 4 Business Divisions: Drilling Services, Completion Systems, Integrated Project Management, Capital Equipment Sales.

The company has offices in Russia, Belarus, Kazakhstan, Azerbaijan, Ukraine, Venezuela, Argentina, Serbia, Saudi Arabia, Oman, the USA and the UK with the headquarters in Moscow, Russia and Houston, USA.

## NNEWTECH SERVICES HOLDING LIMITED VERSATILE OILFIELD SERVICES BRAND FAMILY

- **NewTech Services** – Eastern Hemisphere – All Business Divisions / OEM
- **Frontier International\*** – Western Hemisphere – All Business Divisions / OEM
- **Frontier Oil Tools** – Completion Systems / OEM & Services
- **Wolverine Oilfield Technologies** – Drilling & Measurements / OEM
- **Remote Measurement Systems Limited** – Drilling & Measurements / OEM
- **Frontier MWD Systems** – Drilling & Measurements / OEM
- **SMS Precision Tech** – Drilling & Measurements / OEM
- **TechGeoBur** – Drilling & Measurements / OEM & Services
- **Hydrobur-service** – Downhole Tools / OEM & Services
- **Varel NTS** – Drill Bits / OEM

Founded in 2012, Varel NTS Plant, a subsidiary of NewTech Services Holding Limited, is a leading original equipment manufacturer of matrix and steel body PDC drill bits in Russia and CIS. The plant uses state-of-the-art production technologies, advanced machinery, and quality management systems to produce premium PDC drill bits. The Varel NTS manufacturing plant is API, ISO 9001, and 14001 certified. Backed by the best-in-class service provision, efficient manufacturing and global presence, the plant ensures rapid production lead time, customized approach, and application-specific designs.

\* Frontier International is a subsidiary of NewTech Services Holding Limited in North and South America.



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