

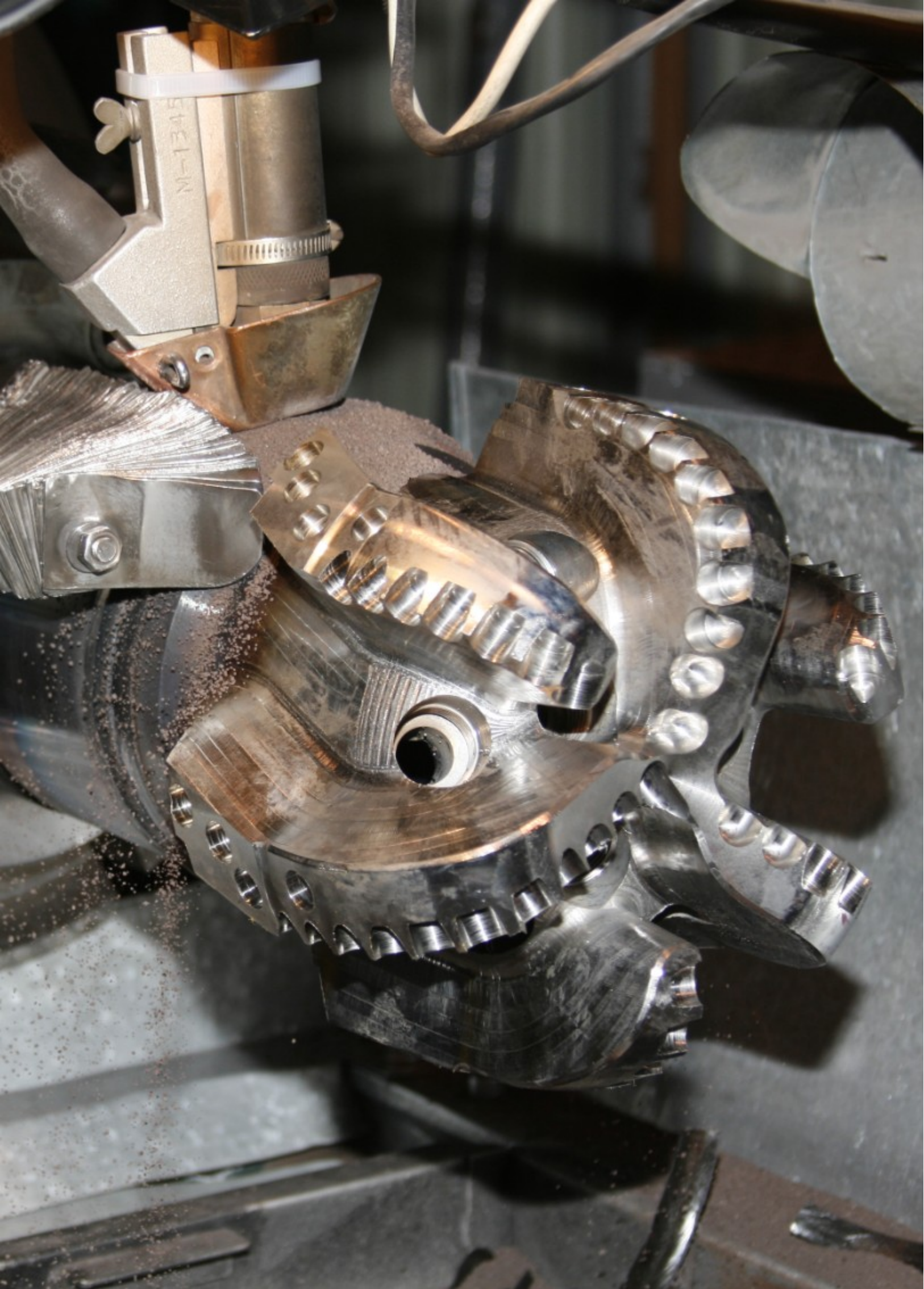






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ABOUT ENTERPRISE

> ADVANCED PRODUCTION

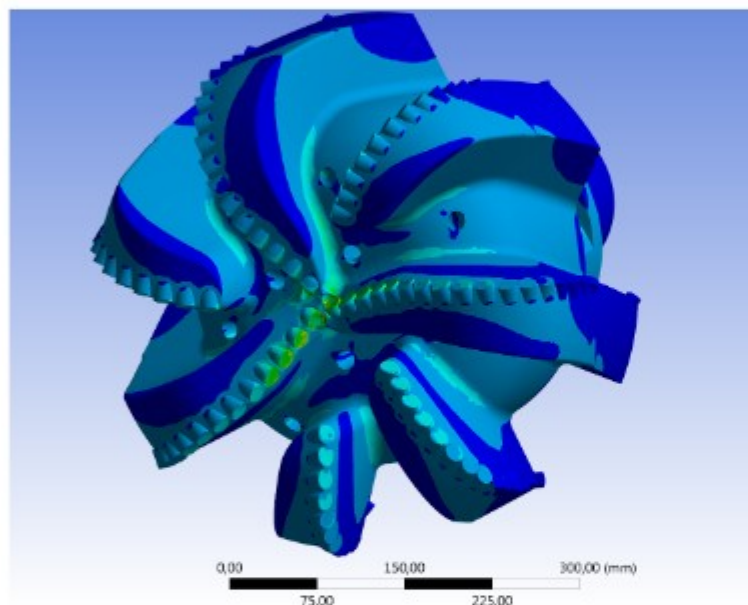
- Cornerstone of economic stability of the Russian Federation is amongst other things the effective development of the fuel and energy complex. However to ensure the development of the fuel and energy complex an intensive growth of oil and gas industry raw materials base which is impossible without the introduction of new drilling technologies and tools.
- “BURINTEKH”, Ltd is the largest Russian manufacturer of high-tech tools and equipment for drilling and workover oil, gas and mining wells, a high-tech oilfield services company.
- Since 1999 enterprise has specialized in the development, production, supply and service of tools, as well as reagents for drilling and workover oil and gas wells. And over the past years has become in the industry a symbol of consistent quality and innovative approach to business.
- Each development of “BURINTEKH”, Ltd is a unique solution of the most complicated technological problem that a particular customer faces while drilling well. It is an individual approach that allows in the shortest possible time improving the technical and economic indicators of wells for various purposes.
- “BURINTEKH”, Ltd products and services are in demand not only in the territory of the Russian Federation but also in the world successfully competing with the offers of foreign companies. The breakthrough to foreign markets demonstrates the high potential and competitiveness of the enterprise breaking the pattern that Russian companies do not have their own advanced technologies.
- Of course international level access was possible by means of combining the best production and engineering resources. At the production sites of the enterprise, modern equipment is used, including CNC machines, the latest multi-axis machining centers. At each stage of production, modern, effective means of quality control are used.
- However the main key to success of “BURINTEKH”, Ltd is a team of professionals possessing all the knowledge and skills necessary for successful work, and besides aimed at an effective result and dynamic development.
- Research work is also of great importance so the company pays great attention to it. Thanks to this the performance of both manufactured and newly developed products is constantly improving. For example, by 2019 on the territory of Western Siberia the meterage per bit can achieve 20 042m although literally 10 years ago 10 000 m was the limit.



DESIGN AND MODELLING

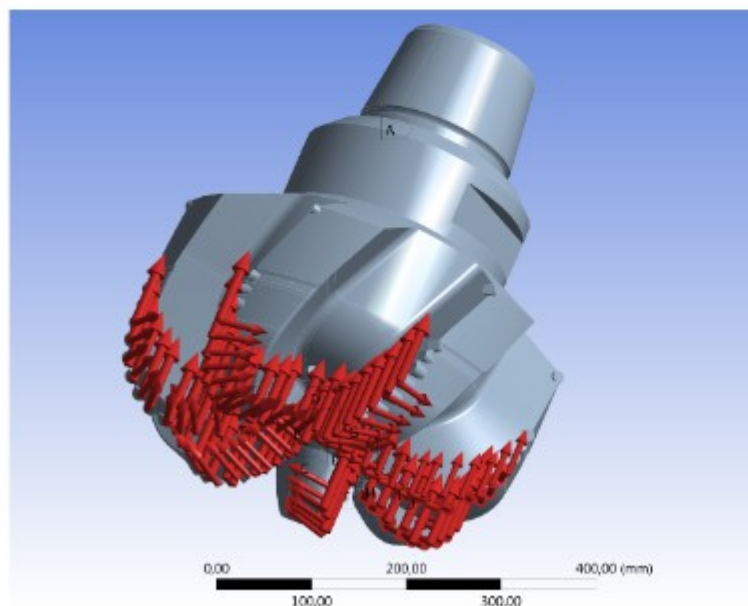
> MODERN CALCULATION SYSTEMS

- Modern calculation modules simulate operation of the bit in a wide range of hardness and abrasiveness of rocks based on performance analysis of a single tool. This allows maximizing the effectiveness of rock destruction in difficult intervals and maintaining tool life. Software systems allow selecting the tool depending on the geology, well design and drilling practices.
- Computer analysis of bit hydraulics allows ensuring the balance of mud flow rate, cutting structure cooling and prevention of tool erosion. As a result of the calculation optimal parameters of nozzles arrangement are determined, which allow organizing the flow of the washing liquid, ensuring maximum efficiency of the bottom-hole zone cleaning.



- Force calculation of the bit body is carried out to determine the degree of compliance of the tool with operational loads for a given safety factor. The calculation is performed by finite element method with the application of axial and cutting forces. The calculation of the stress-strain state of the model is performed, the loaded zones are identified and the safety factor is determined by the allowable stresses.

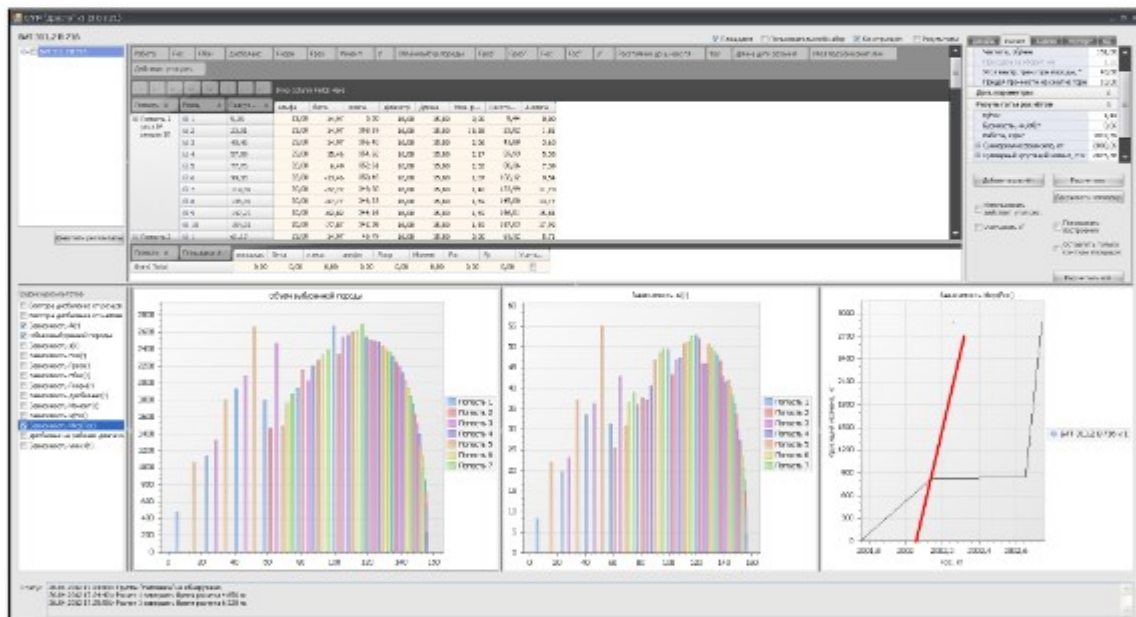
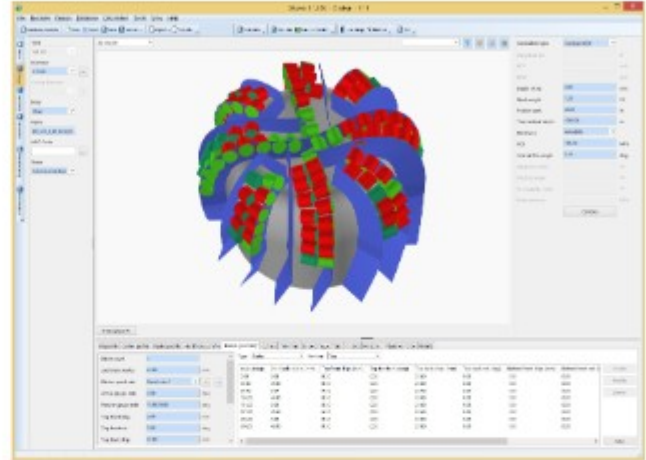
- According to the results of the calculation overloaded zones or zones of power flicker are detected. Particular attention is paid to the zones at the blade roots and areas of peak loads. The distribution of the safety factor in the areas most subjected to deformation and destruction is evaluated.



- Force calculation of the bit body before failure of the tool joint is carried out in order to determine the serviceability of the tool by calculating the safety factor when torque is applied to the tool joint at which the pin is broken. The calculation is performed by the finite element method and helps assessing the condition of the body under critical loads.

> CUTTING STRUCTURE EFFECTIVENESS

- During drilling on each cutter apply forces. In total these forces create an undesirable deflection force. In the international practice of bits industry the percentage ratio of deflection force to axial load, i.e. imbalance is assumed to be **5%**. "BURINTEKH", Ltd bits are balanced to an imbalance of **less than 3%**. Low imbalance allows increasing the efficiency of rock destruction, evenly distribute loads on cutters and ensure the stability of cutting structure which is important when drilling rocks of any category of hardness.



- Modern VTL methods allow effectively evaluate and select diamond cutting structure. To control and compare the quality of cutters, a test for abrasive wear on granite is carried out on own test bench. The declared characteristics of new types of PDC cutters are checked. The results are entered into the database and compared with other cutters. The most impact and abrasion resistant cutting structure is installed on the tool and sent to field tests.

- VTL test results and the result of the bit operation in the well are recorded in the integrated calculation complex. Comparison of the results of a large number of VTL tests carried out with the results of the cutter tests in field conditions allows estimating the convergence of bench and field tests. This allows maximizing the potential of the tool laid at the design stage. It is possible to compare the performance of bits in specified conditions.

APPLICATION AND EXPANDABILITY

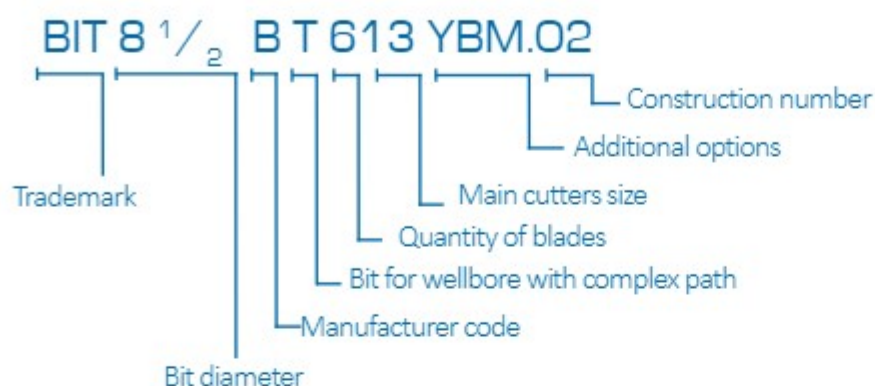
Rocks description	hardness	BIT TYPE					
		4 blades	5 blades	6 blades	7 blades	8 blades	9 blades
Clay, sand, loose	SOFT						
sandstones, clayey siltstones	SOFT TO MEDIUM						
claystone, siltstone, sandstone, porous limestone, rock salt	MEDIUM						
Lamellar claystone, siltstones, limestones, marls, dolomites, sandstones	MEDIUM TO HARD						
Limestone, dolomites, marls, siltstones, sandstones	HARD						

- Basic bit design area of application
- Application area expansion by means of "T" option
- Application area expansion by means of "Y" option

IADC CODE BITS CLASSIFICATION

Body		Rocks		Cutters diameter, mm		Bit profile	
M	Matrix	1	Very soft	2	19 (16)	1	Short fishtail
		2	Soft	3	13	2	Short profile
S	Steel	3	Soft medium	4	10 (8)	3	Medium profile
		4	Medium			4	Long profile

PDC BIT NOMENCLATURE



Cutter diameters	8 mm	10 mm	13 mm	16 mm	19 mm
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NOZZLES



PZ1

Nozzle	PZ1-06	PZ1-07	PZ1-08	PZ1-09	PZ1-011	PZ1-013	PZ1-014	PZ1-016
Drift diameter	$\frac{8}{32}$	$\frac{9}{32}$	$\frac{10}{32}$	$\frac{12}{32}$	$\frac{14}{32}$	$\frac{16}{32}$	$\frac{18}{32}$	$\frac{20}{32}$

FOR BITS WITH DIAMETER FROM 6 $\frac{1}{8}$ TO 12 $\frac{1}{8}$ IN.



PZ2

Nozzle	PZ2-08	PZ2-09	PZ2-11	PZ2-13	PZ2-16	PZ2-17	PZ2-19
Drift diameter	$\frac{10}{32}$	$\frac{12}{32}$	$\frac{14}{32}$	$\frac{16}{32}$	$\frac{20}{32}$	$\frac{22}{32}$	$\frac{24}{32}$

FOR BITS WITH DIAMETER FROM 8 $\frac{1}{8}$ TO 17 $\frac{1}{8}$ IN.



PZ4

Nozzle	PZ4-05	PZ4-06	PZ4-07	PZ4-08	PZ4-09	PZ4-11
Drift diameter	$\frac{7}{32}$	$\frac{8}{32}$	$\frac{9}{32}$	$\frac{10}{32}$	$\frac{12}{32}$	$\frac{14}{32}$

FOR BITS WITH DIAMETER FROM 3 $\frac{1}{16}$ TO 8 $\frac{1}{8}$ IN.

ADDITIONAL OPTIONS

MAIN CUTTING STRUCTURE

Y,T



OPTION "Y"

Highest abrasive resistant cutters

OPTION "T"

Increased resistance cutters

BACKUP ROW

E



OPTION "E"

Additional PDC row behind the main cutting structure

O



OPTION "O"

Additional carbide inserts with impregnated diamonds behind the main cutting structure

C



OPTION "C"

Additional stabilizing inserts behind the main row

GAGE PART

X



OPTION "X"

Gage is protected by carbide inserts with impregnated diamonds

ADDITIONAL OPTIONS

GAGE PART

B



OPTION "B"

Back-reaming cutters on the gage relief

A



OPTION "A"

Thermally stable diamonds reinforced gage

TOOL JOINT

P



OPTION "P"

Box connection

FLUSHING

H



OPTION "H"

Unchangeable nozzles

BODY

M



OPTION "M"

Matrix body

BITS FOR SOFT AND MEDIUM ROCKS

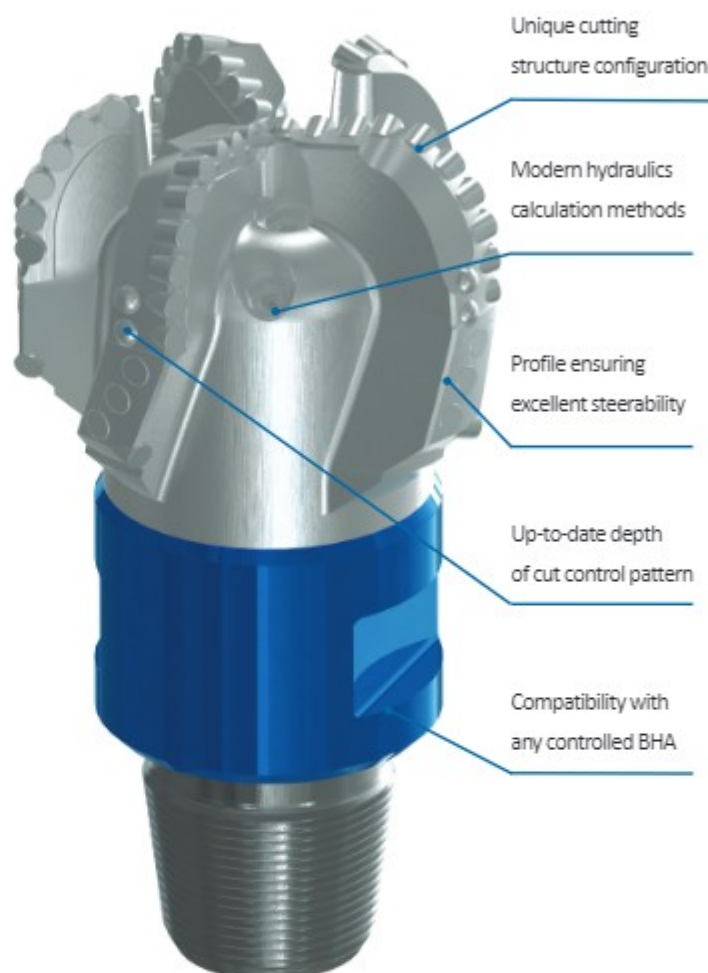
The line of high-speed steerable bits combining the best engineering practices and groundbreaking design is created especially for drilling wells with high rates of penetration.

Elongated cutting profile allows smoothing out the load on cutters increasing its resistance. ROP rates are achieved by means of properly balanced aggressive cutting structure even in cases of designs with the bulk of blades and PDC cutters.

Design of this bits line combine unmatched speed and cutting structure resistance allowing drilling both vertical and directional wells with big horizontal displacement with the ability of intensive buildup rates.

By means of breakthrough designers' solutions and new-generation cutting structure, the bits allow drilling with high effectiveness at low torque and low hydraulic power.

Flushing nozzles optimized for reducing pocketing in bottomhole – bit systems.



TECHNOLOGICAL FEATURES



Best practices of design

Each bit of the line is paid special attention. Design process provides deep analysis from different points of view increases the feedback effectiveness with consumer and decreases the probability of risk of errors.



Spiral shape blade

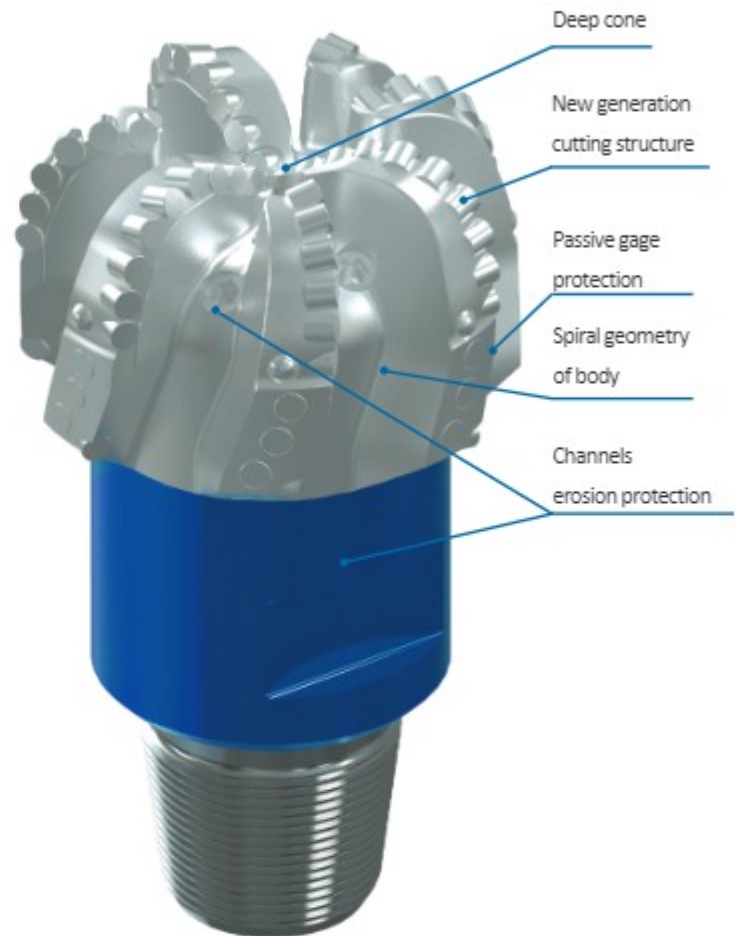
Spiral shape blade promotes more stable performance of the tool and allows locating more cutters.

BITS FOR HARD ROCKS

Drilling of hard and interbedded intervals is always difficult and the effectiveness of tools performance depends on variety of factors. Permanent analysis of runs and comprehensive approach allow significantly boosting technical and economic performance of well construction in such conditions.

This bits line allows drilling medium, hard and abrasive rocks with permanent high speed. The groundbreaking designing technology helps achieving maximum absorbing of vibrations in difficult intervals and reducing impact loads to cutting structure.

Aggressive cone of central part with smooth transition to elongated shoulder zone together with spiral geometry affords increasing cutting elements density thus receiving the necessary tool durability. Patented technology of depth of cut control elements placing on the nose and shoulder parts of the bit provide protection from vibration loads and prevent whirling.



Sometimes bits are equipped with additional row of diamond cutting structure for maximum covering and several-fold increase of operating life. During creation of bits for hard rocks are used diamond cutters of increased impact and abrasion resistance that are selected according to accumulated information on tool performance in the region of operations.

TECHNOLOGICAL FEATURES



Abrasion resistant cutting structure

Permanent researches, VTL tests and bundle of experience-based data allow specialists selecting to high precision the qualitative diamond cutting structure for certain mining and geological conditions and directly for customer requirements.



Gage reinforcement (Patented technology)

Unique gage reinforcing technology helps several-fold increasing tool operating life. Cutting structure distribution density is selected based on certain mining and geological conditions.

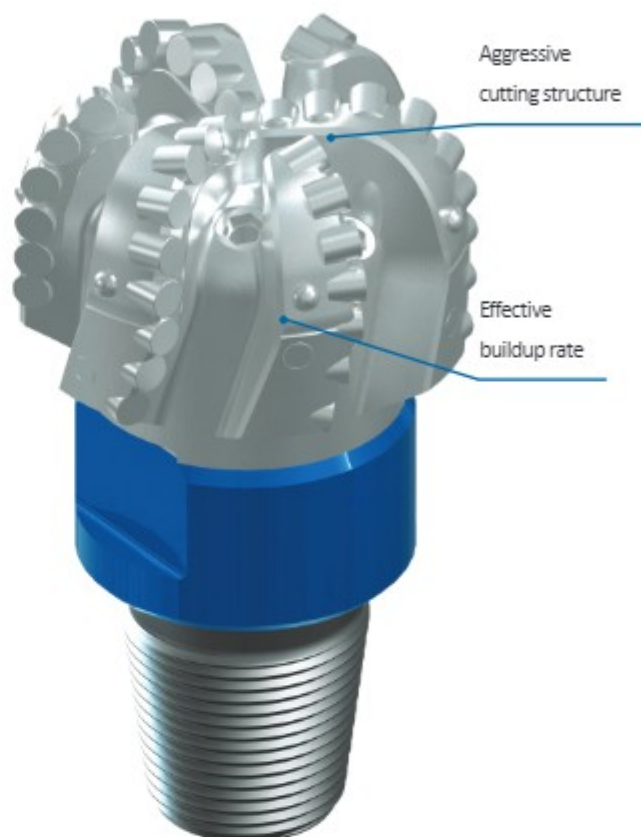
BITS FOR HARD ROCKS

“PH” TYPE BITS

Bits compatible with “Push-the-bit” RSS system have aggressive cutting structure and mean the radial displacement of whole assembly or its major part with respect to well axis.

The use of RSS changes the conventional drilling technology and allows effectively drilling long horizontal sections and wells with complex tortuous profile.

Tools of this type are optimized specially for drilling with high ROP and differ depending on selection of system itself.



“PT” TYPE BITS

Bits compatible with “Point-the-bit” RSS system have long gage part and a set of depth-of-cut control elements on the blades that provide stable bit positioning by means of tilting drive shaft with respect to BHA or by means of changing its curvature.

Unique geometry of profile and cutting structure arrangement provide stable drilling without losing steerability and drilling with low torsional loads in intervals of rocks alteration.

By means of developed nozzles pattern bits allow effectively cleaning bottom-hole zone excluding secondary reworking of cuttings.



IMPREGNATED BITS

This type of tool is effective in drilling with high-speed hydraulic motors and turbines. High rotational speed allows maximum rock destruction.

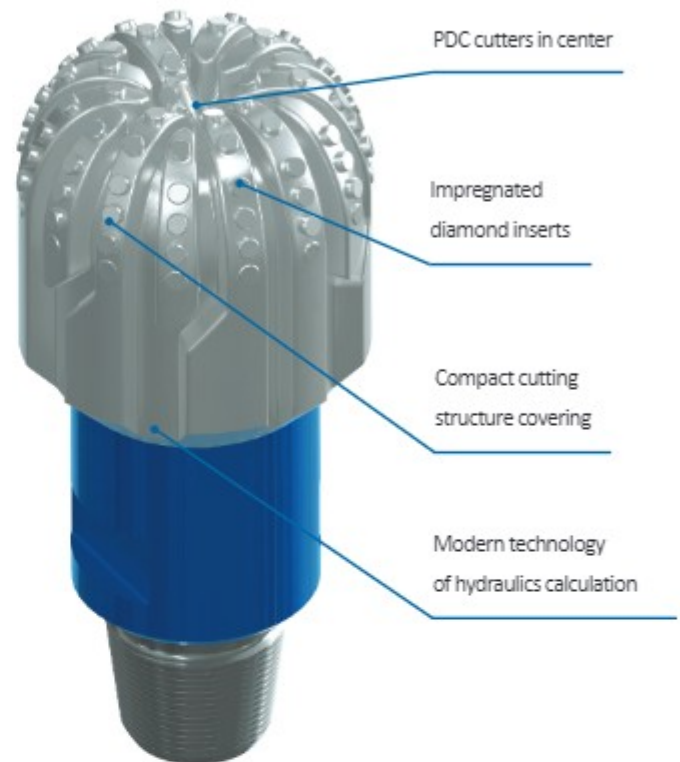
Specially designed bit profile allows placing large volume of diamond material. This feature increases durability of gage and front parts and protects gage in abrasive formations.

Bit designed for drilling with high ROP in hard and strong formations of VII-XI categories of hardness and up to XII category of abrasiveness.

Blades reinforced with specially selected mixture of high quality diamonds, which allows increasing bit durability at high ROP.

Bit cutting structure made up of hot-pressed inserts with impregnated diamonds allows achieving higher ROP.

All impregnated bits have carefully selected junk slot area helping effectively cleaning bottom-hole zone avoiding balling-up.



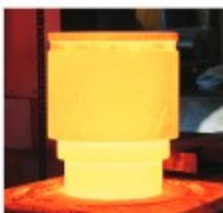
NOMENCLATURE

$8\frac{1}{2}$ D 15 09 ① A

- $8\frac{1}{2}$ – Outside diameter
- D – Diamond cutting structure
- 15 – Quantity of sectors
- 09 – Quantity of flushing ports
- 1 – Type of cutting structure
- A – TSP inserts

- 1 – impregnated cutting structure
- 2 – TSP cutting structure
- 3 – PDC cutting structure
- 4 – polycrystalline composite cutting structure

TECHNOLOGICAL FEATURES



Matrix body

Matrix composition is selected under the improved technology for receiving maximum abrasion and erosion resistance. Matrix tools can be multiply restored. This feature allows increasing operating life of tool and increase technical and economic performance of drilling.

BICENTRIC AND CONCENTRIC BITS

Bicentric bits allow drilling wells of diameter bigger than drift diameter of wellhead assembly, previously run casing and drilled intervals.

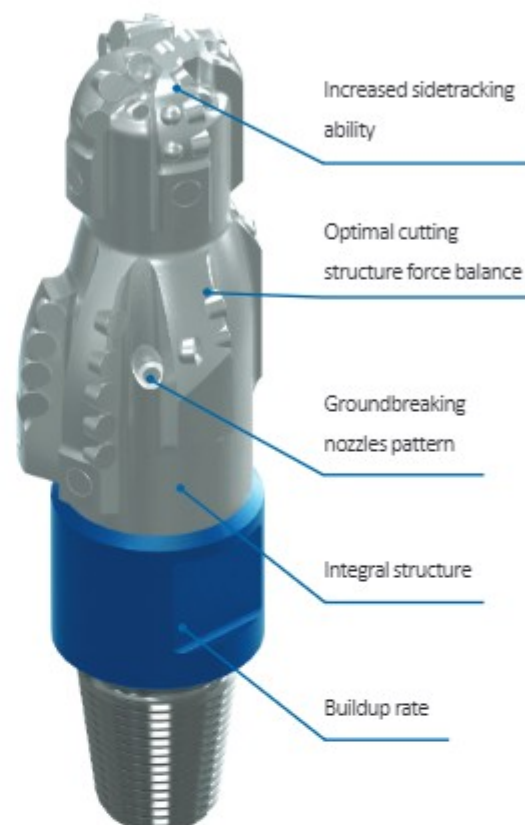
Concentric bits allow drilling wells with simultaneous wellbore reaming across the interval.

Bits of this type have carefully balanced cutting structure that minimizes cutters and casings wear during drilling out mountings.

Bit hydraulics is designed in such a way that flushing holes and junk slot area are forming the direct flow of mud increasing washover velocity.

Design of pilot and reaming parts allows effectively reaming, decreasing whirling probability and increasing bit lifetime.

Body of bicentric and concentric bits represents integrally machined construction excluding welding seams between pilot and part and reamer. Sizes are selected based on provision of the best assembly steerability.



NOMENCLATURE

$\frac{4^3}{4}$ $\frac{5^3}{16}$ $\frac{4^5}{32}$ BT 5 10 H - 02

- $\frac{4^3}{4}$ – Drift diameter
- $\frac{5^3}{16}$ – Reaming diameter
- $\frac{4^5}{32}$ – Max diameter of near bit tool
- BT – Manufacturer code
- 5 – Quantity of blades on reamer
- 10 – Main cutters size
- H – Unchangeable nozzles
- 2 – Construction number



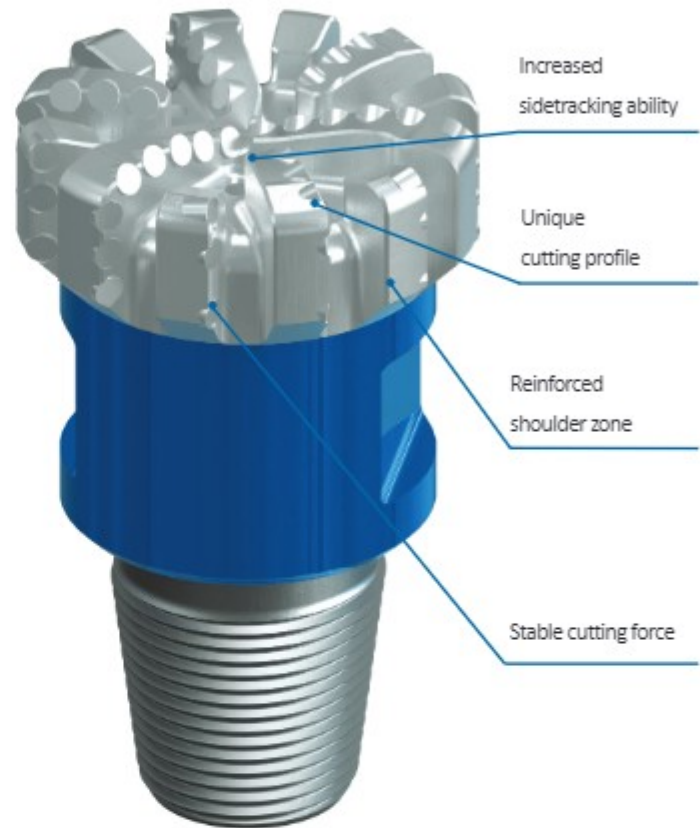
SPECIAL SIDETRACKING BITS

Bits of special designation are designed for kickoff from open hole.

Special design of cutting profile assumes aggressive lateral cutting force necessary for successful sidetracking. Short gage with increased distribution of load to cutters provides stable radial cutting force.

Cutting structure is carefully balanced which provides uniform load distribution and minimizes force imbalance.

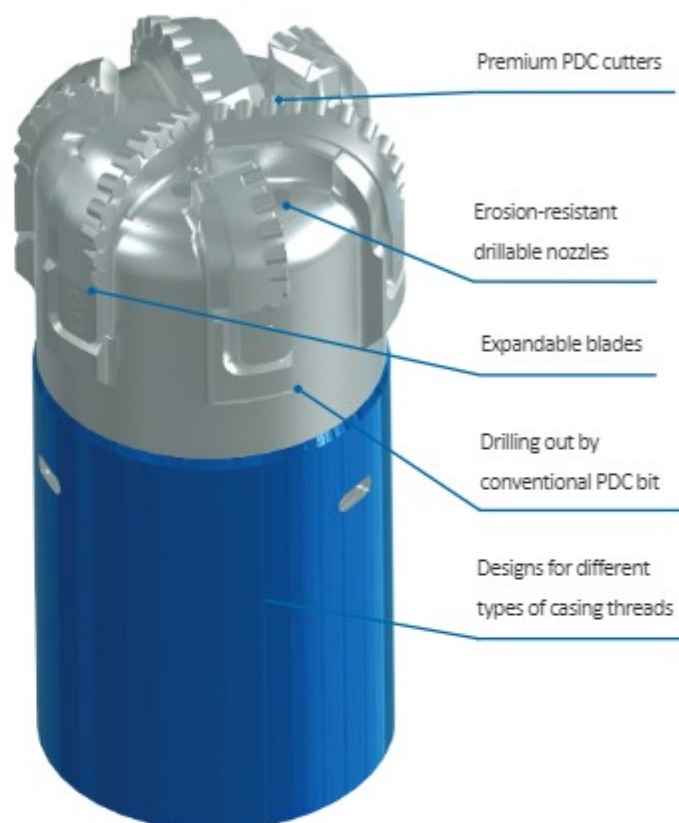
Design of this series also assumes continuation of drilling in short interval after finishing sidetracking operations. Wide range of cutters from polycrystalline diamonds guarantees the selection of optimal bit for specific customer conditions.



CASING DRILLING BITS

Drilling technology using casings allows assure casing running to the target depth in abnormal conditions, for example in circulation loss intervals, transient pressure zones, unsteady wellbore walls. The use of this technology decreases well construction period by means of reducing round trip operations.

BURINTEKH", Ltd casing drilling bits have component body. PDC cutting structure installed to steel blades that are fixed to body. Upon reaching TD before cementing the blades are expanded by core by means of ball drop. Bit core is made from easy drillable material that provide its unconstrained drilling out using conventional PDC bit during drilling the next section.



TECHNOLOGICAL FEATURES



Bit activation is carried out by means of easy drillable ball. Upon reaching TD dropped ball plugs hole and under pressure the drillable center moves forward and blades expand.



Blades expanding under pressure have PDC premium cutters. Inner elements of the bit are made from easy drillable materials.

“BC” TYPE BITS

Small and medium diameter (70-250mm) bits are equipped with tungsten carbide teeth designed for drilling liner equipment, cement and sand plugs, tubing cleaning from paraffin deposits and other operations.

Bits of big diameter (250-500 mm) are ideally suited for drilling sections for conductor and surface casing that are represented by low abrasive soft and medium formations. The design provides welded blades quipped with carbide teeth and hardmetal surfacing material.



“BP” TYPE BITS

These bits are designed for reaming, wiper tripping and smoothing wellbores in low abrasive soft and medium rocks. The use of these bits allows avoiding premature failure of expensive PDC tools. Body profile and cutting structure prevent spontaneous sidetracking in trouble wellbore. Cutting structure represents the combination of PDC cutters and carbide teeth.



GAGE BASKET “BK”

The use of gage basket allows combining wiper trip and logging excluding additional round trip operation thus reducing well construction time. Body profile together with PDC cutting structure allows reaming tight sections and smoothing wellbore walls. Design of the internal part of the basket provides unconstrained run of logging tools.



This image shows a full page of blank handwriting practice paper. It features approximately 28 evenly spaced horizontal blue lines across the entire page, providing a guide for letter height and placement. The background is plain white, and there are no margins, text, or other markings present.





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