



Fixed Cutter Product line manufacturing



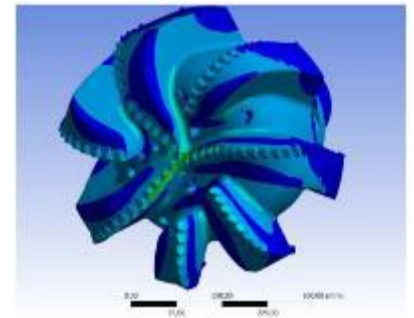
It is more than
Performance....
It's the secret behind
Technology...

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.

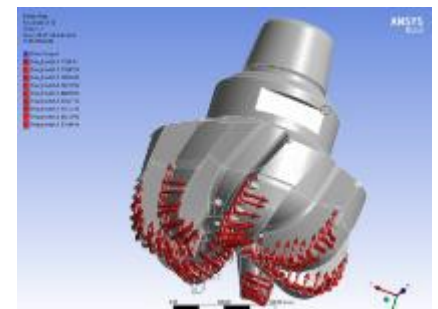


FORCE CALCULATION

The 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.

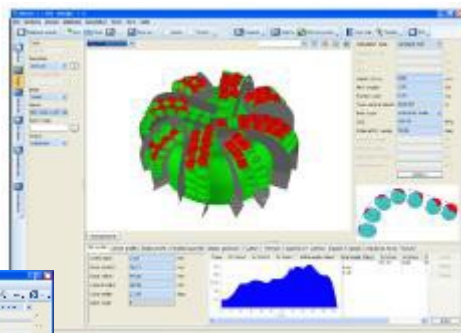
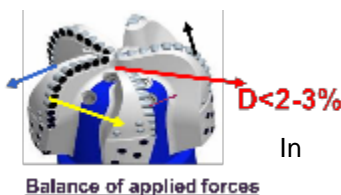
Force calculation of the bit body before failure of the tool joint is carried out in order to determine the serviceability of the tool by calculating the safety factor when torque is applied to the tool joint at which the pin is broken. The calculation is performed by the finite element method and helps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





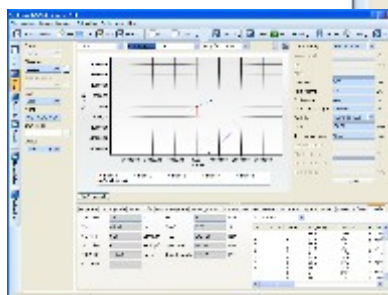
CUTTING STRUCTURE EFFECTIVENESS

During drilling on each cutter apply forces. In total these forces create an undesirable deflection force. 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%.



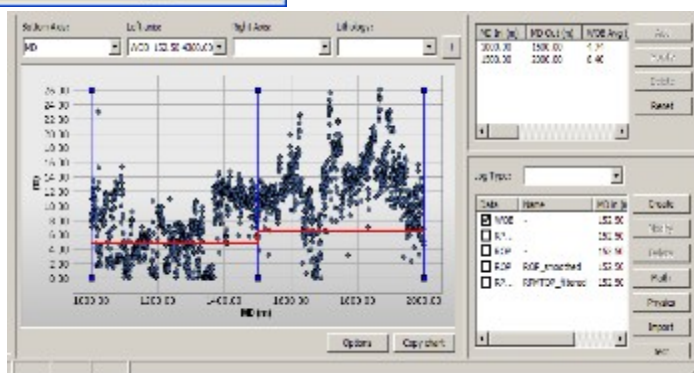
Low imbalance allows increasing the efficiency of rock destruction, evenly distribute loads on cutters cutting structure which is important when drilling rocks of any category of hardness.

and ensure the stability of



VTL TEST

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.

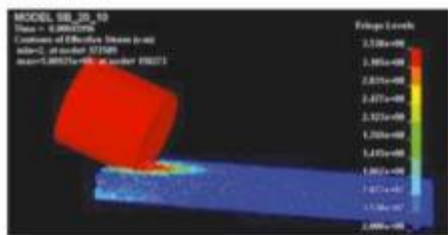
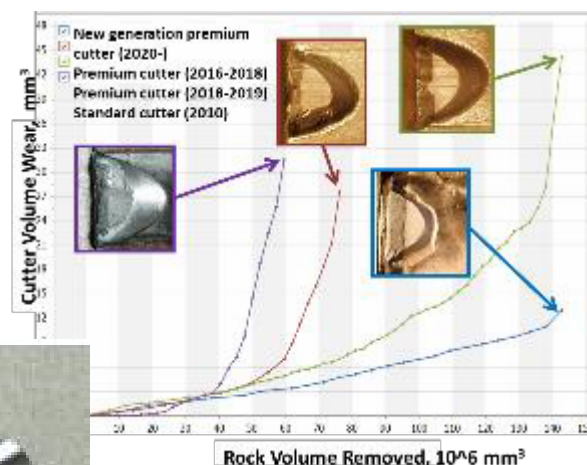


VTL test results and the result of the bit operation in the well are recorded in the integrated calculation complex.

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.

CUTTER QUALITY TECHNOLOGY

Set of design solutions implemented in these bits allows achieving maximum values of penetration rate, total meterage and excellent steerability while drilling both vertical and directional wells. While using of increased shock and abrasion resistant cutters increase life of tool thus providing higher penetration rate by means of preserving cutting structure of bit.





BIT HYDRAULIC DESIGN AND CALCULATION WITH (CFD)

The hydraulic calculation program calculates the flushing parameters in the design stage. This calculation ensures the effective bottomhole cleaning and achieve the minimum residence time of cuttings in bottomhole zone and implementation jetting effect

Program calculates maximum efficiency of bottomhole flushing at given rate of penetration by means of automated step changing the following parameters:

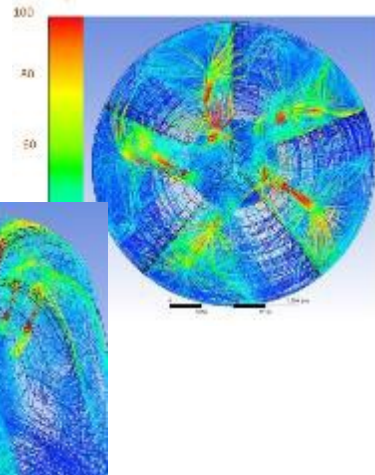
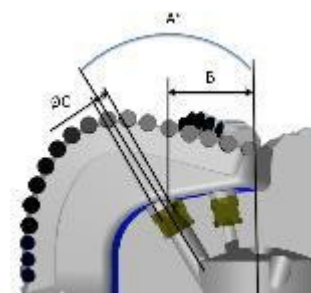
- B – distance from nozzle to bit axis
- C – nozzle diameter (conventional size range)
- A – nozzle angle relative to bit axis

Properly selected and technically implemented model of hydraulic parameters to the bit is one of the most important reasons for the effective operation of cutting structure.

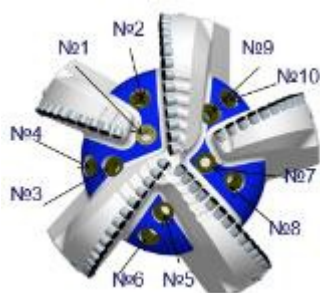
That is why engineers pay special attention to solve problems of improving the performance of the hydraulic system when designing bits. **BURINTEKH** design engineers use **CFD** analysis to simulate the interaction of the bit with the drilling fluid in the bottomhole formation zone.

CFD is a process of mathematical modeling of the fluid close to the bit. Computer flow dynamics analysis shows tangential stresses and turbulent processes; this method also makes possible to evaluate the efficiency of cuttings transportation, bottomhole and cutting structure cleaning.

Hydraulics calculation program obtains the maximum flow rate at the bottomhole and the minimum residence time of cuttings in the bottomhole zone.



Nozzle No	INSTALLATION ANGLE	ϕC , Diameter of the nozzle MM
1	10	11,1
2	30	9,5
3	30	11,1
4	35	9,5
5	25	11,1
6	35	9,5
7	10	11,1
8	30	9,5
9	30	11,1
10	35	9,5

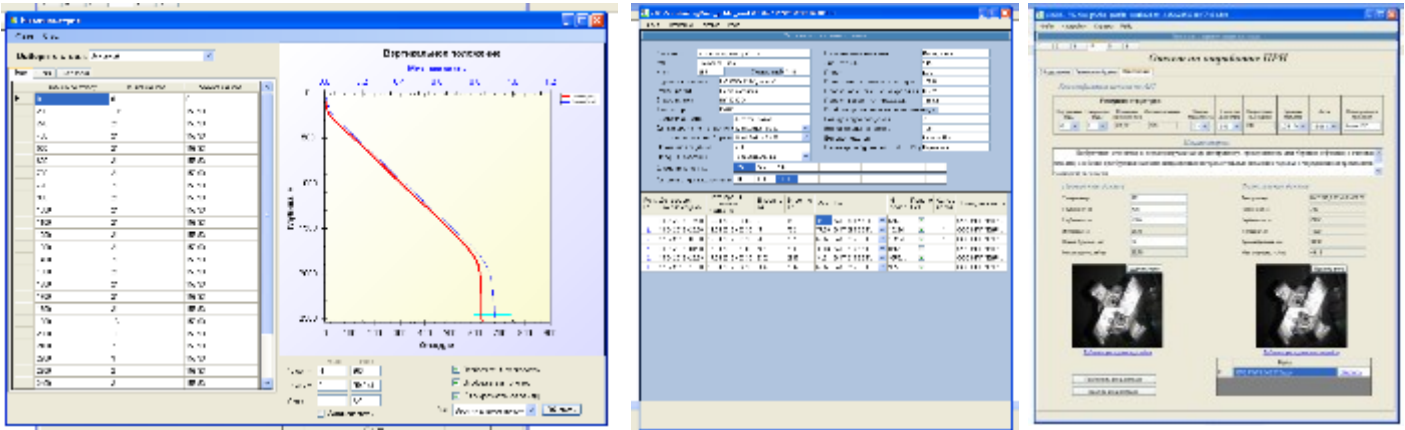


The calculation shows the absence/presence of dead areas and shows the optimum parameters of nozzles.



BIT RUNS DATABASE

After the bit run a report is compiled which is collected in the database, using this database allows effectively designing new bit design according to the bit performance and condition.



The information is carefully analyzed and helps to understand the ways of solving problems in drilling and increase the efficiency of the bit design. If necessary, a new design is created.