

OIL & GAS

PDC Cutters

FASTER DRILLING, LONGER LIFE, LOWER COSTS

— Our PDC cutters deliver the highest level of performance throughout the drilling cycle. Whatever the application or drilling conditions, our cutters meet the challenge to increase efficiency.



elementsix™
a De Beers Group Company

HOW WE DELIVER THE BEST PERFORMING CUTTERS IN THE INDUSTRY

— *By combining materials engineering with a partnership approach and manufacturing excellence*

INNOVATION WHERE THE CUSTOMER COMES FIRST

Element Six can deliver the right innovation at the right time thanks to our customer centred approach to innovation.

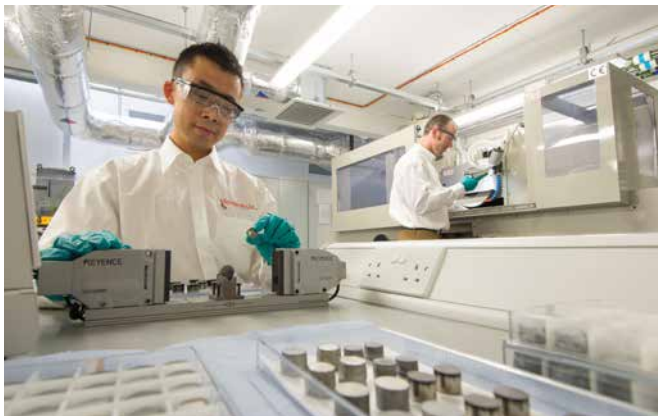
Working closely with our customers means;

- We understand the real-world application requirement from the outset
- You share the benefits of expertise from a 60 year history of continuous diamond innovation

A HUB FOR MARKET READY INNOVATIONS

Working with customers, our Global Innovation Centre can take a product concept and quickly turn it into a tested market-ready product.

Our GIC has more than 140 top engineers, materials scientists, physicists and technologists wholly dedicated to the development of synthetic diamond and carbide.



Over 140 engineers, material scientists and technologists work in partnership with customers at our Global Innovation Centre.

UNRIVALLED END-TO-END INNOVATION CAPABILITIES:

- Material characterisation
- Synthesis and sintering
- Tool assembly
- Prototyping
- Application testing

BACKED BY WORLD-CLASS MANUFACTURING CAPABILITIES

Element Six is an ISO9001 2008 Registered Company.

Continuous investment in both R&D and production technology ensure that Element Six continues to push the boundaries of materials performance.

- Our worldwide manufacturing sites can quickly scale up innovations into production ready products
- Our global manufacturing facilities exploit the benefits of the latest press technologies including both belt and cubic presses
- Consistently high performance can be delivered every time thanks to our unequalled diamond synthesis capabilities and unrelenting focus on quality



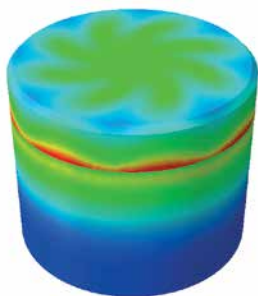
Element Six's unequalled synthesis capability includes the very latest belt and cubic press technology to continuously push the boundaries of materials performance.

CUTTER TECHNOLOGY THAT ENABLES ENHANCED DRILLING EFFICIENCY

— *Improved cutter performance is a product of design, material qualities and manufacturing capabilities unique to Element Six*

ACHIEVING THE PERFECT BALANCE FOR EXTREME PERFORMANCE

Our PDC cutters achieve the highest performance by a complex balance of edge toughness and thermomechanical durability, with a select microstructure, interface height and design. We achieve this through optimising sintering conditions using both belt and cubic presses – a range of capabilities only available from Element Six.



Residual stress modelling and optimisation is an integral part of our cutter development process.

DESIGN AND SYNTHESIS OPTIMISED FOR ANY APPLICATION

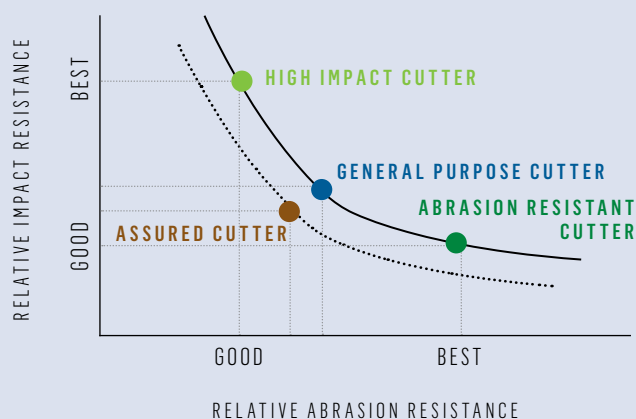
We achieve a balance between impact and abrasion resistance by optimising grain size and synthesis parameters and by adjusting the diamond feed and interface in the cutter design.

ABRASION RESISTANCE IS VERIFIED IN VERTICAL TURRET LATHE TESTS

The Vertical Turret Lathe tests abrasion and allows us to tailor the thermo-mechanical characteristics of our cutters to application requirements.



DESIGN - PERFORMANCE RATIONALE



BACKED BY FIELD PERFORMANCE ANALYSIS

In-house application tests are further validated by analysis of performance in the field.

Element Six closely examines the dull condition of cutters, and the operating conditions in customers applications.

Through this continuous feedback and in-house performance tests, Element Six ensures a detailed understanding of its cutter performance is integrated back into the design process – for cutters that meet the demands of real world applications.

CUTTERS THAT DRILL FURTHER AND PERFORM CONSISTENTLY

— *Providing exceptional durability for longer drilling intervals at greater rates of penetration*

NEXT GENERATION HIGH IMPACT CUTTER

A market leading product offering the highest level of performance.

- For applications where high impact and wear resistance are required
- Superior resistance to surface flaking
- Good edge retention and toughness

ABRASION RESISTANT CUTTER

Field proven to provide exceptional durability.

- Engineered for applications where thermo-mechanical abrasion is dominant
- Smaller wear flat generation leads to more efficient cutting

GENERAL PURPOSE CUTTER

Reliable performance in unpredictable drilling conditions.

- Delivers a balance between impact and abrasion resistance for drill bits required to drill a variety of rock types and strengths
- Exceptional diamond table toughness combined with good thermo-mechanical abrasion resistance enables it to cope with unpredictable conditions



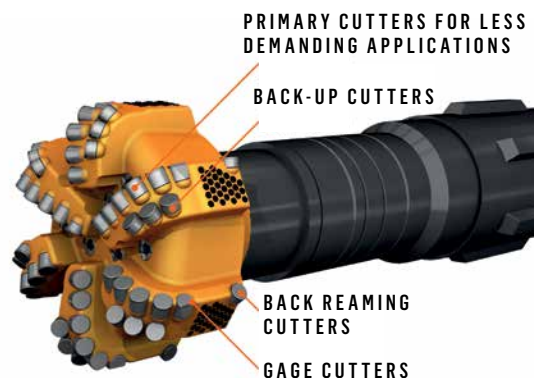
Our range of PDC cutters are engineered for all application areas, to meet customer's specific challenges.

ASSURED GENERAL PURPOSE CUTTER

Element Six also offers an affordable alternative where premium cutter properties are not required.

- Manufactured with the same assurance of quality and reliability as our premium cutters
- Deliver consistent performance in general purpose applications that do not demand premium abrasion and wear resistance

FOR LESS CHALLENGING REQUIREMENTS



Element Six Assured General Purpose cutters can be used in a variety of positions on the drill bit for more cost-effective yet reliable drilling.

ALL CUTTERS AVAILABLE IN STANDARD DIAMETERS OF 13 MM, 16 MM AND 19 MM.

OTHER DIAMETERS CAN BE MANUFACTURED UPON REQUEST.

FOR DETAILS OF SPECIFIC CUTTER GRADES AVAILABLE IN EACH APPLICATION AREA PLEASE CONTACT YOUR LOCAL ELEMENT SIX OFFICE.

PERFORMANCE BACKED BY EXTENSIVE APPLICATION TESTS

— *We make sure our cutters work successfully in our customers' applications by analysing and testing them in real world conditions*

UNDERSTANDING THE OIL & GAS INDUSTRY

At our Global Innovation Centre, a dedicated Oil & Gas team of over 30 scientists, engineers and technologists, supported by an array of advanced test equipment, work closely with customers to understand how our Oil & Gas products behave in the working world of drilling wells.

Extensive laboratory application tests and in-field performance analysis give our team an industry-leading understanding of the relationship between tool performance, materials microstructure and design.

ALWAYS STRIVING FOR IMPROVEMENT

In addition, at Element Six we are always developing new test methods and instrumentation to improve the evaluation of our product's performance.

These unrivalled capabilities and our partnership approach enable our customers to be first to market with successful new products.

OUR TESTING FACILITIES AND CAPABILITIES

Our laboratory based application tests replicate failures observed in the field:

- Vertical Turret Lathe testing measuring thermo-mechanical wear
- A range of abrasion tests to measure abrasion resistance
- Chipping Tests measuring impact resistance and edge toughness
- General laboratory testing to assess performance in specific applications. For example, to measure performance in impact resistance, the propensity for spalling and durability



Our application testing capability allows us to better assess the true field performance of our cutters.

ELEMENT SIX

Element Six, part of the De Beers Group of Companies, designs, develops and produces synthetic diamond and other supermaterials, and operates worldwide with primary manufacturing facilities in China, Germany, Ireland, South Africa, the UK and US.

Element Six supermaterial solutions are used in applications such as cutting, grinding, drilling, shearing and polishing, while the extreme properties of synthetic diamond beyond hardness are opening up new applications in a wide array of industries such as optics, power transmission, water treatment, semiconductors and sensors.

If you would like to know more about Element Six please visit our website www.e6.com or contact us at any of the addresses below.

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