OIL & GAS, MINING & ROAD, WEAR PARTS

Performance Tools

TRANSFORM PRODUCTIVITY

Whether you are looking to increase productivity or adopt new materials, our performance tools are designed to give you the competitive advantage in your marketplace.

elementsix™

a De Beers Group Company


LTMAX 3

WIN COMPETITIVE ADVANTAGE

——— We deliver success globally for our customers.

Over the past 50 years, Element Six has been working in partnership with customers to develop cutting-edge products and materials that offer considerable advantages over their competitors. Element Six has a proven commitment and capacity to innovate and continues to deliver ground-breaking commercial opportunities for our customers. Element Six's unique state-of-the-art Global Innovation Centre (GIC), near Oxford, UK, further enhances our position as the world leader in synthetic diamond and supermaterial research, to find new ways to turn the extreme properties of supermaterials into products with revolutionary performance.

Element Six synthetic diamond and tungsten carbide solutions extend tool and component life, dramatically improving industry productivity and delivering unprecedented levels of efficiency in many industries:

– Agriculture and forestry
– Automotive and transportation
– Chemicals
– Construction
– Mining and tunnelling
– Oil and Gas
– Recycling
– Textiles
– Steel

SWITCH MATERIALS TO GAIN PRODUCTIVITY

Valuable improvements in efficiency, tool life and component reliability can be achieved by switching from steel to tungsten carbide and then from tungsten carbide to synthetic diamond. Element Six can help manufacturers and end users to make that switch and achieve valuable gains in performance.

This makes Element Six the partner of choice for customers all around the world looking to move up the performance and value added chain.

Our customers benefit from Element Six's unrivalled synthetic diamond production facilities to meet their specific requirements.

DEVELOPING THE RIGHT ROAD PICK FOR OUR CUSTOMERS

ROAD PLANING

Element Six has been manufacturing road picks for milling asphalt and concrete for over 20 years. Today Element Six offers three types of road planing picks.

D POWER™ ROAD

Over 25 leading road contractors in over 10 countries have revolutionised their road milling activity with D Power™. D Power™ Picks are tipped with polycrystalline diamond, one of the hardest man-made materials on the planet and exceed 40 times the life of standard carbide picks.

- Competitive advantage through increased pick life and productivity
- Improve fuel efficiency
- Deliver better surface finish
- Reduce wear on capital equipment
- Improve working conditions
- Minimise environmental impact

D Power™ Road Picks are creating significant competitive advantages in asphalt milling projects to a recommended depth of 12 cm on highways and airport runways.

MASTERGRADE® M-SERIES

MasterGrade® M-Series Road Picks use Element Six proprietary nano-technology to enhance the cobalt binder matrix. That gives the picks greater wear resistance and fracture toughness. The result is a versatile, economical road pick with up to 50% greater life expectancy compared with standard picks. Today MasterGrade® M-Series Road Picks are used all over the world on all types and sizes of cold milling machines.

T-SERIES

The T-Series is the Element Six standard range of tungsten carbide road picks. They are in widespread use all over the world and, thanks to our rigorous Quality Assurance Programme, deliver consistent performance, specified life and trouble-free milling. They can be installed on all types of cold milling machines.

"I must admit at the start we were sceptical about D Power™. But the results of our first project were very impressive. The machine operators were the first to be really sold on them, mainly because they can just get on with the job."

Kai Löben, Technical Manager,
Fräsdienst Enrico Feind e.K., Germany

PERFORMANCE TOOLS FOR MINING

EXTREME PERFORMANCE IN THE MOST CHALLENGING ENVIRONMENTS

Underground, the need for continuity, reliability and consistent performance is paramount. Element Six has been working with partners in the mining industry to develop cutting tool solutions that deliver consistency in many different conditions from abrasive powdery minerals to dense igneous rocks. For these demanding environments, Element Six offers a comprehensive portfolio of mining solutions.

INSERTS FOR THE MOST CHALLENGING MINING APPLICATIONS

Element Six manufactures a comprehensive range of inserts for percussive drilling tools, roller cone bits and tunnelling. Percussive drilling is particularly challenging and our range of inserts is specially formulated to cope with the stress encountered during the most severe drilling conditions. The inserts are available in a range of sizes and shapes. In aggressive rock formations our Gradient Carbide technology can also offer significantly more wear resistance and fracture toughness. Where very high MPa values combine with hard abrasive geology, Element Six Percussive Diamond Inserts (PDIs), with their unique 3D PCD (Polycrystalline diamond) technology, can help overcome these very challenging environments. They offer:

– Excellent wear resistance and penetration rates

– Significant energy saving

– Improved rig utilisation and faster project completion

INDUSTRY LEADING TUNGSTEN CARBIDE AND PCD MINING TOOLS

Element Six mining picks offer the best-in-class performance for continuous cutting applications such as soft rock underground mining (e.g. coal, gypsum or potash) or continuous surface mining (e.g. iron ore). When conditions call for greater pick strength Element Six offers MasterGrade® Mining Picks which use our nano-technology.

When extreme performance is required, such as in tough geology or remote mining situations, our technical team can configure customised tools with PCD tips. These extend pick tool life dramatically and can also be combined with our patented hard-facing technology.

These tip formulations can also be applied to rotary drill bits for roof bolting applications and for vacuum drilling.

PRODUCTS FOR EVERY STAGE IN OIL AND GAS PRODUCTION

HELPING TO MEET THE INDUSTRY'S MAIN CHALLENGE

Throughout the Oil and Gas industry the challenge of working in new environments calls for innovative ways to drill deeper, further and faster, as well as achieving new levels of reliability and efficiency. Element Six can help you meet that challenge.

Element Six offer a wide range of materials, products and technical services for use in many applications in the Oil & Gas industry, from upstream drilling and extraction equipment to electrochemical sensing and analysis applications.

We partner with our customers to help them raise productivity and become more competitive by:

– Improving Rates of Penetration (ROP) and cutting the cost per foot drilled

– Reducing rig downtime and shortening drilling project duration

– Improving competitiveness throughout the Oil and Gas value chain

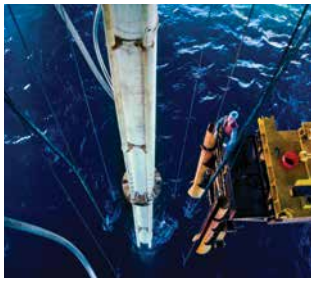
DRILLING INSERTS: TRANSFORMING PRODUCTIVITY

Polycrystalline Diamond Cutter (PDC) inserts from Element Six deliver high impact resistance and exceptionally low wear rates, even in the most challenging rock formations. Tests show they achieve very high ROP with longer tool life, deeper drilling depth and far fewer drill bit changes. Element Six also offers a range of high performance tungsten carbide inserts and synthetic diamond grit for roller cone and impregnated bits; providing the solution for all drilling requirements.

WEAR SOLUTIONS: BOTTOM HOLE ASSEMBLY AND FLOW CONTROL

Element Six's range of tungsten carbide and PCD materials alongside world class engineering expertise make us the partner of choice for maximising productivity throughout all Oil and Gas exploration and production stages.

Bespoke wear solutions include bearings, rotors, stators, nozzles, sleeves, rings, chokes and valves for bottom hole assemblies and well heads.



Element Six PCD wear part solutions dramatically reduce costs in offshore Oil and Gas.

Element Six wear part solutions improve efficiency in topside and subsea valves in the Oil and Gas industry.

SENSING AND DETECTING: INFORMATION AT THE EXTREMES

Very few diagnostic tools can be sent down an oil well and survive, however, tools with sensors made of synthetic diamond can operate reliably and continuously despite the heat, aggressive chemicals and the physical stress encountered down hole. Synthetic diamond has high thermal and electrical conductivity, making it an ideal material for sensing and detecting sulphur content, heavy metals, salinity and PH in hostile environments.

ULTIMATE MATERIALS FOR WEAR PART SOLUTIONS

WEAR PARTS THAT REDUCE MAINTENANCE AND LAST LONGER

Element Six offers a range of materials and components for wear parts such as valves, bearings and turbine parts, in many industries and particularly in oil and gas, chemicals, forestry and agriculture. Our customised wear part solutions extend component life and ensure continuous reliable operation by combining the properties of two principle materials, tungsten carbide and PCD. See the table below for the properties of these materials.

Element Six has unrivalled knowledge of both synthetic diamond and tungsten carbide, with over 50 years' experience in the innovation, production and manufacture of these supermaterials.

ULTRA LOW FRICTION POLYCRYSTALLINE DIAMOND (PCD)

Element Six PCD wear part solutions use the extreme hardness and exceptionally low coefficient of friction inherent in synthetic diamond. It is also immensely strong and tough. These four properties make PCD the ultimate material for wear part solutions.

PROVEN RELIABILITY IN TUNGSTEN CARBIDE PRODUCTS

Element Six offers a complete range of tungsten carbide products in the form of ready-to-press powders, bespoke products and industrial wear parts. Low Melting Carbide (LMC) coatings are also available for various hard-facing applications.

Applications and industries using Element Six tungsten carbide wear solutions include:

- Wear protection components for the mining industry
- Pump, valve and bearing parts for the oil and gas industry
- Surface and sand blasting technology
- Brick and roof tile industries
- Wear parts for metal forming applications
- Carbide rolls for the steel industry
- Wear parts for the recycling industry
- Textile and paper industries
- Synthetic diamond manufacturing

DRIVEN BY INNOVATION TO INCREASE OUR CUSTOMERS' PRODUCTIVITY

At our Global Innovation Centre (GIC), near Oxford, UK, our scientists are focused on developing, the next generation of wear part solutions. We work in close partnership with our customers to develop solutions which reduce costs and increase performance, delivering competitive advantage for our partners and their customers.

At our manufacturing facility in Burghaun, Germany, our capabilities include carbide forming, grinding and polishing, steel machining, EDM cutting, brazing and welding.

Delivering greater operational continuity and reduced maintenance costs.

Element Six wear parts solutions increase product quality in the steel manufacturing industry.

Our wear parts solutions offer valuable improvements in efficiency in recycling operations.

MATERIAL PROPERTIES	PCD	TUNGSTEN CARBIDE
Density (g/cm^3)	4-4.4	12,7 - 15,0
λ(W m^{-1} K^{-1})	160-450	60 - 120
Fracture toughness (MPa m$^{1/2}$)	8-13	8 - 30
Hardness (GPa) 100g	50	7 - 20
Young's Modulus (GPa) Knoop	800	450 - 700
CTE (x10^{-6} K^{-1})	4.2	5,0 - 7,4

ELEMENT SIX

Element Six is a synthetic diamond supermaterials company and a member of the De Beers Group of Companies.

Element Six designs, develops and produces synthetic diamond supermaterials, and operates worldwide with its head office registered in Luxembourg, and primary manufacturing facilities in China, Germany, Ireland, South Africa, US and the UK.

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 already 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 the address below.

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Photo source front cover bottom left: RAG Deutsche Steinkohle

03/2016