



INTRODUCTION TO OIL AND GAS PRODUCTS

February 2019

AGENDA SLIDE

1. INTRODUCTION

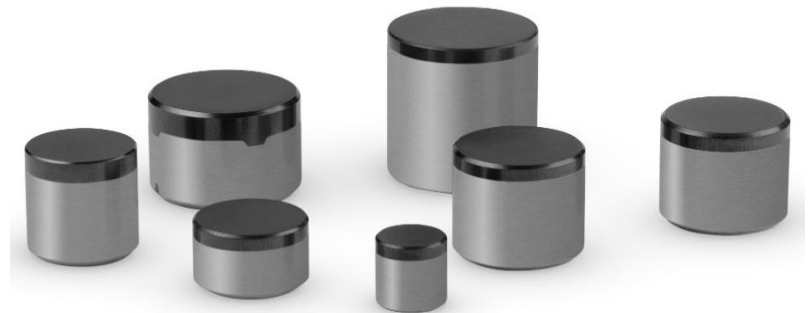
2. INFORMATION & AVAILABILITY

3. DIMENSIONS & SPECIFICATIONS

INTRODUCTION TO OIL & GAS PRODUCTS

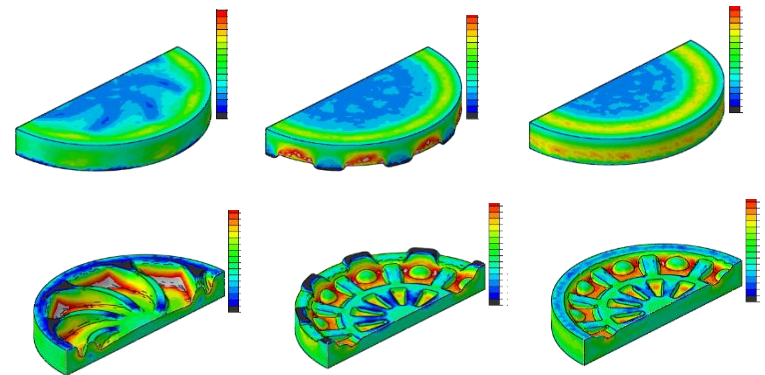
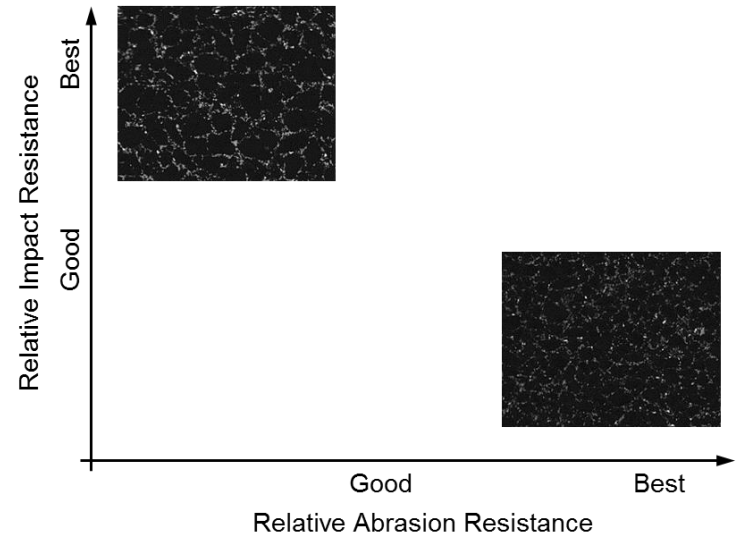
CUTTER TECHNOLOGY THAT ENABLES ENHANCED DRILLING EFFICIENCY

- 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.
- This is achieved by a complex balance of edge toughness and thermo-mechanical durability, with a select microstructure and interface design combined with optimised sintering conditions using both Belt and Cubic press systems – a range of capabilities unique to Element Six.
- At our Global Innovation Centre, an Oil & Gas team of over 30 scientists, engineers and technologists, supported by an array of advanced manufacturing and test equipment, works closely with customers to understand how our Oil & Gas products behave in the working world of drilling wells.



THROUGH A COMBINATION OF MATERIALS ENGINEERING AND MANUFACTURING EXCELLENCE

- Our diamond feeds are individually tailored to the requirements of each application, and selected based on extensive application analysis. However in general:
 - Coarse feeds provide more impact resistance
 - Fine feeds provide improved abrasion resistance
 - Multi-modal feeds with different ratios of fine and coarse feed are preferred as they provide a balance of properties
- Element Six is unique in that it operates both Belt and Cubic press platforms, which when combined with optimised synthesis cycles (pressure and temperatures) provides the capabilities required to produce the best products in the industry.
- Cutter geometry; diamond table thickness and interface design (height, shape etc); is an integral component of cutter performance and is tailored to provide the most appropriate solution to each application.



PERFORMANCE BACKED BY EXTENSIVE APPLICATION TESTING

- 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.

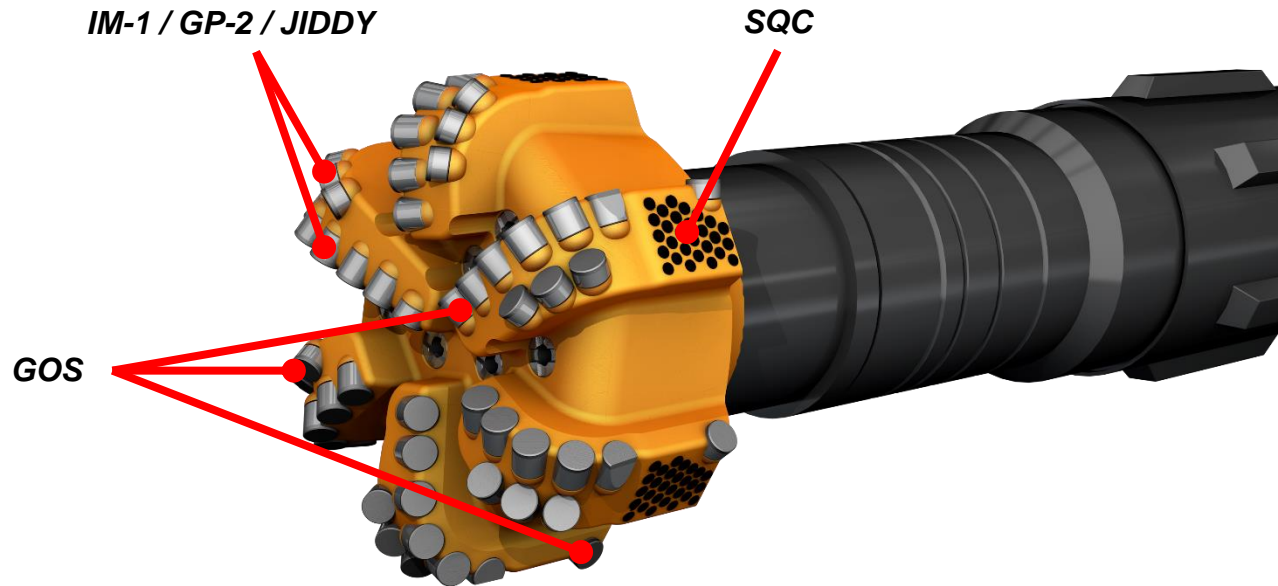
At Element Six we are always developing new test methods and instrumentation to improve the evaluation of our product's performance.

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



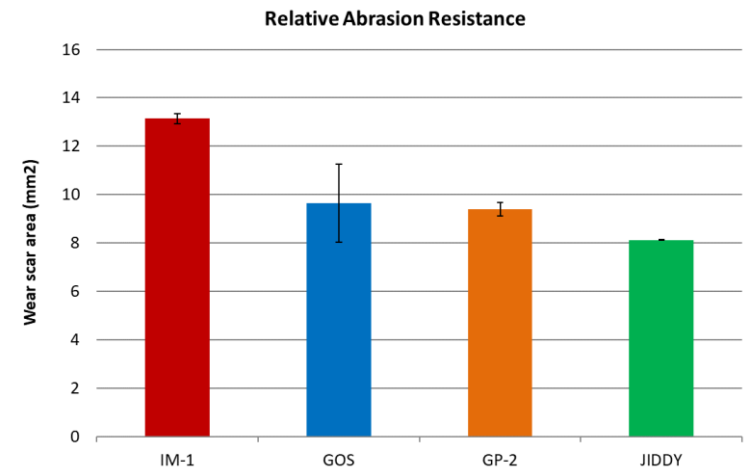
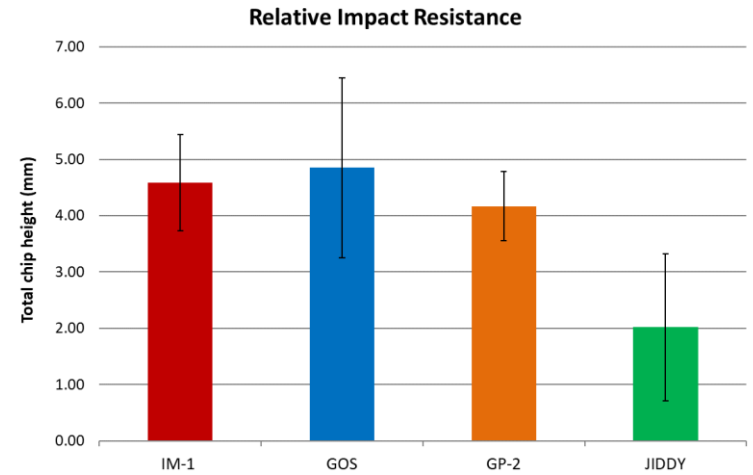
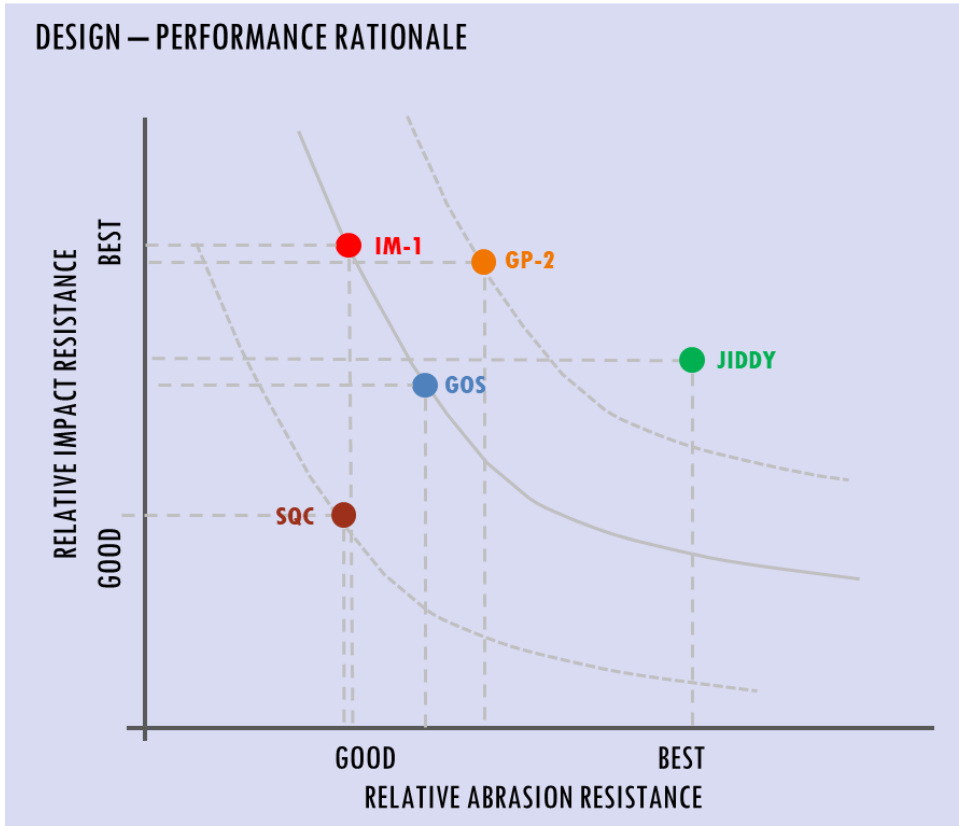
- Our laboratory based application tests replicate failures observed in the field:
 - Vertical Turret Lathe testing measuring thermo-mechanical wear
 - A range of abrasion tests to measure abrasion resistance
 - Chipping Tests measuring impact resistance and edge toughness
 - General laboratory testing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

ELEMENT SIX OFFER A RANGE OF PDC CUTTER TYPES FOR DIFFERENT APPLICATION REQUIREMENTS



- IM-1, GP-2 and JIDDY are suitable for use as primary and back-up cutting elements, in all positions on the bit, in challenging applications where Premium cutter performance is required.
- As our most cost effective option GOS is more suitable as a replacement for Premium cutters in applications which do not require premium cutter performance. GOS is suitable for use in the cone, as a back-up cutter; and a primary cutting element in more benign applications
- SQC is an excellent choice as a gage protection component.

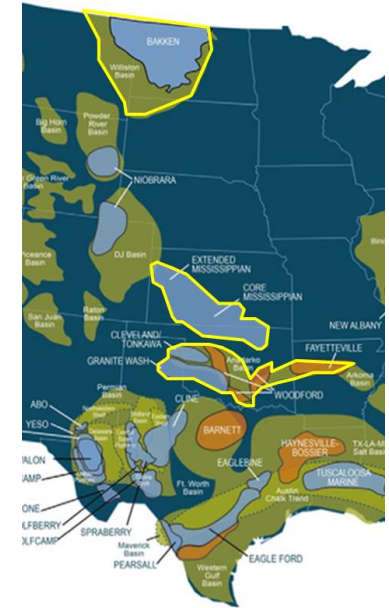
RELATIVE PDC CUTTER PERFORMANCE COMPARISON



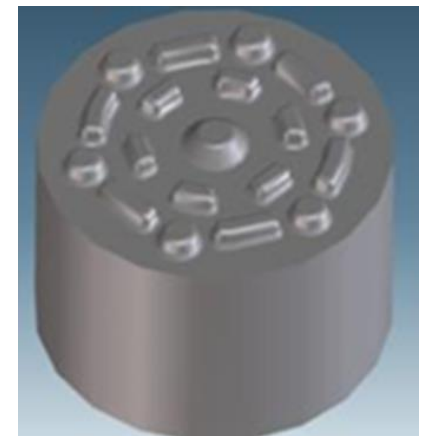
CUTTER INFORMATION AND AVAILABILITY

JIDDY ABRASION RESISTANT CUTTER

- JIDDY is a Premium cutter, offering a combination of high abrasion resistance combined with toughness for the most demanding abrasive applications, such as those experienced in the Mid Continent and Williston plays, requiring excellent thermo-mechanical properties
- JIDDY combines a microstructure designed to provide exceptional thermo-mechanical durability balanced with very good edge toughness; resulting in a cutter that retains a sharp cutting edge for longer.
- Resulting in improved Rates of Penetration (ROP) throughout the assigned drilling interval.

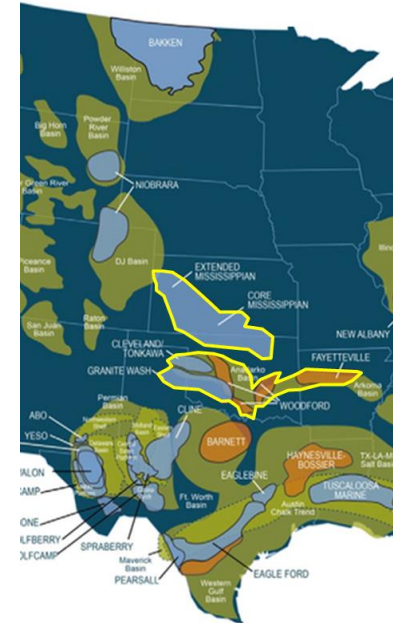


	Size	PCD Thickness	Price to Distributors
JIDDY	R1308	2.0 mm	\$120
	R1313		\$117
	R1608		\$165
	R1613		\$162
	R1908		\$207
	R1913		\$204



GP-2 FOR APPLICATIONS REQUIRING ABRASION AND IMPACT RESISTANCE

- Our GP-2 cutter has been designed to achieve impact performance similar to the market leading IM-1 impact cutter, while also providing a noticeable improvement in abrasion resistance.
- These properties have been tailored through a unique combination of feed, synthesis conditions and interface design.
- The 3mm PCD table on the newly developed “tri-spoke” interface provides a balance between toughness and abrasion resistance ideal for highly interbedded applications such those experienced in the Mid-continent oil province.



	Size	PCD Thickness	Price to Distributors
GP-2	R1308	3.0 mm	\$88
	R1313		\$85
	R1608		\$123
	R1613		\$120
	R1913		\$160



IM- 1 FOR HIGH IMPACT DRILLING

The IM-1 cutter is one of our market leading impact cutters developed for demanding applications that require high fracture resistance and ability to perform under extreme impact conditions, such as the Permian Basin.

IM-1 comprises a select microstructure and interface design that provides a balance of edge toughness and thermo-mechanical durability resulting in a cutter that consistently provides improved Rates of Penetration (ROP) throughout the assigned drilling interval.



	Size	PCD Thickness	Price to Distributors
IM-1	R1308	3.0 mm	\$88
	R1313		\$85
	R1608		\$123
	R1613		\$120
	R1913		\$160



GOS FOR GENERAL PURPOSE APPLICATIONS

At Element Six we recognise cutters represent a significant portion of the overall cost of the drill bit, and that not every application requires premium cutter properties

Utilising cutters or a mix of cutter grades appropriate to the application can have a positive impact on margins and return on investment. Thus we are offering GOS as our Assured cutter product, which is our most cost effective option that comes with the assurance that it has been made in our world class facilities to our stringent Element Six quality standards.

GOS provides a good level of impact and abrasion resistance suitable for a broad range of applications.

	Size	PCD Thickness	Price to Distributors
GOS	R1308	2.0 mm	\$65
	R1313		\$62
	R1608		\$81
	R1613		\$78
	R1913		\$100




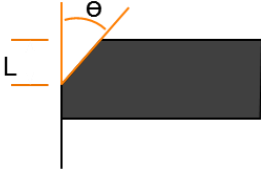

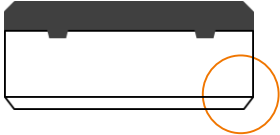
SQC FOR GAUGE PROTECTION

- SQC is the most basic PDC product offered by Element Six for Oil & Gas applications
- It offers cost effective abrasion resistance in non cutting areas of the bits such as gauge pads (Fixed Cutter) and Gauge bevel surfaces (Roller Cone).
- SQC has not been designed as a primary or secondary cutting component can be tailored to suit customer specific dimensions and geometries

	Size	PCD Thickness	Price to Distributors
SQC	R0605	1.7 mm	\$35
	R0808		\$40
	R1008		\$45
	R1108		\$50
	R1313		\$55

CUTTER DIMENSIONS & SPECIFICATIONS

ELEMENT SIX CUTTERS ARE OFFERED IN A RANGE OF SIZES AND SPECIFICATIONS

	COMPONENT HEIGHT	CHAMFER	DIAMOND TABLE	SUBSTRATE
13 MM	<ul style="list-style-type: none"> 8.00 mm 13.20 mm 	DT 0.25mm x 45° DTB 0.38mm x 45°	Varies depending on product family	Standard O&G substrate
16 MM	<ul style="list-style-type: none"> 8.00 mm 13.20 mm 	DTC 0.50mm x 45°		Non-planar Interface
19 MM	<ul style="list-style-type: none"> 13.20 mm 	DTD 0.48mm x 45° DTK 0.30mm x 45°		0.78 x 45° Carbide chamfer
				

	Upper Limit	Lower Limit
OD Tolerance:	+ 0.030 mm	- 0.080 mm
Height Tolerance:	+ 0.100 mm	- 0.250 mm
Diamond Table Thickness	+ 0.350 mm	- 0.350 mm
Chamfer Size	+ 0.070 mm	- 0.070 mm

TERMS AND CONDITIONS

- Prices shown are subject to change without notice.
- Prices may also be changed without notice due to unforeseen cost increases of imported products, raw materials, or currency fluctuations.
- We carefully check pricing and product specifications, but occasionally errors can occur, therefore we reserve the right to change both without notice.