THE SORTING AND VALUING OF ROUGH DIAMONDS

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DE BEERS
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By

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1 INTRODUCTION

The purpose of this paper is to discuss what diamond sorting actually involves. The diamonds, currently under discussion are rough diamonds, and the sorting referred to is the sorting of rough diamonds into their respective categories for valuation, prior to their polishing and manufacture. Naturally, polished diamonds are also sorted into grades after polishing, but there is a fundamental difference between sorting rough and grading polished.

When grading polished the approach is to grade what physically exists and that can be seen under ten times, or greater, magnification, with regard to cut and quality. Although the sorting of rough involves the similar search for physical imperfections, there are also options available for possible improvement, in terms of quality and colour, during manufacturing. While improvement of a polished diamond is theoretically possible, it comes at the cost of having to re-polish the stone, resulting in a smaller yield and additional manufacturing cost.

2 WHY WE SORT ROUGH DIAMONDS

Perhaps the way to start is to explain why it is necessary to sort rough diamonds at all. The simple fact is that no two diamonds are exactly the same. The origin, and crystallisation of carbon to form diamond has already been covered within this Colloquium, but it is worth repeating that although diamonds crystallise in the Cubic system, either as eight-sided octahedrons or as simple cubes, no two diamonds are identical.

As long as diamonds remain within their stable environment, below the earth’s surface, the crystallisation process occurs unhindered. However, it is during the passage of diamonds from deep underground up to the earth’s surface that considerable damage can occur. This process, known as resorption, sees diamonds subjected to extreme changes of temperature and pressure, which can not only bring about physical breakage of the diamonds, but damage to the crystal lattice too.

This means that each and every diamond is unique in terms of its overall combination of shape, colour, quality and size. As diamond manufacturing is so specialised, these four characteristics have led to the manufacturing industry creating a whole range of different categories.

Over time these categories have expanded until today there are something in the region of sixteen thousand categories of diamonds produced from around the world. Sixteen thousand may sound a considerable figure for sorters to contend with, but in practice the reality is a little different. Also, it needs to be mentioned that no single diamond producing country produces all of these sixteen thousand categories.
3 HOW WE SORT ROUGH DIAMONDS

Sorting is about looking at a rough diamond and assessing four important features pertaining to its appearance. This is where the famous four Cs of the diamond industry enter the picture, and in order to understand the sorting of rough diamonds better, it will be necessary to examine each of the four Cs in turn.

3.1 THE FOUR Cs

Although, traditionally, the four Cs should really only apply to polished stones, so well known have they become, that today they can, and are also applied to rough as well.

C Carat weight
C Clarity
C Cut
C Colour

When using the four Cs with rough diamonds, Clarity refers to the quality, Cut refers to the shape of the rough and both Carat weight and Colour are retained unchanged.

With some 16,000 categories to master, considerable skill is required from sorters, in order to ensure that each and every stone is placed in its appropriate category. The reason that so many categories exist is due to size variations, where generally speaking the larger a diamond is, category by category, the greater is the value.

3.1.1 CARAT WEIGHT

The word CARAT is derived from the ancient Greek word for a horn, Keration, which the dried seed pods of the carob tree, Ceratonia Siliqua, resembled. Hundreds, if not thousands of years ago, pearl merchants in the Middle East discovered that these seeds, when dried were virtually identical in size, irrespective from which carob tree they had come from. Thus, over time, they had become the official unit of measurement for sizing pearls, and later on for semi-precious and precious gemstones.

However, comparing diamonds against seedpods was perceived as not very scientific, and so early in the twentieth century, the metric carat was universally adopted as the scientific unit of measurement applied to diamonds. The metric carat is 0.2 of a gram, thus 5 carats weight 1 gram.
The word carat should not be confused with its namesake, when applied to gold. With diamonds, carat refers to weight, but when applied to gold it refers to purity, thus 24-carat gold is pure gold.

3.1.2 CLARITY

This refers to the actual quality of the diamond, and looks at the internal clarity of the stone. Clean diamonds, free from any impurities are rare and most diamonds contain imperfections, such as a glets (crack) or a pique (spot, usually a black carbon spot).

When sorting rough, it is not only the presence of these imperfections that determines the value of the stone, but also where these imperfections exist within the stone. If these imperfections are situated on the peripherals, polishing could possibly remove them thus leaving the polished stone unblemished. However, should polishing not succeed in removing them in their entirety, at least they will be confined to the girdle, where their presence can be minimised, by being covered by a claw when mounted in jewellery.

Often, especially where such imperfections are spread out within the stone, it will not be possible to remove them all. Then the challenge becomes to reduce the visual impact of the imperfections, as far as possible, within the polished stone. The two areas that should be avoided, if at all possible, are directly under the table of the polished stone or in the culet, which is the sharp point at the bottom of the stone. Any black spots in these two areas tend to be magnified and thus make the polished stone appear worse than it actually is.

3.1.2.1 The Ratio between Gem and Industrial

Some thirty years ago the average diamond mine around the world was 20% gem and 80% industrial. There was a noticeable corresponding cost differentiation between these two categories, which meant that the value of the gem had, to a large extent, to cover the cost of mining the industrial.

However, because of considerable advances in diamond technology, including the use of lasers in diamond cutting, the last thirty years has seen the dramatic growth of a middle category called near-gem. Near-gem is so called because it is almost gem quality, and value, but not quite. In fact it has been developed from the top thirty percent of the industrial assortment. These diamonds contain small clean areas, along with very poor areas.

The rationale behind this part of the assortment is that the stones can be broken open, the clean areas polished into small gem quality stones, and what remains sold on for industrial purposes. The growth in popularity of these goods has seen an increase in the prices of the top end of the industrial range,
which has led to the establishment of the new category, near-gem. The advantage to South Africa has been that marginal mines have been kept open thanks to the increased value attached to the 30% near-gem.

3.1.3 CUT

The cut refers to the physical shape of the rough diamond, for this plays an important part in determining the potential yield of the stone. There are two basic shape categories into which diamonds are usually sorted. These are:

3.1.3.1 Sawable, for those stones that can be sawn to produce two or more smaller diamonds, and

3.1.3.2 Makeable, which denotes that the stone will be “made” as it is, or cleaved.

The role of the manufacturer is to obtain the largest possible clean diamond, and thus the decision to saw or “make” a diamond is of vital importance, and can usually determine the economic viability of the stone. The general “rule of thumb” is that octahedrons and do-decahedrons (twelve-sided), and rounder, bulky stones tend to be sawn, while the more broken, twisted, flatter stones tend to be made and polished as they are.

However, this does not take into account the existence of several categories of “difficult” stones, which present the manufacturer with additional challenges. Several categories of “problem” or “difficult” stones exist within the assortment, and they need to be identified within the assortment:

3.1.3.3 Twins, are, as the name implies, are where two or more stones have fused together, or an inter-penetrant twin, where it is difficult to differentiate where the various sawing and cleaving grains occur. Every diamond has an internal grain structure, which permits how and where a diamond can be sawn or cleaved, rather like wood. However, diamonds can only be sawn along a sawing grain and cleaved along a cleaving grain. Any attempt to do otherwise usually ends in disaster.

3.1.3.4 Macles, are inter-penetrant twins where one part of the stone has the sawing and cleaving grains in one orientation, which then differs from the corresponding grains in the other part of the stone.

3.1.3.5 Cubes, are stones where although the sawing and cleaving grains exist, they are not that easily identifiable. Furthermore, such stones, if sawn or cleaved, tend to produce awkward models for polishing, with accompanying loss of yield.
The advent of laser technology has meant that former problem stones, such as a macle or a twin, can now be cut by means of a laser, without regard as to where the respective sawing or cleaving grains lie.

3.1.4 COLOUR

Although there are only a handful of basic colours, they can be expanded out to over two hundred different shades, which cover the range of the visible spectrum from colourless to light green, green, yellow, dark yellow, light and dark brown, and even grey and black. While these colours may be regarded as within the “normal” range, there are also colours, which fall outside this range.

3.1.4.1 Fancies

Such colours, called “fancies”, include blue, pink, red and amber, all of which are extremely rare and thus valuable too.

3.1.4.2 The presence of Nitrogen

In the Cape series of the polished colour grading scale, which covers the range from white to deep yellow, the presence of the yellow colour in diamond is usually due to small amounts of nitrogen being included within the crystal lattice. As white light enters the diamond, the nitrogen will absorb certain colours from the spectrum, thus resulting in the colour of the diamond.

4 HOW LONG DOES IT TAKE TO BECOME A SORTER?

There is no easy answer other than a lifetime! As has already been mentioned, no two stones are the same, and in order to be able to master the full range of the assortment, which encompasses all 16,000 categories, a diamond sorter is always learning.

However, the real skill is not necessarily the acquisition of the knowledge of all these categories, but rather, how to interpret the samples, which as will be described in section 5.3.1, are the benchmark against which the assortment is measured. The time required for this differs from individual to individual.

As sorting experience expands, intuition takes over, and sorters “instinctively” know where best to place a diamond.

4.1 SORTING EQUIPMENT

There are four main items of equipment used for sorting rough, namely;

4.1.1 THE HAND LOUPE (either 6 or 10 times magnification) for fine detail work,
4.1.2 **THE HEAD LOUPE** for more general classification,

4.1.3 **THE SCOOP** for picking up large quantities of diamonds and,

4.1.4 **A PAIR OF TWEEZERS** for picking up individual stones.

5 **THE SORTING PROCESSES**

The diamonds are sent to Harry Oppenheimer House from the various De Beers owned diamond mines in South Africa. As these diamonds have been extracted directly from the ground, it is necessary to clean them first.

### 5.1 THE CLEANING PROCESS

The physical cleaning of the diamonds plays an essential role within the passage of the diamonds through Harry Oppenheimer House. The entire process is "hands-off", in that a weight loss is expected during the removal of the non-diamond material that will be present. Thus, the diamonds stay within sealed canisters or glove boxes, throughout the entire operation. Also included is the sieving of the diamonds into various sieve size categories. Once cleaning and initial sizing has been completed, the diamonds can be officially imported on line and unsealed.

### 5.2 IMPORT

The diamonds canisters are unsealed and weighed, using strict weighing tolerances. Once this has been completed the diamonds are distributed to the various sorting departments, for sorting to commence.

### 5.3 SORTING

The sorters work to a five-week sorting programme, and each mine’s production is sorted separately. Once the sorting programme has been completed, the Government Diamond Valuators, appointed by the South African Diamond Board, then verify the assortment, prior to its shipment to the DTC offices in London.

#### 5.3.1 SAMPLES

No two people ever see objects in exactly the same way, and the same is true of diamonds. Thus the possibility of disagreement may occur, and to counter this, samples are used, and have become an essential aid in ensuring consistency in the sorting. Therefore there are samples for shape, quality and colour, and these samples are the benchmark, against which the assortment is matched.
5.4 EXPORT

Once each of the South African productions has been verified by the Government Diamond Valuators, the various productions are rolled together, category by category, prior to shipment to London. The shipment is then placed into shipment trunks with Diamond Board inspectors present to oversee the procedure.

6 COMPLIANCE WITH THE KIMBERLEY PROCESS

Under the recent international diamond industries' agreement, known as the Kimberley Process, only participating countries, which have ratified and comply with the terms of the agreement, are acknowledging the import or export of conflict-free rough diamonds. Therefore as the De Beers' South African shipments are prepared for dispatch to London, representatives of the South African Diamond Board are present to oversee compliance with the Kimberley Process, and that the terms and conditions are observed. Once they are satisfied, a Kimberley Process Certificate is issued permitting the export of the diamonds.

The actual Kimberley Process Certificate accompanies the shipment trunks being shipped to London. Upon arrival, a tear-off folio is returned to the South African Diamond Board, verifying both delivery and authenticity of the shipment. Without the compulsory Kimberley Process Certificate, British Customs will not permit entry of the diamonds into London. Similarly, when diamonds are sent to South Africa a similar Kimberley Process Certificate, issued from a participating country, also accompanies the shipment to verify the conflict-free origin of the diamonds.