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INDUSTRY REPORT

Rise of the Synthetic Stone: A Polygon Industry Report

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INTRODUCTION

On March 15, 2015, the world's largest diamond 'greenhouse' opened for business in Singapore.

Owned and operated by **IIa Technologies**, the facility is a sprawling testament to the potential of disruptive innovation. Located in an industrial area of Singapore, the complex spans 200,000 square feet; inside, around 200 state-of-the-art machines produce Type IIa diamonds around the clock using the Microwave Plasma Chemical Vapor Deposition (MPCVD) method.

IIa Technologies isn't the only diamond farm to undertake a major expansion in recent months. **Scio Diamond**, a South Carolina-based diamond grower, announced in March that it would double production capacity after receiving a $2.5 million investment from Heritage Gemstone Investors. Like IIa Technologies, Scio is able to produce high-quality Type IIa diamonds for a variety of applications, with a focus on the industrial market.

These companies are expanding at a pivotal moment for the diamond industry. While synthetic diamonds have been around for decades, the quality, ubiquity and scale of production of synthetic stones in 2015 is unprecedented. Producers of natural diamonds are understandably concerned about the increasing viability of synthetic diamonds as a desirable product for the luxury jewelry consumer.

Nearly all industrial demand for diamonds is satisfied with HPHT synthetics.

SYNTHETIC DIAMOND TECHNOLOGY

HPHT vs. CVD

True synthetic diamonds can be manufactured using several methods. The most reliable and common of these methods are High Pressure, High Temperature (HPHT) and Chemical Vapor Deposition (CVD), which are used by nearly all synthetic diamond manufacturers. Diamonds created using these methods typically exhibit properties that are on par with or superior to those exhibited by natural diamonds, including hardness and the ability to conduct heat.

Diamonds created using HPHT or CVD can be used in a wide variety of applications, from industrial-strength abrasives and tools used for cutting and polishing hard materials, to CO2 lasers, heat sinks, power switches and gyrotrons. They can also be cut into gems and treated with radiation to produce colors, including yellow, orange, brown, blue, green and clear white. However, gem-quality stones created with HPHT method are not in high demand because HPHT stones are generally of a low quality, with poor clarity and a tendency to be tinted yellow or brown.

In 1956, General Electric perfected the HPHT method, which led to the widespread adoption of HPHT diamonds for industrial uses. Today, ResourceInvestor.com estimates that 98% of industrial demand for diamonds is satisfied with synthetics made using HPHT.

The CVD diamond production method was patented in 1954, two years before General Electric's discovery of HPHT, but efforts to produce gem-quality diamonds using CVD were not recognized by scientists until the late 1980's.

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Annual global production of rough diamonds peaked in 2006 at 176.7m carats.

In a research paper from 2013, Kitco notes that CVD production of diamonds is much more economical than the HPHT method, despite the fact that HPHT diamonds require fewer ingredients and less time to create. For this reason, HPHT is generally used to produce industrial-grade diamonds, while CVD is used almost exclusively for gem-quality stones.

Currently, synthetic diamonds account for only about 2% of total gem diamond sales worldwide.

NATURAL DIAMONDS: PEAK SUPPLY?

Globally, the production of natural rough diamonds is in decline. According to data from research firm Frost & Sullivan, annual global production of rough diamonds peaked in 2006 at 176.7 million carats. Between 2006 and 2013, annual global rough production has fallen significantly from this peak, with only 131 million carats produced in 2013.

Of all the rough diamonds produced globally every year, 99% originate from one of nine countries: Angola, Australia, Botswana, Canada, the DRC, Russia, Namibia, South Africa and Zimbabwe. Dwindling production at most major mines in these countries is forcing extraction companies to dig deeper, driving up production costs and shortening the lifespan of the mines. The Bain Global Diamond Industry Report for 2013 projects that beginning in 2019 global rough diamond production will fall by 1.9% annually.

As well, many new mines being proposed today have projected life spans of less than 20 years. For example, the new Gahacho Kue mine in Canada is only expected to operate for 11 years. The Snap Lake mine, also in Canada, was bankrolled by De Beers Group to the tune of $2 billion in 2012. The mine has not yet reached production goals and has a lifespan of only 20 years.

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Undisclosed synthetics are increasingly being found in batches of natural stones.

Exploration budgets for diamond mining have also plummeted: after peaking at $985 million in 2007, only $490 million was spent on diamond exploration in 2013.

While other numbers seem to contradict the projections of dwindling rough production, even these optimistic assessments include figures that reflect a worrying gap between projected diamond supply and growing global demand: KPMG notes that while total global supply of rough diamonds is expected to rise to 175 million carats by 2020, driven by increasing production at new and existing mines, global *demand* for diamonds is expected to surpass available supply by 72 million carats during the same timeframe. It is this projected gap between supply and demand that is the primary motivator driving today's synthetic diamond producers.

The predicted gap between global rough diamond supply and increasing consumer demand represents a huge opportunity for producers of lab-grown diamonds, who are positioned to fill the gap with a practically unlimited supply of synthetics.

UNDISCLOSED SYNTHETICS IN SUPPLY CHAIN

Despite the availability of synthetic diamond detectors, undisclosed synthetics are increasingly finding their way into the natural diamond supply chain. In February 2015, 110 undisclosed synthetic stones were discovered among a batch of natural diamonds in Surat, India, the largest diamond cutting center in the world.

This event was just the latest in a series of high-profile discoveries of synthetic diamonds hidden within parcels of natural stones to occur in recent years. The discovery added fuel to the fire of natural producers' concerns about the pervasiveness and quality of synthetic stones, but also about the effect that ongoing discoveries of synthetics among packages of natural would have on overall consumer confidence in diamonds as both commodity and luxury item.

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The world's largest producers of rough have formed a new industry association.

Other recent discoveries of undisclosed synthetic diamonds include:

- In May 2012, more than 600 undisclosed synthetics were sent to the International Gemological Institute in Antwerp in an attempt to have the stones certified as natural. A separate parcel of 10 undisclosed synthetics was sent to an IGI lab in Mumbai around the same time.

- In January 2013, New York City-based Analytical Gemology & Jewelry received a parcel of 4,556 stones; 243 turned out to be synthetic.

CIRCLING THE WAGONS: PRODUCERS OF ROUGH TAKE AIM AT SYNTHETICS

Traditional producers of rough aren't taking the challenge from diamond growers lying down. In March 2015, Bloomberg.com reported that representatives from the world's largest diamond producers had met to discuss concerns about the future of the diamond industry and the increasing supply of synthetic stones in the global supply chain in particular.

Anglo American PLC, Alrosa AO, Rio Tinto Group, Petra Diamonds, Gem Diamonds, Dominion Diamond Corp., Lucara Diamond Corp. and OAO Lukoil all participated in the meeting, which resulted in the creation of the world's first diamond industry association. It was reported that the new association would have an annual budget of $6 million, to be used to promote natural diamonds and the traditional supply chain model.

Industry analysts were quick to note that, in the past, diamond producers have generally been averse to collaborating with competitors and that the new association signaled an unprecedented level of cooperation between producers, indicating a real concern about the future of the industry among its most prominent players.

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De Beers Group produces several devices that can detect synthetic diamonds.

Together, the eight producers of the association account for the majority of the world's supply of rough diamonds. The association represents a new era for the diamond industry, which has been without cultural or structural leadership since 2004, when De Beers Group lost a decade-long legal battle with the United States government over charges of diamond price fixing. As a result of the ruling, De Beers was effectively barred from doing business in the U.S. between 2004 and 2014, limiting the group's power within the industry.

Now that De Beers is once again allowed to ply its trade in America, the producer has rolled out a comprehensive strategy to consolidate its position as an industry leader while simultaneously taking aim at synthetic stone producers. In February 2015, De Beers Executive Head of Strategy Bruce Cleaver reportedly declared synthetics to be a threat to profitability and sustainability; In April, the company published an article on its website titled "De Beers Leads The Way In Tackling Undisclosed Synthetics".

De Beers is an industry leader in synthetic detection, and produces several devices that are able to identify potentially synthetic diamonds including the Automated Melee Screener (AMS), and the DiamondView and DiamondSure devices.

CONCLUSION

The value and utility of high-quality synthetic diamonds lies entirely in the eye of the beholder. For consumers, synthetic stones represent an opportunity to buy diamonds at lower prices and to support sustainable production practices; for unscrupulous parties, synthetics offer an opportunity to take advantage of uneducated buyers. Synthetics provide economical solutions for industrial, medical and high-end technology products that require the precision and durability of diamonds. Synthetics also directly challenge the market dominance of the diamond production cartels of the past century.

It is ironic that the diamond market – for so long, tightly controlled and manipulated by the De Beers Group – is being thoroughly disrupted by technology innovators who have no reverence for the diamond producers of the 20th century. For traditional producers, the very existence of high-quality synthetic stones threatens to undermine (no pun intended) the value of the global natural diamond supply.

There are several reasons why the latest iteration of diamond-producing technology is poised to disrupt the diamond industry in ways that previous generations of technology have not, including quality, ubiquity, cost and social acceptance. Beyond these reasons, there is a fundamental weakness, and business opportunity, in the global diamond supply chain that the synthetic diamond industry addresses directly, with potentially destructive results for producers who continue to expend time and resources digging diamonds out of the ground.

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