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GPUs revolutionizing Diamond Industry

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A Rare Gift from Mother Earth….

Image: www.debeersgroup.com

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The Diamond Industry

- 10 out of 12 diamonds worldwide are processed(cutting and polishing) in India
- Americans buy approximately 50% of the world's diamond jewelry
- Today the Worldwide diamond jewelry sales is around $71B (as recorded in the year 2011)

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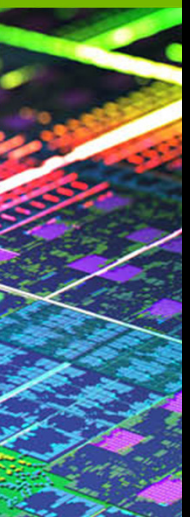

Key Challenges

- To get maximum number of rough stones processed in minimum time (Average workflow cycle of a diamond is 20-25 days)
- To get rough stones processed with minimum wastage
- 24/7 uptime, 2min downtime = $25 loss

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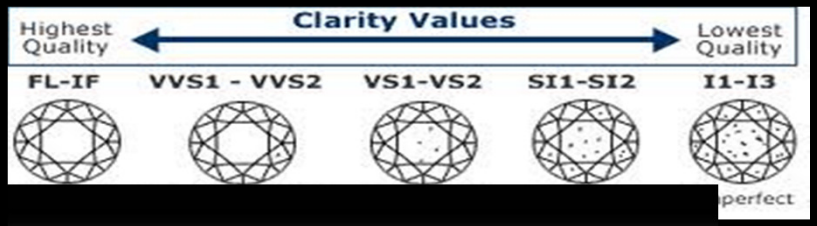
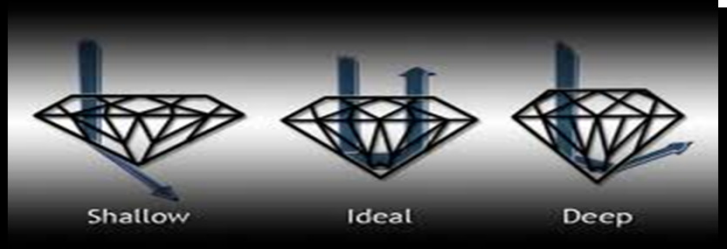
The 4 ‘C’s of a diamond

- Color
- Carat
- Clarity
- Cut





…determine the 5th C – ‘Cost’

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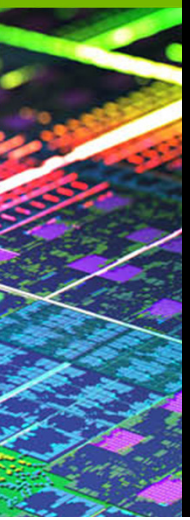
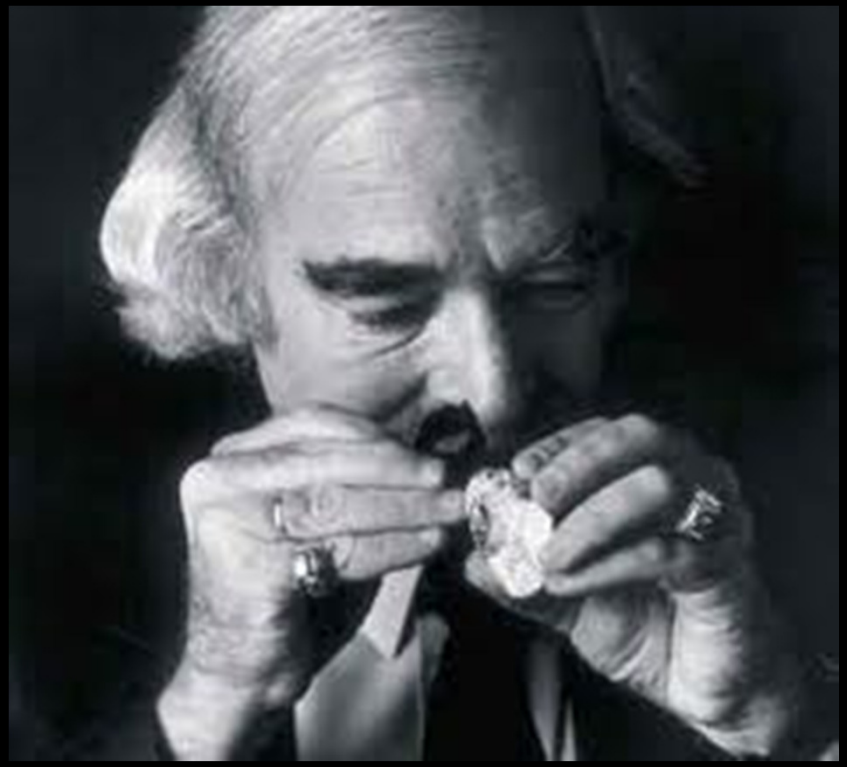


Diamond Planning Process before 90s



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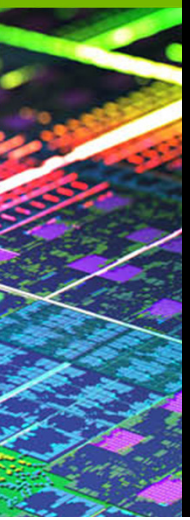
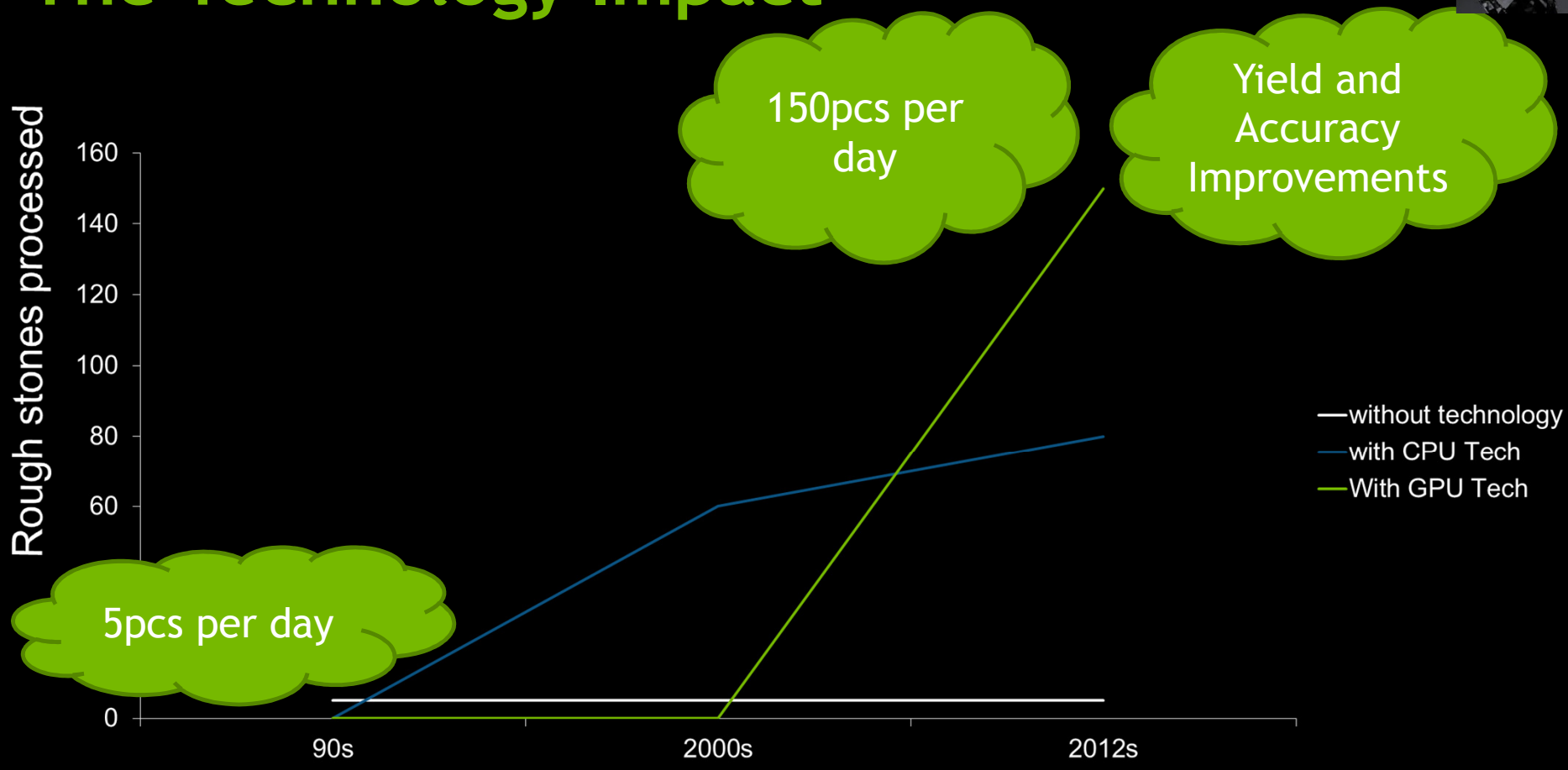
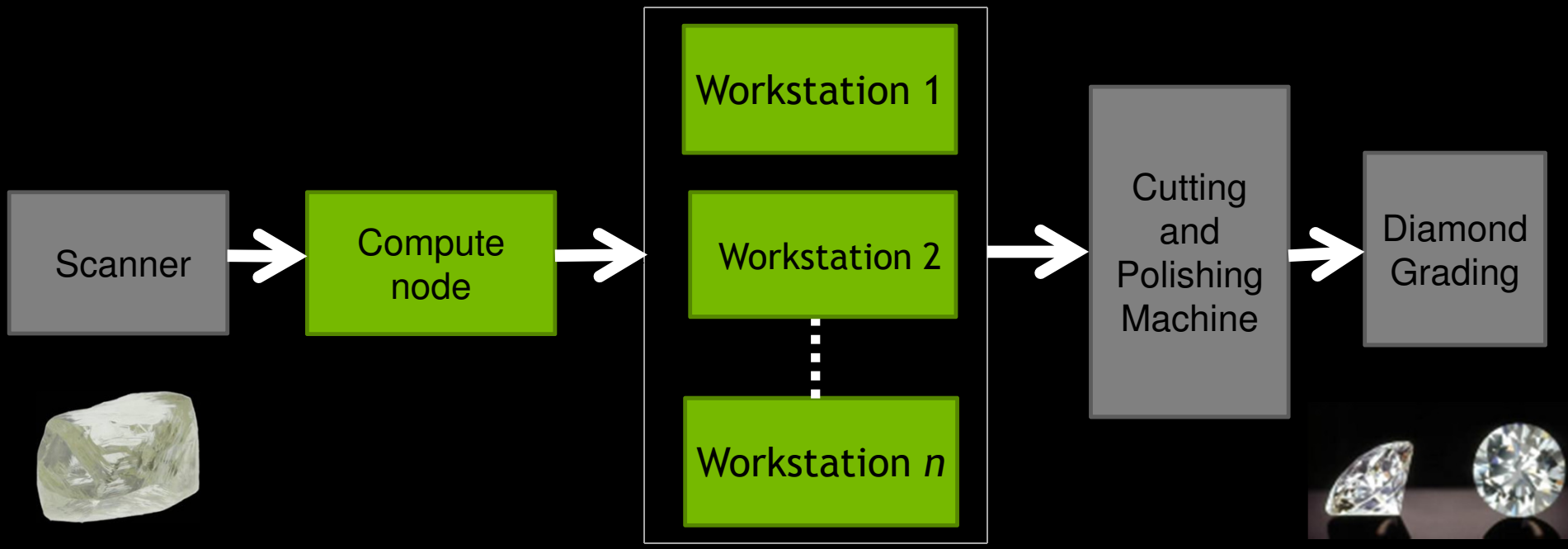
The Technology Impact





Diamond Workflow…..Right Now



- Scanning of rough stones
- 2D – 3D Conversion
- image reconstruction
- Rough Planning Stage
- 3D Viz
- Ray tracing

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Stage1: Scanning of rough stone to construct a 3D Volume

- The scanner scans the rough stones by taking 2D projections from specific angles

- The data is then reconstructed to form a 3D Volume (2D – 3D conversion process)

- It accurately maps the inclusions present inside the stone

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Stage1: Image reconstruction in the Scanning process

- Iterative reconstruction Techniques

  Algorithms are CUDA enabled

- CuFFT , DWT libraries – To remove noise and blurry images

- Reconstruction process on GTX560 is typically 15-20min

GPUs provide ~2x – 3x performance improvement

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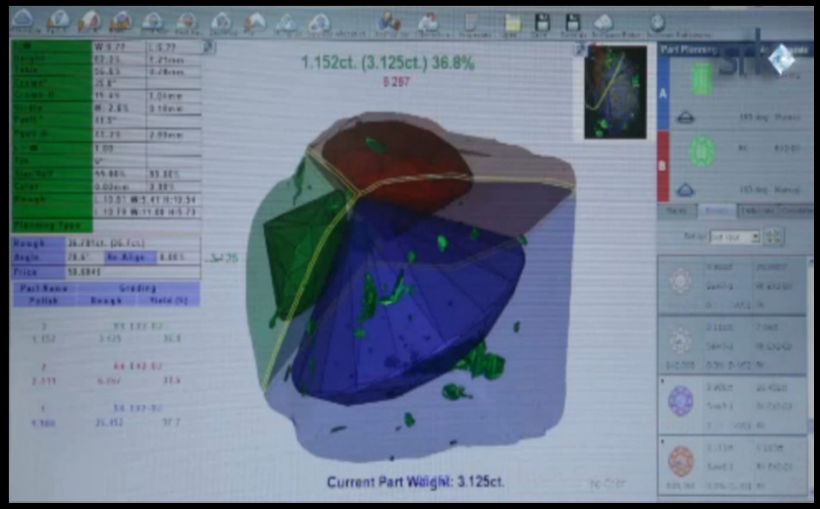
Stage2: Rough Planning with 3D Viz

GPU drives



www.srkexports.com

- Surface and Volume rendering to filter inclusions (impurities)
- OpenGL/DX rendering
- Shader libraries for lighting, interactivity etc
- Alpha blending for displaying transparency

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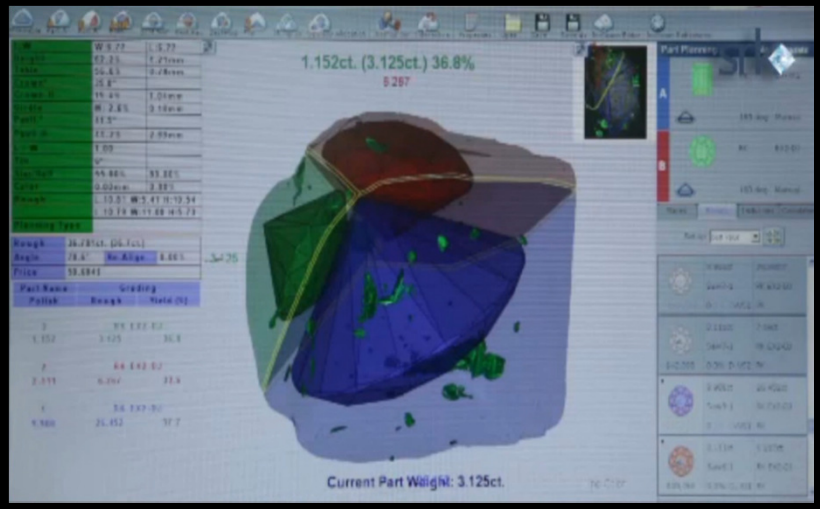
Stage2: Rough Planning with 3D Viz

GPU drives

- Density Fields to find most dense areas.
- Density Contrast to find Cracks, holes..etc



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Ray Tracing to simulate reflections to determine the diamond **'Cut'**

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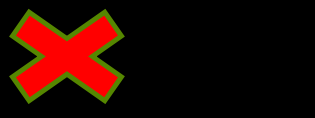
Diamond Cuts and light reflections

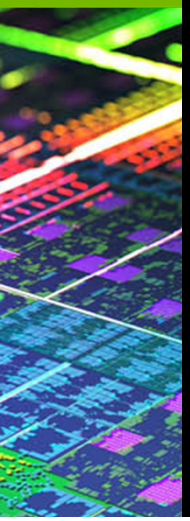


Shallow Cut

Deep Cut

Ideal Cut

Total Internal Reflection



Ray Tracing - *OptiX*

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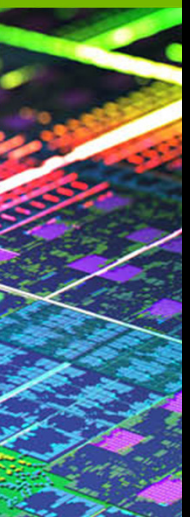

GPUs have revolutionized by:

- Improving Yield and Quality of diamond
- Reducing Planning Time
- Improving bottom line for organizations

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And this Art so beautiful……

……even ‘Miss World Cannot resist it