

Professional Grade 3D Printers Versus Low Cost Hobbyist Printers for the Custom Jeweler/Designer

There have been a number of new low cost 3D printers released into the jewelry market place over the last year. They are making great promises to the industry, but as with any major equipment purchase, be sure you do your homework before you buy to find out if it is the right solution for your business. Not all desktop LED printers are created equal. The lower price tag up front may translate into higher costs down the road, from maintenance on lower quality components to loss of business because of lower quality production.

This new breed of 3D printers relies on LED pocket projectors as a cost saving measure. These low cost consumer projectors are made to watch movies or PowerPoint presentations and not for 3D printing consistent parts. If all you want is a rough example to verify a design, they will deliver a suitable model, but not for high quality production and definitely not for the fine detail required for quality jewelry.

Consumer LED pocket projectors utilize a diamond shaped pixel, which is great for viewing an image as the eye blends the pixels; however, for 3D printing, a square pixel is particularly important in order to deliver high resolution, crisp details on small textures such as small prongs and micro pave. 3D CAD programs as well as most digital imaging from televisions to computers rely on a square-shaped grid pattern of pixels. Open up any photo on your computer and zoom in far enough to see the pixels. You will notice that they are laid out in a square pattern. When transferring those pixels to a diamond pattern, adjustments need to be made by the software so that one square pixel is now located within multiple pixels instead. This conversion leaves jagged edges as well as inconsistent results. As you can see below, something as simple

as a straight line 1 pixel wide will result in a jagged line on a diamond pattern. A simple ring head with 90° angles proves to be a challenge for the diamond pattern but is precise and smooth on a square pixel pattern. Even though it is on a pixel level, the finished model will not be smooth from a diamond pixel pattern, which will lead to casting problems and poor model quality.



The EnvisionTEC Perfactory® Micro uses a professional grade DLP engine utilizing a square shaped pixel, allowing for perfectly smooth, ready to cast models. EnvisionTEC spent years gaining experience with DLP® (Digital Light Projection) technology from Texas Instruments®, then used that knowledge to design the Micro with single pixel resolution that is focused evenly across the entire build envelope. This leads to not only the smoothest possible surface finish, but also consistency for each piece on the build. The image below

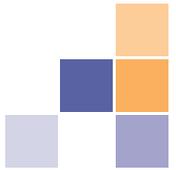
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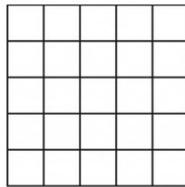
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represent a test pattern displaying from a EnvisionTEC projector, one pixel line, two pixel lines and three pixel lines that projects the same throughout the build area. You will notice that they are exactly the same whether they are located in the center or on any spot throughout the build. This consistency is not possible with a 3D printer utilizing a consumer grade projector due to the square to diamond conversion process, leaving not only the jagged outer edge problem, but also a tendency towards "blurring" the further the piece is away from the center of the build.

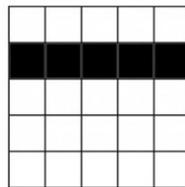
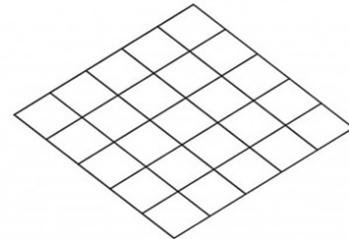
Another cost saving measure that contributes to the "blurring" effect is the use of plastic optics lenses on the

lower priced 3D printers. These optics are designed to view an image from 10-20 feet away and not to view intricate details of a piece of jewelry under 10X magnification. Over a short period of time, these plastic lenses will begin to distort, especially as they are not designed for use with a light source at the wavelength needed to cure resin. The lenses can begin to fog within a few weeks of exposure to this kind of light. As the fogging and distortion begin, inconsistency in builds will begin, with parts of the model not fully curing. Castability is greatly affected by expansion during burnout, even to a point of causing significant cracking in the investment.

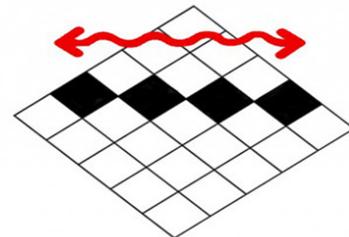
Square Pixel Orientation



Diamond Pixel Orientation



Single Pixel Line



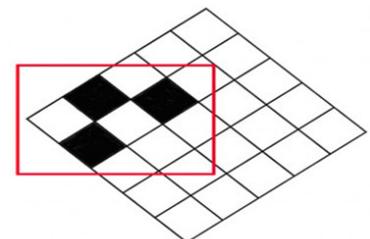
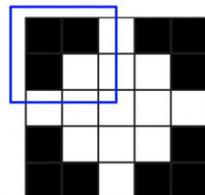
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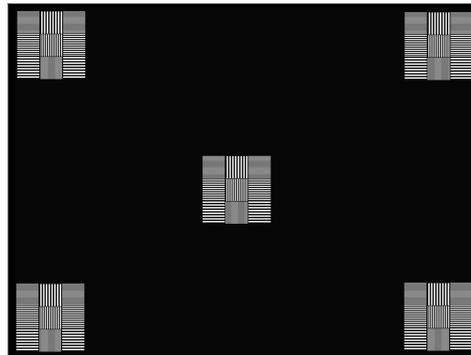
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EnvisionTEC's Perfactory® Micro optics are made out of industrial grade glass that is specially optimized for the precise wavelength of the LED light source in the projector. The photopolymers for use with the Micro are also optimized for the wavelength of the light transmitted through the glass. This optimization of optics, light source and resin delivers high quality detail down to single line pixel resolution that is consistent over the entire build area. Two castable materials are currently optimized for use on the Perfactory® Micro, PIC 100 for small, very high detail parts, and EC500 for larger items and items that are more difficult to cast. EnvisionTEC also offers HTM140 for the Micro, for high temperature molding.

model verification software package can run between \$7000 and \$9000. EnvisionTEC includes this software with the purchase of a Perfactory® Micro, allowing for perfect model generation with a minimum of time and effort. A jewelry designer can spend more of their valuable time creating rather than wasting that time hunting for every tiny error in a file that can ruin a 3D print.



David Dorian of Dorian Jewelers tells the following story, "I have been making jewelry for almost 30 years. I am a one-man operation servicing the trade with store stock and custom designs. In 2002, my world changed with the introduction of CAD design. Since then I have tried all methods of model building from using service bureaus to purchasing CNC machines and wax printers. All with mixed results. I found myself catering my designs to the output machine capabilities, or spending lots of time and money to make changes and alterations. All this ended when I purchased the new Micro printer from EnvisionTEC. I can now print multiple copies and variations for clients to review, which usually complete within six to ten hours. The models are durable enough to have customers hold and try on as well as easily ship in the mail. The learning curve for the machine and software is very low. I spend very little time setting up my jobs to run and no more fussing with machine calibrations and software. I have printed close to



The hardware and materials are not the only areas where cost-cutting measures could end up costing more in the long run. 3D printing requires models with closed geometry that is what is called "water tight". This means the wire mesh has to be closed without any folded surfaces, gaps or duplicated lines or surfaces. When preparing a file to be 3D printed, the model must also be supported strategically within the build so that nothing sags or breaks off during the build process. The software required to verify a design, find and repair any errors as well as generate supports, is essential to a successful finished product. As a stand-alone product, a good

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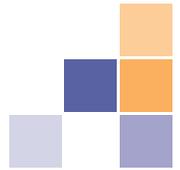
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1000 pieces in the first 6 months of owning this machine. The results are that I can now service my customers faster and better."



"Everyday workhorse reliability – When a jewelry client or associate is relying on me to have their project printed to meet their deadline, the EnvisionTEC has delivered every time. No questions.", Carter Lee from Chicago Charm Company, LLC, describing his Perfactory® Micro

The jewelry industry is relying more and more heavily on technology such as 3D printing to help businesses thrive and grow. Designers who wish to remain competitive by investing in 3D printing have many options at a variety of price points. When it comes to your business reputation, make sure to research those options thoroughly so that a decision can be made about the features and quality you require, not just on price.

About EnvisionTEC, Inc.

Every component chosen for the Perfactory® Micro has been selected for long term use and consistent, professional grade results, offering the same quality as can be found in the larger EnvisionTEC 3D printers. Custom jewelers and designers in this competitive market need to be able to compete with high quality pieces that show their attention to fine detail and EnvisionTEC's Perfactory® Micro allows for professional results without having to sacrifice superb quality for an entry level 3D printer. Most consumer level 3D printers carry only a limited warranty (if any) and little to no technical support. EnvisionTEC backs up the reliability of the Perfactory® Micro with a world-class support team and a 2 year warranty on the imaging source. After purchasing a Perfactory® Micro, an excellent training program followed up by experienced technical support will help to set up even a 3D printing novice for success.

Since its first patent submission in 1999, EnvisionTEC has developed and released a broad array of cutting edge 3D printing solutions supporting the individual engineering desktop as well as large-scale enterprises and manufacturers. EnvisionTEC provides organizations of any size the capability to rapidly manufacture true-to-life and functional duplications of any CAD rendering with 3D representation that is unmatched in the industry. With nearly 100 patents, EnvisionTEC enjoys a strong customer and partner base in education, jewelry, automotive, dental, medical, animation, toys, sporting goods, aerospace, and consumer packaged goods. Please contact us at www.envisiontec.com for further details.

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