

Case Study: A-Tech uses FreeForm® Systems to Model and Communicate 3D Data with Large Toy Industry in South China, and Overseas.

Customer: A-TECH Product Engineering Company. Model maker for major toys and premium toys.

A-Tech Product Engineering Company (A-Tech), based in Hong Kong, is one of the professional prototype makers in the toy industry and has two main factories in Shenzhen, South China. They first learned of the SensAble™ FreeForm® Modeling Plus™ system about 4 years ago and implemented this unique system—a 3-D touch enabled Computer Aided Sculpting System (CAS)—into their workflow. Originally their clients in the United States, who are users of the FreeForm Modeling Plus system, recommended that they use it as a modeling tool and to help improve communications about designs beyond the Pacific region. After becoming familiar with the system, other group companies in China also started to share the system, and now they use it more and more. A-Tech is one of the group companies that includes two more Rapid Prototype makers in China. They have 70 sculptors and a total of 220 employees. The General Manager of A-Tech, Mr. Eddie W. H. Kwan, says that the FreeForm system is the most frequently used modeling software within their production pipeline, even though they have many major CAD systems. This is why they currently have installed 15 systems (5 FreeForm Modeling Plus systems and 10 FreeForm® Concept™ systems).

Current Situation in China's Toy Market—Using the FreeForm Modeling Plus System for Product Design

To be more compatible in the market, many Hong Kong and Chinese companies that produce toys/collectibles have already integrated CAD/CAM into their workflows. Although there are various CAD systems available and each of them has a specialty to suit different needs, a system that enables simulation to test product safety once the model has been created or modified is the core need in the toy industry. The FreeForm Modeling Plus system—a unique touch-enabled system for product design that includes a haptic device that allows users to touch and manipulate virtual 3D objects—meets this need. Direct physical interaction makes the system easier to learn compared to other 3D CAD systems. The major features of the FreeForm Modeling system include Sculpting, Constructing, and Rendering environments; Surfacing; NURBS and Parasolid® interoperability; and Mold functionality that provides a model-to-mold workflow. Now companies can extend the digital workflow to downstream production with different CAE/CAD/CAM applications.



The FreeForm Modeling Plus system includes the PHANTOM® Desktop™ haptic device which enables modelers to use their sense of touch to sculpt with virtual clay.

3D relief/emboss designs, such as the one shown, can be easily created using 2D files such as bitmap images or Adobe® Illustrator® files.

In 2003, SensAble introduced the affordable FreeForm Concept system that suits the needs of the modeling market in China. A sub-set of the modeling functions such as Scaling, Modeling, Sculpting, and Mirroring are included in the system, along with the Deco tool, which allows users to apply paint, images and other details to models. The FreeForm Concept system does not include Surfacing, NURBS and Parasolid interoperability, and the mold functionality. In December 2003, A-Tech needed more systems, and after learning about the FreeForm Concept system, they added 5 systems to their daily workflow. Now they use both types of FreeForm systems based on the work they need to do. For a client who needs a painted model, A-Tech finishes with color to meet the request, and then opens native files from the client in the FreeForm Concept system to double check the design and communicate with other vendors (also FreeForm system users in China) who are managing other product requirements. Generally in the toy industry, there are many companies involved that are organized by function such as licensors, planning using 2D sketches or 2D illustrating software, 3D rapid prototyping (RP), mold making, and finally manufacturers. A licensor is usually located in the United States or Europe, and typically has an agency, which is located in Hong Kong, for managing the productions from prototyping through manufacturing in South China where the large toy factories are located.



The FreeForm Concept system includes the PHANTOM® Omni™ haptic device which allows designers to use their sense of touch to model and apply paint, images, and other details.

Prototyping is an important process in the toy industry. It requires a lot of manual processes like sculpting, sanding and painting. In the past, this tedious process usually takes several months to be completed before the physical model can be sent to the client for approval. Most of the time, a traditional prototype maker needs to repeat this time-consuming process again and again, if any modifications are needed. Based on their experience with the FreeForm Modeling Plus system, A-Tech's Eddie, W.H. Kwan says at first the system doesn't give you an instant result in terms of improving the productivity or reducing the cost of production—due in large part to low labor costs in South China. However, the benefit of using the system gradually shows over time.

The Process of Communicating with Overseas Customers

Eddie explains that most of their customers, which are licensors and Marketing companies, are located overseas and in 80-90 percent of the cases have sent 2D sketches to A-Tech to use in the creation of the 3D models. Getting client approval has been very time-consuming. This problem can be solved by using the FreeForm system visualization features that allow user to render a single view of the model or create a QuickTime® Virtual Reality animation for design reviews and collaboration. The rendered image or animation can be sent via email or FTP site to their overseas customers. Of course, if the client also uses the FreeForm Modeling plus system as a modeling tool and for choke testing simulation, they can exchange a native FreeForm file directly. Even if the customer does not initially approve the design and requests adjustments, especially complicated adjust-



QuickTime® Virtual Reality animations speed design reviews and collaboration.

ments like changes in dimension and size of the product, the FreeForm Modeling Plus system can do it quickly and easily. Models that took months to re-do in the past, can now be finished in just two or three days. As an example of how A-Tech collaborates with their clients, A-Tech receives a native FreeForm file as a master model from the client and then remodels and modifies in the FreeForm Modeling Plus system. The product features that they frequently use on daily jobs include evaluating undercuts of models and creating a split model with many pieces in it to send back to the client. The client in the United States needs to have a split model with parting line evaluated by A-Tech for considering downstream processes.

The Use of Reverse Engineering

Moreover, Eddie mentions they rely mainly on the FreeForm system to do Reverse Engineering for use with 3D scanners because there are still products where they receive a physical model as the starting point. They had tried to do this with other CAD/CAM systems. They found that the result was not satisfactory, as most CAD systems require the scanned data to first be converted into a different file format (each of the CAD systems has a native file format) before they can actually use it; and, during file conversion, detail is often lost and the accuracy of the scanned data can also be affected. However, the FreeForm Modeling Plus system doesn't have this problem because all scanned data can be imported into the system directly, so it is faster, better, and more accurate.

Eddie believes the FreeForm system is a very powerful system to model anatomical figures and offers a strong advantage in developing models with organic shapes especially for some sophisticated, licensed models where consistency and accuracy are the most important issues. Usually after they get the first approval copy, the file is saved for later use or modification on a series of the same product.



FreeForm digital clay model.

A-Tech relies mainly on the FreeForm system to do Reverse Engineering for use with 3D scanners because they often receive a physical model as the starting point. Scan data can be imported into the FreeForm system directly as an STL polymesh making it a fast and accurate way to work.

Time and Cost Reduction on the Digital Workflow

Eddie says integrating FreeForm into their workflow has saved them an average of 30% on production time and 10% on total cost. The reason why cost savings are low is because after the digital model is created they still need to output a physical model using rapid prototyping (RP) machines. RP machines are still expensive to purchase and run, so it is difficult to reduce costs instantly. Eddie believes the FreeForm Modeling Plus system provides advantages for modeling and also for tooling design using the mold functionalities, as it guarantees a higher quality design and minimizes the chances of needing to make tooling adjustments.

The Goals and Benefits

At first, Eddie encountered resistance to the idea of adding the FreeForm system to their process. Sculptors employed for traditional clay modeling initially refused to use this new technology, but after a few trials, they learned the benefit of using the FreeForm system. A-Tech's approach is to have a sculptor and an engineer work together. The engineer who operates the CAD package learns the FreeForm system. The engineer who understands each menu/tool works with the sculptor who is skilled on how to sculpt the model. This way, their individual skills and the capabilities of the company are both improved. After fully integrating the FreeForm systems into their workflow, A-Tech gained a good reputation within the industry. Eddie adds that no matter which CAD/CAM system you are using, there is no best one. You have to try different combinations of systems to develop the best solution for success. The FreeForm system, like other high-end CAD systems, requires an investment in terms of time and money, and he thinks this is why only a few companies in China are willing to invest in this kind of new technology. In other words, having a strategy that takes advantage of digital solutions that includes the FreeForm product family is the right investment. Also it is very important to keep educating sculptors about technology more and more as the models A-Tech receives from their clients are very sophisticated and accomplished. He thinks that he will hire a few more designers to use animation tools for future products, so he is very interested in the new SensAble ClayTools™ system for 3ds Max®, Maya® and Rhino™.

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