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Paper

INTERPRETATION OF INTRICATE DRAWINGS INTO ACTUAL OBJECTS

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ABSTRACT

This paper will look the intricacies that interpret an artist drawing into actual objects through programming, commenting on the differences between drawing and programming. Expectation is something that offers confusion when the relationship/resemblance between the original idea and final outcome are considerably different.

The investigation based around two case studies, cutting 2mm bone china sheet into a three dimensional objects, with very fine detailing, the application and interpretation of the programming is crucial to a successful outcome. By looking at the work of ceramic artist Chris Wight it will discuss the differences in two bodies of work where water jet cutting and its programming has vital consequences to end result. It has enabled the production high quality artifacts that target a very elite international audience that places the technology into another commercial realm.

Using igems software this paper intends to demonstrate the differences that need consideration when cutting objects of considerable value and with intricate detail using a standard industrial set up.

1. INTRODUCTION

For the past six years the researcher has been working with artist Chris Wight to explore how the water jet process can be incorporated into his practice. Each product has brought about different issues to be considered when using the water jet process. Chris Wight is an artist working in bone china and has been doing so for the past twenty years. His work has been exhibited nationally and internationally and the work he has developed with water jet technology has been viewed at Galleries such as the Yufuku Gallery, Japan and Scottish Gallery, Edinburgh Scotland. He initially started to investigate the water jet process as a means of seeing whether the bone china could be cut and if any damage occurred and then how it might add in the manufacture of more complex forms.

This paper will mention two projects *"Curvilinear constructs"* designed for a solo show at the Yufuku gallery in Japan and more recently the *"Silhouette forms"* based on two vase forms *"shapes 39 and 1251"* from the collection of Royal Crown Derby. This second body of work is still currently in development. However both look at how the water jet process has enabled shaped and cut outs to be generated some in a simpler format and others the drawing has had to be broken down, reconsidered and reprogrammed to achieve the artist's aesthetic.

Figure 1: Curvilinear constructs

Figure 2: Silhouetted forms

As this point is must mentioned that unlike those working in the field the knowledge automatically presume is something that the industry should be aware of as those working in different specialism's and areas of production often need to see firsthand in their own material before they commit to undertaking further cutting or production of cutting. This will become apparent in why this artist has chosen to work with the given technology and how over a period of time started to change his approach, so that his approach has become more suitable for commercial water jet cutting, from how he worked previously.

2. CURVILINEAR CONSTRUCTS

The outcome of this body of work was to produce forms that could slot perfectly into one another to generate a more organic three dimensional forms using 2mm thickness bone china; taking two dimensions material into the three dimensions to produce artwork for a solo exhibition at the Yufuku Gallery, Japan. The main premise of this body of work was the cutting of the sheets to interlock with few internal voids to be cut. Maximisation of the bone china sheet and to see whether "bridging or tagging" was required to maintain and keep as many shapes as possible from the sheet without them falling through the grid.

As in any project undertaken with an artist initial trials were carried out just to investigate the quality of cutting and to establish a rapport/confidence with the artist. This allows them to be introduced to the technology and its suitability to the concept/aesthetic they want to generate. Although in this project Chris is not using the machine directly that relationship between the person operating the machine, cutting the work and the artist has to be comfortable and confident. At each stage of production there is an element of engagement. It also allows the operator to understand the material, its value and what the artist is aiming to achieve. There can be occasions in which the operator and artists is not engaged and this can led to misunderstanding, quality of cut not suitable for the given market and possibly a viewpoint that this technology is not suitable to creative engagement which other evidence has proved otherwise *(Cutler 2012).*

This building of trust or confidence is through the initial drawing presented the artist was keen to produce computer drawing that he felt could explain his ideas. Initially these where in photo-shop the method the artist had used for several years in previous work. Initial questioning in the delivery of the artwork has often been in the use of photo shop; the simple jpeg line drawings demonstrating the concept. However, this was not ideal in transferring into the igems software and illustrator is the better solution for artists wishing to have their ideas interpreted. Illustrator allows dwg files to be exported and entered into the water jet software (igems). What is found is simple shapes when highlighted still have multiple points *(figure3)* and need to be smoothed and reduced on entering the water jet software. It makes no difference if the shapes have be drawn with reduced vectors.

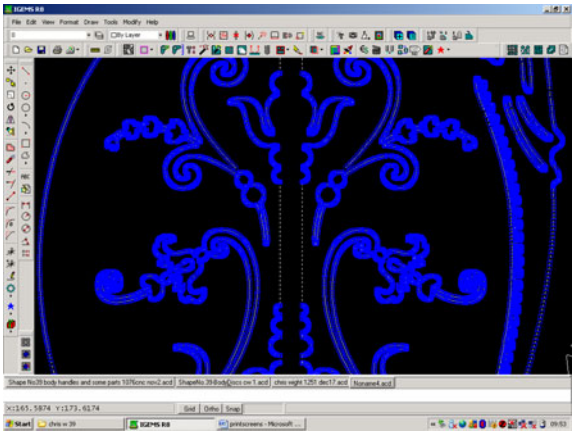


Figure 3: imported drawing with multiple nodes

Figure 4: Cutting curvilinear forms

The machine set up was using a .76 nozzle, speed rate between 300-500mm/minute. As in previous research (Cutler 2006) the cutting speeds are reduced manually whilst cutting to help achieve the desired quality of cut. Previous use of 120 garnet for cutting was the speed being reduced by 30-40% to achieve a very good cutting quality that would meet the disenable clientele that would be viewing and purchasing this work. The sheets were set up on the machine with 6mm plywood sheet underneath to reduce residual blasting and to give more strength and less risk of losing parts. As in all work the researcher has undertaken with cutting glass the bone china is treated as though it was glass, given its thickness, fragility and the market the quality was paramount as was the ability to meet the expectation of the client in terms of realising his creative requirements. During the cutting it was also noted that the original drawing had to be modified such as long slender shapes were best cut vertically across the slats of the machine rather than horizontally as they were more prone to slip into the water. This was similar with forms in the Silhouette Forms and will demonstrated further into the paper.

In the initial stages of designing the forms the artist often asks question in relation the drawing matching the outcome or matching the thickness of the jet used to create the shape. The thickness of the line being drawn in illustrator is not too important as once transferred into the vector and into the water jet software the line produced on the screen is standard. Explaining this is quite difficult and often could only be understood once a few examples are cut and the transfer of the artwork has been explained fully, with often the artists watching that procedure of nesting the forms into a given sheet.

Artists often visualise better once a sample is in their hands the nesting on the screen often does not give them the visuals impact to understand the distance between each object, thickness of the cut line and the final result. As operators are aware the drawing and result can be different in terms that the final piece is tangible. Operators should be to visualise the differences between a nesting drawing the alternation needing to be made, the action and effect of the jet and the expected result. Conveying these slight differences are important to successful outcomes and enables the artist to start drawing in a manner that allows them to foresee differences/changes prior to programming. The height of the nozzle can widen a cut as can the ware of the nozzle. In some instances of cutting as the work is not requiring total precision a more worn nozzle may be used to generate a softer edge that may suit the shape required or something such as an internal line with the body of a shape.

In this case study the conclusion was the understanding of the sheet size, maximising the elements able to be on the sheet and the direction in which to place various shapes. Nesting the long narrow shapes vertically across the water jet bed slats and to tag smaller items together. The tag size around 1.5 mm in width giving enough strength to not be affected by any movement of the work at the end of cutting when water can push the plywood underneath up and out of position. Tagging was particularly important in regards the Silhouetted forms.

The main consideration for the programmer and artists is the delivery of the file and communication in the transfer of idea from paper into the material provided. Illustrator is a better initial contributor to the image being recorded and transferred without corruption. In this case Chris now produces a layout of the components to help efficiently, by minimising nesting and programming time. The initial testing and communication eases the anxiety of those not experiencing the water jet previously.

Finally the objects where received very favourably *(Crafts Arts, p.67-69)* enabling further work to commence on another project looking at developing the method of communication and cutting in a more effective manner. This led to looking at the Silhouetted forms from Royal Crown Derby. Within this first case study the important was the cut of the external shape and the distance allowance for the slots. This could not be more than the thickness of the sheet and was found it was better to under do the distance than over. The artist could diamond file excess to slot together but if over, the forms had to be recut. Although the sheets of bone china were 2mm in thickness as hand-rolled there could be variation by keeping the nozzle approximately 2mm over from the sheet the cut thickness was consistent. Allowing occasionally for the sheet to have buckled in firing the nozzle was manually raised whilst cutting to cutting the nozzle distance consistent. There was no bonding in the manufacture of the forms all interconnected manually using used the quality of the water jet cutting.

Figure 5 & Figure 6: Curvilinear constructs white and black bone china

3. SILHOUETTE FORMS: 1251 AND 39

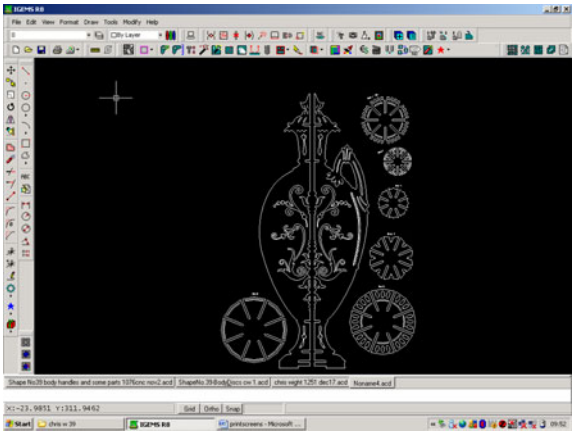
Chris Wight explored the archive and chose two vases to influence this current body of work. The water jet process in this was twofold one to generate the slot pattern for the forms to interlock together and secondly to generate the patterns that decorate the surface.

Shapes 1251 and Shape 39 are both vases from the from the Royal Crown Derby Collection *(figures 7 and 8),* a company that works in bone china to produce their wares but use much colour and decoration, bone china is the vehicle body rather than the end result. Chris aesthetic was to interpret these in a more graphic manner showcasing the bone china in a more sculptural and non-functional format.

Figure 7: Original form from Royal Crown Derby, Shape 1251

Figure 8: Original form for royal Crown Derby form 39

The outline forms are similar to curvilinear constructs however the internal patterns required some alteration and there was much discussion and investigation to achieve the desired effect. The bone china sheets are of a similar size to those used in curvilinear constructs. The machine set up the same, as was the method of set up. In this case study the artists worked primarily with illustrator to allow the operator not to redraw the original files and reduce of the time programming *(figures 9 and 10)*.



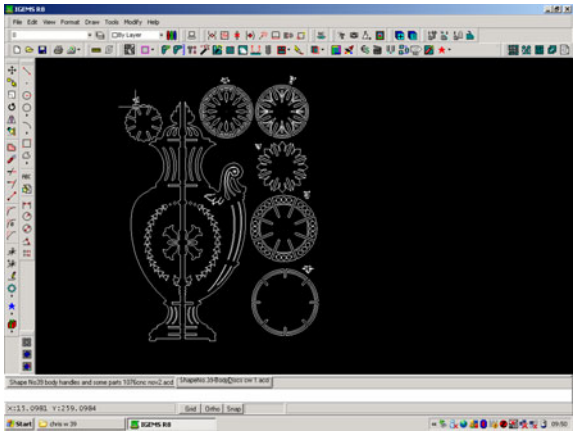
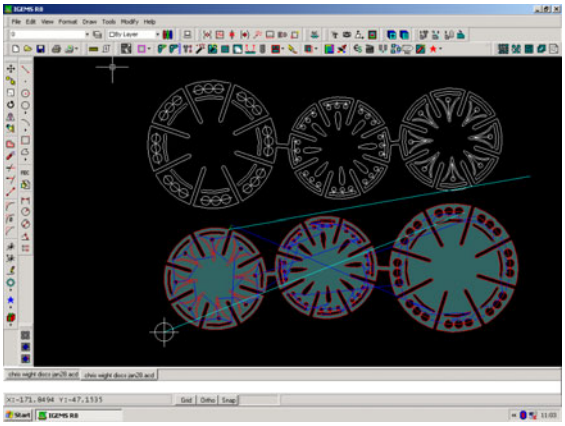


Figure 9 & Figure 10: The original illustrator drawings imported into igems software

Knowing the width of the jet and the effect of the cut generated by the machine enabled us to look at the drawings and modify to meet had been drawn. As mentioned previously the initial concept drawing does not always match the matching programming but in doing the changes the end result meets the clients expectation and aesthetic required. Example of the discs for both vases had areas where lines intersected shapes. The width of these lines where of a similar width to the jet and could be programmed as line instead of as a rectangle. In the drawn leaf details of the neck of the vases this simple linear line was

broken into two linear movement as the knowledge of the jet returning on itself on an acute angle would make the line too wide.



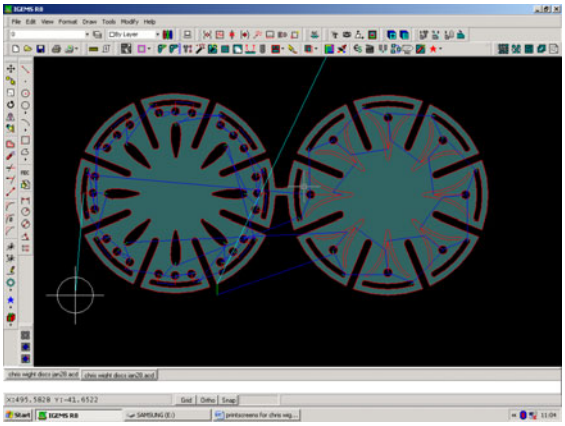


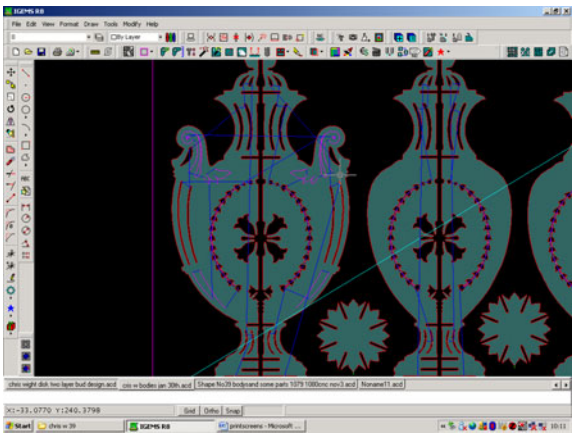
Figure 11 & Figure 12: Screensave of nesting development of the discs used for silhouette forms and the tagging to keep shapes together

In relation the discs each had a different item to consider in relation to their dimensions and the operators knowledge of how the jet operates on the smaller acute angles and tight radius required to meet the aesthetic the artist needed. In some shapes the initial drawing where modified in some instances the internal cut out required the form to be dissected into several parts involving several low pressure pierces to generate one shape *(figure 11)*.

The size of the work in some cases the discs ranged between 35mm and 50mm in diameter. Although a finer nozzle could be used the .76 was the standard set up and more available he decided on working with another cutting company at a later date if this where to go into production. The design although probably not very cost effective with in some discs over 40 piercing points to generate one disc *(figure 12)*.

The bodies of each vase too had modifications to consider enabling successful cutting of the forms. In some cases drawn shapes where modified to become just lines. By knowing the width of the jet itself could generate the shapes required or the thickness of gap needed. Areas where modifications were made are the leaf detail in the neck, the long spine detail on the vase body and the star detail in the handle *(figure 13 and 16)*. The initial double line was reduced to a single line in the leaf detail at the neck of the vase and was further broken down into two line sections and the acute angle of jet returning on itself made the cut to clumsy. By doing the two lines it become crisper and like the initial concept.

The back spine detail *(figure 14)* originally drawn as a cut out through a series of trial became a series of small 2.5mm circles with a single line drawn close to their edges. This generated the required form. Although requiring a long programme in cutting due to the number of low pressure piercings (this machine is not variable pressure and bone china cannot withstand a high pressure pierce) the outcome was the desired result. Elements such as these are crucial in a successful outcome and enables the artists to see the modifications as a necessity than someone interfering in the concept. This use of line and cut out then gives the different weight of line in various areas of the work look less machine-like or have line cuts outs to heavy for the object.



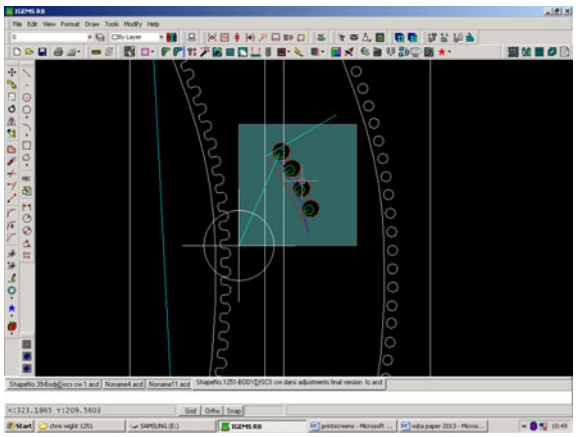


Figure 13 & Figure 14: details of modifications made in the nesting programme for the vase and spine detail

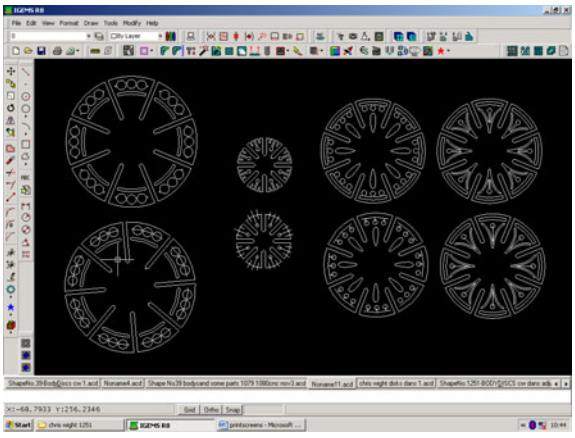


Figure 15: drawing of the original discs with altered nesting drawing underneath.

Figure 16: Bone china detail

In figure 16 the detail of the star in the handle was made by programming just three short lines, with that knowledge of the jet making the shape the artists had originally drawn. The line detail of the leaf detail can be seen as can the combination of using a cut-out shape and singular lines.

4. CONCLUSION

The end result demonstrates the success in being to communicate the modifications made in the nesting cycle as well as the order of cutting to make each component work successfully together. The positive outcome was that the artists started to work directly into illustrator and understood that occasionally some memory or image lost could occur as the water jet system would often have multiple nodes for an organic form and that although smoothing out in the system prior to transfer did not often change. The knowledge of process on the bone china becomes more intuitive from being involved and watching the nesting and

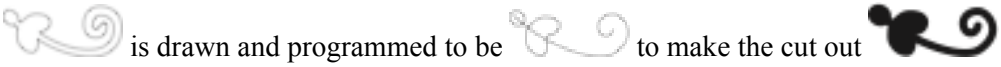
cutting process. This allowed the understanding of why an operator may change or modify drawings to suit meeting several criteria that his may not of considered before such as the following;

- Maximisation of the bone china sheet
- Amending of the drawing to meet the aesthetics of the original drawing
- Cutting maximum elements in a more cost effective manner
- Tagging forms to reduce lost
- Simplifying the nesting and programming
- Use of prior software and how it affects the methods of the operator programming
- Understanding of clear guidelines and drawings that explain the concept and outcome requirements
- Establishing testing procedures and that knowledge of additional material to allow that investigation

These are just some of the items learnt however the outcome within a general commercial cutting environment may not be seen to be cost effective. The artistic engagement is in some cases a good experiment in the cutting of different materials and a good method of improving how operators handle fragile and expensive materials. From the artists perspective establishing a mode of communication helps build that confidence in achieving a certain outcome that includes modifications to the original drawings. Chris now has established a method of communication via phone, email and visiting. Initial trials are always undertaken with him present if after that time further changes are made the operator will cut and take a quick image on their phone and send before continuing with any further cutting. This method is quick, cost effective and gives the artists a sense of being in control of their own work.

The artist himself has made a small drawing of the form to help him understand the difference between what you draw and what is visualised by the water jet operator. This helps him to keep understanding when generating concepts using the water jet process how the jet might impact on the drawings and this helps the drawings to compensate for the jet. Thus enabling to produce the final result *(figure 18)*.

"Nozzle width can range between 1mm and 1.5mm depending on height from sheet and wear on nozzle.
1mm ▪ 1.5mm ▪
5point STROKE is closer to effect of nozzle width!
So you need produce your drawings with this in mind!!" (Chris Wight 2012 pdf)


is drawn and programmed to be to make the cut out

1.5mm nozzle is approx. 5 point stroke 1mm nozzle is approx. 3 point stroke

Figure 17: Drawings to stroke thickness to understand nozzle compensation difference between 1mm and 1.5mm compensation when working in the initial stages with illustrator

Figure 18: Final result silhouette form shape 2151

5. REFERENCES

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6. ACKNOWLEDGEMENTS

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