

VISUALIZATION OF SPECIAL VEHICLE DUMMY BODY PARTS WITH THREE DIMENSIONAL PRINTER TECHNIQUES

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ABSTRACT

PT. Pindad Persero is a military manufacturing industry specialized vehicle division that uses three-dimensional printer techniques, in each design to accelerate the form of a prototype product development. A three dimensional printer is a new breakthrough in the world of technology, a printer that is capable of printing three-dimensional objects, not in the form of images or writing on a paper but rather a tangible form that has dimensions both real dimensions and scale of comparison. The advantages of three-dimensional printers, it is possible to make complex shapes. This is due to the flexibility of printing movements in the three-dimensional scope. Related to this, in every opportunity to promote a product, of course the role of three dimensional printers is very important, as a display tool or technique in promoting a three dimensional printer product process, so that this role can accelerate the process of duplicating forms or the realization of forms with temporary material or dummy, this technique is quite effective and reduces production costs, and the results of the form 99% resemble the real form, refining the shape of the dummy body parts of combat vehicles, of course there needs to be special techniques so that the results are perfect as in real forms, both in form and technique finishing paint finishing.

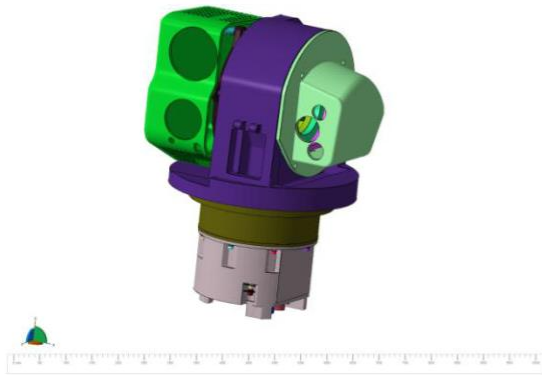
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PRELIMINARY

Research and development are continuously carried out to achieve future goals to increase business capacity and technology. PT Pindad has cooperated with various parties both at home and abroad in an effort to develop vehicle function technology, especially combat vehicles to meet national defense and security needs.

The design of a vehicle, especially a combat vehicle, is very closely related to several supporting body parts when fighting, both from

the transmitter, respigation to the main supporting weapons equipment. At this time the manufacturing industry of PT. Pindad in particular, has begun to produce combat vehicles with specifications and materials made in the country. In relation to the development or development division especially PT Pindad, always innovating, of course it is necessary to have a form test and visual image as a support in perfecting the form, this is where the material form of the dummy comes into play.



Picture 1. Digital Image Visualization Process
(Source: Hardy Adiluhung 2018)

Dummy results from the process of using a 3-dimensional printer technique is a very fast process by only relying on digital images followed by a 3-dimensional STL (Stereo Lithography) printer technique, this process can determine the quality of the 3-dimensional print results, but is still not as perfect as the shape on digital images or the quality of mass production. After the shape is printed, the shape is refined after the 3D design file is ready, then the process of printing using a 3D printer. The length of time required for the printing process can depend on the dimensions of the model. Stages made include the printer engine reading the 3D design then arranging layers in succession so that it becomes a virtual model that is automatically combined to form a complete complete object

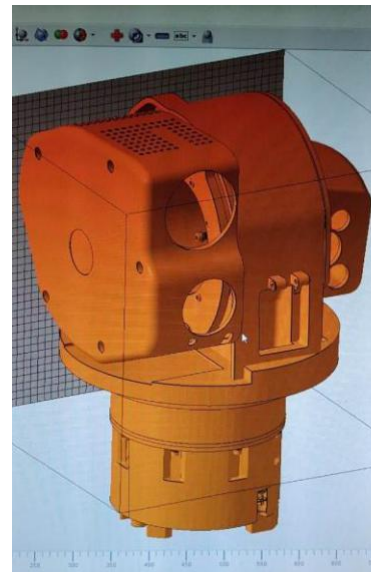
According to (Mc Cormick, 1987) the definition of visualization is a method of using computers to transform symbols into geometries and allow researchers in terms of observing computational simulations that can enrich the process of scientific discovery so as to develop deeper and unexpected understanding. From this definition, we can conclude that visualization is an intermediary media for visual representation of data that is more interactive so that it is easy to understand and increase one's understanding when viewing data. The results of the intermediary media, of course, have several stages to go through, and progress to a more tangible three-dimensional form. In this case the role of 3-

dimensional Printing or also known as Additive Layer Manufacturing which displays data in printed form.

METHOD

The method used uses qualitative methods. According to Supriadi in Yeni Rachmawati (2005: 15) expressed that creativity is a person's ability to give birth to something new, both in the form of ideas and real work that is relatively different from what already exists. Creativity is a high-level thinking ability that implies an escalation in the ability to think, characterized by succession, discontinuity, differentiation, and integration between stages of development. Creativity is the ability to create or create creativity (Big Indonesian Dictionary, 1990: 456), creativity can also be meaningful as the latest and original creations created, because creativity is a unique mental process to produce something new, different and original. Creativity is a comprehensive, imaginative regular brain activity leading to an original result.

RESULTS AND DISCUSSION



Picture 2. Part Detail Image Process Results Before Entering the 3-Dimensional Printer (Source: Hardy Adiluhung 2018)

The manufacture of body parts with 3-dimensional print, ABS plastic Filament material is very different from the principle of making manufactured body parts. This 3-dimensional print process is still the same as that used in standard inkjet printers, where the printer makes many layers of color prints to form an object to look as desired. What distinguishes the two is that 3D printers do not use ink but molten wax plastic materials and so on to make objects, have similarities with the manufacturing process, but from the level of precision and detail are still not as perfect as the results of molding in factories or mass production. Because the principle taken from the dummy body part process is a trial of the similarity in shape and visual dimensions and compatibility between the supporting parts. In this case the aim is to simulate the application of a special vehicle body.

PIRINT 3 DIMENSIONAL PROCESS



**Picture 3. The 3 Dimensional Body Part Print Process
Special Vehicle (Source: Hardy Adiluhung 2018)**

As a complement or refinement of the shape after the 3-dimensional print is processed, the next step in the most important process in

perfecting the shape is to rearrange the shape of the results of the 3-dimensional printer with the tamping technique on the surface of the printed layer, but this tamping technique must determine the thickness of the outer shell, there is a reduction in dimensions before the print process is carried out, with a reduction in dimensions by 0.3 mm, after the print process is complete, start the sanding technique, use sandpaper 400 to bind the lines or layers of the print strokes, afterward the dulling process is done, with the type of putty used labeled auto glow and Isamu, why take the brand, because the absorption of this putty has a good enough strength so that it will not be separated from the 3-dimensional plastic print material or called by the name of ABS plastic.



**Figure 4. Putty process
(Source: Hardy Adiluhung 2018)**

Another case with other modeling technologies such as those applied to CNC machines (Computer Numerical Control) that do subtractive manufacturing, 3-dimensional printing machines apply additive manufacturing technology that is arranging an object from the printed material layer. While on laser printer machines (laser cutting and milling machines), the material will be sculpted and wasted, aiming to maximize the main shape of the vehicle body part, thus providing a strong effect and perfect shape like the original body part, which

distinguishes from the original product only from the material and functions that cannot be operationalized or dummy. Such a principle is certainly always done in the manufacturing industry, as a measurement and determine the ideal shape of the model that will be made later.

The process of finishing the shape and coloring technique is very influential on the final vision, this is the main form that will be shown and applied to the vehicle body. The author tries to apply directly the results of the finishing process and see the differences and visuals on the shape. The dummy plays a big role when the dummy is installed in the original vehicle, as a simulation of a product and display form when the vehicle is exhibited indoors.



Picture 5. Dummy Body Part results Finishing & Base Paint (Source: Hardy Adiluhung 2018)

Paint Coloring and Finishing Techniques



Picture 6. Results of a Surveillance Dummy Camera Form With TNI Green Paint Finishing (Source, Hardy Adiluhung 2018)

The technique is carried out in the process of perfecting the shape, with techniques such as the process of painting the car body, this technique is taken as to facilitate the process, starting from the initial sanding using 1500 fine hamplas, with wet hamplas technique or using water, this technique aims to perfect the surface and the detail of the shape, if there is a damaged or cracked area, it can be covered with an auto glow putty type, this putty process is the same as the forging on the 3-dimensional printing material at the beginning. Furthermore, the preparation for painting with paints and types of supporting materials such as duco paint material used in vehicles, this material is quite effective and durable. The process of painting with the effect resembles the original material that is iron, the process is painted by giving the texture of orange peel to look like a rigid and sturdy material resembling iron material.



Picture 6. Application of Dummy Body Part for Surveillance Cameras on TNI Special Vehicles (Source, Hardy Adiluhung 2018)

Conclusion

This 3D model can be created using special 3D design software. the software must also be supported by the printer that will be used. The shape of a dummy, which is processed using 3-dimensional printing techniques, can be said to be easy in practice, but all this depends on the

creativity that everyone has and the purpose for what this refinement process is carried out, based on the needs needed, whether for trial form only or there is a need another to be exhibited in an event as a display of a product. All return to the functions and needs, of course, in the process of creating a product there is a test, both of forms and other needs, in this case the dummy is very instrumental, as a temporary visual form.

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