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paper text:

SUSTAINABLE PRODUCT DEVELOPMENT FOR CAR LIFTING EQUIPMENT USING 1

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E-mail : willy@petra.ac.id 1 Abstract Sustainable development is an integral concept for achieving quality of limits, interdependence, fundamentals and equity. Virtual reality

means existing or resulting in essence or effect though not in actual fact, form, or name. 3

Machine design is always interesting for most people, it is also becoming more and more popular now a days. Showing the performance of a machine design during the design phase is

possible to do using 3D Max and ANSYS software. Car lifting equipment is a device to lift a car for several workshop purposes as replace oil, fix car's break, 1

overhaul engine, periodical maintenance and many others. Conventional car lifting equipment design needs a lot of cost, time, and materials because it needs doing the real test to understand the performance of the car lifting equipment design. The primary target of this research is to search and decide which mechanism is the most suitable for this machine and also the virtual reality to show its performance during the design phase. In this research, sustainable product development using virtual reality with 3D Max and ANSYS software is used rather than conventional design. The goal of this research is to show the performance of the machine during the design phase

using 3D Max and ANSYS software. Finally, **car lifting equipment** 1

has been designed in this research using 3D Max and ANSYS software as a solution of

sustainable product development. Designing **car lifting equipment using 3D Max and ANSYS** virtual reality **software** 1

can reduce materials, cost and time of product development. Virtual reality

using 3D Max and ANSYS software is a 1

sustainable technology for sustainable product development in the car lifting equipment design. Keywords: Sustainable Product Development, Virtual Reality, Car Lifting Equipment. 1. Introduction

Time to market has been generally admitted to be one of the most important keys for success in manufacturing companies and product design. **Combination of factors such as ever changing market needs and** 2

expectations, rough competition and emerging technologies among others, challenges industrial companies to continuously increase the rate of a **new products to the market.**

The marketplace provides numerous incentives for the

more rapid introduction of new products to market **7**

(Carrilo and Franza, 2006). To develop a successful product, customer requirements need to be carefully considered during product design (Lin,et al., 2006)

Quality function deployment (QFD) has widely **been used to translate customer requirements to technical design requirements (Prasad, 1998). QFD** **4**

helps us to interpret and organize the various groups of requirements, the output being the set of product specifications. Besides that, current socio-economic trends towards developing more eco-friendly products within a sustainable growth scenario, add a new complexity to the manufacturing companies mostly but not only, to the product specification and design must be determined designers. Sustainable product development before, which is affected by six factors. First,

approaches used in industry to date mainly price, whether **the** **6**

equipment are expensive or focus on reducing the environmental impacts not. Second, lifting capacity, in this case the of products (Maxwell and Vorst, 2003). capacity is the weight of the cars. Third, the Sustainable technology is a part of the car lifting equipment size, whether the broader concept of sustainable product equipment are big or small. Fourth, material, development (Weenen, 2002) and virtual the strength of material that used for basic reality means existing or resulting in essence material for the machine. Fifth, the car lifting

or effect though not in actual fact, form, or **3**

equipment working mechanism, the easiness name (Anggono, 2006). Understanding the of the machine working mechanism that the mechanical design is very hard to do because users do not need assistant to help him to it is very hard to visualize the mechanical operate the machine. Last, maintenance, the design product and the performance of the practical maintenance will be easy the users to mechanical product during design phase. take care the machine. Product Design is always interesting to most of the people. It is also becoming more and 2. Theoretical Background more popular now a days. To predict the performance of the mechanical product during Virtual Reality is “a set of image and sounds design phase is

possible to do using 3DMAX produced by a computer, which seem to and Finite Element Method technology represent a place or a situation that a person (ANSYS Software). Virtual reality technology can experience or take part". With the using 3DMAX and ANSYS software can existence of this new virtual reality system, perform the performance of the mechanical we are able to understand more the working product during the design phase (Anggono, mechanism of the machine. Moreover, we 2004). know that virtual reality can simulate the Currently, many type of car lifting working process of machine from the equipment which is placed in workshops. This beginning until the end of the process. equipment usually designed both manual and Virtual reality is a simulation from the electronic, working processes of this reality or imagined environment model which equipment are various such as using hydraulic gives visual experiencing tree dimensions, jack or mechanical. such as length, width, and depth. Also, it These machines are various and quite provides more information in term of visual same with ordinary jack, but the form and the interactive experience that becomes the real working process are quite different and more condition or animation completely, with its complicated. The various car lifting sound that can provide feedback. The basic equipments is shown in figure 1. form of virtual reality is three dimension images, which can be explored interactively by personal computer. The popular product that usually used for giving virtual reality effect in personal computer are Bryce, Extreme 3D, Ray Dream Studio, 3D Studio Max, and True Space. Figure 1. Car lifting equipment Source: www.mohawk.com Car lifting equipment is equipment that usually used in workshop and becomes one of the most important equipment. To search and decide the most suitable mechanism, Figure 2. Hydraulic scheme Fluids in closed area can be used to transfer energy from one place to another place. After that, to make circular or linear movement we need some capacity. The advantage of this hydraulic system are become the characteristic of incompressible fluids (relatively) with different height of density. A hydraulic system which based on fluids can work in higher pressure and can be used to make huge forces. Concept development is a design process way which choosing worked object as market needs. Basically, designing are oriented to activities, such as manufacturing body, choosing material and whatever which needed to make the product function well and properly Figure 3. Concept development scheme Source: http://www.rqriley.com/index.html 3. Research Methodology Figure 4. Research methodology 4. Result and Discussion Designing this car lifting equipment, manufacturing process can be done manually which means mechanical design process which involve in designing car lifting equipment car are more oriented to product development process. A good Development Concept will give huge impact to the final result of all product development process which will be done. In this step, the requirements from the market are identified, specified from the product is determined, chosen from the product is determined. This step is the basic of all product development process which will be done. If we do not pay attention to this step properly, it will lead to a bad effect in all of product development process, which affects the final result. Thus, the final results obtained are not perfect. Identifying the customer needs can be done by researching the problems which occurred in nowadays condition. After that, it is being developed into a new design concept from the product which newly manufactured. In this case, the product being manufacture are car lifting equipment. By having identify customer needs process, the product which created will give extra satisfactions and ease to the users. Besides that, the users will easier in choosing existing mechanism process or to find new mechanism process from car lifting equipment. The list which obtained from identifying customer needs process will summarize in a list called list of requirements. Based on the customer needs which are listed in list of requirements, we can do determining the target specification from designing process of car lifting equipment. Basically, this establish target specification step is similar with identify customer needs step. However, in this step, the current requirements are matched with technical constraint and available fund which is owned. Methods which can be applied in establish target specifications step is function analysis method. In function analysis method, the first step to do is concentrating to the achievement that will be

done in designing process and not how to achieve it. Table 1. List of Requirements Cars Lifting Equipment The activity in generate product concepts step are providing alternatives which enable us to do the process. After that, we choose the alternative that we want to use, where the chosen mechanism is the best mechanism which fulfills the requirements and technical specifications is needed. In choosing handling equipment material, we also need to pay attention in constructing this car lifting equipment, because handling equipment material types which is used can affect the strength of frame and stick as main facility which facilitate the motion of the equipment. Pugh's concept selection method is the best concept selection method to choose the product concept for car lifting equipment. Figure 5. Product Concept Source: www.mohawk.com Usually this scoring (concept selection) is in B (better) alphabet form and awarded to the closely match scoring with the criteria above. S (same) is given if the thing which is used for that equipment available in the market. W (worse) is given if the thing or equipment is unmatched with above criteria. Table 2. Concept selection for cars lifting equipment design Based on the data above, the price consideration and price which is offered in the market, portable mid-rise lifts design is highly suggested since it is more profitable. This is happened since it is easy to use and maintain, portable to move, cheaper than other model, and have lifting strength which is needed by daily car. Figure 6. Car Lifting Equipment Design Figure 7. Car Lifting Equipment structural calculation using ANSYS software Based in the ANSYS FEA result car lifting equipment design is safe. The criteria based on Von Mises stress calculation for structural application (figure 7). To understand the mechanism of the car lifting equipment design, 3DMAX virtual animation software can be perform the simulation of the car lifting equipment design during the design phase. The simulation the car lifting equipment design using 3DMAX virtual animation software can be seen in figure 8 Figure 8. Design in 3DMAX software Figure 9. Animation result using 3DMAX By using virtual reality, could be concluded that the shape and dimension of the semi automatic binding machine will be better displayed. Using 3DMAX virtual animation software, how this machine works could be better visualized, even before this machine being made. Conclusion Designing car lifting equipment using 3D Max and ANSYS virtual reality software can reduce materials, cost and time of product development. Virtual reality

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