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DESIGNING PRAM TESTING EQUIPMENT

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Abstract: The birth of a child is the biggest completion in one's life as due to the biological functions one can forward their genetic values by conception, later morality in education. Human life is a great value, thus we can say the vehicle carrying the baby or toddler should be safe and reliable. The article shows the consideration of equipment that is suitable for testing the adult handle.

Keywords: *pram, load test, designing considerations, environmental awareness*

1. The operative standard and the chosen test

The perfect operation of a child pram is guaranteed by testing in line with the appropriate standard of MSZ EN 1888-2012. The durability test against the lifting-pressing stress of the handguard of the adult's handhold has been chosen out of a great number of tests.

The standard defines an optimal pram construction with appropriate size and reinforcement points, as well as the test weights put in the pram. For a pram shorter than 800mm two different test weights can be used, one of them is "test weight A", which is (9+0.01/0) kg, the other is "test weight B", which weighs (15+0.01/0) kg. For prams longer than 800 mm "test weight F" is applied, which weighs (13+0.01/0) kg.

The handhold can be pressed with the maximum strength up to 450N, this way pressing the rear structural elements of the pram as far as the front wheels are considered up to the front wheels' 120±10mm. Lifting the load of the pressed structure means lifting the rear wheels onto the height of 120±10mm. The cycle shown in the first passage should be repeated 3000 times, with (15±2) cycle number per minute.

This phase of the test is to study durability while crossing a hardshoulder. The second phase can be described by a more simple cycle during which by raising the handhold and lifting the rear wheels the structure moves up until they reach the height of 120±10mm. Full pressure moves onto the first wheels of the pram. After that comes letting the wheels down, in a more careful way, that is making the pram slower.

The second phase of the test has 7000 cycles, the cycle number per minute has been the same as it was in the first task (15±2). All in all, the test studies the durability of the pram through the adult handholder. A pram passes the test only if it survives 10,000 cycles without any serious damage.

2. Summary of designing

The first step after the patent and segmented market research was followed by the conceptualised designing process, in which different forms of solutions appeared from the abstract function analysis to exact function structures. Studying the different versions of solutions according to the system of showing positive values with Copeland value analysing method, the optimal version appeared which gave guidelines for the later designing process. Important security and material usage restrictions and requirements were considered, which could influence the forming of construction, paying attention to the importance of the environmentally friendly design of the equipment, and safe usage.

For the forming of the construction we needed to make clear the force requirement of moving the pram at given parametres.

During the study this force means a periodical load on the elements of the testing equipment, this way we need sizing for fatigue, which can be done by the Soderberg procedure. First, the procedure for the general case was described, which later was used for the parts of the clamp device.

With the help of sizing procedure the clamp device was optimised with a finite element software.

3. Design considerations

Considerations refer to several fields, for example, the regulation of 16/2008 (VIII. 30.) NFGM, which is a regulation for the safety requirements and maintenance of machines.

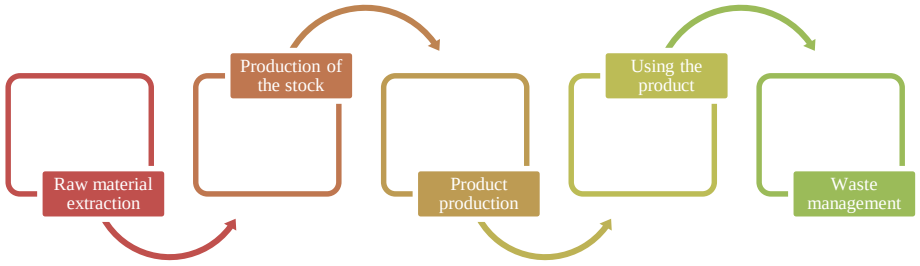


Figure 1. Life-cycle of a product-material [2]

It is important to approach designing from environmentally friendly perspec-tives as environment resources are limited and their usage takes place in an irresponsible way. In the present case circumstances coming from the life cycles of the equipment dominate.

Raw materials should be easily accessible from trade, this way energy resources are minimized as raw materials are produced in bulk, or the tool part is made more efficiently than it could be at home.

We have to use parts that make the structure more simple (e.g. function contraction), this way the required number of elements could be decreased.

The raw material parts also should be produced with minimal environment load, or at least the recycling of the raw materials should be easy.

The elements used in the device should be replaceable, or at least recyclable. This way we can increase the lifespan of the device and the raw material, so there less material will be needed to extract.

At assembly or at uniting certain parts into bigger units dissociable technologies should be used technologies taking into consideration the possibility that it can be used for other tests, as well as for possible replacement of tools.

Special tools that have to be manufactured should not be needed for the assembly of the equipment. Safety elements should be used, which prevent the failure of parts manufactured with bigger environmental load.

4. Application of considerations

The support structure of the equipment could be made of aluminum profile, with a profile shape from any other market, or general steel in the appropriate form. In the case of aluprofile, fitting elements to each other takes place through nitches and flexible nuts with corner elements and switching element available with profiles.

Uniting a working element and its course of elements moved by it can mean function uniting (like a pneumatic actuator).

The effort for the most simple way of forming the number of parts can be decreasing the number of parts. For example, in the case of an aluprofile the sheet under the pram could be placed on the walls of nitches of the aluprofiles, and it is enough to tie them in the end.

5. Outlook onto the issue of material usage

It can be stated that raw materials are of great importance in any designed equipment or machine. We usually choose the materials according to their mechanical properties that are necessary for the aspect of function completion; however, there are other trends, which lead to smaller environmental load. Certainly we have to pay attention in the case of materials to different effect carriers through which processing procedure we should take over to achieve the appropriate geometry and size. We can find a lot of charts and graphs about the expenditure of certain materials, for example, the chart of energy needs of the Autodesk which was worked out for the economical planning. In the chart the load of certain material groups is compared with the expenditure on energy.
(Figure 2, http://manufacturingtoolbox.typepad.com/my-blog/2012/02/)

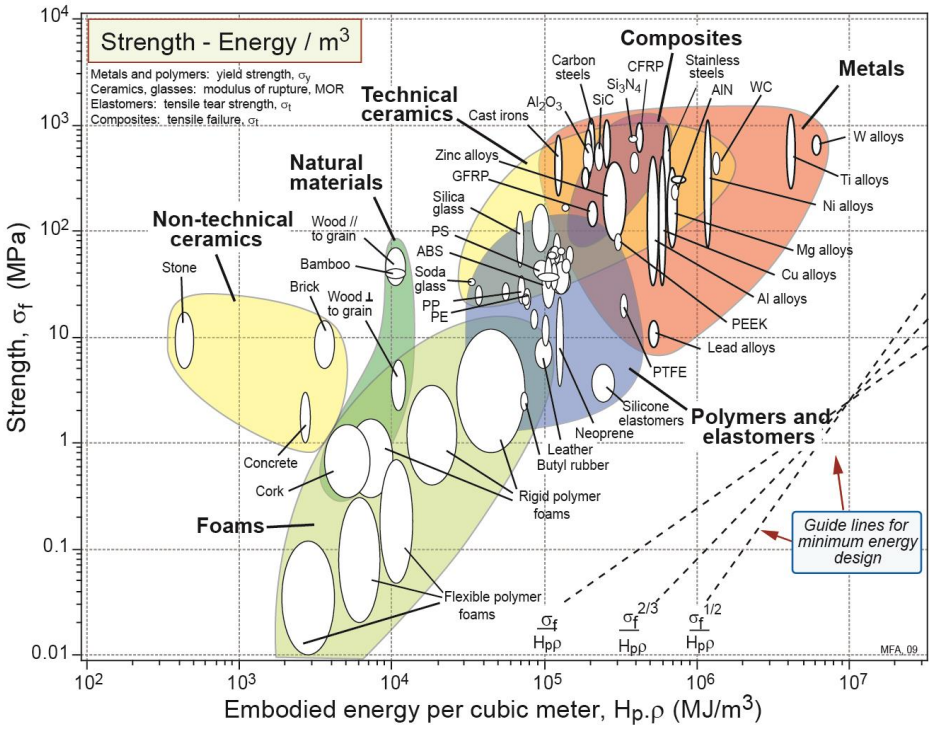


Figure 2. Energy necessity diagram

6. Acknowledgement

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