Universidad Continental

FACULTAD DE INGENIERÍA

Escuela Académico Profesional de Ingeniería Mecánica

Tesis

Design of a Hydro Bicycle for the Junin, Huancayo Region

Alexis Yiber Aylas Quispe
Jean Carlos Tovar Solano
Armando Felipe Calcina Sotelo
Nabilt Jill Moggiano Aburto

Para optar el Título Profesional de
Ingeniero Mecánico

Huancayo, 2024

INFORME DE CONFORMIDAD DE ORIGINALIDAD DE TESIS: EN FORMATO ARTÍCULO CIENTÍFICO

A	:	Gutarra Meza Felipe Decano de la Facultad de Ingeniería
DE	:	Calcina Sotelo Armando Felipe Asesor de tesis en formato artículo científico
ASUNTO	:	Remito resultado de evaluación de originalidad de tesis en formato artículo científico
FECHA	:	12 de Marzo de 2024

Con sumo agrado me dirijo a vuestro despacho para saludarlo y en vista de haber sido designado asesor de la tesis en formato artículo científico titulada: "Design of a Hydro for the Junín – Huancayo Region", perteneciente al/la/los/las estudiante(s) Aylas Quispe Alexis Yober y Tovar Solano Jean Carlos, de la E.A.P. de Ingeniería Mecánica; se procedió con la carga del documento a la plataforma "Turnitin" y se realizó la verificación completa de las coincidencias resaltadas por el software dando por resultado 16 % de similitud (informe adjunto) sin encontrarse hallazgos relacionados a plagio. Se utilizaron los siguientes filtros:

	SI	NO
• Filtro de exclusión de bibliografía		X
• Filtro de exclusión de grupos de palabras menores (N° de palabras excluidas:)		X
• Exclusión de fuente por trabajo anterior del mismo estudiante		X

En consecuencia, se determina que la tesis en formato artículo científico constituye un documento original al presentar similitud de otros autores (citas) por debajo del porcentaje establecido por la Universidad.

Recae toda responsabilidad del contenido la tesis en formato artículo científico sobre el autor y asesor, en concordancia a los principios de legalidad, presunción de veracidad y simplicidad, expresados en el Reglamento del Registro Nacional de Trabajos de Investigación para optar grados académicos y títulos profesionales – RENATI y en la Directiva 003-2016-R/UC.

Esperando la atención a la presente, me despido sin otro particular y sea propicia la ocasión para renovar las muestras de mi especial consideración.

Atentamente,

DECLARACIÓN JURADA DE AUTORÍA

El presente documento tiene por finalidad declarar adecuada y explícitamente el aporte de cada estudiante en la elaboración del trabajo de investigación a ser utilizado para la sustentación de tesis: formato de artículo científico.

Yo: Aylas Quispe Alexis Yober, con Documento nacional de identidad (DNI) N° 75513512; teléfono 935832483; estudiante de la Escuela Académico Profesional de Ingeniería Mecánica.

Yo: Tovar Solano Jean Carlos, con Documento nacional de identidad (DNI) N° 77798317; teléfono 977499741; estudiante de la Escuela Académico Profesional de Ingeniería Mecánica.

Yo: Calcina Sotelo Armando Felipe, con Documento nacional de identidad (DNI) N° 19855148; teléfono 964841056; asesor de la Escuela Académico Profesional de Ingeniería Mecánica.

Yo: Moggiano Aburto Nabilt Jill, con Documento nacional de identidad (DNI) N° 45103226; teléfono 971454590; docente de la facultad de Ingeniería Mecánica.

Ante Usted, con el debido respeto me presento y expongo:

Declaramos que hemos participado en la ideación del problema, recolección de datos, elaboración y aprobación final del artículo científico.

Firma
DNI: 75513512

Firma
DNI: 77798317

Firma
DNI: 19855148

Firma
DNI: 45103226

Firma del asesor
Calcina Sotelo Armando Felipe

Articulo

INFORME DE ORIGINALIDAD

16%	15%	%	6%
INDICE DE SIMILITUD	FUENTES DE INTERNET	PUBLICACIONES	TRABAJOS DEL ESTUDIANTE

FUENTES PRIMARIAS

1	cris.continental.edu.pe Fuente de Internet	8%
2	Submitted to La Trobe University Trabajo del estudiante	2%
3	www.ncbi.nlm.nih.gov Fuente de Internet	1%
4	Submitted to University of Durham Trabajo del estudiante	1%
5	noexperiencenecessarybook.com Fuente de Internet	1%
6	Submitted to Visvesvaraya National Institute of Technology Trabajo del estudiante	1%
7	Submitted to Liberty University Trabajo del estudiante	1%
8	www.ijmerr.com Fuente de Internet	1%

Excluir citas	Apagado	Excluir coincidencias	Apagado
Excluir bibliografía	Apagado		

Design of a Hydro Bicycle for The Junín- Huancayo Region

A Aylas Quispe[1, *], J C Tovar[1], A Calcina [1] and N Moggiano[2]

[1]Escuela Académica Profesional de Ingeniería Mecánica, Universidad Continental,
Huancayo, 12000, Junín, Peru
[2]Engineering Research Unit, Faculty of Engineering, Universidad Continental, Huancayo-Peru.

[*]Email: 75513512@continental.edu.pe

Abstract. The objective of this study was the design of a hydraulic bicycle and the assembly of a floating structure, steering and propulsion to be able to navigate. To this end, a variety of studies have been conducted. A study on the selection of the most suitable materials for the marine environment was also conducted, where a detailed analysis of each component of the power transmission was carried out, where the Shigley-McGrawhill mechanical engineering design book of machine elements was also used. The study of the structural part was carried out to ensure the integrity of the user, also a study of the transmission of pedaling power to the propeller and the pontoons to be able to withstand a maximum load of 120 kg and stability to ensure buoyancy.

1. Introduction

The practice of sport leads us to achieve a series of benefits: Improvement of physical health: with the practice of some type of sport we manage to prevent a large part of cardiovascular diseases, as well as various types of cancer, it also helps us control our body weight achieving fat reduction and we manage to improve our resistance to fatigue, as well as improving sleep. Improved mental health: Playing sports reduces stress levels and is usually a good treatment for depression or anxiety. Sport through effort makes us release endorphins that are known as "Happiness Hormones" Provides good habits: A good physical education from an early age causes the habits to which the individual gets used to are healthier avoiding the consumption of drugs or alcohol to be able to perform their exercises correctly [7] . In addition, team sports foster personal relationships with both the members of a team and those of the rest (healthy competition). [1] [6]

For this reason and for academic purposes it was decided to create a proposal for a solution to this problem, where the machine was designed applying the VDI 2222 technology that was created by German engineers and is mainly based on planning, conception, project and development. with which the loads and efforts of all the components of the machine will be calculated, as well as the appropriate material for the construction will be selected, in addition, through the use of the SolidWorks program, a prototype will be made in which it will also be possible to perform simulations of forces and loads on each component and element of the machine and thus determine the optimal sizing and material for its construction. [2]

The bicycle is the most used means of transport by people, this vehicle is used daily in the world, most of them are domestic bicycles or for walks, this vehicle helps in the conservation of the environment by reducing pollution levels and contributes to health care and avoid direct contact Peru is a country where there is an abundance of coastal areas and this is due to the Pacific Ocean, as well as the large number of rivers and this facilitates the realization of aquatic activities such as water cycling, but a common problem that can be seen is the high cost of hydrobicycles and therefore people with limited resources can not acquire it, So for this reason the design of a hydraulic bicycle to carry out this physical activity that is also healthy is essential and feasible for the population, especially for people who want to bring land cycling to the aquatic environment. [4]

2. Materials and methods

For the use of this study, we use a suitable design using the VDI 2222 and VDI2225 methodology, which is the design process, as part of the creation of the product.

The materials to be usedare carbon steel tubes, these steels respond well to cold work and cementing heat treatment. It has a high weldability index and due to its high toughness and low mechanical strength, it is suitable for machinery elements and conventional uses of low demand. These steels are used in shafts, chains, rivets, screws, bolts, fasteners, gears, pinions, machine parts, low-strength pins, presses and cams [5].

2.1 *System of proposals*

With the proposed system, a hydraulic bicycle supported by simulations and calculations is designed, it will consist of an aesthetic chassis, pontoon floats with a capacity of 120 kg and the power transmission will consist of a pedal attached to axes with bevel gears. change the direction of rotation.

2.2 System analysis

For a good analysis of the proposed machine, a black box was taken into account to detail the signals coming in and those leaving as shown in Figure 1.

Figure 1. Black box

2.3 Methodology

2.3.1 *Morphological matrix*

To select the design of the hydraulic bicycle, we looked for those functions that it can fulfill so that it is economical, stable and functional, which gave the sample of the proposal through the morphological matrix that can be seen in figure 2.

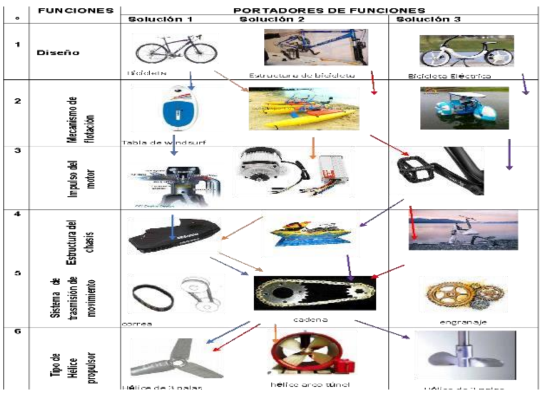

Figure 2. Morphological matrix

2.3.2 *Equation*

To design our hydraulic bike, certain calculations will be needed.

Table 1. Parameters to determine the static system of Hydro bike and analysis.

Parameters	Equation	Reports
Gear calculation	$\sigma_c = -CP\left[\frac{kv * w^t}{Fcos\emptyset}\left(\frac{1}{r_1}+\frac{1}{r_2}\right)\right]^{1/2}$	$-3912.25\ \frac{lb}{pulg^2}$
Bearing calculation	$C_{10} = F_D\left[\frac{x_D}{x_0 + (\theta - x_0)(1 - R_D)^{1/b}}\right]^{1/\alpha}$ $R \geq 0.90$	$1461.72\ lb$
Static analysis	$d = \left(\frac{16 * n}{\pi * Sy} * (4 * (Kf * M)^2 + 3(Kfs * T)^2)^{\frac{1}{2}}\right)^{\frac{1}{3}}$	$1.26\ in$
Limiting factor	$Se = Ka * Kb * Sé$	$27.55\ Kpsi$
	Axis calculation	
Calculation of force and	$Fcos(\emptyset)$	$236.10\ lb$
Calculation of force x	$Fsen(\emptyset)$	$86.22\ lb$
Pwould engine	$T = \frac{d}{2} * F$	$2951.25\ lbf$

Having the calculations already developed, the SolidWorks program was used to develop the simulation of operation, as well as the plans presented to be able to observe the operation of the machine in detail.

3. Result

3.1. Simulation of forces on the main axis of work

For maximum load, the SolidWorks program was used to simulate its deviation.

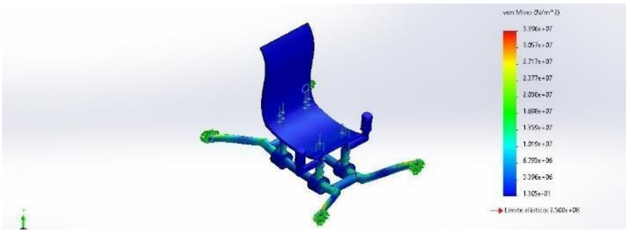

Figure 3. Analysis of static loads -Voltages

Thestatic stress loads on the chair and chassis in Figure *3* have different amplitudes and resulting voltages generating a minimum of 1,305 N/m^2 and a maximum of 3,396 N/m^2.

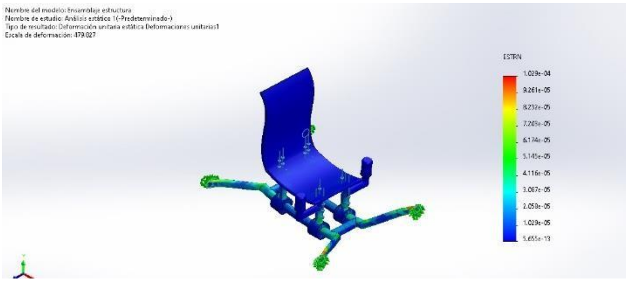

Figure 4. Analysis of static loads - unit deformations

For the analysis of static loads of deformations as shown in figure 4, there is weight in a person that causes him to have a deformation, which must have a minimum of 5.655 ppm and a maximum of 10.29 ppm. Deformation of the material.

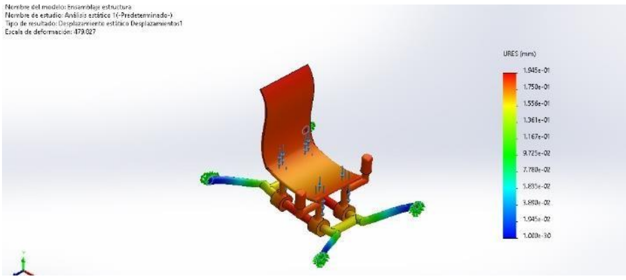

Figure 5. Analysis of static loads -Displacements

For the analysis of static loads in displacements, there will be movements in the seats and the chassis by displacement in the water as we can see in figure 5 the different deformations and forces, which will generate a minimum of 1 mm and a maximum of 1,945 mm.

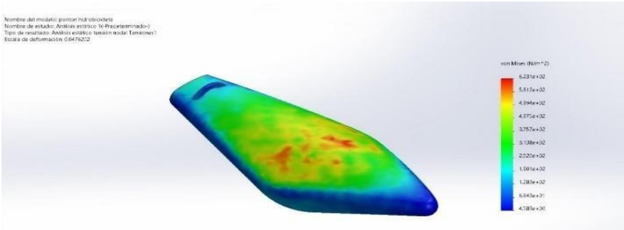

Figure 6. Analysis of static loads for the Project pontoon

Figure 6 shows that there is a higher load on top of the pontoon that will generate the minimum load of 4,583 N/m^2 and a maximum of 6,231 N/m^2 Figure 09 shows that there is a higher load on top of the pontoon that will generate the minimum load of 4,583 N/m^2 and a maximum of 6,231 N/m^2.

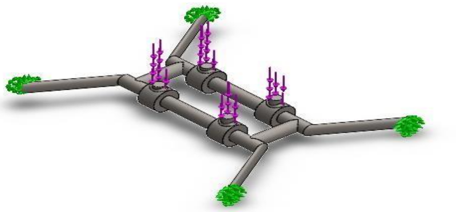

Figure 7. Hydraulic bicycle chassis

In figure 7 we can see the simulations obtained in SolidWorks we were able to obtain certain characteristics of the chassis that resulted in a mass of 109.91 Kg, a volume of 0.0140026 m^3, a density of 7849.25 Kg/m^3 and a weight of 1077.12 N.

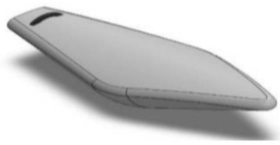

Figure 8. Hydro Pontoon Bike

In figure 8 with the simulations obtained in SolidWorks it was possible to obtain certain characteristics of the pontoon of the hydraulic bicycle, which gave us a mass of 1071.25 Kg, a volume of 0.830425 m^3, a density of 1,290 Kg/m^3 and a weight of 10498.3N

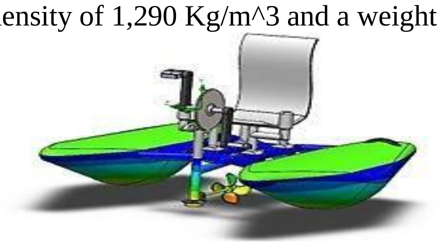

Figure 9. Analysis of static loads of the project, shock with water

Figure 9 shows us the complete design of the hydraulic bicycle, which shows the loads it will have when in contact with water.

4. Conclusions

This design is efficient to move through the water in steady state as lagoons that are in the province of Huancayo giving great environmental and healthy impact to the population.
The mechanical design and static simulation in SOLIDWORKS provided the data on the stresses of the structure.
The one with the best solution to the main problem was selected and after having gone through a series of calculations and observations, it was taken as the final solution.
The design of the propeller is based on the transmission ratio generated, resulted in a design of 4 propellers with a speed of 2.59 m / s that considered the different measures according to the characteristics of the prototype such as height of 1.00m and width 1.48m, obtaining an efficient and ergonomic wind turbine.

5. References

[1] M. Lynn, M. Fraser, P. Roberts «Improving cycling safety through infrastructure design: A bicycle simulator study», Transportation Research Interdisciplinary Perspectives, **vol. 18**, no. 100768, pp. 209-217, marzo 2022, doi: 10.1016/j.trip.2023.100768.

[2] J. I. Rojas-Sola, A. Fernández-Sora, A. Serrano-Tierz and D. Hernández-Díaz, «A Historical Review: From Engineering Drawing Towards Design Engineering», Dyna, **vol. 78**, no. 167, p. 17-26, 2011.

[3] C. O. Vélez-Chávez, "Sustainable and healthy mobility by bicycle in times of Covid in the city of Manta", Polo Conoc., **vol. 6**, no. 2, Art. No. 2, February 2021 .

[4] I. C. Medrano, "In our day there are great technological advances that make our lives easier, reduce our physical efforts, and lead to greater productivity.", p. Four.

[5] J. Marulanda, A. García y J. Vitola, «Protección Against Corrosion by Molten salts of a Carbón Steel by Thermal Spray», Dyna, **vol. 76**, no. 157, pp. 251-256, jun. 2009.

[6] Carlos A. Toledo, Daniel S. Gordillo, and Diego J. Sánchez, "Modeling, Design, and Simulation of Anti-Theft Device for Bicycles," International Journal of Mechanical Engineering and Robotics

Research, **vol. 9**, no. 11, pp. 1463-1473, November 2020. DOI: 10.18178/ijmerr.9.11.1463-1473 [7] Smith, J., Petrovic, P., Rose, M., De Souz, C., Muller, L., Nowak, B., & Martinez, J. (2021).

Placeholder Text: A Study. The Journal of Citation Styles, 3. DOI: 10.1016/j.ejor.2022.08.041