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Presentation of Content

In a first article we present, *Quality evaluation of oat flour and wheat flour blends for cookie production*, by MORALES, Victor, MARTÍNEZ, Eliel, ESPITIA, Eduardo and BARDOMIANO, Jaime, as a second article we present, *Pencil of fire*, by GÓMEZ, Isabel, FLORES, Jaime, BARROZO, Marybel, ESPADA, Fabiana, MORALES, Iver, ZELAYA, José and BRAVO, Abrahán, with adscription in the Universidad Mayor, Real y Pontificia de San Francisco Xavier de Chuquisaca, as the third article we present, *Continuous improvement in production logistics to minimize waste*, by HOLTZEIMER, María de los Ángeles, GUILLEN, Mima, RIVERA, Denisse and VALENTIN, Pedro, with adscription in the Universidad Tecnológica Paso del Norte Pez Lucio, as fourth article we present, *Application of second-order conductors through the design and manufacture of a welding machine made with recycled materials*, by DIAZ, Eyran, ORTEGA, Edgar, SILVA, José and MONTIEL, Gloria, with adscription in the Universidad Tecnológica de Torreón.

Content

Article **Journal Journal-Economic Development Technological Chance and Growth**
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Quality evaluation of oat flour and wheat flour blends for cookie production

Evaluación de calidad de mezclas de harina de avena y harina de trigo para galleta

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Abstract

In the present study the physicochemical, rheological and sensory quality of mixtures of oat flour and wheat flour for cookie was evaluated. The experimental material was used oats cultivar Turqueza and wheat variety Urbina S2007. Five formulations of mixtures of oat flour and wheat flour were prepared treatments. The experiment was evaluated using a simple ANOVA and Tukey's test at P≤0.05 indicating significant differences in all variables studied. The Formulation 4 (25:75) has been associated parameters biscuit good quality, sedimentation volume (30.3 ml), kneading time (3.0 min), stability in kneading (3.0 min), tolerance to over-Kneading (7.3 mm) mixogram height (46.6 mm), dough strength (88.0 Wx10-4J), the relationship tenacity-extensibility (1.3 PL), factor cookie (5.9). Sensory evaluation cookie by 50 untrained panelists indicated preference formulation 4 (25:75) with respect to the attributes of taste, texture and appearance. The work allowed us to evaluate the functionality of the blending of wheat flour and oats to get a cookie.

Sedimentation, Mixogram, Alveogram, Biscuit factor, Sensory attributes

Resumen

En el presente estudio se evaluó la calidad fisicoquímica, reológica y sensorial de mezclas de harina de avena y harina de trigo para galleta. El material experimental utilizado fue avena variedad Turqueza y trigo variedad Urbina S2007. Se prepararon cinco formulaciones de mezclas de harina de avena y harina de trigo como tratamientos. El experimento se evaluó aplicando un anova simple y una prueba de Tukey a P≤0.05, indicando diferencias significativas en todas las variables de estudio. La Formulación 4 (25:75) ha sido asociada parámetros de buena calidad galletera, volumen de sedimentación (30.3 ml), tiempo de amasado (3.0 min), estabilidad al amasado (3.0 min), tolerancia al sobreamasado (7.3 mm), altura del mixograma (46.6 mm), fuerza de la masa (88.0 Wx10-4J), la relación tenacidad-extensibilidad (1.3 PL), factor galletero (5.9). La evaluación sensorial de la galleta por 50 panelistas no entrenados indica preferencia de la formulación 4 (25:75) respecto a los atributos de sabor, textura y apariencia. El trabajo permitió evaluar la funcionalidad de la mezcla de harina de trigo y harina de avena para obtener una galleta.

Sedimentación, Mixograma, Alveograma, Factor galletero, Atributo sesoriala

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† Researcher contributing first author.

Introduction

In Mexico, oats are the fourth most produced cereal with 91, 049.05 tons of grain per year. The use of oats as fodder has increased. The problem is that the above, affects the marketing of oats for human consumption, considering the low demand and that the Mexican diet does not include the regular consumption of this grain due to lack of information on its nutritional content and lack of bread products (SIAP, 2015).

In Mexico, according to SIAP (2015), the main grain oat producing states in 2013 were Chihuahua, Mexico, Zacatecas, Durango and Hidalgo.

Ubicación	Producción (Ton)	Rendimiento (Ton/Ha)
Baja California	545.42	0.55
Chihuahua	57,227.95	2.01
Coahuila	276.3	2.11
Durango	2,951.50	3.02
Hidalgo	4,670.05	1.07
Jalisco	2,185.80	3.52
México	16,604.37	1.46
Tlaxcala	1,743.80	1.89
Zacatecas	4,843.86	3.2
	91,049.05	**1.84**

Table 1 Oat production in Mexico, year 2013
Source: SIAP, 2015

According to Villaseñor et. al. (2009), the oat variety (Avena sativa L.) Turquesa is of spring habit and was obtained in the Oat Breeding Program of the Valle de México Experimental Field (CEVAMEX) by genetic recombination and selection. The cross that gave rise to the variety was made at the Bajío Experimental Field (CEBAJ) during the fall-winter cycle of 2003. Turquesa was obtained from a simple cross between the Experimental F2 line CV-83(5-0C) 8C-0C and the variety Karma.

In the segregation generations, the combination of mass or population selection methods and derived families was applied, and in generation F6 the line that generated Turquesa was obtained. Peeled oats are composed of various macronutrients and micronutrients, as well as fiber and natural antioxidants. Carbohydrates are the major components. Starch is the carbohydrate present in the greatest quantity and is composed of amylose and amylopectin chains.

Fiber is divided into soluble and insoluble and is the main contributor to the reduction of cholesterol levels in the blood. The amount of protein varies considerably, and the determining factor is the environmental conditions during growth. Oats are one of the cereals richest in protein, but they do not form gluten, so they are not breadable (Welch R. and McConnell J.; 2001). In contrast, wheat produced in Mexico is 3,357,306 tons, and this represents 5% of world production. Bread products are obtained from wheat, and Mexico ranks 6th in the export of cookies and 12th in the export of bread and pasta (SIAP, 2015).

Since the refined flour produced by milling the grain allows the production of white flours. Soft wheats that produce white refined flours are in great demand for the production of cakes and breakfast cereals. Additionally, their use is recommended for the production of wholemeal flours, since these are considerably lighter than those resulting from amber and red wheat (Solís et. al.; 2008).

Ubicación	Producción (Ton)	Rendimiento (Ton/Ha)
Baja California	516,479.78	5.95
Chihuahua	155,274.23	5.44
Coahuila	25,086.26	3.41
Durango	12,857.14	3.82
Guanajuato	74,575.03	2.43
Hidalgo	3,541.28	1.66
Jalisco	101,615.58	3.31
Michoacán	63,469.65	2.52
México	24,662.76	2.67
Nuevo León	53,923.51	2.17
Oaxaca	10,152.39	0.98
Puebla	7,333.12	1.75
Sinaloa	81,747.39	4.63
Sonora	2,089,841.43	6.86
Tlaxcala	90,575.20	2.67
Zacatecas	12,920.55	1.67
	3,357,306.90	**5.29**

Table 2 Wheat production in Mexico, year 2013
Source: SIAP, 2015

According to SIAP (2015), wheat production in Mexico is centralized in the states of Sonora, Jalisco, Chihuahua and Baja California.

The variety of flour wheat for cracker (Triticum aestivum L.) is Urbina S2007. It is of spring habit and was obtained by hybridization and genetic selection through the method of mass F3 crosses in the wheat breeding program of INIFAP at the Bajío Experimental Field (CEBAJ).

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The cross that gave rise to this variety was made in 2000. The female parent of Urbina S2007 involved four different genotypes recombined in five crosses, and the male parent was the Casilda/Centella cross. The Urbina S2007 variety is of spring growth habit, semi-dwarf, 91 cm tall; intermediate vegetative cycle, with 77 days to flowering and 124 days to physiological maturity. The Urbina S2007 variety has white grain, due to the low pigment content, both in the endosperm and in the pericarp of the grain; this is a desirable characteristic in flour wheat.

Refined wheat flour allows the preparation of fresh doughs and baked goods with a soft texture that keeps the processed product longer. When a grain is refined, most of the bran and part of the germ are removed, which results in losses of fiber, vitamin B, vitamin E, minerals, unsaturated fats (Slavin J. et al.; 2004).

According to the above, it is possible to use mixtures of oat and wheat flour formulations that are functional to obtain good quality doughs and cookies.

The objective of this project is to evaluate the biscuit suitability of oat flour and wheat flour formulations based on their physicochemical, rheological and sensory quality.

Methodology to be developed

Place of experimentation

The work was carried out in the wheat quality laboratory at the Experimental Field of the Valle de Pecuarias (CEVAMEX-INIFAP).

Pecuarias (CEVAMEX-INIFAP), located at Km 13.5, Los Reyes- Texcoco highway, Coatlinchan, Texcoco, State of Mexico.

Experimental material

Turquoise oats were grown under seasonal conditions in the town of Coatepec, State of Mexico, during the spring-summer 2014 growing season.

Urbina S2007 wheat variety grown under irrigated conditions at the Bajío experimental field in Roque, Guanajuato, in the Fall-Winter 2014 cycle.

Methods and equipment

Grain samples of both wheat and oats were cleaned of impurities such as stones, husks or foreign material.

To condition the wheat, the hectoliter weight was determined by the method (AACC Method 55-10), hardness by the pearling method (AACC Method 55-20), moisture by the FOSS NIR System method (AACC Method 39-10), and moisture by the FOSS NIR System method (AACC Method 55-20).

Once the wheat was conditioned, it was milled using a Brabender Model 880-200 mill (AACC Method 26-20). The oats were hulled and heat treated in an oven at 100 °C for 12 hr to inactivate the oxidative enzymes 12 hr to inactivate the oxidative enzymes; and then milled in a hammer mill with a 60-100.

With wheat flour and oat flour, the mixtures to be evaluated as treatments were prepared as follows:

	Tipo de Mezcla				
Relación	1	2	3	4	5
Harina					
Avena (%)	100	75	50	25	0
Trigo (%)	0	25	50	75	100

Table 3 Formulated flour blends

The flour mixtures were subjected to the Zeleny sedimentation test (AACC Method 56-61). Subsequently, the rheology of the dough was evaluated by means of Chopin's alveograph using Alveolink NG software (AACC Method 54-30) and Mixograph (AACC Method 54-40).

The cookies were then processed by the (AACC Method 10-5OD) determining the biscuit factor.

Finally, the sensory evaluation of the cookies was carried out with 50 untrained panelists applying a preference test for three sensory attributes taste, texture and appearance.

Statistical analysis

The analysis was performed using the SAS statistical software version 9.1, applying a completely randomized experimental design and a Tukey test≤0.05 to indicate significant differences between formulations (SAS, 2002).

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Results

Variable behavior

Table 1 and Table 2 show the mean squares for each of the variables analyzed. Significant differences were observed between combinations for each of the variables measured, which indicates that the mixtures of different proportions of oats to wheat flour modify the sedimentation volume, the characteristics of kneading such as time, stability and tolerance, as well as significantly modify the variables measured in the alveograph, such as strength, tenacity, extensibility and the tenacity/extensibility ratio.

This consequently affected its biscuit quality. This is in agreement with that published by (Czubaszek and Karolini- Skaradziñska, 2005).

Cuadro 1. Cuadrados medios del análisis de varianza de variables de fisicoquímicas y mixográficas de masa de la mezclas de harinas de avena y trigo.

FV	GI	HH	VS	TA	EA	ALM	TSA
COM.	4	1.8**	457.0**	0.9**	10.0**	62.0**	22.7**
Media		10.8	24	3	42	48	5.3
CV		0	6.2	11	8	5	16
Error	10	1.8	2.2	0.1	0.1	5.9	0.7
Total	14						

* *= significativo (α = 0.05); CV= coeficiente de variación; FV= fuente de variación; COM. = combinación de harinas; GI = grados de libertad; HH= humedad de la harina; VS = volumen de sedimentación; TA =tiempo de amasado; EA= estabilidad al amasado.

Cuadro 2. Cuadrados medios del análisis de varianza de variables alveográficas de masa y galletas de mezclas de harinas de avena y trigo.

FV	GI	P	L	W	PL	FG
COM.	4	1437.0**	21840.0**	26324.1**	37.5**	0.4**
Media		62.8	79.1	122.8	2.8	6.5
CV		4.8	21.1	8.2	15.1	2.5
Error	10	9.4	278.6	101.7	0.2	0.02
Total	14					

* *= significativo (α = 0.05); CV= coeficiente de variación; FV= fuente de variación; COM. = combinación de harinas; GI= grados de libertad; P =tenacidad de la masa; L= extensibilidad de la masa; W= fuerza de la masa; PL =relación tenacidad/extensibilidad; FG =Factor galletero.

Cuadro 2. Cuadrados medios del análisis de varianza de variables alveográficas de masa y galletas de mezclas de harinas de avena y trigo.

FV	GI	P	L	W	PL	FG
COM.	4	1437.0**	21840.0**	26324.1**	37.5**	0.4**
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Moisture and Sedimentation

Volume evaluation

Table 3 shows the means of the variables measured for the combinations analyzed. Moisture and sedimentation volume decreased as the percentage of oat flour in the mixture increased, which is in agreement with (Luczycka et. al.; 2013).

Cuadro 3. Resultados de humedad y sedimentación de las formulaciones de harina de avena y trigo.

Tratamiento	Composición	HH (%)	VS (ml)
Formulación 1	100% A	9.9 e	10.3 e
Formulación 2	75 %A-25%T	10.3 d	15.0 d
Formulación 3	50%A-50%T	10.9 c	23.0 c
Formulación 4	25%A-75%T	11.3 b	30.3 b
Formulación 5	100% T	11.9 a	41.3 a

A = harina de avena; T = harina de trigo; HH = humedad de la harina.; VS = volumen de sedimentación; [a b] indican diferencia significativa a P≤0.05

Mixographic Evaluation

Table 4 shows the mixographic results of the oat and wheat flour formulations evaluated.

Cuadro4. Resultados de variables mixográficas de formulaciones de harinas de avena y trigo.

Tratamiento	Composición	TA (min)	EA (min)	ALM (mm)	TSA (mm)
Formulación 1	100%A	3.3 a	7.4 a	50.5 ba	3.0b
Formulación 2	75 %A-25%T	3.5 a	4.7 b	45.6 b	2.0b
Formulación 3	50%A-50%T	3.4 a	4.8 b	44.3 b	4.5b
Formulación 4	25%A-75%T	3.0 ba	3.0 c	46.6 b	7.3 a
Formulación 5	100%T	2.2 b	2.1 c	55.6 a	8.6 a

A = harina de avena; T = harina de trigo; TA = tiempo de amasado; EA = estabilidad al amasado; TSA = tolerancia al sobreamasado; ALM = altura del mixograma; [a,b] indican diferencia significativa a P≤0.05.

Table 4

According to the above information, it was observed that the time and stability to overkneading decreases as the oat flour concentration decreases in the formulation. The mixogram height was higher in formulation 5. The lowest tolerance to overkneading was presented in formulation 4 and 5 successively, which is in agreement with what was reported by Sobczyk (2008).

Evaluation of Alveagrafica

Table 5 shows the results of the alveographic characteristics evaluated in the flour formulations.

Cuadro4. Resultados de variables mixográficas de formulaciones de harinas de avena y trigo.

Tratamiento	Composición	TA (min)	EA (min)	ALM (mm)	TSA (mm)
Formulación 1	100%A	3.3 a	7.4 a	50.5 ba	3.0b
Formulación 2	75 %A-25%T	3.5 a	4.7 b	45.6 b	2.0b
Formulación 3	50%A-50%T	3.4 a	4.8 b	44.3 b	4.5b
Formulación 4	25%A-75%T	3.0 ba	3.0 c	46.6 b	7.3 a
Formulación 5	100%T	2.2 b	2.1 c	55.6 a	8.6 a

A = harina de avena; T = harina de trigo; TA = tiempo de amasado; EA = estabilidad al amasado; TSA = tolerancia al sobreamasado; ALM = altura del mixograma; [a,b] indican diferencia significativa a P≤0.05.

Table 5

Regarding the alveographic characteristics, it was not possible to determine them in formulation 1 and formulation 2, due to the inappropriate behavior of the alveograph, since this equipment has been designed for the analysis of refined wheat flours.

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However, it was carried out for formulation 3, formulation 4 and formulation 5. The results indicate significant difference of formulation 3, which indicates higher tenacity, extensibility, lower bulk strength and higher tenacity/extensibility ratio, agrees with that reported by Bloksma and Bushuk (1988).

This indicates that strength and extensibility decreased as the percentage of oats in the mix increased, while toughness and toughness/extensibility ratio increased, which is consistent with Sobczyk, (2008).

Evaluation of the Biscuit Factor

The biscuit factor increased as the proportion of oats in the mixture increased, so that it presented the highest value of this variable when the cookie was made with formulation 3 and corresponded to an excellent quality of the cookie made with 100% oat flour.

Cuadro 6. Resultados de factor galletero de formulaciones de harina de avena y trigo.

Tratamiento	Composición	FG
Formulación 1	100% A	6.9 a
Formulación 2	75 %A-25%T	6.8 a
Formulación 3	50%A-50%T	6.5 ba
Formulación 4	25%A-75%T	6.2 b
Formulación 5	100% T	6.1 b

A = harina de avena; T = harina de trigo; FG = Factor galletero;[a,b] indican diferencia significativa a P≤0.05.

Table 6

Figure 1 shows the cookie appearance of the oat and wheat flour formulations. a) Formulation 5, b) Formulation 4, c) Formulation 3, d) Formulation 2 and e) Formulation 1.

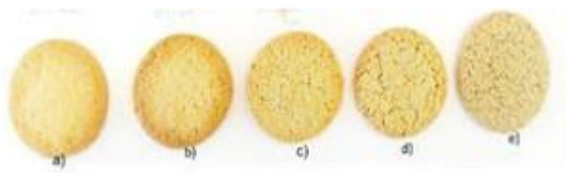

Figure 1 Cookies obtained from evalaudas formulations

Sensory Evaluation of Cookies

The sensory evaluation of the cookies is shown in graph 1. In this graph it was observed that formulation 4 and 3, respectively, were the most preferred in the sensory attributes of flavor, texture and appearance.

Regarding the preference of the taste attribute, the highest preference is for formulation 4 and formualtion 2.

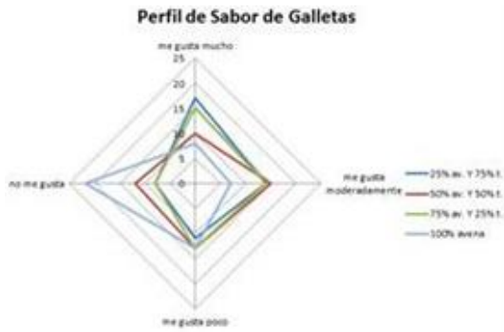

Figure 2 Cookie flavor attribute preference

The cookie texture represented the highest preference for formulations 4 and 2.

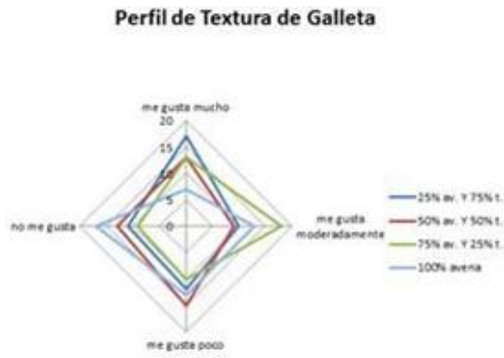

Figure 3 Cookie texture attribute preference

The cookie texture showed a greater preference for formulations 4 and 3.

Figure 4 Cookie appearance attribute preference

As an observation of the panelists, the higher the concentration of oats in the formulation, the more bitter the taste of the cookie.

Acknowledgments

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To the Universidad Tecnológica de Xicotepec de Juárez Puebla for facilitating the research at CEVAMEX-INIFAP.

Conclusions

The formulation of 4 (25% oat flour and 75% wheat flour) showed the best physicochemical, mixographic, alveographic, biscuit quality and sensory characteristics.

With the previous formulation, the technological functionality is fulfilled, so it will be necessary to evaluate the nutritional contribution.

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Pencil of fire

Lápiz de fuego

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Abstract

The research project seeks to develop its own technology for design and construction of pencils or fire pirógrafos, from ferromagnetic debris burned as are the ballast of the luminaries who operate gas (Fluorescent, hotbeds of neon, etc.) under an architectural design of new and innovative processor architecture is as E-E which allows greater room to add more laps in proportion to the primary and secondary for a better performance. Also, on this research paper seeks to develop an insulator on the basis of the composition of clay- dental plaster and ash to the core of pyrography to reduce the flow of heat and achieve a better insulation to prevent burns on the hands of artists and give them a tool to work safely and reliably.

Fire, Pencil, Woodburning, Core

Resumen

El proyecto de investigación busca desarrollar una tecnología propia para el diseño y construcción de lápices de fuego o pirógrafos , a partir de desechos ferromagnéticos como son las reactancias quemadas de la luminarias que funcionan a gas (Fluorescentes, focos de neon, etc) bajo una arquitectura de diseño de transformador nueva e innovadora como es la arquitectura E-E que permite un mayor espacio para añadir mayor número de vueltas de modo proporcional al primario y secundario y consiguientemente un mayor rendimiento. En este mismo sentido el presente trabajo de investigación busca desarrollar un aislante sobre la base de la composición de arcilla- yeso de dentista y ceniza para el núcleo del pirograbador para reducir el flujo de calor y lograr un mejor aislamiento para evitar quemaduras en las manos de los artistas y dotarles de esta forma una herramienta de trabajo segura y confiable.

Fuego, Lápiz, Pirógrafo, Núcleo

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Introducction

In today's world, whose main characteristic is the permanent change of knowledge and rapid advances in technology, it is necessary to provide solid training and continuous improvement of the human resources that society needs to face the dynamics in which it develops. Therefore, higher education must adapt to the social and economic requirements originated by the accelerated processes of scientific and technological change and world globalisation. Social demands have increased and a more capable, fuller and more humane professional is required, in this sense the University must commit efforts to train competent professionals, with a critical and reflective sense, for that reason the research component in the training of human resources is essential so that the mode of professional action is through scientific research, therefore from the classrooms of the undergraduate, and from the first courses in the Faculty of Technology we intend to impregnate the scientific spirit in our students through end-of-course projects and other types of manifestations, which seek the mastery of the scientific research method by the students and this is how the result of the research carried out during the course of several semesters in the subject of Basic Physics III, which corresponds to the third semester of Engineering, is presented in this scientific fair, which is the development of technology to manufacture pyrographs or fire pencils.

When we put a graphite pencil in the hands of a plastic artist we can admire his drawings with their shades and contrasts typical of this technique, but if we study the laws of Joule, Ohm, Faraday, Lenz, Ampere so beautifully summarised in Maxwell's Equations, and we apply them in the design and construction of a device called a fire pencil or Pyrograph, we will put in the hands of the artist a technological resource that transferred to the dimension of art, can convert simple and simple wood (not admired) in true works of art whose shadows and contrasts can be achieved with the variations of voltage and current and that inspired by the talent of the artist can be worthy works of art. The arts have arisen from the need of human beings to express their thoughts and feelings. In the same way, some craft manifestations have their origins within peoples and cultures as a means of expression, which over time, is transformed into a craft.

In certain parts of the world characterised by the existence of extensive wooded areas and a variety of woods, a special technique of decorating wood with an incandescent piece of wood emerged. This technique is called pyrography.

This forest wealth was exploited during the time of the Spanish colony and the Jesuit missions so that both Europeans and indigenous people could make utensils that were used in everyday life; in response to market demand, they began to be made to order.

And although pyrography seems to be a recent art, in Nazca, Peru, a mate decorated in this technique was found dating from 700 AD, with the design of a flower on the neck and nine hummingbirds around it.

The main tool for the pyrography technique is the pyrograph; This device has a handle into which different tips are inserted depending on the effect to be achieved. The incandescent tip burns the wood, which results in establishing a low heat flow and a high temperature gradient between the tip, which is normally between 400 to 200 °C, and the outer wall of the handle, which must be at an average temperature of 25 to 36 °C so that the artist's hand does not feel the intense heat of the incandescent filaments, This gradient must be achieved in a few millimetres of handle thickness because it cannot be too thick, otherwise it would be uncomfortable when drawing. To solve this problem, in the present work different heat insulating materials are investigated on the basis of mixtures of clay-ash-dentist's plaster that have a good mechanical resistance, as well as the use of resistive tips that glow at the lowest possible current for a lower energy consumption. Fundamental elements for the construction and manufacture of Bolivian brand pyrographs.

Materials and methods

Materials

Various materials were used at different times.

- Clay, dentist's plaster, ash, etc.
- Ferromagnetic waste (burnt-out reactances from luminaires).

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- Copper wires for winding.
- Cardboard for reels.
- Connecting cables.
- Female-male plugs.
- Nickel and nicron resistors.

Instruments:

- Multimeter with thermocouple for measuring temperatures.
- Clamp tester for current measurement.
- Voltmeters.
- Precision balance.

Methods used

We are undoubtedly in the era of the integration of the sciences, which is why we will approach the dialectical paradigm, where a more active role of the subject in the development of knowledge is denoted and which states that the essence of the phenomenon is never known, but only a reflection of it. In this context, dialectics is defined as the science that studies the most general laws of the development of nature, society and thought.

Theoretical methods to be used:

Theoretical methods allow us to penetrate from the phenomenal to the essence of the studied object, to model it and establish its essential relations and to make it concrete in the construction of the nationally manufactured pyrographer.

Documentary research: For the bibliographic study of all the antecedents and references on the development of transformers, their application in pyrographs and fire pencils in the international context.

Modelling: Used to model the functioning of the pyrograph in an idealised and schematic way before its construction and through the theoretical procedure of abstraction it can be recreated, establishing new relations and qualities of the object.

Concrete and abstract approach: To concretise the idealised model in the construction of the pyrograph itself, so that all the research lands in a concrete way in a new pyrography equipment of national manufacture.

Systemic approach: Because it allows the pyrograph to behave as a whole formed by many elements in such a way that each element fulfils certain functions and maintains stable links of interaction between these elements.

Analysis and synthesis: For the mental and material decomposition or division of the pyrograph into its component parts, in order to determine the essential elements that make it up, and for the integration of the previously analysed parts, as well as to discover relationships and general characteristics inherent to the object of study.

Abstraction and Generalisation: To reflect the stable and necessary general qualities and regularities of the pyrographer.

Statistical methods

To determine the differences between the treatments to which the clay-gypsum-ash sample was subjected and to establish the reliability of the results. Parametric statistics will be applied, which will allow us to apply its own scientific methods to collect, organise, summarise and analyse data, as well as to draw valid conclusions and make reasonable decisions based on such analysis. The supporting software used is Mstat (Statistical Software).

Empirical methods

The empirical methods will allow to collect the experimental data in the different tests through instruments designed for this purpose, and then to process them.

Software used

Software for transformer design, created by the students themselves in JavaScript Mstat (Software for experimental design) Spreadsheet (Excel)Microsoft Word

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Design and construction of the transformer

An E_E architecture transformer will be designed, i.e. different from the conventional one because there is a greater possibility of more turns entering the primary and secondary circuit in a proportional way, which represents a greater possibility of better power performance.

Design and calculation

This section briefly explains how Ohm's, Joule's, Ampere's and Faraday's laws support the design of the transformer.

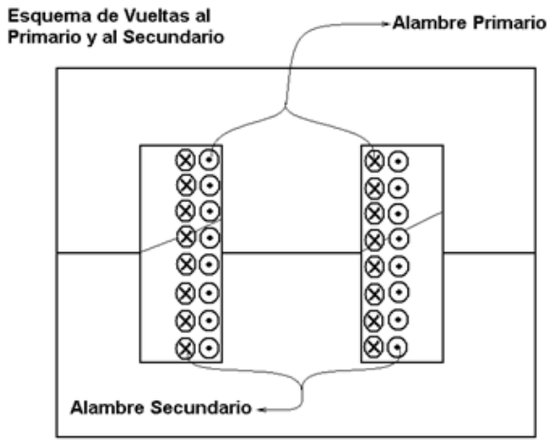

Figure 4

The input voltage is alternating and works with its r.m.s. value Vf which is 220 V.

$$V = V_{MAX} \times Sen(wt) \quad (1)$$

Frequency

$$f = 50Hz$$
$$V_{MAX} = 311V$$
$$V_F = 220V$$
$$V_F = \frac{V_{MAX}}{\sqrt{2}}$$

Application of Ohm's Law

V1 =I1 xZ1

V2=I2 x Z2

Where:

Z1=impedance of the primary circuit in ohm.

Z2=impedance of the secondary circuit in ohm.

The impedance concepts apply because the voltage is alternating.

Application of Ampere's law.

The alternating current of the primary circuit generates a field B also alternating which is calculated with Ampere's law along the path which would be the average perimeter of the core, this field in turn when cutting the core section S, generates the magnetic flux.

$$\oint B.dl = \mu_0 i_1$$
$$B\lambda_p = \mu_0 i_1$$
$$B = \frac{\mu_0 i_1}{\lambda_p}$$
$$B = \frac{\mu_0 \times I_{MAX} \times Sen(wt)}{\lambda_p}$$
$$B = B_{MAX} \times Sen(wt)$$

$$\phi_B = B \times S$$
$$\phi_B = B_{MAX} \times Sen(wt) \times S$$
$$\phi_B = \phi_{MAX} \times Sen(wt)$$

The magnetic flux, being time-varying, then induces an alternating voltage V2 also in the output coil, which turns out to be the transformed voltage, thus fulfilling Faraday's Law as the principle of operation of a transformer.

$$V_2 = -N_2 \frac{d\theta_B}{dt}$$
$$V_2 = -N_2 \times \phi_{MAX} W \times Cos(wt)$$
$$V_{2MAX} = N_2 \times \phi_{MAX} W$$
$$V_2 = -V_{2MAX} \times Cos(wt)$$

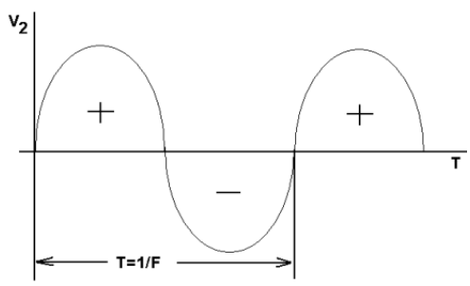

Figure 2

The formulas for the circuit without load and with load are:

$$\frac{V_1}{V_2} = \frac{N_1}{N_2}$$

No load

$$\frac{\sqrt{\eta} \times V_1}{V_2} = \frac{N_1}{N_2}$$

With load

Where n= assumed power efficiency, which in this case is 90%.

Data:

Input circuit

V1=220 V (input voltage)

f= 50Hz. (frequency)

a= 2 cm. (core width)

Output circuit

V2=5 V (output voltage)

f= 50Hz.

P2=30W (output power)

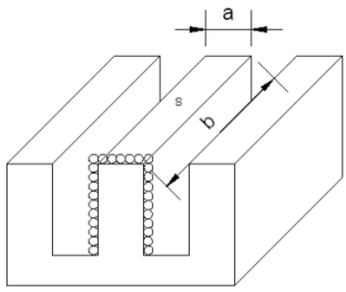

Figure 3

b=? (Core length)

C=0.932 cm (window width)

n=90% (assumed yield)

Incognitas

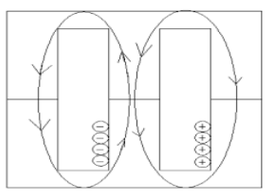

Figure 4

P1=? (input power)

i2=? (Output current)

i1=? (Input current)

S =? (Core cross section)

b=? (core length)

Primary wire size according to AWG standard Secondary wire size according to AWG standard w1=? (Weight of primary)

w2=? (Weight of secondary)

N1=? (Number of turns of the primary)

N2=? (Number of turns of the secondary)

Solution

1. Calculation of P_1:

$$\eta = \frac{P_2}{P_1} \Rightarrow P_1 = \frac{P_2}{\eta} = \frac{30}{0.9} = 33.33W$$

2. Calculation of i_1:

$$P_1 = V_1 \times i_1 \Rightarrow i_1 = \frac{P_1}{V_1} = \frac{33.33W}{220V} = 0.15A$$

3. Calculation of i_2:

$$P_2 = V_2 \times i_2 \Rightarrow i_2 = \frac{P_2}{V_2} = \frac{30W}{5V} = 6A$$

4. Calculation of the average power:

$$P_a = \frac{P_1 + P_2}{2} = \frac{33.33W + 30W}{2} = 31.6W$$

5. Calculation of section(s)

$$s = 1.5\sqrt{P_a}$$

$$s = 1.5\sqrt{31.6}$$

$$s = 8.44cm^2$$

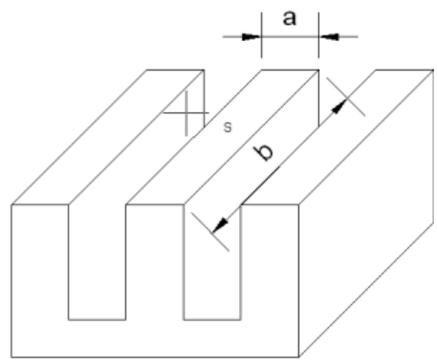

Figure 5

6. Calculation of b:

$$s = a \times b \Rightarrow b = \frac{s}{a} = \frac{8.44cm^2}{2cm}$$

$$b = 4.2cm.$$

To optimise $\Rightarrow b = 5cm.$.

7) Calculation of No. of turns:

a) For input circuit:

$$N_1 = \frac{10E8V_1}{4.44 \times f \times s \times B}; \text{Dato : B} = 900$$

$$N_1 = \frac{10E8V \times 220V}{4.44 \times 50 \times 8.44 \times 900}$$

$$N_1 = 1304.6 Vueltas \rightarrow 1305 Vueltas$$

b) For output:

$$N_2 = \frac{V_2 \times N_1}{V_1} = \frac{5 \times 1305}{220} = 29.65 \rightarrow 30 vueltas(\text{sin } c\arg a)$$

Optimisation: (for this type of core the correction factor is O. 567 obtained from previous experience with this design) therefore the new number of turns will be:

$$N_2 = \frac{V_2 \times N_1}{V_1\sqrt{\eta}}$$

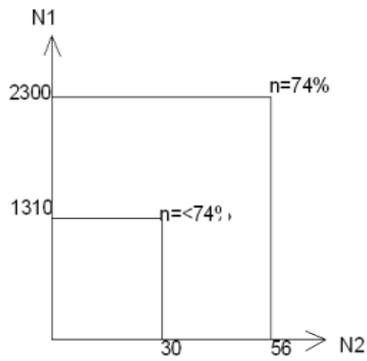

Figure 6

$$N_2 = \frac{5 \times 2305}{220\sqrt{0.9}} = 56 vueltas$$

This correction is necessary because the power output with 1305 turns would be much lower than expected, so it is necessary to increase the number of turns up to 2300 for an acceptable power output.

With i1=0.15 Amp according to the table we have a 39 AWG gauge for safety reasons and based on previous experience we increase the thickness to 32 AWG.

ii=6A from the tables we have the 18 gauge, for safety reasons we will take the 15 gauge.

Primary	Secondary
Turns	
Gauge AWG	
Weight per length (gr/m)	

Table 1 Design summary table

8) Calculation of perimeter:

$$l = (2a + 2b) = 2 \times 2 + 2 \times 5 = 14cm$$

$$l = 14cm = 0.14m$$

9) Calculation of weight for purchase:

$$w_1 = 0.2844\frac{gr}{m} \times 0.14m \times 2300 = 91.67gr \Rightarrow por \text{ seguridad } 100\,\text{gr}$$

$$w_2 = 14.67\frac{gr}{m} \times 0.14m \times 56 = 126gr \Rightarrow por \text{ seguridad } 130\,\text{gr}$$

Reel construction

It is constructed of pressed cardboard, taking care that the core plates fit without difficulty.

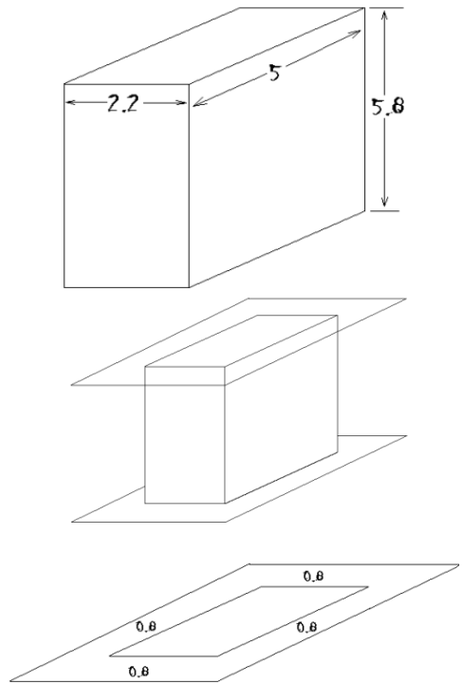

Figure 7

Experimental tests on the transformer

In this circuit no current flows through the tip of the pyrograph, i.e., there is no heat dissipation.

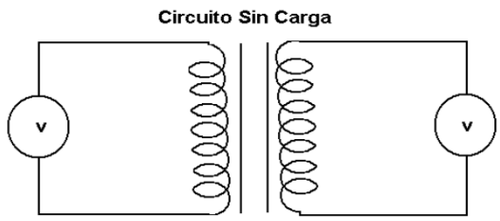

Figure 8

ϕ_1	ϕ_2	V_1	N_1	N_2	V_2(Experimental) (volt)	V_2(Teórico) (volt)	R_1 (ohm)	R_2 (ohm)
32	15	219	2300	40	3.21	3.8	237	0.54
				45	3.62	4.3		
				50	4.05	4.7		
				56	4.37	5		

Table 2 No-load voltage output tests

	Calire primario	N1	V1 (V)	I1 (A)	P1 (w)	Calire secundario	N2	V2 (V)	I2 (A)	P2 (W)	N (%)	obs	Z1 (ohm	Z2 (ohm)
1	32	2300	219	0,16 A	35,04	15	56	2,67	8,45	22,56	65	optima	1368,75	0.32
2	32	2300	219	0,12 A	26,28	15	50	2,63	7,32	19,25	73	Òptima suave	1825	0.36
3	32	2300	219	0,10 A	21,9	15	45	2,49	6,09	17,18	78	suave	2190	0.40
4	32	2300	219	0,08 A	17,52	15	40	2,2	6,37	14,04	80	suave	2737,5	0.35

Table 3

Where:

ϕ1= Rating to Primary

N1 = Number of Turns to Primary

V1 = Input Voltage to Primary

ϕ2 = Secondary Rating

N2 = Number of Turns to Secondary

V2(Theoretical) =Output Voltage to Secondary

V2(Tester)=Output Voltage taken with the Tester

R1 = Primary copper winding resistance

R2 = Resistance to the Secondary of the copper winding

$$V_2 = \frac{V_1 \times N_2}{N_1}$$

This formula1 was used to calculate the theoretical output voltage for a no-load circuit.

Interpretation of results. We observe that there is similarity between the experimental value and the theoretical value, the fact that the experimental voltage is lower than the theoretical is due to the fact that in reality the operating efficiency of a transformer can never be 100%.

Experimental tests with the circuit under load: In this test, the nickel tip of the pyro-etching machine goes into incandescence and under these conditions engraves the wood, the data obtained are:

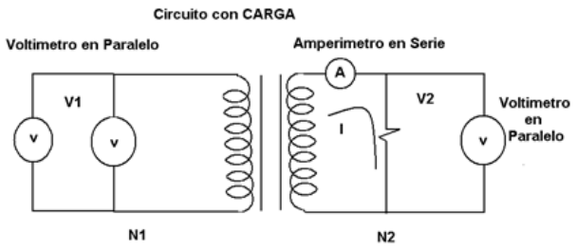

Figure 9

P1=Input power (w)

P2=Output power (w)

Z1=Primary circuit impedance (ohm)

Z1=V1/I1

Z2=Secondary circuit impedance (ohm)

Z2=V2/I2

Results

Interpretation of results and discussion:

- It is observed that the more power consumed the efficiency decreases from 80% to 65%.

- As explained in the interpretation of results, with the E-E structure a better efficiency was obtained than would be obtained with an E-I structure, because the height hE-E is double the height hE-I, which allows a greater number of turns proportionally to both the primary and the secondary, which favoured the project.

- From our point of view, working with a theoretical ŋ of 100 % and not 90 %, it is possible to obtain a higher real ŋ than the one obtained; consequently, P2 would be almost equal to P1.

- An efficiency of 74 % is because the transformer delivers energy to the surroundings in the form of heat (entropy) and because of power losses due to hysteresis, eddy currents in the core and the Joule effect in the copper windings.

- Overall, it was a good project because the test of ŋ > 70 % was passed, a silent and aesthetically optimal transformer was achieved for the two devices (pyrograph and plastocut).

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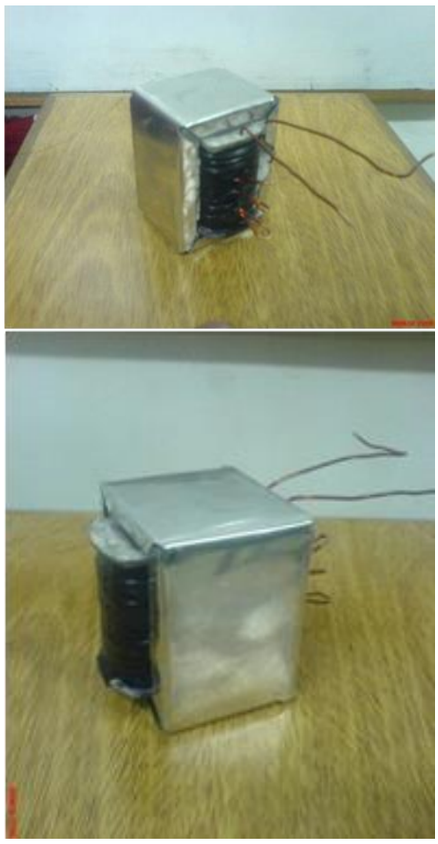

Figure 10 Photos of the transformer designed and built, ready to be attached to the handle of the pyrograph

Measurement of the thermal conductivity k of a clay - ash - gypsum sample.

Aim of the test: To measure experimentally the thermal conductivity of a solid formed by a mixture of clay, dentist's plaster and ash in order to establish the optimum proportions for maximum thermal insulation for the manufacture of pyro-etching tools.

Theoretical basis - Fourier's law indicates that the heat flow (q) in cal/sec depends on the material expressed through its thermal conductivity (k) cal/sec-m-ºC in cal, as well as depending on the temperature gradient (dT/dx) in ºC/m and the heat flow area (A) in m2 according to:

$$q = -kA\frac{dT}{dx}$$

Separating variables

$$\int_0^x q\,dx = -\int_{T1}^{T2} kA\,dT$$

Considering that the test will be tested on cylinders of 1. 7 cm in diameter and 1.8 cm long with different proportions or doses of Clay - dentist's plaster - Ash, then we assume that the heat flow, is constant and that the conductivity k does not vary because it is very much the path, also the cylinder is insulated on the y-axis, in the z-axis so that the heat flow flows in the x-axis. the better insulation we do in simple reality will flow some heat along the y, z axes, considering some margin of error, the integration is performed only in the x-axis (one-dimensional heat flow), the equation will be:

.q x=-kA(T2-T1)

Clearing:

$$q = kA(T1 - T2)\frac{1}{x}$$

On the other hand, the heat generated by the Joule effect in the incandescent filament that is in contact with one end of the cylinder will be:

$$P = VI = I^2R = \frac{V^2}{R}$$

The power dissipated by the incandescent filament can be calculated, by measuring the voltage V the current I flowing through the filament, by serial connection of ammeter and parallel connection of voltmeter.

As the heat source is the electrical power P, we can match both equations, but the power P is expressed in watts which equals joule/sec, while the heat flux q is in cal/sec. We will have to convert the joule to its equivalent in cal. (1 cal =4.18 Joule) then let Pc be the energy flow in cal/sec.

Pc= P*(1 cal/4.18 julio)

Equating both equations gives

Pc=q

Pc= $q = kA(T2 - T1)\frac{1}{x}$

By subtracting k we finally get

$$k = Pc\frac{x}{A(T2 - T1)}$$

Where:

k= thermal conductivity

Pc= heat flux due to Joule effect heating, in cal/sec

x =length of the cylinder in m

A=flow area (area of the cylinder) in m2

T1= temperature at the hot spot of the cylinder (at the wall in contact with the glowing filament) in ºC

T1= Temperature at the other end of the cylinder in ºC

Area A is calculated by knowing the diameter D of the cylinder:

$$A = \pi \frac{D^2}{4}$$

Practical procedure

- Isolate the cylinder in the y-axis, z-axis and behind the hot spot to force a heat flow in one direction only and in one axis only (x-axis).
- Measure with a thermocouple the temperature T1 at the heat source, and at the other end of the cylinder T2.
- Measure with a ruler the diameter Dy length of the cylinder x
- Measure the current flowing through the filament I and the voltage V of the filament with an ammeter.
- Calculate the power P by Joule effect in watts (joule/sec) and convert to its equivalent in cal/sec.
- Calculate the thermal conductivity k with the formula.

Schematic of the experiment:

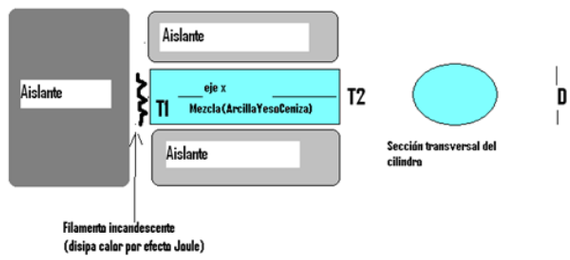

Figure 11

Five treatments were applied (which were the different doses of components) and three replicates, i.e., three samples with the same composition to give greater reliability to the results. The experiment applied was a completely randomised block design, as the samples were heterogeneous, in order to give greater reliability to the test.

The treatments in % by weight are:

T1= 100% clay

T2= 100% dentist's gypsum

T3=10% Dentist's plaster 10%

Ash 80% clay T4=15%

Dentist's plaster 5 % ash 80% clay T5=5%

Dentist's plaster 15% ash 80% clay

No.	T1°C	T2°C	V (volt)	I(amp)	P(watts)	P2(cal/seg)	D(m)	A(m²)	x(m)	k(cal/seg-m-°C)
T1	217.33	38.67	2.46	8.06	19.828	4.743	0.017	0.000227	0.018	2.1055
T1	210.67	47.33	2.44	8.11	19.788	4.734	0.017	0.000227	0.018	2.2984
T1	234.67	42	2.4	8.12	19.488	4.662	0.017	0.000227	0.018	1.9189
									k(promedio)	2.1076
T2	211	27	2.43	8.08	19.634	4.697	0.017	0.000227	0.018	2.0245
T2	209.5	27.5	2.42	7.95	19.239	4.603	0.017	0.000227	0.018	2.0055
T2	203	29.5	2.45	7.86	19.257	4.607	0.017	0.000227	0.018	2.1057
									k(promedio)	2.0452
T3	205.5	30	2.42	7.63	18.465	4.417	0.017	0.000227	0.018	1.9960
T3	201	31	2.4	7.6	18.240	4.364	0.017	0.000227	0.018	2.0356
T3	196.5	29	2.38	7.61	18.112	4.333	0.017	0.000227	0.018	2.0514
									k(promedio)	2.0277
T4	208	30.5	2.33	7.63	17.778	4.253	0.017	0.000227	0.018	1.9002
T4	206	29.5	2.38	8.34	19.849	4.749	0.017	0.000227	0.018	2.1336
T4	205	29.5	2.35	7.4	17.390	4.160	0.017	0.000227	0.018	1.8799
									k(promedio)	1.9712
T5	205.5	26	2.32	7.44	17.261	4.129	0.017	0.000227	0.018	1.8243
T5	195.15	28	2.29	7.44	17.038	4.076	0.017	0.000227	0.018	1.9338
T5	199.5	27	2.29	7.39	16.923	4.049	0.017	0.000227	0.018	1.8612

Table 4 Experimental data for measuring the thermal conductivity of a clay-ash-gypsum sample

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Casos	Repeticiones	Tratamientos	Conductividad térmica (cal/seg-m-°C)
1	1	1	2.1055
2	1	2	2.0245
3	1	3	1.9960
4	1	4	1.9002
5	1	5	1.8243
6	2	1	2.2984
7	2	2	2.0055
8	2	3	2.0356
9	2	4	2.1336
10	2	5	1.9338
11	3	1	1.9189
12	3	2	2.1057
13	3	3	2.0514
14	3	4	1.8799
15	3	5	1.8612

Table 5 Data prepared for input to Mstatc

Results from MSTATC (Software for Experimental Design)

Heat Transfer

Title: thermal conductivity of solid mixtures
Function: FACTOR

Experiment Model Number 7:

One Factor Randomized Complete Block Design Data case no. 1 to 15.

1	2	3	Total
1	*	1.970	9.850
2	*	2.081	10.407
3	*	1.963	9.817
*	1	2.108	6.323
*	2	2.045	6.136
*	3	2.028	6.083
*	4	1.971	5.914
*	5	1.873	5.619

Factorial ANOVA for the factors:

K Value	Source	Degrees of Freedom	Sum of Squares	Mean Square	F Value	Prob
1	Replication	2	0.044	0.022	2.1584	0.1780
2	Factor A	4	0.094	0.023	2.3005	0.1469
-3	Error	8	0.081	0.010		
	Total	14	0.219			

Replication (Var 1: Repetitions) with values from 1 to 3 Factor A (Var 2: treatments) with values from 1 to 5

Variable 3: Thermal conductivity in cal/sec-m-C

Grand Mean = 2.005 Grand Sum = 30.074 Total Count = 15

Interpretation

The value of F tables for 95% confidence based on the ANOVA table, with degrees of freedom of treatment (4) and degrees of freedom of error (8) reads Ftablas=3.84.

As Ftablas is greater than Fcalculated=2.3005 (obtained from the ANOVA table), it is inferred that although there are numerical differences between the thermal conductivities of the different mixtures, there are no statistically significant differences between treatments, which means that it is the same to use any of the compositions.

This means that it is the same to use any composition, therefore the null hypothesis Ho is accepted. This means that there are no differences between treatments.

However, it is observed that the lowest conductivity corresponds to treatment 5 (5% dentist's plaster 15% ash 80% clay) better insulation although not significant compared to the rest of the treatments as revealed by the statistical study, but by having a higher proportion of ash which is a cheap waste and without cost, we decided to recommend treatment 5 in the manufacture of the pyrography core, as it is cheaper and slightly better insulator than the rest due to its lower thermal conductivity.

Construction of the fire pencil or pyrographer

Once the appropriate insulator has been defined (5% dentist's plaster, 15% ash - 80% clay), the core is made with this mixture, where the glowing filament will be, then glass wool is used to insulate the inside walls of the wooden handle. The figure shows the composition of the pyrograph and the temperature profile after construction. The temperature was measured with a thermocouple.

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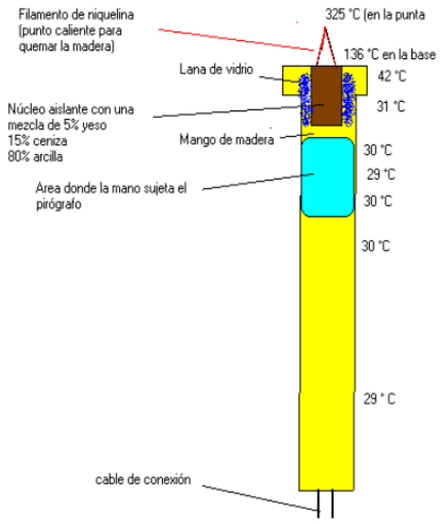

Figure 12

Interpretation. The mixture of 80% clay, 5% dentist's plaster and 15% ash is a good insulator that reduces heat flow.

Conclusions

The tested E - E architecture in the design and construction of the transformer for the operation of the fire pencil was favourable in that a silent, aesthetic, small transformer was achieved with an average efficiency of 74 %, which is considered acceptable. It is possible to improve this efficiency by adding proportionally more turns to both the primary and secondary.

Statistically it was concluded that any treatment or composition of the clay-dentist's plaster-ash mixture gives the same insulation results and therefore the hypothesis has been tested and rejected.

However, it is observed that the lowest thermal conductivity corresponds to treatment 5 (5% dentist's plaster 15% ash 80% clay), although not significantly compared to the rest of the treatments, as revealed by the statistical study, but as it has a higher proportion of ash, which is a cheap and inexpensive waste product due to the economic factor, it is recommended that this treatment be used in the manufacture of pyrography or fire pencils.

The heat flow was significantly reduced with the new insulating material (80% clay, 5% dentist's plaster and 15% ash) of which the core of the pyrography pencil is made and which, together with the glass wool and the wooden handle itself, provides optimum heat insulation, since the temperature at the hot point is approx. 325 ºC, but in the area where the hand comes into contact with the handle the temperature is between 29 and 30ºC, an acceptable range that will prevent the hand from suffering burns.

The objective was achieved because a technology for the design and construction of pyrographs has been developed and one of our own pyrographs has been built as a model.

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Continuous improvement in production logistics to minimize waste

Mejora continua en la logística de producción para minimizar desperdicios

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Abstract

Organizations of the new millennium, require consolidate its position in an increasingly volatile market, globalization requires companies to optimize their processes to generate differentiation strategies that give competitive advantages. An integrated logistics system, applied within and outside the organization to adequately manage the movement of materials and products, streamlining the supply chain from suppliers to customers. This document describes 10 steps taken in a method of work to develop a proposal for continuous production logistics route assortment of materials improves, which aims to reduce by 50% two of the waste generated in described plant: material handling and movement of unnecessary personnel.

Integrated logistics, Production logistics, Continuous improvement, Waste, Route selection

Resumen

Las organizaciones del nuevo milenio, requieren consolidar su posición en un mercado cada vez más volátil, la globalización requiere que las empresas optimicen sus procesos para generar estrategias de diferenciación que le den ventajas competitivas. Un sistema logístico integral, aplicado dentro y fuera de la organización que administre adecuadamente los movimientos de materiales y productos, agiliza la cadena de suministro desde proveedores hasta clientes. En este documento se describen 10 pasos llevados en un método de trabajo para elaborar una propuesta de mejora continua a la logística de producción en la ruta de surtido de materiales, que tiene como meta disminuir en un 50% dos de los desperdicios que se generan en la planta: manejo de material y movimiento de personal innecesario. Se pretende mejorar la logística de producción identificando la condición actual de surtido que realizan los materialistas en el área de producción, ya que identificando las acciones que se llevan a cabo actualmente en el abastecimiento y manejo de material, se obtiene un conocimiento más profundo de las actividades, actores y factores que intervienen en dicho proceso clave, este conocimiento permitirá desarrollar una propuesta para planear acciones que lleven a un mejoramiento del sistema.

Logística integral, Logística de producción, Mejora continua, Desperdicio, ruta de surtido

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Introduction

One of the challenges faced by companies in this millennium is to navigate in a global society, this leads them to develop a competitive character that allows them to remain current in the market. Factors such as quality, price and speed of response are today essential elements for organizations, this means that companies are constantly reviewing their processes to improve them and consequently offer a quality product or service. The application of continuous improvement methodologies through the use of quality and lean manufacturing tools help the various functional areas of organizations add value to their processes. This article proposes a continuous improvement plan for integral logistics,

Only necessary movements and displacements, a fundamental part of logistics

The waste of labor, unnecessary movements and inadequate handling of materials in the industry are problems that can constantly be seen in the supply process in the production areas. The situation presented as a case study in this document describes the circumstance that exists in the material assortment area of a manufacturing company in Ciudad Juárez, Chihuahua, where the diagnosis under the scenario of the first observation shows materialistic that incur in dead time, unused personnel that carry out activities that do not correspond to their work but that are assigned by their coordinators.

Incfulfillment of the production goal due to delays in the supply of the required material and some other scenarios that are familiar in industries that underestimate the value of logistics in the organization.

In order to demonstrate the benefits that can be generated by the fusion of quality tools, lean manufacturing techniques and, above all, the purpose of production logistics, the objective of this study is based on identifying the current condition of assortment that materialists perform in the production area in a manufacturing company in Ciudad Juárez, Chihuahua and develop a proposal for an improvement plan for production logistics.

By identifying the actions that are currently carried out in the supply and handling of material in the production area in the company in question, a deeper knowledge of the activities, actors and factors that intervene in said key process is obtained, this knowledge It will allow to develop a proposal to plan actions that lead to an improvement of the system.

This article begins with the approach of the challenges faced by the organizations of this millennium and the need to link terms such as logistics, quality and lean manufacturing, to generate value propositions starting from a theoretical framework and subsequently describe the methodology used in the investigation that generated this text, the exposition of the results and the preliminary conclusions.

Literary review

LProduction logistics and industrial engineering converge when a company sets the goal of generating strategies that minimize waste in unnecessary movements and an adequate use of material handling and finished products, this is due to the challenges of a new competitive reality of manufacturing organizations. this millennium, where the joust takes place in a dynamic and provocative battlefield, in which it is not enough to produce a good or service with quality, but rather it must present a flexible process with high levels of productivity, as well as having the maximum speed of arrival to the market in response to customer requirements.

Thes tools and methodologies used in engineering to generate improvements in the processes and products of organizations, are aimed at adding value to the product or service, the waste that occurs in companies is therefore the contrast of these plans of improvement.

Cantú (2010) mentions that a "monitoring of the performance of key processes" should be established, under the methodology known as daily operation management, which consists of: "a set of activities carried out every day by each area or function of the organization to achieve its purpose, and involves activities aimed at maintaining and improving the current state of the area" (p. 141).

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By determining a comprehensive logistics system, a holistic view of the movement that occurs in materials from their procurement, storage, processing and distribution is favored, this leads to a change in the paradigm that frequently occurs when considering that logistics is only the distribution and transportation of the finished product, since its relationship with the administration of the flow of goods and services is perceived, from the acquisition of raw materials and supplies at their point of origin, to the delivery of the finished product at the point of consumption.

According to this, a comprehensive logistics system, by synchronizing its component functions, achieves an agile flow to quickly respond to a changing and increasingly demanding demand presented by customers; This system can be better understood when its subsystems are addressed: Supply Logistics, Plant Logistics and Distribution Logistics.

Supply logistics, groups the functions of purchases, reception, storage and inventory management, includes activities related to the search, selection, registration and monitoring of suppliers. Plant Logistics covers maintenance activities and plant services (water supplies, electricity, fuel, materials, etc.), industrial safety and care for the environment. Distribution Logistics includes the activities of shipping and distributing finished products to the different markets, constituting a link between the production and marketing functions. The Supply and Plant Services subsystems are grouped under the name of Production Logistics. (Monterroso, E., 2000).

Grove, cited by Pau and Navascués, (2001) establishes that "The production process (or transformation in systems theory) creates wealth, that is, it adds value to the components acquired by the company. That is why it is said that the material is more valuable as it progresses through the process and its capacity to satisfy human needs increases‖, this gives relevance to good material management within the company.

Returning to Cantú (2010), keeping an eye on the processes that are developed in Production Logistics as "key processes" to add value to the product, would avoid wastage, waste or "muda" as the Japanese call it.

Muda is ―specifically all that human activity that absorbs resources but does not create value: failures that need rectification, production of items that nobody wants and the consequent piling up of stock and leftover products, steps in the process that are not really necessary, movements of employees and transportation of products from one place to another for no purpose, groups of people in a downstream activity waiting because an upstream activity has not been delivered on time, and goods and services that do not meet customer needs. (Womack, J., Jones, D., 2012).

For Production Logistics, the reduction of unnecessary movements of materials and people is fundamental, identifying a lot of handling and movement of parts, long distances traveled or excessive displacement of the operators leads to directing the efforts to design proposals that lead to the improvement of the processes.

The application of a Lean program both for the reduction of waste and for the improvement of the quality of the processes is explained by paying attention to the lean principles through the breakdown of its tools such as the 5's, SMED, TPM, Jidoka, Heijunka, Kanban, Visual control, Quality techniques, Staff participation systems, among others, according to Juárez, Y., Rojas, J., Medina, J. & Pérez, A. (2011) ―one is dedicated to a particular aspect of waste elimination in each part of the process.

The problems, whether sporadic that occur every day, or chronic with which an organization gets used to living through basic quality tools, can be identified, classified, analyzed and measured, and it can be considered that for each previous action there is a basic quality tool or technique that can be used.

Be Linches (2008) lists ―the 7 tools‖ for problem solving (p. 65):

- Verification list.
- Histogram.
- Management charts.
- Control charts.
- Pareto chart.

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- Cause/effect diagram.

- Distribution or dispersion diagram.

The application of the continuous improvement methodology, quality tools or one or several lean techniques help reduce waste in organizations, added to this, logistics must be recognized as one of the key functions of the company. that allows to optimize the processes and that, if applied in the organization, leads to speeding up the flow of materials and information.

Based on the literature, thinking about developing continuous improvement projects applied to production logistics leads us to consider the possibilities of minimizing waste in the organization, considering this as the starting point for the research presented in this article.

The research methodology narrates the activities carried out by the materialists at the time of supplying the stations in the production area in the organization under study, this, through a qualitative approach with a descriptive scope, delimiting from a broader context.

The manufacturing industry in Ciudad Juárez.

The industrial sector is a very important component for the growth and economic development of a country, in Ciudad Juárez the manufacturing sector is experiencing great dynamism that is reflected in the growth of manufacturing exports and the income of the establishments belonging to the program of the Manufacturing, Maquiladora and Export Services Industry (IMMEX) who, through job positions and manufacturing orders, present a relevant indicator to demonstrate that the decisions made in this sector are correct.

It can be considered that from the signing of the North American Free Trade Agreement (NAFTA) that entered into force in 1991, manufacturing and therefore the IMMEX companies emerged as a source of foreign exchange for the country, without excluding the number of jobs it has generated in this border strip of the municipality of Juárez.

But this dynamic is due to the growing demand from foreign markets and the results of the domestic economic policy that has created favorable conditions for exports through a fiscal, customs and administrative program that supports said activity; allowing Mexico to have a technological development and a growing participation in international markets,

For Mexico, and in this case specifically for Ciudad Juárez, international subcontracting operations have allowed the products manufactured in their companies to compete in national and international markets, which is why it is important to design strategies that manage to improve processes at all times. industries that take place in them.

The methodology for this research was simplistic since a manufacturing company from Ciudad Juárez, Chihuahua, was considered as a case study, observing a non-experimental cross-sectional design since variables were not manipulated and the data were taken in a single moment, of a descriptive type. narrating the events witnessed. Observation, anecdotal records and document review were used as data collection instruments. (Hernández, R., Fernández, C., Baptista, P., 2014)

Specific context

The company in which the study is carried out is located in Ciudad Juárez, Chihuahua, considered one of the main suppliers of wipers for the automotive industry, with important clients such as Nissan, Volkswagen and Ford, and also produces parts for spare parts that can be locate at convenience stores like Wal-Mart and Auto Zone. The material assortment process in the production area was considered as the specific area to carry out the case under study in this investigation. Of all the processes carried out by the company, one was located in which quality tools for diagnosis and lean tools could be used to design a proposal to improve the production logistics system.

The universe to be considered were the 80 materialists who work in the production area in the three shifts, the estimated sample for the study is not probabilistic for convenience since, as its name indicates, it was considered for the convenience of the study. (Hernández, R. et al, 2014).

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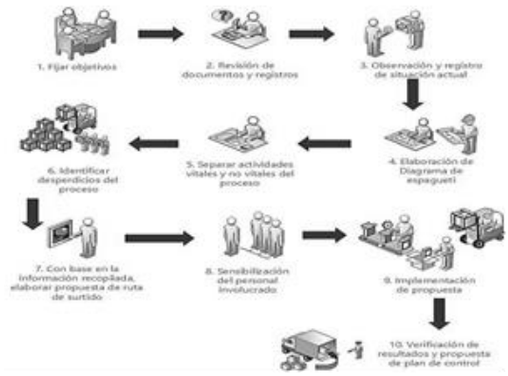

Figure 1 Research methodology

Results

1. The following objectives were reached:

- Identify elements, subjects and circumstances that arise in the selection process of the case study.

- Propose an assortment route.

2. Review of documents and records.

- The document review was carried out: 80 people were detected moving the material, which are presented in Table 1, this staff is divided into three shifts.

- Met goals were also identified.

Turno ↓	1	2	3	4	5	6	7	8
1	11	4	5	2	2	2	2	2
2	5	4	4	3	3	2	2	1
3	4	2	-	2	-	-	-	-
Back ups	3	3	2	2	2	2	2	2
Total	23	13	11	9	7	6	6	5

Table 1 Cnumber of personnel for the assortment of materials by shift and station

3. Observation and recording of the activities that are currently being carried out, detecting the following:

- InexIstent assortment routes defined.

- InexStrong material change indicator.

- The runner must get pallets out of the plant.

- The necessary equipment is not available to supply the number of components that the area requires, so the materialist must do the same operation over and over again.

- Repetitive movements.

- Disorder in the area.

- Unnecessary displacement of material that accumulates for undefined periods in temporary spaces.

- The material is on the floor.

- Improper handling of material

- The materialist performs non-vital activities.

4. Elaboration of the spaghetti diagram, to identify and confirm movements of materialists.

This black lines in Fig. 2, represent the route made by the materialist, after observing the diagram, the points of the location of internal suppliers and the need for the proposed route to have a continuous flow and to control the waste of movements, in addition, the need for a 5'S project was considered to minimize the disorder of the area.

Figure 2 Spaghetti diagram

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5. Identification of vital and non-vital activities of the process. Records were made with the collected data and the activities that were vital for the material supply process were determined in such a way that the machines were kept operating without stoppages due to lack of material, identifying the standard time that must be handled on the route.

6. Waste identification

The waste identified through the registration tools was the following:

- Transportation: Unnecessary movement of materials and people.
- Movements: Unnecessary movement of Geent and materials within the process.
- Waiting: wasted time of people.
- Inventory: Failure to meet delivery deadlines.

Once the data was recorded and organized, it was analyzed to generate ideas that allowed the design of a proposal to improve production logistics, specifically in the material assortment process.

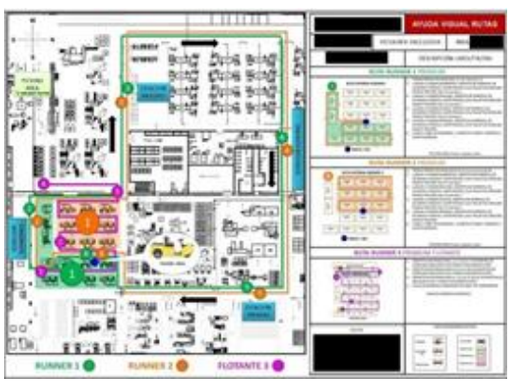

Figure 3 Passortment route proposal

Since the mapping was carried out, it was considered necessary to start with a 5'S program since the disorder of the area, in addition to giving a bad appearance, was non-functional, the implementation of a kamban system and the assortment route proposal were also considered.

7. Proposal

If the proposal emanates from the work team, it has a greater probability of success, this is because people hardly accept changes that they consider taxes, but when they are made to participate in improvement projects, a brilliant idea is not expected from a single person. mind, but many ideas from great minds that will be able to add value to the process. With this in mind, an informational meeting was convened, and a brainstorm was held to propose solutions.

The proposal to improve production logistics covered the following points:

Prepare a 5'S plan, since it is considered necessary to maintain the work area to present it clean, organized and safe, since a disorganized and unclean environment impacts the morale and efficiency of the worker.

For the production logistics to be fulfilled, establishing a standard work in the route and times of the supply route allows to supply the machines without the risk of stoppage due to lack of material or that it is lying on the floor due to oversupply.

The handling of materials through the appropriate equipment is also a point to consider in a logistics project, but many times there is no budget to design or buy new equipment, so on some occasions what you have must be adapted to the needs. In this way, in the case study, the adaptation of a vehicle formed by a tugger and 3 wagons was suggested (Fig. 4).

Figure 4 Adapted transport equipment

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8. Sensitization

The result of the investigation leads to the reflection of the fulfillment of an improvement that can be considered within a Lean culture since "it is not something that begins and ends, it is something that must be treated as a cultural transformation if it is to be lasting and sustainable. ‖, this because it is ―a set of techniques focused on added value and people‖. (Hernández, J., Vizán, A. 2013).

Sensitizing the staff involved in the change is a fundamental part of it, since they must know the benefits that the new work system brings to everyone.

Something that is required when generating a change is to establish compliance rules and make themselves known to those who will have to apply them (Figure 5), as well as the need for them to implement the improvement. Much is said that the most valuable element of an organization is human capital and therefore in any improvement project the personnel who will implement the change must be made aware and trained.

Figure 5 Rules for the runners

9. Iimplementation

The first thing that was carried out in the implementation of the improvement project was the awareness of the key element: people. Professor Jeffrey Pfeffer quoted by Heizer & Render (2009) states that "It is possible to achieve sustained competitive advantage through the way people are managed". The Kaizen of man starts from the premise that man is the most important resource of the organization, and that the participation of all employees to achieve quality is a basic premise.

Building an environment of respect and mutual commitment, as well as taking advantage of the mental and physical capacities of the employees, allows us to avoid wasteful labor. Involving employees as much as possible, sensitizing them and training them offers an advantage in the implementation of any change.

The workers were explained how to operate the proposed route, the formats necessary to keep the records and the rules to follow in the new way of working. The improvement proposal was implemented with a continuous flow and with the purpose of controlling the waste of movements, in addition to minimizing the disorder of the area, since material that is not used cannot be handled on this route. To determine the times of each supply route, it was necessary to analyze the number of parts needed, taking into consideration the highest standard number that the machines produce per hour in order to keep them running; the start was taken into account so that the materialist did not present problems when beginning with the completion of his journey.

In the case of the study in question, situations as important as the fact that the production lines have enough spaces so that the material can withstand a little more than an hour without the need for restocking were detected through observation. that every hour the tour must be carried out so that the production lines do not suffer stoppages and are always supplied.

Due to the fact that in the analysis of the causes it was determined that many of the repetitive movements were due to the lack of adequate transport equipment and that the materialist could not carry the number of components required in the way that was done, we also worked with the proposal of the adaptation of a material transport equipment, to supply the components that are required.

10. Verification of results and proposal of control plan

The results obtained with the implementation of the improvement plan were clean and orderly areas, clear corridors, material handling and movement of people and materials minimized, efficient and effective use of labor, standardization of work, optimal use of transport equipment material, staff involvement.

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After observing the results of the implementation, the design of a control system is proposed through the use of a verification sheet of the supply route and an internal audit program to follow up on the improvement.

Conclusions and recommendations

Continuous improvement projects make it possible to improve the working conditions of the employees involved and minimize waste. In the case study, the result was the minimization of movements and transfers of materials and people that were determined unnecessary. Greater control of the materialists was achieved by giving route schedules. The number of employees moving material was also reduced, as now only runners can handle it.

Reproducing this system in all areas of the plant would generate a standard job for all materialists and reduce the number of personnel to supply the areas.

Concluding, the analysis of the factors that occur in the initial situation of the case study, led to detect notorious waste in the process, the proposal that was made to establish the supply of materials to the work stations caused a reduction of 60%. of the materialists, for which it is concluded that analyzing the factors, subjects and actions that intervene in production logistics using quality tools allow generating proposals that can lead to a project that minimizes waste.

In the particular case, it is convenient to take this proposal to the entire plant, to ensure that production logistics are streamlined and lead to the achievement of the company's goals.

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Application of second-order conductors through the design and manufacture of a welding machine made with recycled materials

Aplicación de los conductores de segundo orden a través del diseño y fabricación de una Máquina soldadora realizada con materiales reciclados

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Abstract

As part of the terms of methods and work systems we undertook a project the teacher showed us it had to be with recycled materials and we like welding Our idea provides a great reliable initial operation, insurance sustainable and economically "a welding machine home" which is easy to transport and simple assembly process that handles an almost similar amperage between 90 and 105 amperes. Which is sufficient for domestic work and a workshop in proportion, speaking of size, productivity thereof. And it cost about 300 pesos. Type of study. Documentary research as an essential part of a process of scientific research, can be defined as a strategy that is observed and systematically reflects on theoretical and empirical realities using for these different types of documents where it explores, interprets,

Innovation, Electric welding, Recycled materials

Resumen

Como parte de los términos de los métodos y sistemas de trabajo que llevamos a cabo un proyecto que el profesor nos mostró que tenía que ser con materiales reciclados y nos gusta la soldadura Nuestra idea proporciona una gran operación inicial fiable, seguro sostenible y económicamente "una máquina de soldadura casa" que es fácil de transportar y el proceso de montaje simple que maneja un amperaje casi similar entre 90 y 105 amperios. Lo cual es suficiente para el trabajo doméstico y un taller en proporción, hablando de tamaño, a la productividad de este. Y cuesta alrededor de 300 pesos. Tipo de estudio. La investigación documental como parte esencial de un proceso de investigación científica, se puede definir como una estrategia que se observa y reflexiona sistemáticamente sobre realidades teóricas y empíricas utilizando para ello diferentes tipos de documentos donde se explora, interpreta,

Innovación, Soldadura eléctrica, Materiales reciclados

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† Researcher contributing first author.

Introduction

Read in the book a real and practical solution that can generate income and we wonder how? taking what already exists and reinventing it in such a way that it is economical and at the same time functional and that better be profitable

A seated example of this is, taking as such a house, the protections, doors, garage railings, etc., for the comfortable and safe stay of the individual or a family in said house, (an example that is too simple but at the same time concise of what we propose). Now the expansion and growth plans of construction companies such as Geo houses.

Ruba among many others, is to provide houses for almost any pockets of the hand of bank credits or infonavit and others, therefore the security in said houses as mentioned above remains on the part of the new owner of the property.

It is there, where our proposal enters. A person who has knowledge of welding and wishes to take advantage of the field left open by the construction of the aforementioned properties will obviously need the appropriate equipment, which we know in advance is not cheap, welding machines that exist in the market of brands like Lincoln, Miller, infra, among others, it ranges between 10,000 and 15,000 pesos, and it is not easy to obtain financing these days with just a good idea. Our idea provides a great reliable, safe, sustainable and cheap initial operation, "a homemade welding machine" which is easy to transport and has a simple assembly procedure that handles an almost similar amperage between 90 and 105 amps. Which is enough for domestic work and a workshop in proportion, speaking of size,

Within the topic of entrepreneurship, a sector that has been showing strong growth is that of businesses started and operated by women. It has been shown that this type of entrepreneurship has a significant impact on the economic development of countries, in reducing poverty and in generating employment (Brush and Cooper, 2012).

General objective. Create an ecological awareness about the importance of recycling materials and supported by innovation, give them a practical use that generates a source of income.

Specific objectives: 1. With the use of plastic materials and cables, design and manufacture a portable, homemade welding machine, designed for light welding work.

Idenntification of the problem

It is necessary that we promote the reuse of materials to help reduce pollution, which increasingly causes greater health risks, recycling materials and giving them an alternative use for what they were designed for is of the utmost importance. And with this project we want to help in a comprehensive way to this end by reusing plastic materials and cardboard, we have to understand that there are two types of renewable and non-renewable resources to classify them is done as follows.

Variables: X The usable matter that exists on earth, (xo) The original quantity of the resource at the time of starting, (a) The speed of generation of the resource, variables and considerations, (b) Exploitation, the speed of consumption and/ or loss of resources, (t) Previous times lead us to propose an algebraic formula. $X= xo + (ab)t$. Through this expression we can deduce the following: Case 1 if $a > b$ we have a faster rate of regeneration of the product, it is an over-produced resource Case 2 if $a = b$ we have that the rate of generation is equal to the rate of consumption or loss is a renewable resource, Case 3 if $b>a$, we have the rate of consumption loss is greater than the rate of regeneration this is a case of non-renewable product

Basics for welding machine

In order to describe an electrical circuit in a cathodic protection system, a power source connected to one or more components by means of a wire made of a conductive material such as copper is necessary. The electrical circuit constitutes a power source that will provide us with a force by establishing electrical potential differences across the components of the circuit and we will measure it as follows: current in amps, force and power difference in volts, and resistance in ohms.

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Drivers

According to the types of material, the electrochemical reactions of a conductor system will be the electrical conductivity we can associate with a movement of the electric charge is classified into two:

First-order conductors: they are those that have electrical conductance, electrons being the carriers of the charge, for example most metals, graphite, oxides, and their conductivity decreases when there is an increase in temperature.

Second order conductors: These conductors have ionic or electrolytic conductance, and the carriers are the ions. Giving a mass transfer associated with conductivity. And they occur in aqueous solutions with dissolved salts, as an example we have soils and ionic salts, and their conductivity increases when the temperature increases

Firstly, the term voltage is given to the potential of an electrical system and cell galvánica to name devices that transform chemical energy into electrical energy.

From this we understand that a common galvanic cell is made up of two metal parts and a saline solution containing ions called an electrolyte.

The flow of charge can be transferred by means of electrons (electric current) or by ions (ionic current) and an electrolyte is that substance that conducts current by an ionic flow

Welding machine elements Plasma and this composed ofandelectronsthat carry the current and that go from the negative to the positive pole, ions metallic that go from the positive pole to the negative, totomesgases that become ionized and stabilized as they lose or gain electrons, and of fusion products such as vapors that will help to form a protective atmosphere. It reaches the highest temperature of the process.

In this area that surrounds the plasma and has a lower temperature than it, formed by atoms that dissociate and recombine, giving off heat due to the combustion of the electrode coating. Gives the electric arc its conical shape.

Fusion temperature: the heat action of the arc causes the fusion of the material, where part of it is mixed with the filler material of the electrode, causing the welding of the pieces once solidified.

Crater: Groove produced by heating the metal. its shape and depth will be given by the penetration power of the electrode.

Welding bead: it is made up of the base metal and the filler material of the electrode, and two parts can be differentiated: the slag, made up of impurities that are segregated during solidification and that are later eliminated, and on the thickness, formed by the useful part of the filler material and part of the base metal, the weld itself.

Figure 1 Design and operation of the welding machine

Electrodes: they perform the following functions: proportional the metal so that it can be welded, protect the molten pool from the harmful attack of oxygen, protect the cord from surface oxidation by covering the molten surface (slag) They are metal rods prepared to serve as the pole of the circuit; at its end generates thetorco and electric. In some cases, they also serve as a flux material. The metal rod is often coated with a combination of materials that vary from electrode to electrode. The coating on the electrodes has various functions, which can be summarized as follows: Electrical function of the coating. Physical function of the slag, Metallurgical function of the coating.

How does the welding machine work chemically? First the term voltage is given to the potential of an electrical system and galvanic cell to name devices that transform chemical energy into electrical energy. From this we understand that a common galvanic cell is made up of two metal parts and a saline solution containing ions called an electrolyte. These are charged with the power outlet and the water that is ionized with the salt is what conducts the energy and from there the force to be able to weld.

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The welding machine uses aqueous solutions with dissolved salts, we began to investigate and we consider that our contribution as an innovation is that it was made with recycled materials and we also observed the need for welding work that has to be done in the bony place that the machine it has to be transported and we came up with the idea of doing it in a 20-liter plastic container for its ease of transportation and we began to carry out the project and be able to land in a practical way that could generate income and we asked ourselves do how?

Taking what already exists and reinventing it in such a way that it is economical and at the same time functional and profitable.

As an example of how to apply the project, it has a house, and the protections, doors, garage railings, etc., for the comfortable and safe stay of the individual or a family in said house. That is where our proposal comes in.

A person who has knowledge of welding and wishes to take advantage of the field left open by the construction of said properties already mentioned will obviously need the right equipment, which we know in advance is not cheap, welding machines that exist in the market from brands such as Lincoln, Miller, Infra, among others, range between 10,000 and 15,000 pesos and it is not easy to get financing these days just with a good idea.

Our idea provides a great reliable, safe, sustainable and economical initial operation "a homemade welding machine" which is easy to transport and has a simple assembly procedure that handles an almost similar amperage between 90 and 105 amps. Which is enough for domestic work and a workshop in proportion, speaking of size, to its productivity. And it has an approximate cost of 300 pesos. See figure 1

Literature review

What is innovation? It consists of a learning process, which arises from an initial level of knowledge from it, new knowledge is created and the products, production processes and business organization are applied.

Technological innovation activities are the set of scientific, technological, organizational, financial and commercial stages, including investments in new knowledge, leading or trying to lead to improvements, an implementation of new or improved products and processes. Nonaka and Takeuchi (1995). Innovation consists of a continuous learning process by which companies. They generate new technological knowledge. Drucker (2005) defines innovation as the organized search and systematically in order to change the opportunities that exist in the environment.

Innovation and the innovative entrepreneur raises six basic sources for innovation, The unexpected: to surprise. The incongruous: the difference between what is and what should be. The need to improve an existing process. The breakdown of an industrial structure changes or market demographic changes. Changes in perception, modality and meaning No to knowledge, as many scientists as scientists. Varela R. (2001). Colombia's national innovation system SNIC, conceives business innovation as a mental disposition, a way of thinking about business strategies and practices that contribute to the commercial and financial success of the company, has an important impact on the technological capital of the company. company and promotes dynamic research and learning processes.

The Oslo Manual, 3rd Edition defines innovation as the introduction of a new or significantly improved product (good or service), a process, a new marketing method or a new organizational method, in internal practices at company, workplace organization or external relations. Due to the change, to the new culture of consumption, and to the technologies that are available.

Innovation Categories: Innovation efforts are mainly divided into 4 categories according to the magnitude of the impact and the term, see Figure 1, which are: 1. Incremental Innovation, 2. Disruptive Innovation. 3. Innovation of business models, 4. Innovation in new businesses.

Typically, incremental innovation efforts revolve around current products and services and are short-lived.

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Term, both in its development and in its scope; disruptive ones tend to focus on significant changes or new products and services for the same markets (Christensen, 1997).

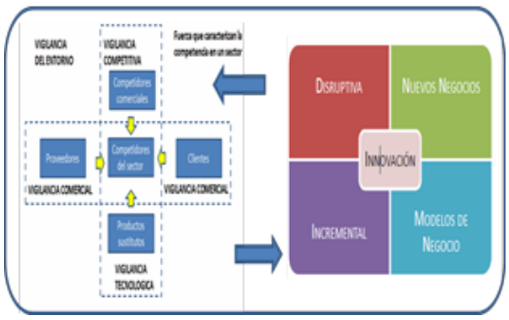

Figure 2 Surveillance types and their relationship with innovation

Technological surveillance. Monitoring is a basic activity in innovation management, it consists of constant external and internal monitoring, see figure 1, it is a systematic process that allows providing good information to the right person at the right time, since often the information is consultation in a disorderly and chaotic manner. Wanting to know everything leads to enormous, expensive and useless work. The company must decide in which areas it wants to be well informed, for that it will have to answer the following questions: 1.- What is the objective of the surveillance. 2.- What information to look for. 3.- Where to locate it. 4.- How to communicate it. 5.- Here in directing it. 6.- What means are we going to allocate.

The competitive surveillance. Deals with information about current competitors and potential, as an example we have, investment policy, entry into new activities or future strategies. Technological surveillance. Information will be received on the technologies available or that have just appeared and can be incorporated into new products and services, processes or focus on the organization. Be systematic, it must be organized with methods in order to carry out a scheduled follow-up. Be structured with a decentralized internal organization based on the creation and exploitation of networks. Palop and Vicente, (1994)

Medollology

Type of study. Documentary research as an essential part of a scientific research process, can be defined as a strategy that systematically observes and reflects on theoretical and empirical realities using different types of documents where data and information about a subject are investigated, interpreted, and presented. specific subject of any science, using for it, methods and instruments whose purpose is to obtain results that can be the basis for the development of scientific creation. The characteristics of documentary research are defined by: The collection, selection, analysis and presentation of coherent information from the use of documents. Carrying out an adequate collection of data and information that allow rediscovering facts, suggesting problems, guide towards other sources of research, guide ways to develop research instruments, develop hypotheses. To be considered as a fundamental part of a much broader and finished scientific research process. Be carried out in an orderly manner and with precise objectives, in order to be the basis for the construction of knowledge. The use of different techniques and instruments for the location and classification of data, to document and content analysis (Hernández, 2006).

Results

We consider that the objective was achieved since when we made the prototype and were able to weld in the maintenance area of the Technological University of Torreón and later in the house of our colleague Edgar Ortega and be able to carry out a small protection we were excited because if it works and we were able to see in a practical way what we studied since many times in school the concepts remain in pure theory.

Conclusions

We realized that the books handle concepts that are sometimes very understandable and sometimes very complicated, so we liked this experience and we hope to be able to continue applying other concepts and putting them into practice.

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* Correspondence to Author (example@example.org)
† Researcher contributing as first author.

Introduction

Text in Times New Roman No.12, single space.

General explanation of the subject and explain why it is important.

What is your added value with respect to other techniques?

Clearly focus each of its features

Clearly explain the problem to be solved and the central hypothesis.

Explanation of sections Article.

Development of headings and subheadings of the article with subsequent numbers

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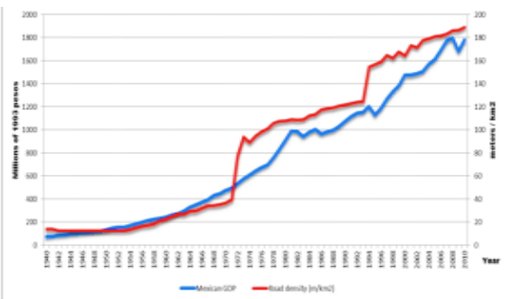

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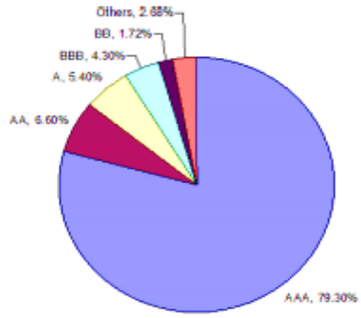

Figure 1 Title and Source (in italics).

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	favourable economic conditions to meet its commitments
CC	Borrower is highly vulnerable
C	Borrower may be in bankruptcy but is still paying its obligations
D	Borrower has defaulted on obligations and CRA believes that it will generally default on most or all obligations
MOODY'S scale varies slightly	
Investment Grade	From AAA to BAA3
Speculative Grade	From Ba1 to C, (C being in default)

Table 1 Title and Source (in italics**).**

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Each Article shall present separately in **3 folders**: a) Figures, b) Charts and c) Tables in .JPG format, indicating the number and sequential Bold Title.

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$$Y_{ij} = \alpha + \sum_{h=1}^{r} \beta_h X_{hij} + u_j + e_{ij} \quad (1)$$

They must be editable and number aligned on the right side.

Methodology

Develop give the meaning of the variables in linear writing and important is the comparison of the used criteria.

Results

The results shall be by section of the Article.

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Tables and adequate sources thanks to indicate if they were funded by any institution, University or company.

Conclusions

Explain clearly the results and possibilities of improvement.

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