Volume 3, Issue 4 – January – June – 2019

Journal-Industrial Organization

ISSN 2524-2105

RINOE®

Journal - Industrial Organization, Volume 3, Issue 4, January – June 2019, is a journal edited semestral by RINOE. La Raza Av. 1047 No.- Santa Ana, Cusco. Peru. Postcode: 11500, WEB: www.rinoe.org journal@rinoe.org. Editor in Chief: MIRANDA-GARCIA, Marta. PhD. ISSN-2524-2105. Responsible for the latest update of this number RINOE Computer Unit. ESCAMILLA-BOUCHÁN, Imelda. PhD. LUNA-SOTO, Vladimir. PhD. La Raza Av. 1047 No.- Santa Ana, CuscoPeru.Postcode: 11500 last updated June 30, 2019.

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Presentation of Content

In the first article we present, *Analysis of the factors that affect competitiveness of a supplier in the oil sector, in the state of Tabasco*, generating a development proposal, by ELISEO-DANTÉS, Hortensia, MOREJÓN-SÁNCHEZ, Juana María, PÉREZ-PÉREZ, Iris Cristel and GARCÍA-REYES, David Antonio, with affiliation in the Tecnológico Nacional de México, as following article we present, *Inventory control policies for a polyester company*, by BLANCAS-RIVERA, Rubén, CRUZ-SUÁREZ, Hugo, TAJONAR-SANABRIA, Francisco Solano and VELASCO-LUNA, Fernando, with affiliation in the Benemérita Universidad Autónoma de Puebla, as following article we present, *Application of a change model, in the Industrializer de la Madera Colibrí, S. de R. L, in order to redesign the production line*, by GONZÁLEZ-RAMÍREZ, Claudia Teresa, VALDESPINO-MORA, Rebeca and PEREZ-PALOMARES, Violeta Nallely, with affiliation in the Instituto Tecnológico de Zitácuaro, as following article we present, *Electronic control card for transmission of mobile load crane type KRUPP*, by CABRERA-ORNELAS, Javier, MARTÍNEZ-ZAMORA, Juan Alberto, MARTÍNEZ-MONTALVO, Anselmo and HERNÁNDEZ-NARVÁEZ, María Luisa, with affiliation in the Instituto Tecnológico de Jilotepec.

Content

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June 2019 Vol.3 No.4 1-6

Analysis of the factors that affect competitiveness of a supplier in the oil sector, in the state of Tabasco, generating a development proposal

Análisis de los factores que inciden en la competitividad de una empresa proveedora de insumos en el sector petrolero, en el estado de Tabasco, generando una propuesta de desarrollo

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DOI: 10.35429/JIO.2019.4.3.1.6 Received March 28, 2019; Accepted June 20, 2019

Abstract

Objective: To detect the factors which affect competitiveness of the hydrocarbon sector from the study context. In order to generate a proposal for the improvement of that sector. Methodology. Through working with experts, it is possible to interrelate information that allows visualizing in a global way the study problem. This is achieved through the study of the context variables (six), with support from the structural analysis scheme that will generate the four potential areas where the conflict zone, power zone, zone of autonomous problems and exit zone are located, allowing the clear detection of the incident factors. Results. Given the previous scheme and with an in-depth analysis, we propose a model that generates the strengthening of the key factors (power zone), also we search for a way to stabilize the factors of the zone of conflict; all this will consolidate the work of the type of organizations studied, enabling them to be competitive in a globalized environment.

Competitiveness, Context variables, key factors

Resumen

Objetivo: Lograr detectar del contexto de estudio los factores que están incidiendo en la competitividad del importante sector de hidrocarburos. Con la finalidad de generar una propuesta de mejora para dicho sector. Metodología. A través del trabajo con expertos se logra interrelacionar información que permite visualizar de manera global el problema de estudio. Esto es a través del estudio de las variables del contexto (seis), con apoyo del esquema del análisis estructural que generará las cuatro áreas potenciales donde se encuentran la zona de conflictos, zona de poder, zona de problemas autónomos y zona de salida, permitiendo la detección clara de los factores incidentes. Resultados. Dado el esquema anterior y con un análisis a profundidad permite el poder proponer un modelo que genere el fortalecimiento de los factores claves (zona de poder), también buscar una ruta para la estabilidad de los factores de la zona de conflicto, todo ello vendrá a consolidar el trabajo del tipo de organizaciones estudiadas que les permite ser competitivas en un ámbito globalizado.

Competitividad, Variables del contexto, Factores claves

Citation: ELISEO-DANTÉS, Hortensia, MOREJÓN-SÁNCHEZ, Juana María, PÉREZ-PÉREZ, Iris Cristel and GARCÍA-REYES, David Antonio. Analysis of the factors that affect competitiveness of a supplier in the oil sector, in the state of Tabasco, generating a development proposal. Rinoe Journal-Industrial Organization. 2019. 3-4:1-6.

† Researcher contributing first author.

Introduction

In recent times, the economic model of developed countries has migrated to the knowledge industry, which determines as its competitive strength intangible assets, comprised of people's knowledge, attitudes, values and skills. The increasing value of these assets as key products for the economy and society is due, largely, to current international conditions. That is, organizations generate value, according to Drucker (2006), based on their ability to manage knowledge, thereby obtaining a competitive advantage in the globalized market.

Since the intangible resources of companies involve the competences of people and the results obtained from them, the complexity of their management and control increases considerably, because, although it is a capital that the company has, it is not property of the organization as such, rather, it hires the use of said capital through its collaborators. In this context, and in order to direct the present investigation towards aspects related to obtaining intellectual capital in organizations, the need arises to develop a formal scheme.

Intellectual capital, in this sense, encompasses the intangible resources of the organization in three fundamental dimensions: human capital, relative to the competences of employees; structural capital, related to intangible assets that are owned by the organization; and social capital, which refers to the company's relationships with customers, suppliers, etc. It is important to mention that it is called capital because its origin come from economic sciences, and so, the scholars committed to the growth of profits in companies identified the potential of intangible resources to generate economic value to organizations.

Background

Although the country's backwardness is attributed to the competitive disadvantage facing international markets, the main problem of Mexican companies is the difficulty of adapting to change, that is, the lack of flexibility in organizational structures, which keeps them rigid, obsolete and unable to face the challenges of a rapidly changing context.

In this sense, the reactivity of the productive sectors of the country has resulted in a deficient operability, causing the shortage of teleological culture and organizational prospective, aspects that are characteristic of the human factor.

The foregoing becomes very important, since, according to Villegas, Hernández and Salazar (2015, p. 204) "human capital is the main source of intellectual capital and factor of creation of added value that transcends in the companies of the industrial sector in Mexico." Their intellectual capital positively affects key elements for organizations, such as financial profitability, market capitalization and the level of value of the share.

In this sense, Mexican companies face the loss of their competitive capacity due to their deficit to obtain intellectual capital, as noted by Joya, Gámez, Ortiz and Gálvez (2015, p. 91) in their study focused on 19.7% of the total of companies that have failed between the years 2010-2015, from the state of Jalisco. In their study, they describe that organizations are not aware of the value generated by intellectual capital; therefore they do not encourage collaborative work, nor the development of their collaborators, coupled with the inflexible structure they manage, which makes effective anticipation impossible before context changes.

Intangible assets are considered by managers as essential for achieving organizational objectives; however, of the three dimensions that make up intellectual capital, the human capital and structural capital need to be strengthened, mainly in relation to the training of personnel regarding information technologies, as well as in the investment in information equipment and systems. (Larios, 2009).

Simó and Sallán (2008, p. 74–76) affirm the need to develop methodologies for assessing knowledge both implicitly and explicitly, because they create value in organizations to measure and evaluate their intellectual capital, since they would be able to evaluate their background and relationship with the results, which are considered as other intangible assets.

ISSN-2524-2105

Problem Statement

At present, the main economic activity of the state of Tabasco is oil mining, with a contribution of 54.1% to the state GDP in 2016 (SE, 2017). Tabasco is the second state nationwide which, after the state of Campeche (80.9% of state GDP), depends the most on the oil industry, an aspect that triggered the economic recession of both states in the period 2016-2018. However, at the end of 2018, there has been a slight recovery in the oil sector.The above suggests that the economic dependence of the state of Tabasco on the hydrocarbons sector has generated stagnation in the organizational structures of the companies belonging to the industry, which suffered the abrupt consequences of the economic crisis in the past years, causing their extinction or reduction in size, as they were unable to anticipate the aforementioned event.

Given the international trend of migrating to the knowledge industry and the value that this transition has generated according to various studies in different productive sectors, large transnational industries have taken competitive advantage over Mexican companies, causing in the worst case scenario, their extinction. This is a result of their lack of solvency in economic, technological and strategic terms to meet the demands of the market. (Larios, 2009; Joya et. Al., 2015; Beurregard, 2015). The main challenges for companies in the field of intellectual capital are, according to Ramírez considers (2007, p. 151), first of all, the need to improve the tools for managing investment in employee skills, databases and technological capabilities, as well as the accounting-type measurement of intangible assets, so that the difference between companies where intellectual capital can be seen in contrast to which this asset is neglected can be reliably verified. Finally, the ability to measure long-term returns on investment in people, skills and other intangible assets.

Based on this and on the theoretical basis of the present work, we assert that the use of the immaterial resources available in Mexican organizations, which represent the means to generate wealth in the future, is not managed efficiently and, in some cases, it is even null. This is an alarming aspect, considering that intellectual capital is the engine of productive force that brings greater value to the companies of first world countries.

International context

According to the U.S. Energy Information Administration (2018), 127 countries extract crude oil and 95 dry natural gas; the United States being the main supplier in both cases, as shown in Tables 1 and 2.

Nº	Coauntry	Oil - production (barrels/day)	Year
1	Estados Unidos	15,647,000	2017
2	Arabia Saudita	12,090,000	2017
3	Rusia	11,210,000	2017
4	Canadá	4,958,000	2017
5	China	4,779,000	2017
6	Irán	4,695,000	2017
7	Iraq	4,455,000	2017
8	Emiratos Árabes Unidos	3,721,000	2017
9	Brasil	3,363,000	2017
10	Kuwait	2,825,000	2017
11	**Mexico**	**2,260,000**	**2017**

Tabla 1 Producción diaria de barriles de petróleo y otros líquidos de cada país en el año 2017
Fuente: U.S. Energy Information Administration (2018)

Table 2 presents the average daily production of barrels of crude oil by country in 2017. A total of 127 countries were identified by the U.S. Energy Information Administration as producers and sorted in descending order according to their production.

Nº	Country	Dry natural gas - production (cubic feet / day)	Year
1	Estados Unidos	27,291,000,000,000	2017
2	Rusia	23,508,000,000,000	2017
3	Irán	7,577,000,000,000	2017
4	Qatar	5,875,000,000,000	2017
5	Canadá	5,618,000,000,000	2017
6	China	5,152,000,000,000	2017
7	Noruega	4,375,000,000,000	2017
8	Arabia Saudí	3,859,000,000,000	2017
9	Australia	3,717,000,000,000	2017
10	Argelia	3,302,000,000,000	2017
11	Turkmenistán	2,735,000,000,000	2017
12	Indonesia	2,546,000,000,000	2017
13	Malasia	2,454,000,000,000	2017
14	Emiratos Árabes Unidos	2,190,000,000,000	2017
15	Uzbekistán	1,840,000,000,000	2017
16	Egipto	1,796,000,000,000	2017
17	Países Bajos	1,601,000,000,000	2017
18	Nigeria	1,571,000,000,000	2017
19	Reino Unido	1,487,000,000,000	2017
20	Argentina	1,445,000,000,000	2017
21	Pakistán	1,379,000,000,000	2017
22	Tailandia	1,363,000,000,000	2017
23	Trinidad y Tobago	1,297,000,000,000	2017
24	**Mexico**	**1,115,000,000,000**	**2017**
25	India	1,114,000,000,000	2017

Tabla 2 Producción diaria de pies cúbicos de gas natural seco de cada país en el año 2017
Fuente: U.S. Energy Information Administration (2018)

ISSN-2524-2105

Also, Table 3 shows the daily production of dry natural gas by country (which sums a total of 95), in cubic feet, according to data taken from the U.S. Energy Information Administration (2018).

It is estimated that this year the availability of oil in the world will be reduced, due to an agreement between the member countries of the Organization of Petroleum Exporting Countries (OPEC) and other allied countries, including Russia, with the purpose of mitigate the price drop that crude oil had in October 2018, since Ixchel Castro, manager for Latin America of Petroleum and Refining Markets of the consulting firm Wood-Mackenzie stated: "Now, for 2019, we are facing a scenario in which oil supply will grow above demand. "

National context

Mexico occupies the eleventh place in the production of crude oil and the twenty-fourth in dry natural gas, making it one of the main suppliers of hydrocarbons worldwide. (US Energy Information Administration, 2018).

The exploitation of a relatively new type of resource has caused the progressive decline in US oil production to reverse.

Mexico's crude oil production will continue to fall in the short and medium term, according to the Mexican Association of Hydrocarbons Company.

Intellectual capital

Intellectual capital, which is currently understood as:

"The set of individual or collective knowledge that can substantially increase the production of material and spiritual goods. It is today the greatest source of wealth for organizations. It is comprised of all the intangible assets of an organization or a place that, despite not being reflected in the traditionally used financial statements, generate value or has the potential to generate it. (Garcés, 2011).

Methodology to develop

Emergence of the idea

In this investigation, in order to establish and ensure the efficiency of the thematic unit, we have structured the delimitation of the idea that guides this study, as shown in Figure 1.

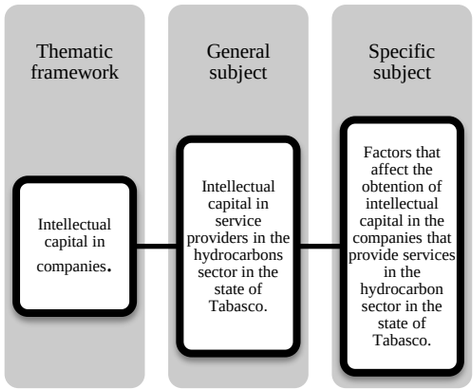

Figure 1 Thematic scheme for the delimitation of the subject
Source: Self Made

The thematic framework addressed in the present paper is intellectual capital in companies, so that research is oriented towards the adoption of intellectual capital within organizational systems, given the international relevance of intangible assets as a new economic base. As a general research topic, we establish the study of intellectual capital in the companies that provide services in the hydrocarbon sector in the state of Tabasco, since nationally and statewide (Tabasco), its main economic force is oil mining.

Finally, the specific issue addressed by the study consists of the factors that influence the obtention of intellectual capital in the companies that provide services in the hydrocarbon sector in the state of Tabasco, since we work under the premise that the intellectual capital approach as a new source of wealth generation in the state has not been adopted, an aspect found during the development of the research protocol.

Applied Tools

Based on the perception of sector experts, the method we used is: structural analysis, which is also part of the design of the double entry matrix, structured with the impact factors in the industry studied and the incidence that each one maintains over the rest. P

ISSN-2524-2105

The matrix offers a broad vision of the interaction that exists between the factors, quantifying the levels of motility and dependence of one factor with respect to others, which outlines its graphic location within a Cartesian plane, classifying the quadrants by zone. According to the methodology, the quadrants are described below:

Quadrant I Conflict Zone
Quadrant II Power Zone
Quadrant III Zone of autonomous problems
Quadrant IV Departure Zone

In order to determine the factors that belong to each zone, we consider their level motility and dependence with respect to the others; the percentage value must be obtained by factor of the two aforementioned items. These values are compared with the parameter determined by the proportional equivalent of the total number of factors. According to the area in which the factor is located, the role it plays is defined.

Once the above is established, the scenario design is concluded, which is used to outline the diagnosis of the current situation of the sector, based on the analytical criteria assessed by the author, who proposes a comprehensive development model that counteracts the critical points identified in the research, in order to achieve the competitiveness of the industry under study.

In addition, the conclusions inferred by the author of the research, according to the results obtained during its development, are grossly expressed, as well as the pertinent recommendations for the implementation of the proposal.

Conclusions

This research paper reflects a pragmatic and synchronous line of work, which is why, like Reed, Lubatkin and Srinivasan (2006), it offers a vision of the company based on intellectual capital and is oriented towards the identification and study of the variables that affect the obtention of intellectual capital in Mexican organizations, starting from the general (the context variables), to the particular (specific incidence factors that are immersed in the context variables).

Currently, the suppliers of the oil industry face a great challenge, due to the great competition that exists in this sector and the political variables. We present the methodology followed in the present investigation, since it is still ongoing.

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ISSN-2524-2105

Article **Journal-Industrial Organization**
June 2019 Vol.3 No.4 7-13

Inventory control policies for a polyester company

Políticas de control de inventario para una fábrica de poliéster

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DOI: 10.35429/JIO.2019.4.3.7.13 Received March 28, 2019; Accepted June 30, 2019

Abstract

In this paper, we study an inventory control model, which is analyzed by means of a difference equation. This model is applied to study the stock of a polyester company. In this company, two types of polyester are manufactured, and it is considered a stochastic demand. In the paper, an optimal policy of production is determined, which minimizes the total expected discounted cost. The one-step cost function is integrated with the following components: production, storage and sale lost. The methodology consists on applied the dynamic programming approach and some results of convex analysis to determine a (R, Q)-optimal policy, where R and Q are positive numbers. R represents the maximum level of production and Q is the minimum stock. Finally, with a company database of monthly sales, we adjust a probability distribution and present a numerical implementation of the optimal. Furthermore, simulations to observe the asymptotic behavior of the stock are illustrated.

Inventory control systems, Markov decision processes, Dynamic programming

Resumen

En este trabajo, estudiamos un modelo de control de inventarios, el cual se analiza mediante una ecuación en diferencias. Este modelo se aplica para estudiar el stock de una fábrica de poliéster. En esta empresa se fabrican dos tipos de poliéster y se considera una demanda estocástica. En el trabajo, se determina una política de producción óptima, que minimiza el costo total descontado esperado. La función de costo de un paso se integra con los siguientes componentes: producción, almacenamiento y ventas perdidas. La metodología consiste en aplicar el enfoque de programación dinámica y algunos resultados del análisis convexo para determinar una política óptima (R, Q), donde R y Q son números positivos. R representa el nivel máximo de producción y Q es el stock mínimo. Finalmente, con una base de datos de ventas mensuales de la compañía, ajustamos a una distribución de probabilidad y presentamos una implementación numérica de la política óptima. Además, se ilustran simulaciones para observar el comportamiento asintótico del stock.

Sistemas de control de inventario, Procesos de decisión de Markov, Programación dinámica

Citation: BLANCAS-RIVERA, Rubén, CRUZ-SUÁREZ, Hugo, TAJONAR-SANABRIA, Francisco Solano and VELASCO-LUNA, Fernando. Inventory control policies for a polyester company. Rinoe Journal-Industrial Organization. 2019. 3-4: 7-13

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Article **Journal-Industrial Organization**
June 2019 Vol.3 No.4 7-13

Introduction

In this work we pose an inventory management problem, which we will model through a dynamic system in discrete time and seek to find the optimal operating strategy in a polyester factory. Inventory management consists in matching supply with demand. The problem rests in searching for an optimal operating strategy that indicates the amount which will be produced or purchased in each period, to minimize the expected total discounted cost.

Historically, this problem is of quite importance in the theory of operation research. We have a first approach to this area of research with the economic order quantity formula (EOQ), proposed by Ford W. Harris in 1913; this model is applied when considering deterministic demands. On the other hand, when there are stochastic demands, there are several models that study inventory management. The first one was proposed by Scarf in 1960, who studied a dynamic system which models inventory management and demonstrates that the optimal operating strategy is (*R, Q*) class. After Scarf, other authors followed him and demonstrated for different dynamic systems that the optimal strategy remains being (R, Q) ([4], [5], [11] and [12]).

In this paper, we consider the demands in different periods as: stochastic, independent and identically distributed. In addition, the dynamic system is Markovian-type and can be identified in a Markov decision model. In this way, Markov Decision Process theory (MDP) can be applied [5]. This model is applied to the control of inventories of two types of polyester, where it is important to consider the aforementioned assumptions and without considering deterministic or fixed demands [9]; besides, optimal operating strategies easy to implement are obtained in this work. The main goal is to show that the optimal strategy is of the form (*R, Q*), also known as reorder point strategies. This kind of strategies consists in producing a level *Q* in the warehouse if the inventory is below *R*, otherwise, production is not carried out.

The work is structured as follows: first, we show the description of the model, where the dynamic system that will model inventory management is proposed, the objective is to find an optimal operating strategy. Through Markov Decision Process theory, we exhibit the existence of an optimal strategy.

Thus, in the following section we show that the characterization of the optimal strategy is (*R, Q*) type. As a main result, we modeled the inventory management of a polyester factory which is identified with a dynamic system and we observed that the assumptions necessary to have optimal strategies (*R, Q*) are met. Finally, we present numerical results of the inventory management of the factory.

Objectives

Shanghai Tang Fashion Company is a textile industry company. This type of industry is one of the most important manufacturing sectors in Indonesia. Relevant data in [8] mention that the textile industry in Indonesia still faces a series of internal and external problems which mainly consist of planning uncertainty due to exchange rate fluctuations that lead to increased production costs and shortages of qualified human resources. Shanghai Tang Company faces a similar problem in terms of inaccuracy of inventory management with uncertainty in demand; for example: the quantity, color and type of products of the company. Some of the products that the company manages are:

– Benhur polyester burr,
– Donker polyester burr.

The objective of this research is to find an inventory management policy in order to minimize costs and meet the demand of the product. In this way, the following considerations about the inventory system will be assumed: the inventory is reviewed at the beginning of each week and the decision of polyester production is made, at the end of the week, the quantity of the product sold in kilograms is counted and the inventory level is saved. For this, we consider the following variables:

1. The amount of Benhur kilograms in the inve weeks denoted by for Do polyester by
2. The amount of Benhur kilograms, produced by , and for Donker by
3. The success of havi production in the war polyester by , demanded fo Donker polyester by

ISSN-2524-2105

4. The demand at the end of the period denoted for Benhur and for Donker by

In this way, we will model the inventory of each product handled by the company with the equation in differences:

$$x_{t+1,s} = x_{t,s} + y_{t,s} - d_{t,s} \quad (1)$$

and $t = 0,1,2, \ldots$, where $x_{t,s}$, $s = 1$ represents the stock of the Benhur polyester and $s = 2$ for the Donker polyester. In addition, we observe that each $x_{t,s}$, $y_{t,s}$ are positive, and their range will be denoted by: $x_{t,s} \in [0, M_{x,s}]$, $y_{t,s} \in [0, M_{y,s}]$, respectively.

Equation (1) is motivated by the work done by David Lindley [7], applied to the theory of waiting lines. We observe that model (1) follows a stochastic Markovian process [6] and fulfills the following hypothesis:

Hypothesis 1

– For each s = 1,2, the sequence $\{D_{t,s}\}_{t=1}^{\infty}$ are independent and identically distributed random variables with a continuous distribution function F_{D_s} and a density function f_{D_s}. In addition, $\mu_{D_s} = E[D_s]$, with E the hope operator associated with the distribution function F_{D_s}.

– The sequence of variables $\{Z_{t,s}\}_{t=1}^{\infty}$ are independent and identically distributed random variables with Bernoulli distribution with parameter p_s and are also independent with the sequence $\{D_{t,s}\}_{t=1}^{\infty}$ for each s = 1,2.

In each period, costs are generated in the inventory; these costs are: storage, production and demand costs not supplied or shortages. Through the following function we contemplate all the costs in each type of polyester, for each s = 1,2:

$$C_{t,s}(x_{t,s}, y_{t,s}) = \begin{cases} c_{y,s} y_{t,s} + h_s x_{t,s} & \text{if } x_{t,s} \geq 0 \\ c_{y,s} y_{t,s} - \pi_s x_{t,s} & \text{if } x_{t,s} < 0 \end{cases} \quad (2)$$

where
$c_{y,s}$ is the fixed cost of production,
ω_s is the cost per kilogram produced,
h_s is the cost per kilogram stored,
π_s is the cost per kilogram missing.

On the other hand, because production always takes positive values, the following is satisfied: $y_{t,s} \in [0, M_{y,s}]$ for each $t = 1, 2, \ldots$. Thus, in each period t a distribution δ_t and the succession of all these distributions $\pi = (\delta_1, \ldots, \delta_{T-1})$ is known as strategy or operation policy, and the set of all strategies is denoted by Π.

A particular case of an operation strategy is Markovian stationary deterministic policies (SDP), which have the characteristic: $\delta_t(x_t) = y_t$ for some measurable function $f : X \to A$. We note that this kind of policy has the main characteristic of having a simple implementation, since it does not involve a probability distribution and only requires the correspondence rule f. An example of an SDP strategy is those of type (R, Q) with $R \leq Q$ defined as follows:

$$f(x_t) = \begin{cases} Q - x_t & \text{if } x_t \leq R \\ 0 & \text{if } x_t > R \end{cases}$$

The model presented in equation (1) induces a stochastic process $\{x_t\}$ with probability distribution P_{π}. $\{x_t\}$ is also a stochastic process that depends on the probability distributions given in a π policy. Thus, there is a problem regarding the probability measure which involves all these distributions. First, we define the stochastic process sample space $\{x_t\}$,

$$(\Omega, \mathcal{F}),$$

with $\mathcal{F}$ its corresponding σ-algebra product. The elements of Ω are of the form

$$\omega = (x_1, x_2, x_3, \ldots),$$

with $x_t \in X$ and $x_t \in A$ for each $t = 0$

Let = { “ } , s = 1,2 and an initial state , then by the Ionescu-Tulcea Theorem [1], there is only one probability measure in (, *F*) such that

for each . The stochastic process ( ) is called the Markov Decision Process at discrete time [6]. The hope with the measure is denoted by

The costs generated in the management of the inventory system at an infinite or long-term horizon can be observed with the following function, for *s* = 1,2

where (0,1) is called a discount factor and means bringing the cost to current value.

Then, the optimal value function is defined

$$v^{z}(x) = \min_{a \in A(x)} \{ C(x,a) + \beta \sum_{y \in X} P(y \mid x,a)\, v^{z}(y) \}, \quad (3)$$

for each x X. To the policy “ that satisfies

$$v^{z}(x) = v(x), \quad (4)$$

is known as an optimal policy or strategy.

The main objective is to find the optimal strategy that satisfies (4) and that it is SDP and (R, Q) type.

Methodology

To find the optimal strategy and the optimal value function (4), we will use the dynamic programming methodology, which consists in dividing the original problem [2] in subproblems. This methodology allows us to find both the optimal value function and the optimal strategy “ .

In order to apply dynamic programming, we first observe that the problem is well defined, that is, that the optimal value function is finite. For this, we use the SDP strategy of never producing in each period, i.e., $f(x) = 0, x \quad 0$, so is not difficult to see that for *s* = 1,2:

Thus, by (4) we have

The following theorem exposes the existence of an optimal SDP strategy and an approximation to the optimal value function . The proof of the Theorem can be consulted in [6].

Theorem 1

1. There is an optimal S
   optimal control probl
2. The functions of iter
   values are d X, fs = n d, 2 fo
   and = 1, 2, . . . ,

$$v_{n+1}(x) = \min_{a \in A(x)} \{ C(x,a) + \beta \sum_{y \in X} P(y \mid x,a)\, v_n(y) \} \quad (5)$$

with , then and the function satisfies the following functional equation

$$v^{z}(x) = \min_{a \in A(x)} \{ C(x,a) + \beta \sum_{y \in X} P(y \mid x,a)\, v^{z}(y) \}$$

for each

Observation:

1. Equation (5) has the
   dynamic programming e
   the original optimiz
   divided into optimizat
   each period and in th
   convergence to the
   function.
2. Using the definition
   (2), the value
   be written as follows

$$v_{n+1}(x) = \min_{a \in A(x)} \{ C(x,a) + \beta \sum_{y \in X} P(y \mid x,a)\, v_n(y) \}$$

With

$$Q_{n+1}(x,a) = C(x,a) + \beta \sum_{y \in X} P(y \mid x,a)\, v_n(y)$$

and

$$v_{n+1}(x) = \min_{a \in A(x)} Q_{n+1}(x,a).$$

Results

The following result on convex functions is an important tool to characterize the optimal strategy and its proof can be consulted in [5].

Lemma 1. If ῄΩϥя ^ я is a convex function and ῄΩ ώ ᴼ Ƅ when *y* , then, there are *R* and *Q* scalars with *R* Ò Q such that

a) ῄΩ ΰ ى ج ῄΩ ώ for each ώ جي π
b) ῄΩ ΰ ط ύ س ῄΩ Ὑ ى ج ῄΩ ώ for each ώ جي π
c) ῄΩ ώ is a decreasing function in ط Ƅ ň Ὑ ,
d) ῄΩ ώ ى ج ῄΩ ᾳ ط ύ for each ώ ň ᾳ with Ὑ ى ج ώ ى ج ᾳ

The following theorem shows that the ώ functions satisfy the hypotheses of Lemma 1. The proof of Theorem 3 can be consulted in [4].

Theorem 3. Considering Hypothesis 1, for each *n* = 1,2, ... the function ώ fulfills:

1. ώ is convex in π ň Ƅ ,
2. Ī Éώ í ň ώ س Ƅ.

In this way, for a horizon *n* = 1,2, ..., the optimal operating strategy is Ὑ ň ῦ class.

Finally, using ώ ᴻ ώ, equation (5) and the previous lemma, we have the following result. The proof of Theorem 4 can be consulted in [4].

Theorem 4. The SDP strategy which solves (4) is (R, Q) class.

Therefore, we can apply the SDP strategy to inventory management of each type of polyester, and give values for *R* and *Q*.

In [8], an inventory study is presented during 2014. First, we observed the efficiency of placing in the warehouse what is required to produce each week. The results are:

Product	Benhur	Donker
Efficiency	85%	80%

Table 1 Eficiencia

Each success or failure to place the product in the warehouse must be independent and, in addition, each implementation ώ has a Bernoulli distribution with parameter ῃ = 0.85, and ώ Bernoulli with parameter ῃ = 0.80.

However, for each type of polyester there are independent demands each month. Based on the data presented in [8], we considered the records of the demands in the first 50 weeks of 2014. Table 2 shows the behavior of the demands in kilograms of some weeks.

Demand (kg)	Benhur	Donker
Week 1	229	632
Week 2	253.9	554.4
Week 3	266	495.9
Week 5	248.5	407.1
Week 10	191.11	380.3
Week 20	200.7	350.5
Week 30	306.5	392.8
Week 40	332.5	461.7
Week 50	130	356.8

Table 2 Demanda

With the data obtained from the demands in 2014, we made an adjustment to a probability distribution. Using the Kolmogorov Smirnov test [10], the demand for each polyester is adjusted to a normal and uniform mixed distribution with their respective parameters.

Demand/polyester	Benhur	Donker
Uniform (a,b)	ώ س ς σ τ ώ س ς φ	ώ س τ ς ώ س φ ς
Normal (ʻ ň „ ˙)	ʻ س ς φ „ ˙ س ρ	ʻ س τ υ „ ˙ س ρ
Confidence level	94%	97%

Table 3 Distribución de la demanda

In this way, Hypothesis 1 is satisfied.

We looked for the cost function (2). In Table 3 we present the fixed production costs, per ordered or produced unit of storage, and shortage per kilogram.

Product	Benhur	Donker
Fixed order cost	ύ س υ	ύ س ω
Cost per order	ώ س ρ τ	ώ س σ τ
Cost per storage	ῄΩ س σ ς	ῄΩ س σ τ
Shortage cost	ᾳ س ρ ω	ᾳ س ρ φ

Table 4 Costos

According to (2), the cost functions for each polyester are expressed as follows:

Benhur

ὅ ώ ň ώ س ύ ρ ط ώ ώ ط ῄΩ Ὸ ώ ط
ώ ώ ط ᾳ Ὸ Ὸ ط ώ ط ώ ώ ^ ,

ISSN-2524-2105

Donker

ő˙ ὠhὤ سي ṅ. ρ ةـي طὤὤطʺΩʹΟ ὠط
ὤ˙ὤ طάʹΟ ʹΟ˙ طي ὠطὤ˙ὤ ^ .

Once identifying the variables involved in model (1), and complying with Hypothesis 1, Theorem 4 is applied and we obtain a policy (*R*, *Q*) class for a finite horizon.

Estimates of the optimal value functions (5) are made in each period, *n* = 1 , 2 , , 52 and the values of ˈYح and ῦح that characterize the optimal policy. Let us remember that ῦح is the minimum of the ʺϘ function defined in (5). The value of ˈYح is calculated by solving the equation given in Lemma 1:

ʺϘح ῦح طṅ سيʺϘح ˈYح .

In the following table we show the results using the discount factor *Ŭ*= 0.9 for each polyester.

Week	ˈYح	ῦح
1	287.5	298.3
2	287.8	298.9
10	289.6	299.2
20	289.8	299.3
30	290.1	299.3
40	290.5	299.3
50	290.7	299.3

Table 5 Política óptima para Benhur

Week	ˈYح	ῦح
1	431.2	632.87
2	433.5	633.8
10	431.9	634.1
20	432.1	635.9
30	432.1	635.9
40	432.4	636.2
50	434.5	637.0

Table 6 Política óptima para Donker

Conclusions

According to the results, we have the following recommendations to obtain the optimal cost at the end of the year.

– For Benhur polyester, if it has a capacity of less than 287.5 kg, it is requested to produce the quantity necessary to reach 299.3 kg. Otherwise, no production is requested.

– For Donker polyester, more kilograms of this type of polyester are produced until 431.1 kg is in stock, provided that the stock is below 637 kg. Otherwise, no production is requested.

This shows the importance of having optimal policies (SDP) belonging to (*R, Q*) class, since they present an easy solution to apply to an inventory system, as in the case of this polyester company.

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ISSN-2524-2105

Article **Journal-Industrial Organization**
June 2019 Vol.3 No.4 14-27

Application of a change model, in the Industrializer de la Madera Colibrí, S. de R. L, in order to redesign the production line

Aplicación de un modelo de cambio, en la Industrializadora de la Madera Colibrí, S. de R.L., a fin de rediseñar la línea de producción

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DOI: 10.35429/JIO.2019.4.3.14.27 Received March 28, 2019; Accepted June 20, 2019

Abstract

The organizational culture of the zone, the micro and medium company does not have any kind of specialized technical advice, much less with the application of integral collaborative consulting The model is related in parallel with applied research, thus providing an alternative solution or guide for people who are going to be venturing into the development of Action-Research, whatever the field of application, and which is difficult to find the characteristics special, applied in the field of work, and above all, click on the results of that application. It can also be modified by its components, since it must have particularity that each company requires to operate or solve a problem at any level and what this entails, since it mainly focuses on Quality as a tool, not as an end; because the end of the first achievement of any organization will be just the certification to venture into new stages that the total quality demands

Model, Quality, Tool

Resumen

La cultura organizacional de la región, la micro y media empresa no cuenta con algún tipo de asesoría técnica especializada, mucho menos con la aplicación de la consultoría integral colaborativa. El modelo contribuye paralelamente a la investigación aplicada, dando así una alternativa de solución o guía para aquellas personas que van incursionando en el desarrollo de la Investigación-Acción, sea cual fuere el campo de aplicación, ya que es difícil encontrar ejemplares con las características especiales, aplicadas en el terreno laboral, y sobre todo, que haga evidente los resultados de dicha aplicación. También puede ser modificado por sus componentes, ya que debe tener la particularidad que cada empresa requiere para operar o solucionar algún problema en cualquier nivel y lo que esto conlleva, ya que principalmente enfoca a la Calidad como herramienta, no como un fin; pues el fin del primer logro de cualquier organización será apenas la certificación para incursionar a nuevas etapas que la calidad total demanda.

Modelo, Calidad, Herramienta

Citation: GONZÁLEZ-RAMÍREZ, Claudia Teresa, VALDESPINO-MORA, Rebeca and PEREZ-PALOMARES, Violeta Nallely. Application of a change model, in the Industrializer de la Madera Colibrí, S. de R. L, in order to redesign the production line. Journal-Industrial Organization. 2019. 3-4: 14-27

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Introduction

The purpose of this article is to present the application of a Change Model in the Industrializadora de la Madera Colibrí, S. de R. L., in order to redesign the production line. Due to the organizational culture of the region, micro and media companies do not have any type of specialized technical advice, much less the application of collaborative integral consulting.

The monterli bcuot es in poriginated by the activities carried applied research, thus application of the change model and the redesign solution or guide for of the production line. into the develop-Action of the Research whatever the field of **Background** cation, since it i difficult to find copies with the special characteristics, appli above all, that makes application.

The structuring of this research is presented in such a way that each section establishes some definitions, concepts, tools or situations, as well as the suggestion to develop them. Pretending that the reader has an overview of how he can develop his own model for the company that will be consulted.

Background and Diagnosis. The company is described at the beginning, as well as current situation to have an understanding of its evolution.

Organizational Culture In this section the basic components to start the process of change are approached, providing the necessary tools to obtain the vision, mission and objectives of the company, through sessions with the most important factor of the organization that are the workers.

Case study. The project of the change model is presented, the main problem detected by the group of stakeholders was the Re-design of the Wood Goods Production Line, which is stated in its general objective, the application is raised of the 5´s, as well as the process for the achievement of aspirations, duly justified.

The relevance of applying these tools (parallel to the redesign) was analyzed with those involved, since the application of the 5's is essential, as a basis for continuous improvement and after this program has been implemented and maturity is assessed.

The group should follow up on the feedback of the action plans that are operating under the problem-solving process, ensuring that solutions to the problem presented are generated. Methodological approach. To obtain results of the objectives set out in the company, it is important to transmit the new approach to see the organization as a process, through the elements of the integral collaborative consulting.

The results show the quantitative data we are venturing i
Background
The industry in Mexico has been losing ld, competitiveness, this is due to the fact that many of s of the occasions the dynamics of each organization are due to circumstantial factors, but not in a habitual or customary way, coupled with the lack of support from a policy. -ca well defined and planned to increase the potential of a country like ours with rich natural resources, but without the competitive environment, this is warned by the Center for Industry Studies (CIS), an analysis body of the Confederation of Industrial Chambers (Con-camin).

It is unavoidable that Mexican companies make modifications in administrative, financial, productive, investment, commercialization, but, in order for it to be carried out, a substantial change in mentality, attitude and the action. To achieve the above, the company requires support in its different areas with advice from experienced and specialized personnel that promotes and helps to implement integral strategies for the organization, this change in the organization is a difficult but not impossible factor, as long as the company has the willingness to do so in all its aspects.

Specialized advice within a company promotes the achievement of a better return on resources, considering that it is not a new problem; It is something that organizations have suffered for years, inclining them to try to resolve these situations with their own staff, without having good results due to lack of training, updating and specialization of the same, or paying large sums of money when hiring signatures of consulting to help them implement methods and ideas for improvements, and again without achieving the expected results.

ISSN-2524-2105

It is difficult to keep a company afloat in the midst of a weak economy and often the absence of an organizational culture brings with it the lack of efficient management methods. Industrializadora de la madera Colibrí, S. de R.L., dedicated to the transformation of wood into handles for hand tools, has entered into the manufacture of plastic handles for shovels. Having antecedents in the wood works initiated from the year of with a workforce of 40 workers, located in circuit 2 west, Apple 3 Lot 9, of the industrial park of H. Zitácuaro, Mich.

The company is located in an area of approximately 1,000 square meters, distributed in the following areas: 1 for plastics, 5 for wood, 9 for process, 1 space for wood ovens, dressing area and check-in area , 1 dining room and administration area.

One of his main achievements is presented in the process of manufacturing wooden handles because his experience and knowledge of this product has allowed him to reach a level of competitiveness, originating his incursion with transnational companies such as: TRUPPER, Fab-rica of Brochas la Azteca, among others.

Justification

La Industrializadora de la Madera Colibrí, S. de RL, argues the beginning of a shift towards productivity, based on the needs and benefits that remain uncovered from the approaches made in the diagnosis, to mention the lack of recruitment and selection, in order to have the appropriate people for the work to be done, which has generated a high turnover.

There are great distances between the machines, which generates a greater use of time in transferring the material from one machine to another, as well as personnel and idle machinery, as a result of the above there is also waste and rework because the sequence of the operation that each of the products they produce is not known.

The problem lies in the ignorance of what quality is, with the foregoing it is again confirmed that even in this century there are companies that continue to work on the stereotyped inheritance that has been used from generation to generation.

The Industrializadora Colibrí has now entered into a transition with this model of change, having as a strategy the training throughout the company, to mention some of them. The fact of being in a world where competitiveness and quality systems are the value of each service provided has prompted Colibri to mount the change, taking into account that quality is everyone's business or does not work.

Objective

General

Provide the Industrializadora de la Madera Colibrí, S. de R. L., with its own exchange capacity.

Specific

Apply a situational diagnosis to the company
Use comprehensive collaborative consulting tools
Use effective techniques and tools in the interaction method,
Train in organizational culture
Apply the problem solving process
Generate an ad hoc change model to the organization

Research question

Is it possible to strengthen the company, through the application of a Change Model?

Theoretical basis

Investigation action.

Kurt Lewin (1951) considered the father of action research, said: The research necessary for social practice can be better characterized as research for social engineering or social management. Strictly action research does not have to define a new type of research project, since its working modality generates knowledge, produces changes and is compatible with other types of research..

The actions of this methodology originate in the context of education, but it has been expanding its application in other fields of science, since its name says so, there is a great link with the cognitive and obtain measurable effects in reality. of the object of study.

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Among its most typical features is the participatory character: through those involved or people who are within the organization who own the process under study. The project contextually adopted action research, a methodology that facilitates that the planned activities in any field of labor application are tied to technological development, with this methodology approach in which it consists of acting immediately when a problem has been identified that It is clear and feasible of a solution, in this way credibility is gained in the process since tangible results are being offered from the first moments of resolution for the organization, so results are not expected until the end of the consultancy , influencing reality through the workers involved seeking to solve problems and needs, being these same process self-managers.

Diagnosis

Its main function is to examine the problem facing the company thoroughly, uncover the factors and forces that cause the problem.

Before initiating the diagnosis, the first phase is the one that is the entrance, where the psycho-logical and formal commitments with the owner of the company are established, identifying the object of change to reach the desired state to through logistic assurance, relationship building and understanding of the situation. (Guizar, 1999), logistic assurance, ratification and rectification of stakeholders or group members, who will suggest the area where interviews and meetings will be held, in addition to the time available to carry out the various scheduled activities.

Analysis Plans

In figure 1 five levels are shown, in it you can establish the degree of detail that is required to study the system or process as height is gained, these are: satellite level, plane, helicopter.

Figure 1 Analysis Plane

The microscope is the lowest level where detailed analyzes, cabinet or laboratory investigations, historical records or specific calculations are carried out at the tip of a pencil.

The level of man with feet on the ground is associated with those who in a tour of the facility can be seen with the naked eye, such as the location of workers in the different operations of the production process, the problems related to the organizational environment.

The superior planes of analysis, helicopter, airplane, and satellite are reserved for the most general aspects to consider, men feet on the ground and magnifying glass are warned in those aspects in greater detail, preventing trees from preventing us from seeing the forest and thus achieving an adequate distance from the present problems (di-agnostic), the desired future (vision) and the ways to achieve it (strategy).

Another methodological consideration of transcendence is the approach of the organization. Traditionally, a company is analyzed for its functionality by its hierarchical structure, by the levels of management involved and / or the functional dependencies involved in the research object. See figure 2.

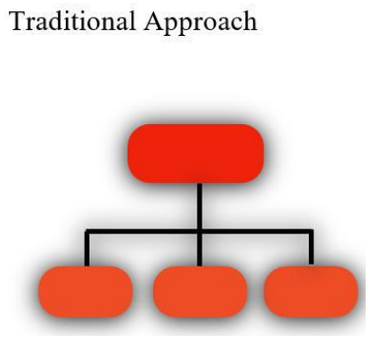

Figure 2 Traditional approach-hierarchy

With a new approach, the analysis is carried out on the basis of the organization as a process, Starting from this and from a satellite analysis plane, some examples could be: ministers, transformation, distribution and sales. Figure 3.

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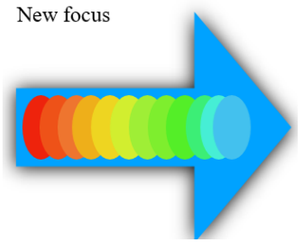

Figure 3 New approach - process

Interactive method

This method is the channel through which runs the actions of the integral collaborative consultancy that was applied to this project to achieve the change proposed by the members of the organization, being they the owners and maximum responsibility of the content of the solution proposals.

It is difficult to conduct effective meetings if you do not have a minimum knowledge of the groups and the phenomena that occur in them, so it is necessary for people to interact and influence each other, interaction is a key element of forming a group; therefore the combination of interaction, communication and participation are three indissoluble phenomena within a group.

The interactive method helps to have a common approach, generate a pro-active atmosphere, suggest techniques to solve problems, be alert against manipulations, be effective, facilitating meetings to function in a timely manner, techniques must be adapted to the personality and needs of the group involved, if not, adjust or modify.

Key characters of the interaction method.

The facilitator It is neutral to the group, does not contribute to their ideas or evaluate them, helps focus the energies of the group by suggesting alternative methods and procedures, protects the members of the group and gives everyone the same opportunity to participate, provides the logistics necessary before and after the meeting.

The register. Write down the basic ideas in pan-letters in front of the participants, collect the ideas of the exponent, do not evaluate them; captures ideas with great word savings, this way of registering does not slow the development of a re-union.

The head of a group. He does not conduct the meeting, he is an active participant, he retains all his powers and responsibilities, he makes the final decisions, he takes control of the meeting if he is not satisfied in the development, he is responsible for the agenda.

The group member He is an active participant in the meeting, he keeps the facilitator and the registrar in his neutral roles, he makes sure that the basic ideas are recorded; makes procedural suggestions and determines the course of the meeting.

Number of participants. The optimal size is 7 + 2, it cannot be less than five or greater than nine. In the industry the tasks performed in Small groups are more satisfied than those who participate in large groups.

Organizational culture

There are many companies that decide to implement new operation models throughout the company, whether of quality, sales, suppliers, etc., without taking into account a determining factor to maintain and reach maturity of the new system to be established, that is, to create a culture of total quality, being that leadership and administration are the essential ingredients that allow a company to develop better in today's and tomorrow's competitiveness. (Joe, B. 1998).

The integral collaborative consulting

In this process the role of the consultant is very important and its objective is to help the organizational system to improve its adaptability. This logic leads us to the concept of process consultation in which the consultant helps the organization make a diagnosis of itself, select its adaptation responses and determine its own progress.

The current technical-scientific revolution is shaping the traditional integral and collaborative cut, which indicates five phases: entry, diagnosis, response, disunity and closure, which were basic elements in all action in the project that are supported by the consultancy collaborative integral as shown in the following figure 4.

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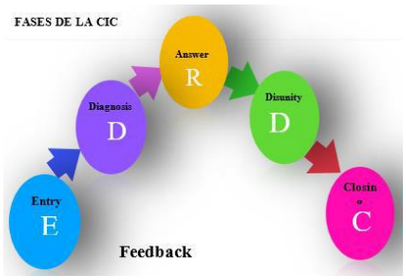

Figure 4 Traditional Court of Collaborative Integral Consulting

Entry. Phase where the psychological and formal commitments with the employer are specified, refers promptly to the logistics and the ob-links that both parties contract.

Diagnosis. At this stage, relations with those involved in the company are deepened, not only based on the declarations of entry with the employer, but also on the concrete actions that are lived in the organization; is when the consultant knows many elements of the Organizational Culture and the Values in which they interact, this facilitates the detection of existing problems and frustrations, as well as the approximation of potential barriers that will interpose in the process of change.

Answer. They are the action plans derived from the diagnosis, this scheme is useful to specify the fundamental content of the stage.

Disunity. This is carried out in an imperceptible way when the organization has begun to internalize a new style to realize its own capacity for change.

Closing. It is a formal moment where it is very clear that the objectives set out at the entrance have been achieved and that the formal and psychological commitments have been met.

The involved It is those who make the final decision, those who are affected by them, those who possess the relevant skill and experience in the matters to be treated, who can slow down or accelerate decisions according to the position they occupy.

Troubleshooting Process

The problem solving proc
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collaborative integral c
participation of workers
the way to achieve succ
common process, it provi
map to follow, a common
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The approach allows u
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It is important to mention the participants at the beginning of each meeting the depersonification of the problems, not to find guilty, but to reveal the causes that originate it, thus co-combining all efforts to change the current situation, the problems are categorized according to the essential process and the way they affect.

This process is indep
collaboration and collab
consulting, but ithoids as
of interaction; hence th
the potential for actio
committed leadership in
valuable aspirations, mo
participants and face the
that mahkee puspoblvemg proces

Problem Identification and Selection. It is a very important stage of the process, the situation to be changed is written, how is it really?

Problem Analysis The causes are not analyzed, if you have a well identified problem you can move forward. It is necessary to consider two questions: What do you want to know? When do you know what you are going to do?

Potential Solutions Generation. The previous steps are considered, and it is important to review the problem definition, the key causes, the positive and negative forces, as well as the limitations.

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Selection and planning of the solution. The decision is taken of the potential elements because they have to choose from, action plans are made that are the implementation of the solution.

Solution application. In this phase it is executed and controls the solution according to the plan developed in the previous step.

Solution Evaluation. In this phase the circle can be closed when evaluating the results, it is evident when a change in circumstances, situation, people and their actions is recognized, culminating directly where the identification stage begins, which leads to a new cycle of problem solving.

Change Model

It is important that each member of the company is generated to be confident and involved

In the change. For this, information sessions were held, dynamic related to the thematic and some social events focused on gaining a better level of integration, significant actions such as, writing down each their triumphs in life and in the same way frustrations, making with the latter a deposit of waste (to which we set fire), displays of affection and delivery of equipment where they declared themselves to fight for one and for the others, just to mention a few.

It is important not to ignore the following fundamental principles for the creation of a culture of change:

Each person is a set of strengths and weaknesses, the important thing is that all are areas of opportunity.
Everyone needs to have a sense of purpose, direction and expectations.
One must expect the best of all that life provides us. An internal life of quality leads to a satisfactory life.
People with strong ideas provide a vision that transcends, engages with people, service, innovation and quality. Their commitment is that all members of an organization be free, positive and expanding.

Because people become what they think, decide and do, it is necessary to know some terms related to the subject, for their understanding as visionaries:

View. It is the situation that our mind sees. Imagine the macro results you want to get.

Mission. It is a general statement focused on the macro results that are sought; It is the basis of the objectives and expectations specific. Dream. It is a deep and hopeful feeling about the possible, but without specific intent.

Philosophy. It is generally a relatively complete set of truths, values and beliefs that feed, found and focus the origin of the dream, the stimulation of the vision, and the formulation of the mission. The key components of a Cam-bio Model are:

Commitment to a vision, mission, and transcendent goals.
Recognition that people will follow those who learn, not those who already know.
Focus on the logical and creative deployment of people's strengths focused on systemic change.
Practice the values continuously.
Timely delivery of incentives.
Promotion and training of self-directed teams.
Promotion of the purposeful behavior.
Focus on positive results.
Foster leadership in the process.
Mutual belief that "we can achieve anything.
Generate a culture of commitment to continuous learning and the new dimensions of the service.
Creation of a work evaluation criterion based on innovation, quality, creativity and change.
Setting policies and programs that support and increase the high level of physical, mental and spiritual energy.
Expansion and evidence of all dimensions provided by organizational change.

Daily exposure to one or more of these statements can change the attitude of workers within an organization. Attitude is everything. Attitudes are the mental and emotional manifestations of values.

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Members of a team that possess authority feel valuable and are able to perform a higher quality of workforce than those who feel without authority, confused, negative and open or secretly hostile. Paradigm changes must focus, with an almost maniacal intensity, on delegating authority to the individual and the team.

Methodology to develop

In every project it is important to consider the constitutive elements for each stage of action, and in the investigation - action in combination with integral collaborative consulting is no exception, in this subject a compilation of the elements to take Organizational interventions such as analysis plans for understanding and problem solving, A new approach to see the organization as processes.

It is important to emphasize that the activities applied were the five stages of the collaborative integral consulting process.

Entry

The Wood Industrialist "Colibrí" has weak organizational objectives (identified in the phase of formal commitments). When talking with some of the workers, they feel the need to be clear about the activities that they must carry out, since sometimes they are changed from machine or labor to attend to other tasks, lack of controls on orders and product deliveries, Orders are met without providing the raw material and human resources to carry out the task.

Diagnosis

Describe the causes of organizational problems, as well as identify the guidelines for the future development of the company, in the quality of products and services, to meet or re-base customer expectations.

The questionnaires and interviews will be applicable throughout the organization, aimed at: Management level, middle management level and line operator level. The diagnosis determination was based on the application of 3 instruments:

"Johary" window. Know the degree of openness of the company, in its direction and understanding in inter-person relations, with the purpose of measuring effectiveness and knowing the disposition with which you have for the transition to a model of change.

Diagnosis for Quality. Describe the causes of the organization's problems, as well as identify the actions for the development of the company.

Process for Organizational Development. Know through this too application of questionnaires and interviews, the type of participation, climate, values and innovation, as well as the needs of staff within the organization,

Answer

The method of interaction was considered as the backbone of meetings with those involved, since much work is carried out in a short time, it is dynamic and motivating,

It contributes to individual responsibility with regard to group decisions, it is flexible and practical to be used in part or in its entirety.

The process of analysis for change is not unique and linear, but totally iterative, on which it turns again and again to refine and deepen the analysis, so it must be considered an open-ended process, where it does not end any field; but simply when there is a cut that can subsequently be continued. It is not necessary to worry if in the first iterations the analyzes are incomplete, since the process to be repetitive and as the analysis plane is lowered, the depth and detail is guaranteed as far as it is desired to arrive.

Definition of the Mission, Vision and Quality Policies by those involved in different sessions, contributing to the identification of those involved in the organization

Change Model, Vision

It is an important achievement integrate the elements s figure 5

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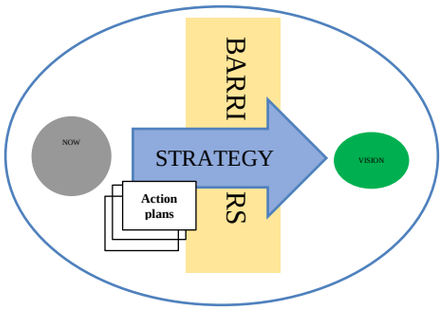

Figure 5 Change Model

The + - SS amedfers to the Now is the starting epotihnet owhgeanization is located The positive aspects constituting the forces t achei etvhe desired change, the negative aspects are necessary to define and identify their caus to be subsequently eliminated or turn them int positive forces. It is now important to identi those involved through the essential process o the company.

Problem Solving Process

Key element for the process of implementing the change model, its elements are:

Problem identification and selection.
Problem Analysis
Generation of potential solutions.
Selection and planning of the solution.
Solution application.
Solution Evaluation.

Techniques for the Problem Solving Process To generate ideas and gather information:

– Brainstorming
– Writing ideas
– Diagram Why? For what?
– How diagram? When?
– Verification Forms
– Interviews and surveys
– To select ideas and achieve consensus:
– Listing Reduction
– Balance Sheets (Positive - Negative)
– Weighted Voting
– Criteria assessment models
– Paired Comparisons
– To plan actions:
– Flowchart
– Gantt chart
– Critical Route Diagram (PERT-CPM).
– To analyze and reflect data:
– Cause-Effect Diagram (Ishikawa Fishbone)
– Force field analysis
– Histogram
– Pareto Analysis (20 x 80) Sector Chart
– Time Graphs

Process Approach and Improvement Continues for Quality

It is vital to carry out an analysis of the various organizational aspects, such as the responsibility of management, resource management, product realization, analysis, measurement and improvement, effectively combining innovation, allowing the company to ensure its future success. . To reach total quality, we must understand that this implies a radical change in people's mentality, the conception of the organization and the improvement processes that characterize this approach.. In each phase and activity the feedback cannot be lacking with all those involved in and out of the sessions, this gives an exponential strength to the process of change.

Case study

The entrance to the Industrialization of the Colibrí Wood was carried out, in order to give clarity and follow-up to the methodological process and action plans generated in each of the sessions, its monitoring and feedback.

Entry. In the first interview, a relationship was established with Mr. Gustavo Colín Uribe, explaining the objective of a new approach to work, professional work, and the needs of the organization, where the psychological commitment was established and formal, in this way it allowed us to carry out professional activities and follow up the work process map, exhausting all the issues and reaching feedback, resulting in him recognizing the needs of his company, and showing himself willing to collaborate in the activities that arose through the realization of the consulting work of the new collaborative and comprehensive approach and as a trigger for the change model.

To make known the concepts that will be used hereafter, as well as the methodology to follow in each of the sessions, such as:

– Commitment.
– Integral collaborative consulting concept.
– Change Model
– training

ISSN-2524-2105

– Involved
– Brainstorm
– Essential process

With all of the above, apart from allowing them to work better and with greater security, it gives them greater satisfaction, since they can see everything in order and cleanliness without anyone invading their assigned areas; so they save a lot of time for any operation.

The organization and distribution of areas allowed taking advantage of a space for dressing rooms and check-in; same that will facilitate with its proximity the access to your working day, as well as at the end of it, without this cause delays in clock records.

Diagnosis. First, the quality diagnostic questionnaires were prepared according to the company, as well as the analysis and review of the other two questionnaires. The whole logistic aspect was prepared as it is: An isolated place of any type of person who works in the company, with the purpose of giving absolute freedom to the respondent, since this type of instrument of information collection allows that the individual makes statements and / or reflections that he does not dare to share or Even with his best partner, they were asked that the information was confidential and that was the case.

The company was informed of the results obtained at the meeting following the application of the surveys; of which they expressed (those involved):

– Actually the Johary Window seemed very good tool and we are willing to carry out dynamics and / or techniques that allow us to develop skills and improve ourselves.

– The information thrown at us was very useful since it makes us more clear on how we are as a company.

– This type of questionnaire has helped us to obtain who will be in charge of the Assurance of the Quality, as well as who can form the Committee for Quality Assurance, and also confirms the proposal they had for these assignments.

The administrative party was able to verify the level of integration of each of the workers from these tools, which allowed them to start, they only allowed them to put the front mirror so that they could be seen; as an individual and as a work team, or at least how they conceived it until then.

Since then we see that there is greater participation of workers, in the contribution of ideas seeking change.

Determination in session with those involved in their essential process of the Colibri Industializer. See figure 7.

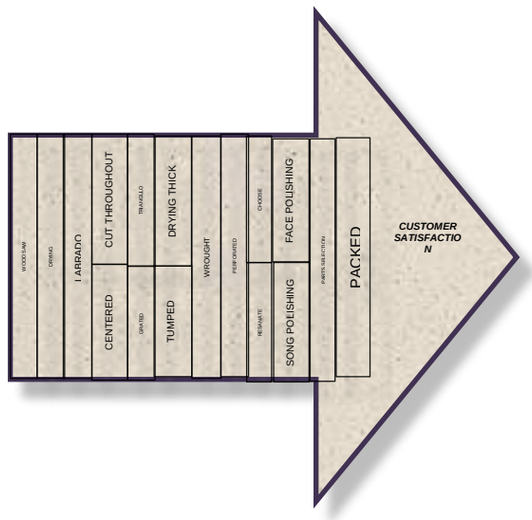

Figure 7 Essential Hummingbird Process

One of the actions of those involved with great impact was to achieve the definition and implementation of the following:

Colibri Mission

“ In the company our mission is to meet the needs of our customers, with staff satisfied and author made, in wood and plastic products, with quality”.

Hummingbird Vision

"To be a quality company at the state level, leader in the field".

Colibri Quality Policy

"Provide our customers with constant satisfaction through reliable products and services in an efficient and timely manner, at a fair price, maintaining excellent organizational health and generating a culture that contributes to environmental protection".

List of Problems and Frustrations

It was done through brainstorming, where those involved poured all the problematic situations that afflicted the company, having 19 problems.
Hierarchy Matrix

In order to solve the company's problems, the main problems were addressed, the hierarchy matrix was carried out and classified according to the following: High Control, Short Time, Low Cost and High Impact.

The resulting problems were the following:

1. Generate responsibility in workers.
2. Lack of quality control.
3. Lack of communication between staff.

A tour of the production line was resumed in the next consulting session, taking as a standard the essential process of the company (also generated by them) with the purpose that those involved ratify their status as experts, verifying step by step each component of the same and observe the reality of work under the production hall. Following the route that was made on the production line, it was determined that the distances between each machine presented a problem during the process of each product that was made, in addition the existence of idle machinery was detected, consequence of the distances and the disorder of the same.

An accumulation of sacks was discovered, all in disarray, scrambled, containing waste of rework and pieces of boards, which are sometimes used to remove sticks and brushes; such accumulation increasingly invades the production line, since the amount of wood leftovers generated per day is excessive; In addition, each of the sacks are not labeled or identified, which generates a lot of waste of time in the selection of the material (in the case of reworking). From the training given on the essential process and on the verification on the line and analysis of the problem, those involved at the end of the route along the line concluded that the problem prior to the lack of quality control was the redesign of the line, since when verifying the essential process that was formed in the first meeting they could see an exaggerated disorder in the location of the machines as well as the enormous separation that exists between some of them.

So it was agreed to attack this problem; for which it proceeded to redesign the line of work through a following Action Plan.

Conclusions of the Case Study

The culture for quality must be entering the organization and people in a way so natural, training and driving, to allow so that the effect of the acid test is facilitated, for each innovation, proposal or redesign, to reach the levels where it has to be validated or discarded, so that it is authentic.

In case of passing the acid test, the administration may be certain or not of how well the company system knows that directs, and on the other hand, the rest of the organization, will be the balance between the ideal and the real.

When it is possible to prove and approve a proposal of a certain nature and that has been shaped by those involved in it, a reason for satisfaction and pride is created, but above all the ties of confident, for the fact of having trusted in himself.

It is clear that there can be no improvement without those involved. Feedback gives strength to the cohesion of the group of stakeholders.

Results

The research - action has as fundamental objective to obtain tangible results for the benefit of the organization. In this section The work process carried out in each organizational intervention is presented, where the concepts and models are validated to act in a more effective, capable and intelligent way and obtain the desired results.

In the planning process, emphasis is placed on the importance of being oriented inward rather than outwardly, changing the way of interacting by modifying formal organizational structures, discovering the most useful interaction patterns that exist between people and people. processes.

ISSN-2524-2105

Redesign of the Line

Waste:

The waste was generated after the manufacture of all products, which was no longer affordable to give other treatment to take advantage of it, an average of 10 bags per day were generated that were reserved in a specific area for when there was a considerable number for sale, because if it were sold on a daily basis it would cause a very high cost of transfer since it is delivered directly to the customer at his address.

Of the 10 sacks mentioned, the material that could be considered as raw material for other products to be manufactured was selected, such as: taquete, wooden brush and brooch, separating 2 sacks of material for said products, so the 25% waste.

Positive results were obtained from the sale of products derived from the waste material and from it, see Table 1.

Product	Quantity in piece	Cost	Income Obtained
Waste	240	$ 5.00	$ 1,200.00
Skewer	14,000	0.12	1,680.00
Brush	4,000	1.5	6,000.00
Total			$ 8,880.00

Table 1 Income from the sale of derivative products

There is an order of 100,000 pieces of skewer.

- The implantation of [illegible]s resulted in savings in the supply of electric power, being $2,315.00, going from an initial consumption in the amount of $5,554.00 to an end of $3,239.00 with a saving of 42%
- Decrease in staff turnover by 10%
- Workers' absences decreased from 5% to 3%
- The variety of manufactured items increased, 20 different products were manufactured, currently 30, increasing by 50%
- The idle machinery with 27%, currently it is 13.5%
- Currently there are no idle personnel.
- Punctuality increased by 35%
- Production increased from 5,000 pieces to 6,000 with a unit making of $2.50, a profit of $2,500 per day.

Production Line Design

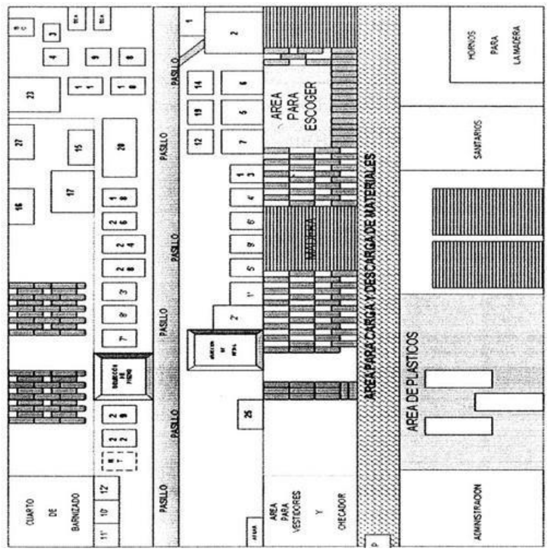

Figure 7 New Production Line

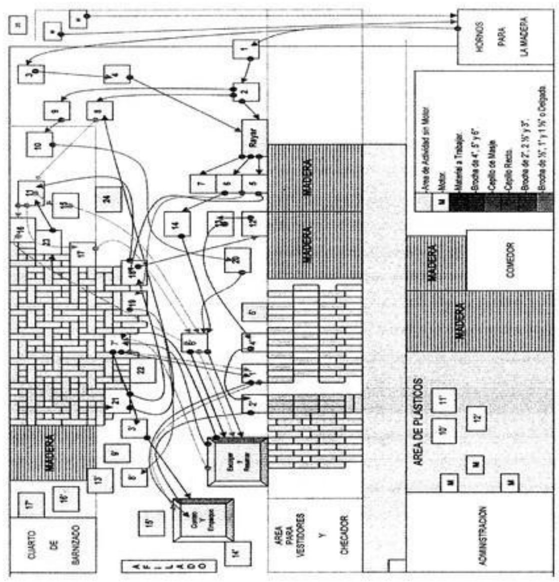

Figure 6 Initial scheme of the Production line

Through the management as a standard of the Model of Change proposed for the organization and in the cause the Collaborative Integral Consultancy given to the Industrializadora de la Madera "Colibrí" S. de RL, it was possible to design and implement a model of change orientation towards quality, based on the needs of the company, breaking mental schemes and customs that did not allow them to grow as people and as a company. From the diagnosis and the feedbacks, made to the company, the training processes were opened, decreasing the resistance to change more and more, this is proven from the degree of self-opening and receptivity to feedback, declaring the balance to criticize and be criticized constructively, according to the objective of Johary's window.

ISSN-2524-2105

With the questionnaire for Quality applied, acceptance of leadership and openness to change is allowed, based on the formulation of questions at the 3 declared levels, allowing to locate the ideal people to lead in the production area.

With the training given to the Model of Change (MC), Interaction Method (MI), Problem Solving Process (PSP), Achievement of Aspirations, etc., were triggers to mount the change. At the beginning of the work with those involved, all purchases were covered with loans from the bank, now and from the savings and profits and the application of consulting strategies the debt is covered and invested in the same, without having to request additional bank credits. A palpable example is that initially the company had only the wooden products ship, now the ship has plastic products.

The quantitative results presented are thanks to the delivery of those involved in the transformation of their organization, fulfillment and feedback of the action plans, initiated from the organizational culture, diagnosis, etc., which were mentioned above.

Discussion

It is observed that when applying a Change Model, the method of interaction that leads the company to guide its thinking to process is essential, promotes an organizational change, based on the definition of its vision, mission, and values, and thus starting from small and simple modifications in the line of production, allowing the increase of items produced that satisfy quality and service customer expectations. With the re-design of the line, machinery and personnel were optimized, since with the same capacity installed they met the orders that were increasing over time.

Care should be taken to produce over installed capacity, because it would generate high storage costs in case of not having more orders, in people it causes work stress that affects the loss of sense of belonging and commitment to the organization. Senior management should not lose its new focus of seeing its company with the capacity for continuous change that involves everyone.

The Industrializadora de la Madera Colibrí, has been an area of opportunity in the eastern region of Michoacán, generating employment sources, as well as an economic spill in the acquisition of local goods and services, providing spaces for practitioners of technical education , superior and postgraduate, creating a win-win situation.

Being able to identify the areas of opportunity for growth, change and that everyone wins in the aspects (personal, family, social and organizational) set the tone to continue with a proactive attitude. In this investigation –action carried out in the Wood Industrialization company with tools of the collaborative integral consultancy, with significant results, only some weaknesses of the organization were addressed, having as areas of opportunity in:

– Marketing; apply current tools to open the market and have continuous growth
– Financial rehabilitation, provide components, training in use and application of these to stabilize and plan the finances of the organization.
– Engineering, document in full the procedures for the preparation of all products of the economic entity.
– Just in time, implement add hoc models to cover production and storage
– of the finished products, in the levels
– according to the facilities of the Wood Industrializer.

The activities carried out were directed from the approach of the collaborative integral consultancy with the change model, this generates a perfectly cohesive binomial, which allows an organization to provide its own capacity for change, an action that is not easy to obtain and develop but with the inclusion of the workers called involved gives the opportunity to do so.

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ISSN-2524-2105

Article **Journal-Industrial Organization**
June 2019 Vol.3 No.4 28-34

Electronic control card for transmission of mobile load crane type KRUPP

Tarjeta de control electrónica para transmisión de grúa de carga móvil tipo KRUPP

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DOI: 10.35429/JIO.2019.4.3.28.34 Received May 28, 2019; Accepted June 30, 2019

Abstract

The design, modification and control of machinery and industrial equipment plays a very important role in any company, where machinery and / or equipment is found which are out of operation due to the lack of an electrical / electronic control part which possibly By the model of the machinery and / or equipment is no longer manufactured or is difficult to achieve. This causes economic losses due to having the machinery out of operation. This article presents a proposal to replace the computer corresponding to the operation of the transmission of a mobile telescopic load crane, which consists of using an Arduino programming board for the control part and to obtain the necessary logical sequence of the different transmission speeds, power electronics (power transistors) were used for the power stage through which the necessary voltage and current levels are obtained to which the electrovalves corresponding to the different speeds of the transmission operate. As shown in the content of the work control is very accessible, so, it could be implemented in a sustainable way in other vehicles that have an automatic transmission with changes in speeds through electrovalves.

Control, Crane, Transist

Resumen

El diseño, modificación y control de maquinaria y equipo industrial juega un rol muy importante en cualquier empresa, donde se cuenta con maquinaria y /o equipo el cual se encuentran fuera de funcionamiento por la falta de una parte eléctrica/electrónica de control la cual posiblemente por el modelo de la maquinaria y/o equipo ya no se fabrica o es difícil de conseguir. Esto ocasiona pérdidas económicas por tener la maquinaria fuera de funcionamiento. En este artículo se presenta una propuesta para sustituir la computadora correspondiente al funcionamiento de la transmisión de una grúa de carga telescópicas móviles, la cual consiste en utilizar una placa de programación Arduino para la parte de control y poder obtener la secuencia lógica necesaria de las diferentes velocidades de la transmisión, se utilizó electrónica de potencia (transistores de potencia) para la etapa de potencia mediante la cual se obtienen los niveles de voltaje y corriente necesarios a los cuales operan las electroválvulas correspondientes a las diferentes velocidades de la transmisión. Como se muestra en el contenido del trabajo el control es muy accesible, por lo que, se podría implementar en forma sustentable en otros vehículos que cuenten con una transmisión automática con cambios de velocidades a través de electroválvulas.

Control, Grúa, Transistor

Citation: CABRERA-ORNELAS, Javier, MARTÍNEZ-ZAMORA, Juan Alberto, MARTÍNEZ-MONTALVO, Anselmo and HERNÁNDEZ-NARVÁEZ, Ana Luisa. Electronic control card for transmission of mobile load crane type KRUPP. Journal-Industrial Organization. 2019. 3-4: 28-34

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Introduction

Programmable control through electronics for process control is important today for most companies or applications where precise control is required, it is a fundamental tool in the areas of industrial, commercial and residential engineering.

As already mentioned, there are several electronic equipment such as Programmable Logic Controllers, LabVIEW software which control almost all industrial processes and applications with great precision but are expensive equipment and in many cases require the payment of a license. The alternative presented is the use of the Arduino programmable electronic card which is low cost, reliable, versatile and does not require a license for programming the control sequence.

The method presented in this work to perform the control stage for the operation of the crane transmission consists of an Arduino card that through its digital inputs and outputs can obtain the logic of operation of the transmission to control the inputs of activation of an electronic semiconductor device TRANSISTOR and to be able to activate the power stage of the solenoid valves.

Due to the low consumption that a transistor requires for activation, the control circuit can use any of the many low-cost solid-state devices such as capacitors, resistors, semiconductor diodes, optically coupled devices and integrated circuits.

The content of this work shows that this type of control for automatic processes is truly practical and versatile which can be applied sustainably in any industrial automation process where the need is to program a process manually or automatically by simply changing the programming. This work is intended to replace the original computer which moves the transmission of the crane.

Development and construction of the electronic card

This section explains the function of each element and the reason for its choice.

Arduino Plate One

Arduino is a free hardware platform based on a flat panel with a microcontroller, designed to facilitate the use of electronics in multidisciplinary projects, in this project it was used to program the logic of the input and output signals.

Figure 1 Arduino plate
Source: www.electronicaymas.com,2019

Moc- PC817

A Moc is an optocoupler. That works with an infrared led and an internal phototransistor, the purpose is to isolate the control stage from the power stage.

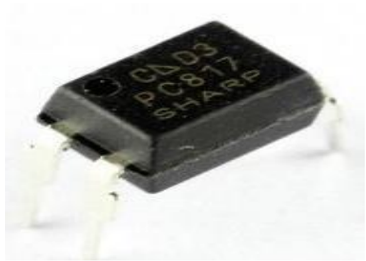


Figure 2 Moc PC817
Source: www.farnell.com

Mosfet IRF630

A mosfet is an electronic semiconductor device used for signal switching and amplification. This semiconductor will be used for the power stage.

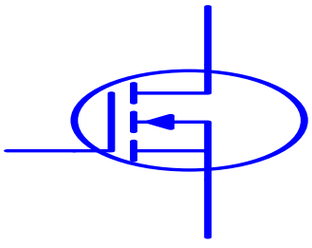


Figure 3 Mosfet IRF630
Source: Own Elaboration

ISSN-Online: 2524-2105

Semiconductor diode

The diode is a semiconductor device which allows the passage of electrons in only one direction. The diode will be used to protect the Mosfet from a possible return of current in the power stage.

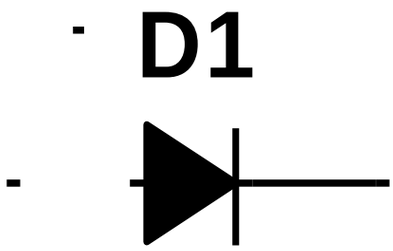


Figure 4 Semiconductor diode
Source: Own Elaboration

Zener diode

It is an electronic device whose main function is to use it as a voltage regulator or as a voltage reference

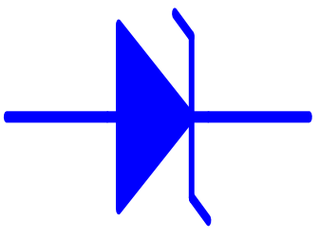


Figure 5 Zener diode
Source: Own elaboration

Relay

A relay is an electromechanical switch. It works by energizing a coil which produces a magnetic field that produces the closing or opening of mechanical contacts which are used for the activation of alternating current (AC) or direct current (CD) devices.

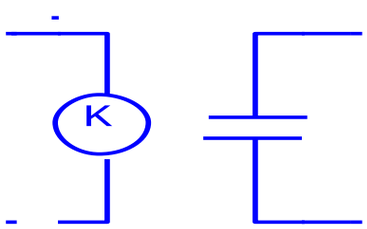


Figure 6 Relay
Source: Own Elaboration

Methodology to develop

The electronic card was designed thinking that the sequence of input and / or control output can be changed or reprogrammed for future modifications in modern crane models which present this problem.

Recall that the Arduino card represents a programming system in C language for applications that require the acquisition, control, analysis and presentation of analog, digital and PWM data.

Control stage

The control stage consists in programming the combinational logic in the Arduino card, the truth table of the speed transmission (Vel) can be seen in table 1. This table was obtained directly from the crane operation manuals.

Vel	Inputs						Outputs				
R2	1	0	0	0	1		1	0	1	1	0
R1	1	1	0	0	1		1	1	0	1	0
N	0	0	0	0	0		0	0	0	0	0
D	0	1	0	0	1		1	0	0	0	1
5	0	1	0	1	1		0	0	1	0	1
4	0	1	1	0	0		1	0	0	1	1
3	0	1	0	1	0		0	0	1	1	0
2	0	1	0	1	1		1	1	0	1	0
1	0	0	1	1	1		0	1	1	0	0

Table 1 Real crane operation table
Source: Own Elaboration

The purpose of programming is to obtain the combination of outputs through the digital terminals of the Arduino board based on the combination of digital inputs, where R1 and R2 represent the two reversals, N neutral, D driver and 1,2,3,4, 5 transmission speeds.

Signal conditioning stage

In general, conditioning of the analog and / or digital signals is necessary in an appropriate manner for the following stages of the operation. The signal may be too small so it would be necessary to amplify it or possibly the signal is large, so its magnitude would have to be reduced; the signal can be analog and digitization is required; be digital and convert it to analog, voltage signal and convert it to current or a current signal convert it to a voltage signal. All these possible signal modifications are known as signal conditioning.

ISSN-Online: 2524-2105

Conditioning of input signals

In this project we will deal with the conditioning of digital signals input to our system, these signals come from the different transmission changes, these signals are 24 Vdc so it is necessary to condition these signals to 5 Vdc since the digital inputs of Arduino are 5 Vcd. Fig. 7 shows the electronic circuit used for conditioning the digital input signals to the system.

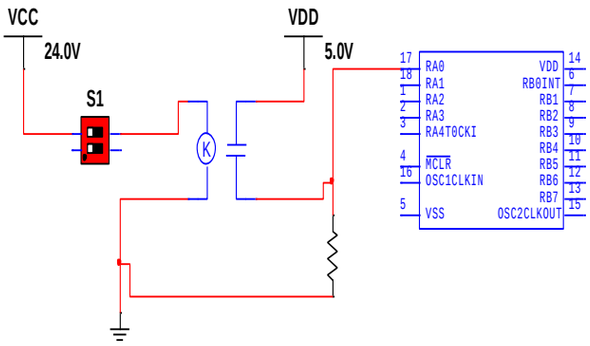


Figure 7 Conditioning of digital input signals.
Source: Own Elaboration

Conditioning of output signals

The purpose of conditioning the output signal is to take the digital output signal from the control system (Arduino) which is 5 Vdc to a 24 Vdc digital signal. In fig. 8 the electronic circuit used in the output stage can be observed.

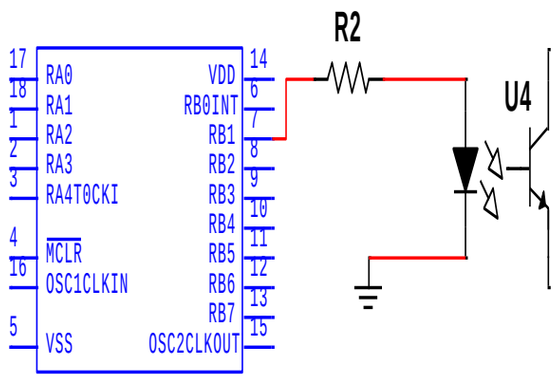


Figure 8 Conditioning of digital output signals.
Source: Own Elaboration

At this stage it was possible to electronically condition both the input to the 24 Vdc system with the Arduino digital inputs of 5Vdc, as well as a successful conditioning of the Arduino output of 5Vdc with the outputs of the 24Vdc system.

Arduino digital signal coupling with the system power stage

Sometimes digital systems control the power systems through an interconnection, in the gate of the TRANSISTORS which act on resistive or inductive loads and are used for lighting control or speed control of industrial motors. The use of power where currents that exceed the Amper are handled, it is necessary to keep in mind the electrical safety of the people first and secondly the protection of the control system.

The connection between the control system and the power system is desirable by means of technologies in which there is no physical (electrical) connection between the two systems, currently the above is possible through the use of OPTO COUPLERS since an optical coupling is achieved and an electrical insulation The reason for thinking about an optical coupling is to protect the control stage from a possible leakage current of the power stage. The control system can vary between intelligent programmable devices such as (microprocessors, microcontrollers, programmable logic devices or computers).

Experimental coupling development

In diagram 1 you can see the block diagram of the coupling.

Diagram 1 block block diagram
Source: Own Elaboration

The electronic circuit design is shown in fig. 9.

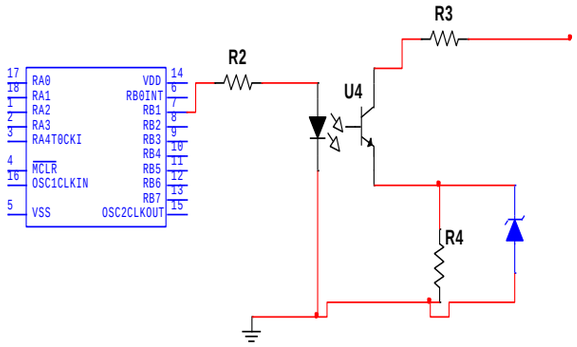


Figure 9 Electronic optocoupler circuit
Source: Own Elaboration

CABRERA-ORNELAS, Javier, MARTÍNEZ-ZAMORA, Juan Alberto, MARTÍNEZ-MONTALVO, Anselmo and HERNÁNDEZ-NARVÁEZ, Ana Luisa. Electronic control card for transmission of mobile load crane type KRUPP. Journal-Industrial Organization. 2019

ISSN-Online: 2524-2105

Although the circuit of fig. 9 is simple, it is very useful because it allows the power stage to be activated safely with a small digital DC signal. The optocoupler separates the power output from the right side of the control input from the left side.

In conclusion, optocoupling is always necessary to guarantee electrical insulation. The optocoupler is a very simple and inexpensive electronic device, with a wide variety of coupling types.

Power stage

This stage involves the use of a Mosfet transistor since these devices are faster than other devices used in power electronics (thyristors, bipolar transistor, etc.). Mosfet transistors currently have a wide application with logic gates in digital electronics. The circuit of the figure. 10. Show the power stage.

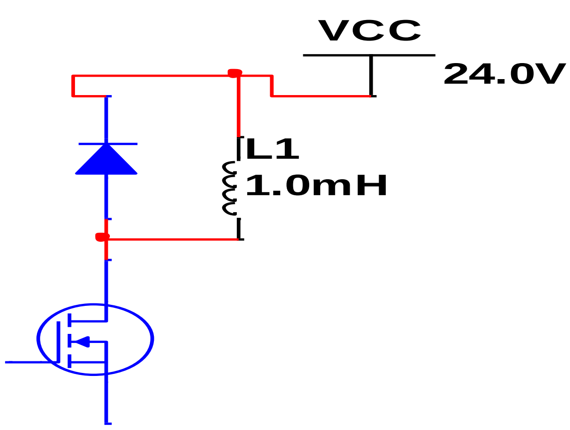


Figure 10. Electronic power stage circuit
Source: Own Elaboration

Figure 11 shows the complete electronic circuit comprising the integration of the control stage, conditioning stage and the power stage. With this third stage of power, the complete project is completed with positive results.

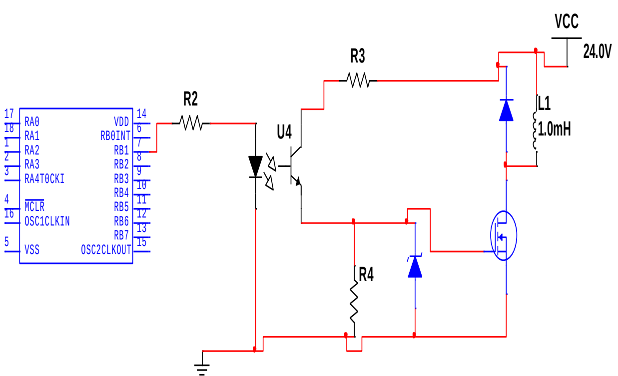


Figure 11. Electronic circuit stage integration.
Source: Own Elaboration

Mathematical development

The morfet transistor can be used in three operating modes that are:

– Saturation
– Period
– Cut

Our interest is to use it in the cutting mode since in this mode the Mosfet behaves as a switching element.

Transfer functions

The following equation defines the relationship between Id and Vgs

Ọ̈ سي Ọ̈ خ خρ طي ممفيب/بزب . (1)

Where:

Id is the maximum current when Vgs = 0
Vgs is the control variable.
Vp and Idss are constant.

It is worth mentioning that when Vgs = Vp la Id = 0mA

From the device specification sheet you can get some electrical parameters such as:

Vgs and Vp in shutdown state.
Idss in power state.
You of your nominal values.

The polarization equations are as follows:

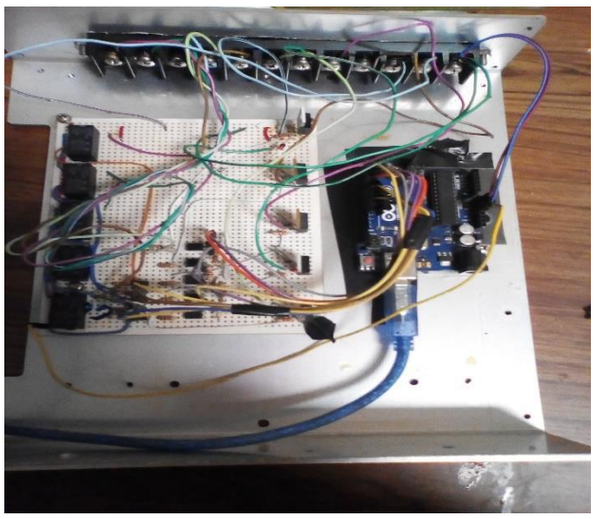
ὠ سيخ ὠ طي ὠ (2)

Ọ̈ سي ممشآ/٢ (3)

ὠ سيخ لب/. (4)

Annexes

The following figures show the finished physical card.



Acknowledgement

The first author thanks the Technician of higher studies of Jilotepec for the institutional support and of his laboratories for the necessary tests for the accomplishment of this work of technological development.

Results

No previous work or manufacturing history was found. The first prototype of the electronic card was finished and tested.

The results obtained were favorable since laboratory tests were carried out where loads were connected with the actual characteristics of the crane transmission solenoid valves.

Field tests were performed where the results were favorable.

The total costs are quite ambitious since they range between $ 4,000.00 and $ 5,000.00 pesos and if it is added that in many cases this type of control is no longer manufactured it has an added value.

This first prototype was developed in bakelite, later it will be developed on a board (PCB) for its greater presentation and functionality The realization time was 30 business days.

The power consumption is approximately half Amper (0.5 Amper).

The biggest gain is in the cost.

Conclusions

The logic program was designed according to the truth table of the crane transmission which is microprocessor engraved on the Arduino card. With the method proposed in this technological development work, the logic of the truth table can be varied or reprogrammed according to the needs of any other crane model only by changing the software and not the hardware. The results obtained can be applied in general to vehicles that have a computer for their operation which includes a combinational logic.

The developed card is of the utmost importance since there are currently cranes that, due to the failure of the transmission computer, are towed by other cranes to the area of operation, so this is a card is a solution so that the cranes can be transport again by themselves reducing costs and reducing insecurity in their transfer.

For future studies or improvements it is recommended to replace the relays with semiconductor devices as well as the exchange of the Arduino card for an industrial automaton since they are more reliable, robust and their life time is much longer.

The possible disadvantages of this methodology is that the Arduino card is of the didactic type and not for industrial use, so the conditioning of inputs and outputs of 24 to 5 Vdc was necessary, which could be avoided with a programmable automaton of the industrial type.

It is worth mentioning that the circuit of figure 11 is for an input signal and an output of five inputs and five outputs in total with what the card has and that are activated independently according to the logic programmed in the Arduino card.

ISSN-Online: 2524-2105

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ISSN-Online: 2524-2105

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Abstract (In English, 150-200 words)

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* Correspondence to Author (example@example.org)
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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

[Title No.12 in Times New Roman, single spaced and Bold]

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Including graphs, figures and tables-Editable

In the article content any graphic, table and figure should be editable formats that can change size, type and number of letter, for the purposes of edition, these must be high quality, not pixelated and should be noticeable even reducing image scale.

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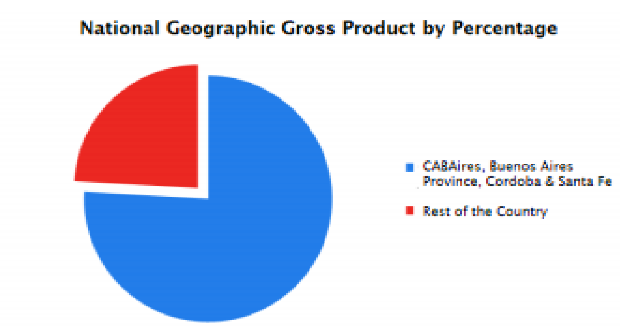

Graphic 1 Title and Source (in italics).

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For the use of equations, noted as follows:

[illegible] (1)

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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.

Annexes

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

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Conclusions

Explain clearly the results and possibilities of improvement.

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Use APA system. Should not be numbered, nor with bullets, however if necessary numbering will be because reference or mention is made somewhere in the Article.

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2524 2105
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