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TOPIC:

ROTARY PEELING MACHINE GUINEA PIGS TO OPTIMIZE AND FACILITATE THE PEELING PROCESS

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Rotary Peeling Machine Guinea Pigs To Optimize And Facilitate The Peeling Process

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Abstract. In the work presented below, the modernization of a guinea pigs peeling machine, existing in the resort "Valle Hermoso" of the parish of Chaltura, Imbabura Province indicated.

This machine at the onset of labor was in disuse since operation for about three people needed, making it inefficient.

For modernization, the process of peeling of guinea manually analyzed for once modernized the machine, optimizing resources can perform with the help of sensors and actuators necessary for that purpose.

As a result of this analysis, a simple but capable of being able to perform the task of controlling the speed of the turntable so that the peeled and additionally the optimum amount of water used in the process is controlled by a control system was implemented water supply, avoiding waste and facilitating the process.

Keywords

Guinea Pigs Peeling, Speed Control, Control Of Water Supply, Guinea Pigs Peeling Machine.

1. PEELING PROCESS OF GUINEA PIGS

The peeling process is the same as guinea pigs has been practiced through the years, with older people, those who do better.

The manual process starts by choosing the most apt guinea pig to the desired preparation (in our case 2 pounds and 3 months old) to be cut neck on the side of the larynx, waiting to drain all the blood possible, then you must introducing the guinea in hot water to scalding the animal and facilitate peeling, finally you must peeling the guinea pig, pulling her hair until there is none of them and be able to remove the viscera of the animal and wash from the inside.

2. RECOGNITION MACHINE

2.1. Structure

It is the base where all components of the machine are seated and is constructed of 1 ½¨ stainless steel angle and covered with stainless steel.

Figure 1. Structure of machine

Source: Author

2.2. Peeling pot

We call peeling pot the part machine where guinea pigs are disposed to proceed with its peeling.

Figure 2. Peeling pot

Source: Author

2.3. Rubber fingers

The rubber fingers are pieces of rubber placed horizontally and vertically in the peeling pot and on the turntable, and are named for to be resemblance to the fingers.

Is in them that the guinea pigs will rub to get the hairs are detached from the body.

Figure 3. Rubber fingers

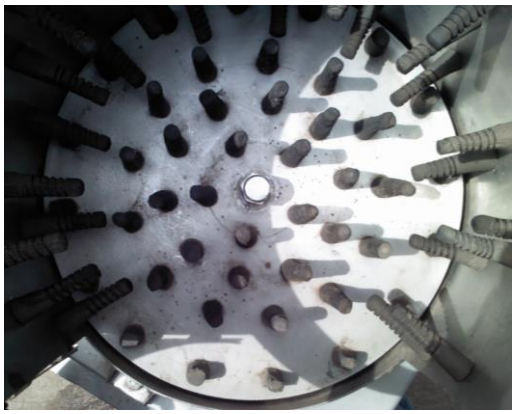
Source: Author

2.4. Turntable

The turntable is the only moving part of the machine, and also has rubber fingers mounted vertically.

When this ratate, makes guinea pigs, by centrifugal force, go to the walls of the peeling pot and rub with rubber fingers.

Figure 4. Turntable



Source: Author

2.5. Electric motor

The electric motor is who transmitted through a band, movement and torque to the axis of the turntable to peeling the guinea pigs.

2.6. Tray to evacuation waste

Is here where the waste will fall, the hair is going to have in the process, dragged by the water added to it.

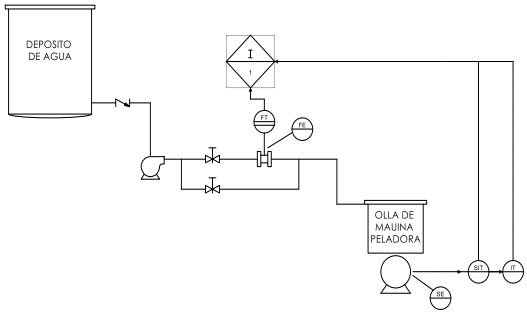
Figure 5. Tray to evacuation waste

Source: Author

3. SYSTEM DESING

The design of the machine is made based on the need of the process, taking into account the necessary devices for the purpose and sizing as required, getting optimize and facilitate the process.

Figure 6. Diagram P&ID of System

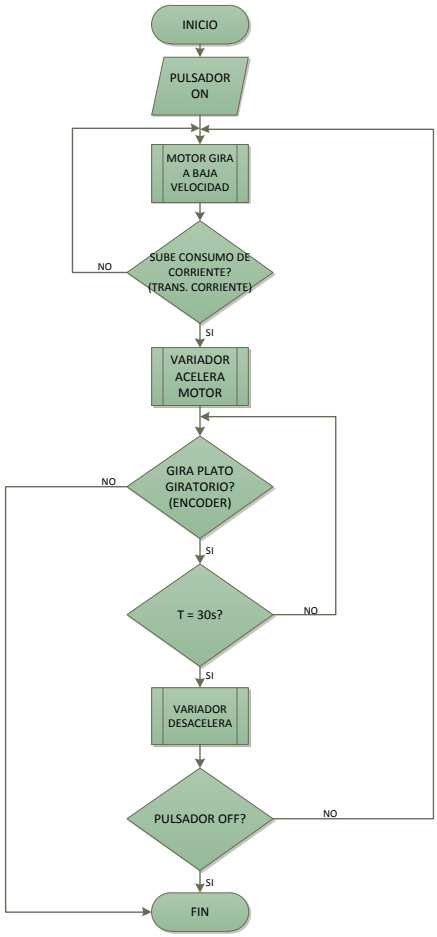


Source: Author

3.1. Speed Control Subsystem

The speed control subsystem has as main objective to deliver optimum speed to machine for peeling the number of guinea pigs that are in the pot as quickly as possible, avoiding the guinea pigs are mistreated in the process.

Diagram 1. Flowchart of operation of speed control subsystem



Source: Author

a) PLC (Programmable Logic Controller)

The PLC is the brain of the system in general, as it is responsible for processing the signals and take the necessary decisions in the process, as implemented the program in PLC.

"The PLC is a control of processes compliant general purpose to virtually all situations that automation is required." (Joan Domingo Peña, 2003)

b) Inverter Drive Speed Controller

"A frequency converter is a device for modifying the frequency and, therefore, the speed of an asynchronous induction motor; that is, it generates an AC with the frequency and voltage necessary for driving said AC motor. "(Pulido, 2000)

The VFD is responsible for varying the speed at which our turntable rotates, in order to when peel the guinea pigs, they suffer the least possible abuse, and their flesh is not damaged.

The optimum peel speed was determined based on testing at various speeds to determine which cause less damage to the animal to be of good quality product.

The dimensioning of the drive was based engine available to our machine, having to:

Motor power = 2HP

Drive power = 2 HP

The rate was determined based on the following tests:

Chart 1. Tests for determining the speed of the engine

FRECUENCIA DEL MOTOR (Hz)	CANTIDAD DE CUYES PELADOS	TIEMPO DE PELADO (SEG)	PORCENTAJE PELADO DEL CUY	PORCENTAJE DE DAÑO EN EL CUY
60	4	60	100%	30%
	4	40	90%	25%
	4	20	70%	25%
50	4	60	100%	25%
	4	40	90%	20%
	4	20	80%	20%
40	4	60	100%	15%
	4	40	90%	5%
	4	20	90%	5%
30	4	60	100%	5%
	4	50	100%	5%
	4	30	100%	0%
20	4	60	80%	0%
	4	50	70%	0%
	4	30	70%	0%

Source: Author

c) Current Transformer

The current transformer takes the current drawn by the motor when working without load and with load, sending the signal to the controller to perform the necessary comparisons and decisions to accelerate the engine as needed.

d) Tachometer

In our machine the tachometer takes pulse signal from an encoder coupled directly to the axis of the turntable.

Its function is to verify that the turntable not stop caused by bindings when guinea pigs are peeled, and compared with the motion of the motor.

e) Motor

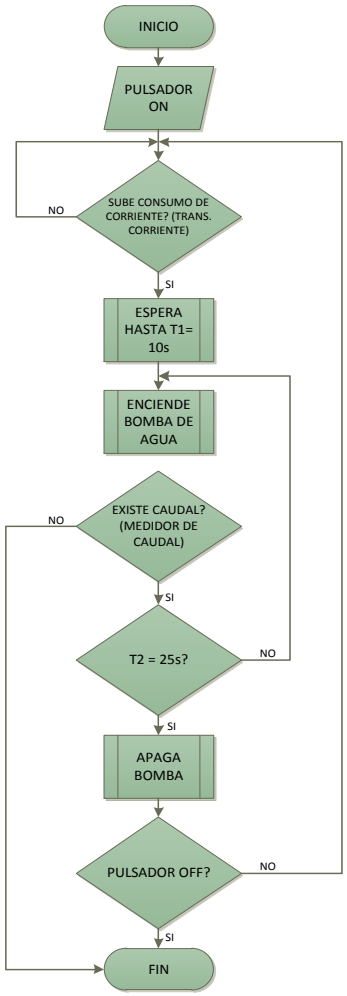
According to tests, we find that the motor has to work with a frequency of 30Hz. Which means 50% of its capacity, this makes the guinea pigs are not mistreated in excess and the peeling process more efficient, less time is used in each process.

3.2. Subsystem Control Water Supply

The control subsystem water supply is responsible for verifying that you are giving the guinea pigs peeling process the required quantity of water so you can remove all debris, such as hair, the process.

The quantity of water needed for the process has been determined based on peeling tests of guinea pigs with different numbers of animals, and once the tests made the right pump was chosen.

Diagram 2. Flowchart of operation of the Subsystem Control Water Supply



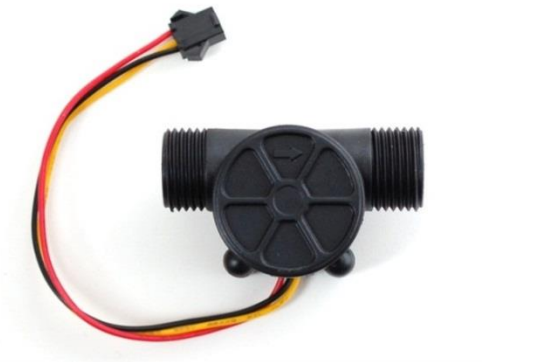
Source: Author

a) Flowmeter

The role of the flowmeter in the process is to verify that there is water in the process, because without it, there is the possibility that waste and animal hair, product of the process, causing bottlenecks in the turntable.

If for some reason the water supply is stopped, the system will send an emergency stop, to verify the causes of failure and take corrective action, all in order to avoid equipment damage.

Figure 7. Flowmeter



Source: www.openhacks.com

The type of flowmeter is a Hall Effect, which delivers a pulses quantity proportional to the quantity of fluid passing through it.

The pulses are input to the automaton for its quick count input, and make necessary comparisons and take the appropriate decisions for the process.

b) Centrifugal pump

"Initially, centrifugal pumps have the disadvantage of low efficiency; however, the improvements obtained based on continuous research, has always taken the lead in the competitive aspect." (Manuel Viejo Zubicaray, 2004)

To determine what is needed to supply the quantity of water used in the process of peeling our machine pump, we proceeded to test for the quantity of water you use the machine supplying it manually, with a sample of 50 data.

These tests were performed when the machine had a manual control for 15 days, peeling quantities of guinea pigs normally peeled on site during normal operation, and noting the quantity of water used in each process.

Chart 2. Tests for determining quantity of water needed in the process of peeling

CANTIDAD DE CUYES PELADOS	NUMERO DE VECES PELADAS	CANTIDAD DE AGUA UTILIZADO POR PRUEBA
4 CUYES	41	15 LITROS
3 CUYES	4	10 LITROS
2 CUYES	2	10 LITROS
1 CUYES	2	5 LITROS

Source: Author

According to tests and in order that the results are accurate, was calculated the average water used in the tests and the deviation from this average, resulting in an average of 14 ± 0.7 lit process.

It means that you consume 14 lit / min, because it takes 1 minute between process and process.

3.3. Electrical subsystem

When building a control system, is vital electrical protections necessary to prevent damage some of the devices of our system.

Were chosen protections necessary to that effect, as shown below:

a) Circuit Breaker

As you can see the unique power loads we have in our machine is the engine that drives the turntable and centrifugal pump between the two consumed a total current of 20 amps, protection consider double current, which means we place a 40 amp circuit breaker for the power circuit.

Chart 3. System loads

Cuadro de Cargas Fuerza			
Carga	Potencia	Consumo de Corriente (A)	Corriente de Protección (A)
Motor del plato	2hp	12	25
Bomba de agua	1hp	8	16
TOTAL	**3hp**	**20**	**41**

Source: Author

a) Contactor

According to the manufacturer of contactors *"For lighting applications and resistive loads normally, the current capacity of the contactor in AC1 LG / LS, applications motors, generators and other machines inductive current capacity is selected in AC3 is selected . "(LS)*

4. CONCLUSIONS AND RECOMMENDATIONS

4.1. Conclusions

- In the present work, it was possible to optimize the process of peeling guinea pigs, since previously the process took about 5 minutes per guinea pig, the machine is now able to peel five guinea pigs in 20 seconds, giving a saving in time 24 min.
- • On the other hand we have the savings in labor, because in order to meet the required number of guinea pigs for sale the restaurant, the owner should have on average 3 people for that process today with the machine, the process requires nothing more than one person to operate it.
- • In terms of costs, the owners should acquire existing distributors peeled guinea pigs, which raised the price of the unit to 50 cents (USD 7.00 unpeeled cuy, cuy peeled USD 7.50), which used weekly by calculating 350 guinea pigs, given as saving USD 175.00 per week. Without taking into account that in high season and special dates to 2000 guinea pigs consumed per week (saving USD 1000).
- • Using a VFD in the operation of the machine, avoid risks in the effects caused by the motor starter contactor in the network.
- • Back when the machine had no speed control, mistreated guinea pigs, making meat red, now that was avoided.
- • In conclusion, by optimizing the process of peeling guinea pigs, time, personnel and money investing these resources in a better customer service.
- • When the machine was purchased, the specifications say that the machine could peel 4 guinea pigs at a time, but after tests performed it was found that optimal performance after the fact in control, is peeling 5 guinea pigs at a time.

4.2. Recomendaciones

- It is recommended that you carefully read the Use and maintenance manual of rotary peeling machine guinea pigs operating it.
- For the guinea pig peeling process should be very careful when opening door to dislodge l peeled and guinea pigs, as this is done with the motor running at high speed.
- If you connect the machine to another location, you must keep in mind that it has a 220V supply.
- You can implement a water heating system with temperature control, and further facilitate the process.
- Must wait 15 seconds between process and peeling process to allow recalculations to system.

5. THANKS

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Born in Riobamba province of Chimborazo on February 26th 1985. Has completed his primary education at Francisco J. Salazar School. In 2002, he obtained a bachelor's degree in Physical-Mathematical specialization at Abelardo Moncayo High School. Currently he is a graduate of the School of Mechatronics Engineering at the Northern Technical University.

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