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Modification of the Electrical Control Truztschler Swing Machine in Textile

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Abstract: ***Leading Company in the textile industry to improve and optimize the production process through the design and modification of electrical control is obsolete, for not having a manual operation for maintenance was raised. To develop the project was necessary to consider the concept of automation, because through it we can control complex production lines with the use and interaction of equipment Control and Power such as: PLC'S, Drivers, Software, contactors, Mechanical systems, hydraulic, Pneumatic and others. The impact that this machine had been incorporated into the cotton cleaning process was very important, because as waste results and line downtime and production costs are minimized.***

Keywords: Optimize Design, Modification, Mechanical, Drivers, Plc´s.

1. Introduction

Distribution systems have energy as a function of providing consumers with electricity produced at power plants and transmission system transmitted to distribution substations. A distribution system comprises of primary feeders that leave from distribution substations, distribution transformers to reduce the voltage to the value used by customers and the secondary circuits to the entrance of the installation of the consumer [1].

Primary feeders are three-phase, 3 or 4 wires; power trunk leads can be single phase or three phase. Tensions between threads vary the distribution system voltage class 2.5 Kilo Volt (KV) at 35 K. The lower voltages correspond to old installations; the modern trend is to use voltages of 15 KV or higher class. In Mexico the primary distribution voltages are recommended 13.2 KV, 23 KV and 34.5 KV. The secondary circuits are generally three-phase, four-wire, 115 to 127 Volts (V) between phase and neutral (200 to 220 V between phases) or 220 to 240 between phase and neutral. The United States uses more single-phase three-wire 120/240 [2].

Industrial processes requiring control of the production of the various products obtained. These are varied and cover many types of products: the manufacture of petroleum products, food products, industrial ceramics, power generation plants, steel, heat treatment, paper industry, and textile industry [3].

In all these processes, it is absolutely necessary to control and maintain constant some variables, such as pressure, flow, level, temperature, PH, conductivity, velocity, humidity and dew point. Measuring instruments and control allow the maintenance and regulation of these constants more suitable than the operator itself could make conditions. Because advances in the theory and practice of automatic control provide the means for optimal dynamic performance, such as improving productivity and eliminate many of the repetitive and routine operations, systems engineers and scientists should have a good knowledge of this field [4].

An automatic control system is a set of connected hardware or interrelated, so that regulate or direct their actions for themselves, is without the intervention of external agents (including human factor) also correcting errors that present in performance. Currently, any device, system or industrial plant has an actuator portion, corresponding to the physical system that performs the action, and some command or control generating the necessary orders for that action or not take place [5].

Controls systems have been of great impact for the development of our society have since allowed:

1. Automate repetitive, tedious and / or dangerous human tasks.
2. Working with many smaller tolerances, improving product quality.
3. Reduce production costs and labor inputs.
4. Improving the safety of operation of the machines and processes [6].

Control systems have vast application areas such as transport industries, including aerospace; chemical and biological processes; mechanical, electrical and electromechanical systems; agro-industries and manufacturing processes; economic, political and social [7].

It is common knowledge today, electrical maintenance is necessary for many aspects of the life of a company, which is free of electrical maintenance in one form or another, be it

a small or medium in your equipment running, workshops, offices, warehouses, stores, departments, among others. This leads to the conclusion that the electrical service must be continuous [8].

The electrical maintenance in an enterprise to detect faults beginning to take shape and can produce in the near future a medium term plant shutdown and / or loss, affecting people and facilities. This allows reducing downtime to minimize the likelihood of unscheduled service outlets, unscheduled, thanks to his contribution in the planning of repairs and maintenance. The benefits of reducing costs include energy savings, protection equipment, inspection and diagnosis speed; quickly and easily check the preparation [9].

The planning, design and operation of electric power systems require studies to evaluate its performance, reliability and security. Typical studies performed are: flows of power, stability, protection coordination, short circuit calculation, among others. Good design should be based on a careful study that the voltage selection, proper size of equipment and selection of appropriate protections are included. Most studies require a complex and detailed model representing the power system, usually set in the design stage. Short studies are typical examples of these, is essential for the selection of equipment, and adjusting their protections in the NOM-OO1-SEE-2005 guidelines to be considered in an electrical system are detailed. The number and size of conductors in any pipeline should not be greater than what can dissipate heat and easy installation and removal of drivers without harming them or isolation (NOM-001-SEDE-1999) [10].

2. Development

In the first phase of development of this project, the electrical installation will be done to control the motors. For this, the pipe ¾ "rail and fastened with clamps are mounted strut. It is noteworthy that the wiring will be done aerially because during the rainy season this department usually is flooded due to the flow of water running down the drain. In doing so, it seeks to prevent channeling and electrical conductors are exposed to these conditions. Once completed I will start laying pipe, now the wiring on the wiring will be done. First we start with the supply lines for the 9 engines having the machine, then the wiring control signals, such as: buses clogging material, maximum and minimum indicator photocells level station buttons start stop and reset general.

After the electrical installation, mounting and power control elements on the general board will be made. It is noteworthy that the machine was stopped for 8 years and there are control elements that are quite obsolete, an example of this are: fuse holders, micro, contactors and wiring, therefore, these teams can no longer be used, since they probably would cause continuous failures, therefore should be removed to free up space inside the cabinet, and thus start distributing our electrical equipment as: General switches, contactors, overload relays, control transformers, terminal boards, drives or also known as investors frequency (Figure 1).

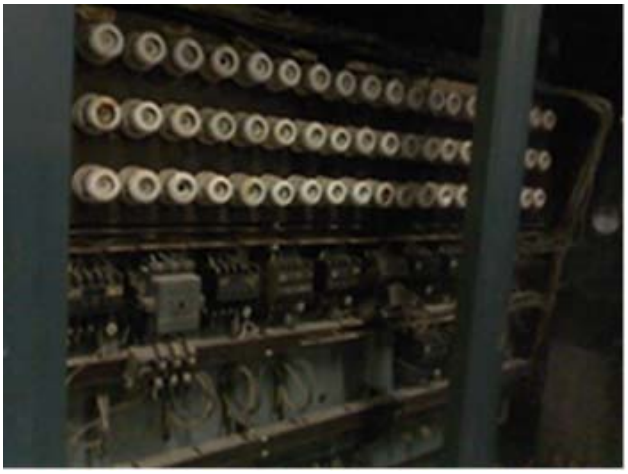

Figure 1: Control Panel Hinged Trutzschler obsolete

The function of the force element is mechanically interrupt the passage of electric current once it has detected an overcurrent or short circuit, using thermal and magnetic elements are accommodated within the construction of the switch. The figure shows how it is mounted and connected the general phase switch ABB brand 3x40 Amps (Figure 2).

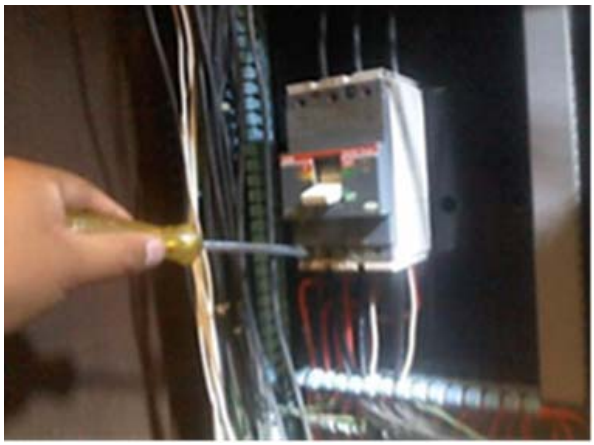

Figure 2: Installation of three phase main switch ABB 3X40 Amp.

After starters are mounted, these are intended to distribute the three-phase power to the motor. This is possible, once the starter coil was switched voltage (127 VCA), thereby mechanically closed three pairs of platinum which circulate in the supply voltage (Figure 3)

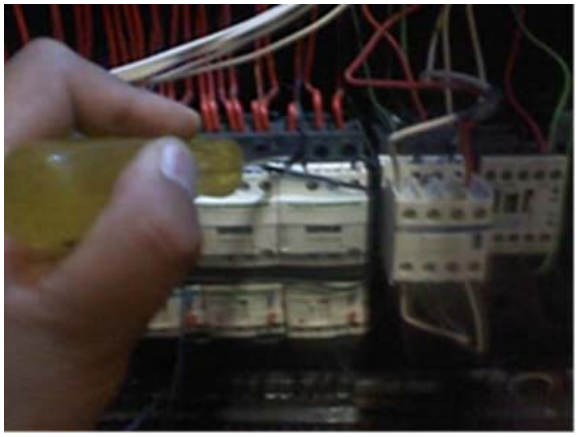

Figure 3: Starters with overload relay wing engines

It is noteworthy that the starters are accompanied by an overload relay. This is intended to protect the motor, through thermal and magnetic elements is housed in the building of this relay, once you have raised the current in the motor windings or detected on intensity due to atmospheric conditions, protection act and avoid having our engine damage. The overload relay is connected to the output (T1, T2, and T3) starter. The supply voltage for the Swing is 440 VCA and considering that the contactor coils are 127 VCA and sensors filling maximum - minimum are 24 VCA, is unnecessary to condition an element that helps us reduce the voltage 440 / 127 VCA. This device is a transformer (Figure 4).

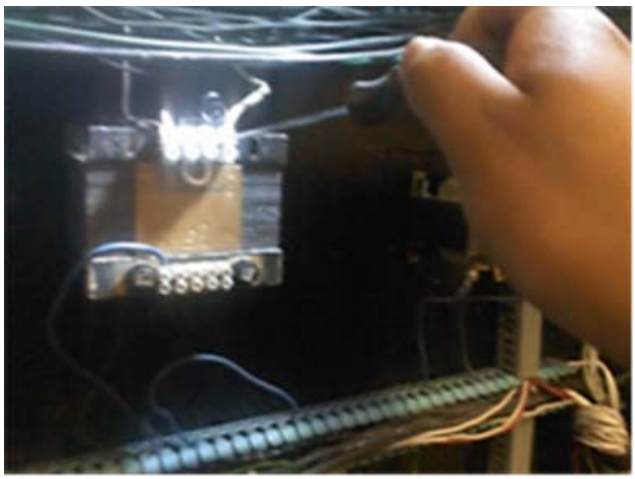

Figure 4: 440/127 VCA gear Transformers VCA and 440/24

Once you have installed and connected these elements energy distribution, now an electronic board that controls the stopping and starting of the machine in the section called Kisner, once it is at its maximum and minimum levels are installed. This card is provided by the Department of Electrical Maintenance of Surgical Textiles. As seen, the control of the machine is designed so that its operation is as simple as possible, so it has been considered by the company and safety of machine operators can stop in sections, if any occur mishap. For the installation, assembly and connection of Yaskawa J1000 Driver will need to read and understand the instruction manual carefully and keep it for future reference. The manual describes the installation, connection, operating procedures, functions, troubleshooting, maintenance and inspections to be performed before operating the equipment.

3. Results

The based project Surgical Textiles Company consisted of starting the cleaning machine "Swing Trutzschler". The project was submitted to the department for preparing cotton, in order to reprocess the contaminated material using the above machine.

Once the wiring is done, preventive maintenance was given to the machine motors, control components and power on the general board of the machine mounted, Yaskawa J1000 Drivers were scheduled. Now the need to energize the machine was to check the start of the same, for that certain variable were monitored before and after startup.

Logistics boot the machine according to the diagram of control and strength.

Input voltages in the force components as: Thermo-magnetic breakers, contactors, relays overcharge in terminals of the motors being correct.

Proper rotation on motors (M1, M2, M3, M4, M5, M6, M7, M9, M10 and M11).

Current consumption of each motor having the swing Trutzschler. The measurements are below the maximum current is taken into the engine data plate.

Operating temperatures of the motors (25 ° CC) at an ambient temperature of 15 ° C, one hour elapsed service. Measurements were made with a Laser Thermometer (Wahl DHS135XEL) are below the temperatures in the engine data plate. Correct interaction of security features such as: buses clogging material, photoelectric sensors for filling and emptying bins, adjustments overload relays (current), and start stop buttons, emergency stops, safety contactor. All elements interact correctly according to the design of the control chart and strength.

Also check that all the mechanical transmissions and couplings will roll correctly, also verify adjustments in belts, chains, bearings, shafts, rollers, also followed his plan to lubricate critical lubrication points on the machine before putting into operation. Correct start and stop signals (RUN and STOP mode) in Yaskawa J1000 Driver. This proper installation and operation of the equipment was found (Figure 5).

Figure 5: General Board of Trutzschler swing

During the week of 04/22/13 to 27/04/13 corresponds. It was checking the working of the machine, which had only a few details such as setting binding mics, right direction sensors filling and emptying of matter on unexpected engine loads, due to faulty mechanical transmissions. These failures occurred in conditions of the process as: operating mode of the machine, shift changes, adjustments to mechanical parts. In the absence of a work instruction to this machine, continuously have problems in operating the machine. A

common fault was within the mode of operation of the machine is that it feeds on the loader, and for that reason increases the motor current and thus fails to overload the engines want to handle this load is generated which is in the mechanical transmission. Also he was on the lookout for the proper operation of the inverters Frequency Yaskawa J1000, failure software J1000 Programming Simulator is triggered to check the computer to respond to disturbances such as lack of signs of starting and stopping, overload, over torque on temperatures, phase loss, voltage drops, minimum and maximum operating frequencies, acceleration and deceleration, among others. This proper programming equipment was evaluated. The operation of the machine, despite his seniority within the company, is acceptable only needed, train and raise awareness to the importance of operating personnel involved in operating a machine. As mentioned, the Swing has been characterized from its electrical and mechanical control, so you can say that it works correctly, only by operating conditions, operator's negligent failure.

It is noteworthy that when operating the Swing, brought thus changes as the change in the line diagram of the plant, in the Lay Out in electrical installations, also the charge consumed for the transformer was increased 440 VAC. Such modifications will be carried out in the medium term by managing electrical maintenance company of Surgical Textiles (Figure 6).

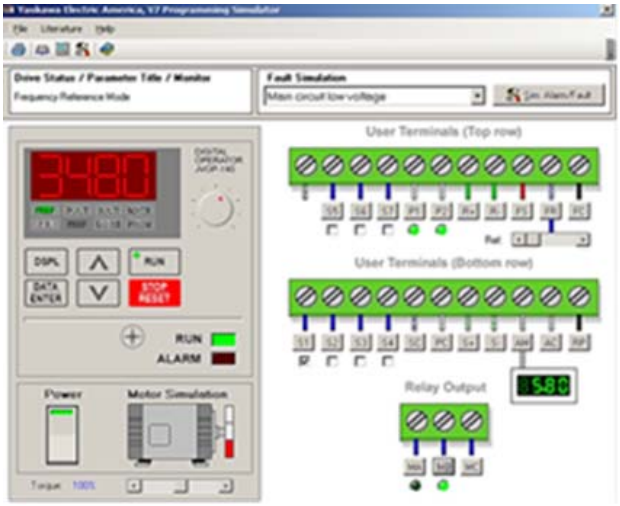

Figure 6: Yaskawa Drive J1000 Simulator start

4. Conclusions

The project was presented at the Surgical Textiles Company. It impacted on reducing the rate of cotton waste that was generated in the department of preparation and implementation of the cleaning machine Trutzschler Swing. As mentioned above, the machine was stopped due to lack of mechanical and electrical maintenance. The machine, since he joined the company, had worked with all the obsolete electrical components, which constantly failed and caused failure of operation and process according to (operators, electrical, mechanical and department heads). The risk of operating this machine was resounding, accidents occurred because the operators of the machine, because sometimes, emergency stops, buses clogging material, not working due to wear of these components, contactors were likewise bridged in some power lines, due to wear on the points of strength and control of these contactors, also had loose connections in the motor terminals, which caused overheating, arcing. Mechanically he was not given maintenance to mechanical transmissions. Operators commented that sometimes small fires had occurred due to the negligence of mechanical maintenance, due to the friction of mechanical parts such as chains, belts, pulleys, gears, spindles, drums, rollers, among others.

The electromechanical maintenance that was done cleaning machine was really laborious, since allocate resources to carry out this project was the first obstacle, as they had to justify such action in order to have all the elements of control and strength to carry out modifying the Electrical Control Trutzschler Swing. Subsequently, problems were found in isolates from the windings of some electric motors (grounded), with this, it was necessary to inform the head of electrical maintenance so he could send them to rewind (external service). The waiting time was not a factor because usually took 3 to 4 days for deliver.

A critical variable considered was channeling drivers using conduits as he was currently on floor with PVC pipe. The rationale for this variable is that during the rainy season, the Department of preparing cotton, where is located the Swing Trutzschler, frequently flooded because the drainage system is not able to fully direct the flow in this network for that reason results in the overflow of the water and thus the electrical conductors that are channeled through pipes on the floor is wet. Therefore, it was necessary wiring air, to protect the physical integrity of human personnel and infrastructure of the company. Also the machine's network of land connected company, to ensure that all dissipate static electricity to cause no harm to human personnel.

These were the most important issues considered in the project, since the design of control chart, interaction of components and power control, scheduling Yaskawa J1000 Drivers, engine maintenance (bearing replacement), characterization of the machine were aspects that had few problems when carrying them out.

References

[1] R. Bishop R. Dorf. Modern control systems. Prentice Hall, 10 Editions, 2005. Roldan Viloria, José. 1999. Manual de Mantenimiento de Instalaciones. España: Paraninfo.
[2] Viqueira Landa, Jacinto. 1993. Redes eléctricas. México, D.F: Alfaomega.
[3] G. Fink. Donald / Wayne Beaty H. Manual de Ingeniería eléctrica Tomo II. 1996. México D.F: Editorial McGraw-Hill Interamericana de México S.A. DE C.V.
[4] Nisen N. Sistemas de Control para Ingeniería. 2004. México D.F: CECSA.
[5] Rosaler, Robert. 1998. Manual del Ingeniero de Planta Tomo I. México D.F: McGraw-Hill Interamericana de México S.A. DE C.V.

[6] Álvarez Laverde Humberto. Pasos Iniciales en el Desarrollo del TPM. 2003. Barcelona, España: Advanced Productive Solutions, S.L.
[7] Juárez Cervantes José Dolores. Sistemas de Distribución de energía eléctrica. 1995. México D.F: Prentice Hall.
[8] Vallen. Señales y Sistemas Para Bloqueo y Candadeo.
[9] http://transfer.gruporegio.com.mx/Usuarios/Catalogo%20Vallen%20Proveedora%20Industrial/Ultimos%20PDFS/Se%F1ales%20y%20Sistemas%20de%20Candadeo%20y%20Bloqueo.pdf
[10] Ávalos Arzate Guillermo. Teoría de Control ajuste de controladores Industriales. México: Institute Polytechnic National.
[11] Instalaciones Eléctricas (Utilización).Reglamento de Instalaciones Eléctricas Norma Oficial Mexicana NOM-001-SEDE-1999. México D.F: Ediciones Andrade S.A. DE C.V.

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