The effect of the development of control and operating systems for flexo printing machines on improving the quality of printing of packaging products (case study of Obeikan packaging)

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Abstract:

Quality means attaining something of a high degree of good quality and great value. It is one of the reliable criteria to distinguish an achievement from other achievements in the market itself. It could be achieved by implementing a set of international standards and rules that are verifiable and measurable. These standards have been found to obtain satisfaction of both users and clients.

The concept of quality control also expresses a set of activities and efforts made by working people that allow the production of standards of quality. Many packaging presses suffer from printing quality problems and lack of quality that satisfies the customer, which increases customer complaints. Although printing machines and most raw materials may be imported from abroad, most of these printing presses do not activate the use of devices or printing quality control and control systems.

The research problem lies in the fact that despite the development of control and operation systems for flexo printing machines, there is no noticeable improvement in the quality of printing or packaging materials by these printing methods. Therefore, it is necessary to apply modern control and operating systems for flexo printing machines to improve the quality of printing packaging products in Saudi presses, especially color management and tension control devices, **hence, the research problem** can be formulated in the form of a question as follows:

Does the application of modern or advanced control and operating systems of flexo printing machines improve the print quality of packaging products in Saudi presses?

This research aims to apply modern control and operating systems to flexo printing machines to

improve the print quality of packaging products.

Many presses houses seek to achieve quality in a variety of ways, including purchasing modern devices to control quality and assigning quality teams only to study the problems that arise within the presses, and also seek to appoint experienced technicians and engineers to manage that system to achieve the highest levels of quality in their printers.

In pursuit of achieving the research goal, the researcher checks the influencing factors that cause problems within the packaging presses after identifying the human capabilities, operational solutions, measuring devices and the quality system used by these presses to find out practical and operational solutions to prevent errors and improve quality.

Key words:

control and operation systems - quality - measurement systems - international standards - packaging products.

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1. Introduction

Packaging products are used only for efficiency and durability to protect contents during storage and shipment. With increased competition between brands more than ever, packaging materials have become an essential marketing tool for this trade. Many packaging materials constitute a challenge when it comes to printing, which shows that the percentage of printing raw materials is estimated at 31% compared to other printed materials, so print Flexo solves these challenges and thus has become the de facto standard for packaging companies who want to print on a variety of paper compared to other methods.

Quality control in factories is carried out according to the standards set for product quality and is carried out at the production and post-production stages:

1. Quality of the raw material (the standard specifications for the materials to be printed) The researcher has conducted experiments inside Al-Obeikan for Packaging to ensure the quality of the materials, for example the tension strength of the material and its ability to paste.
2. Ensure that all stages of production, including trained labor, take place without any excesses or obstacles affecting the quality of the product.
3. Ensure that equipment and devices are running smoothly at full capacity (periodic and emergency maintenance).
4. Ensuring consumers' satisfaction with the product.

2. Overview And Background

There is a dearth of studies that specialize in studying problems and finding practical solutions in the field of Flexo printing machines. The researcher has made a lot of effort to obtain approvals to enter the printing presses, especially that it is difficult to enter some departments of the press, especially the topic is related to quality, which is considered a secret for printing house itself.

3. Research Problem

The research problem lies in the fact that despite the development of control and operation systems for flexo printing machines, there is no noticeable improvement in the quality of printing raw materials in such printing methods, and therefore it is necessary to apply modern control and operating systems for flexo printing machines to improve the quality of printing packaging products in Saudi presses. Especially color management and tension control devices.

The research problem can be formulated in the form of a question as follows:

Is the application of modern or advanced control and operating systems to flexo printing machines improve the print quality of packaging products in Saudi presses?

4. Aims and Objectives

The research aims to apply modern control and operating systems to flexo printing machines to improve the print quality of packaging products.

5. Hypothesis and Methodologies

The study relies on the case study approach to describe the monitoring and quality control processes in one of the printing facilities in the Kingdom of Saudi Arabia (Al-Obeikan Press) and applying the experimental approach that is based on conducting experiments and analyzing

data and information to achieve the goal of the research. The researcher conducted two experiments during operation (friction coefficient and adhesive strength between the material and the lamination layer) as a measure of quality outside the machine in the unit quality of the printing press.

2. Theoretical framework

2.1. Previous studies:

The study of Dr. Khaled Youssef (2015) entitled "Images Rosette Occurrence Eradication on Corrugated Carton Packages printed by Flexographic Post-Printing" "Disposal of the appearance of Rosette on the corrugated cardboard packages printed directly in a flexographic way" The research aims to improve the quality of the appearance of the details of the printed image by taking advantage of the capabilities provided by the image processing program during the preparation of the digital file in the prepress equipment stage in order to control the CMYK diameters of network dots that ultimately lead to elimination of the appearance of rosette in the images. The practical study has sought to develop applied solutions for color typing on one of the raw materials of corrugated and printed flexo method to avoid the appearance of the rosette problem and the study reached the use of a new technique and treatment that was applied in this research while preparing the digital file with the same grid angle for all the operational colors CMY and using the treatment on the Bump up curve to control the diameters of the produced mesh points was possible with it, the diameter of the grid point of the yellow color was greater than the color of the magenta, and the diameter of the mesh point of the color of the magenta is greater than that of the cyan color, and this helped to get rid of the appearance of Rosette.

Printing quality control and control systems:

The process of monitoring and controlling the quality of production of flexo printing is carried out through four basic systems:

Handheld systems HAND HOLD:

It is a small size measurement system, among which is the quality of the plate quality measurement, through which it can measure both the percentage of mesh points and color intensity, and these devices are called PLATE READER, and among them, what is specific to the print are the multi-functional SPECTRODENISTOMETER devices. It can measure many quality elements such as L * a * b and (E Δ).

Systems separate from the offline printer:

They are systems supported by computer programs supported by the international ISO specifications as well as the following forms. Quality control is achieved through the reports resulting from the work.





Online Printing Systems:

In these systems, quality control and control operations are carried out by devices installed outside the machine and connected to it to control the parameters of the machine settings such as the value of opening and closing the ink, and this is done after obtaining a sample of the print and performing the measurement on the table in this regard with standard lighting and the measurement is done on the color control tape. There are systems integrated with the inline printer, such as color recorders, and adjustments are made automatically.

The practical side

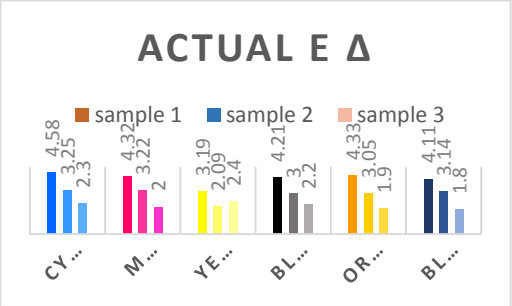
The researcher applied the practical study to search on Saudi Obeikan presses in Riyadh to determine the problem of research and identify modern control and operating systems used in flexo printing machines in order to improve the quality of printing packaging products.

In interviewing those responsible for quality in the printing presses, a number of daily problems faced by workers in these presses were presented, and focus will be on four basic problems in the scope of this research. The researcher also conducted some practical experiments for the stages that affect the quality of the publication, including color mismatch and point loss. The problems of the material, including tension and adjustments, which affect many of the poor quality of the final product and customer dissatisfaction. This practical study has yielded some results and recommendations that will be presented at the end of the research.

Experiment (1) color management (offline)

General conclusion

Whenever DELTA-E is low, this indicates that the color tone is dark, the solvent is increased, and - EXTENDED VARNISH.



Test (2) Tension Tester (online)

The results of the experiment

The researcher found that the technician performs the adjustments based on his own experience in dealing with the machine and advised the researcher to acquire modern tension control devices, which give an indication for adjusting the tension values continuously.

There are different results for experimenting with tension due to the change of machine speeds, and this is of course possible to occur, but it is necessary to set compensatory values continuously to avoid the slight changes that occur.

SERIES N=20 no. of samples	Width mm	Thickness µm	Peak load N	PEAK STRESS N/mm2	Break load N
The best achieved value	25.4	132	47.51	14.2	40.5
(MIN) minimal value.	25.4	132	39.27	11.7	20.4
(MAX) maximum value	25.4	132	58.94	17.6	54.9
S	0.000	0.000	7.67	2.29	10.4
(MED) the average	25.4	132	46.73	13.9	39.0

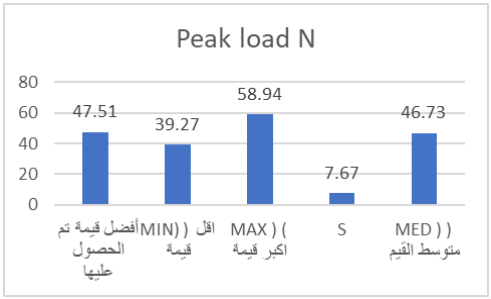
Test 3 the friction coefficient of the used plastic material

The results of the experiment

The result that we obtained: All the measured values do not exceed 0.2, which indicates the quality of the material used, and this was tantamount to ensuring its quality.

Experiment (4) testing the adhesive strength between the material and the lining layer

The results of the examination by experiment: As shown in the following table



CONCLUSIONS

The researcher has studied the case of one of the Saudi presses and conducted many practical experiments inside the house and also discussed those responsible for printing quality to investigate the problems that occur virtually every day within every printing process. He conducted interviews with the technicians of Al-Obeikan for Packaging and put possible solutions that may contribute to obtaining a good product of printing packaging, using all modern and advanced techniques in the field of packaging printing.

The researcher focused on a set of problems, which occurs during the printing process of the machine and the adjustments that are made during operation and its treatment by standard methods.

The researcher also carried out experiments to measure the tension strength and resistance of the material to friction, using standard conditions and desired goals. The researcher includes a set of results and recommendations in this regard.

Results

1. When the DELTA-E is low, this indicates that the color tone is dark, the solvent is increased and EXTENDED VARNISH. Whenever the DELTA E is high, the color tone is light, fresh ink is used directly from the FRESH INK containers.
2. There is a constant and continuous emphasis on testing the material used, checking the tensile strength, friction coefficient, solvent and chemical resistance, and ensuring that printing does not affect the packed product.
3. Carrier-based systems developed in printing machines to maintain tensile values have employed the use of sensors that directly measure tensile strength to provide feedback to control changes that may occur to the printed tape from the material.
4. To maintain control over the tensile values during the printing process, there is a new trend to control the tension by using load cells or transducers, which can provide a signal to the control unit. Before the task, the console is adjusted to the required tension level to avoid problems.
5. It is important to use new hardware and software for quality and accessory with printing presses and not to rely on human expertise at all times. For a company to be ISO or G7 certified, all standards, procedures and conditions must be properly implemented, tested and maintained.
6. New quality solutions enabled accurate prediction of the effect of changing ink concentration or changing anilox drum, which helped the machine operator manage color in the machine itself.
7. There are a number of developments in the embedded colorimeter technology. Since then, new features have been developed to offer what QuadTech refers to as “seven color management breakthroughs”, so named because these capabilities are new in the packaging and transforming industry.

Recommendations

1. Standard production target values must be created for each typography you run.
2. The colorimeter data must be sent to the ink mixer to correct the recipe using programs and "default scales" that can accurately determine the amount of ink remaining per ink unit. Printers can therefore track their ink quantities until you know exactly the correct amount needed to restore color to tolerances, and correction can be done automatically.
3. The production processes must be controlled to ensure quality through the use of devices outside the machine and the devices attached to it to ensure the smooth quality of printing.
4. It must be checked and tested to ensure the quality of the final product.
5. Activating the role of monitoring and quality control systems on an ongoing basis.
6. The need to improve the quality of flexo printing in Saudi printing houses with the available capabilities in accordance with ISO 12647-6

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