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A Study On Customer Expectation Techniques And Challenges Of Quality Control In Yarn Production.Ennar Spinning Mill, Coimbatore.

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ABSTRACT:

This study investigates customer expectations and the difficulties related to quality control in yarn production related to Ennar Spinning Mills. Quality control is critically important in yarn manufacturing due to the requirements for consistency, durability and compliance to global standards. The research also reflects important factors affecting quality perceptions, such as age, occupation and income. The importance of automation and technology adoption, workforce, training and monitored systems are emphasized in improving production outcomes. Data was obtained from 150 respondents through a convenience sampling group and analysed statistically through ANOVA, t-tests and Chi-square tests. The results show that demographic factors, such as age are significant to quality perception, however, there was no significant influence from demographic factors such as, gender and residence. Recommended actions include the adoption of high-level automated technologies, real time monitoring for quality, and comprehensive continuous workforce training for employees. These recommendations would address ongoing production errors, increase operational efficiency, and will prepare local businesses for a shift in consumer expectations, as the textile sector adapts to recover from the impacts of COVID-19. It is important to rely more on enhancing the quality practices of adopting quality control to sustain competitiveness across the textile sector. These practices will greatly produce lasting sustainability for textile businesses.

Index Terms: Yarn Production, Quality Control, Spinning Mills, Customer Expectation.

INTRODUCTION:

The textile industry is undoubtedly one of the oldest and most important in global manufacturing, contributing much to economic growth and providing employment. Yarn production is the basic phase of textile operation that determines the entire quality of the finished fabric. The spinning mills like cotton, wool, and synthetics are turned into yarn, needs quality control measures to keep product consistency and durability in mind. Quality control in yarn-making includes measurement and checking of every stage of its production from raw material to final winding of the yarn. Yarn quality achievement is posed with challenges from variation of raw material, efficiency of machine and process control, and environmental conditions. Any inconsistency in one of these factors can result in defects such as uneven thickness,

breakages, or contamination, thus influencing the final textile product. This study aims to explore the qualitative control techniques in spinning mills such as fiber testing, process-monitoring, defect detection, and their automation. The challenges faced by the industry include selection of raw materials, technological limitations, and cost considerations, which are to be addressed in suggestible ways thereby improving the efficiency and quality of yarn production.

STAETMENT OF THE PROBLEM:

In the yarn production industry, quality control is highly essential in ensuring that the final product meets certain standards of the industry and the requirements of customers. Various challenges have confronted the spinning mills in obtaining steady quality of yarn, such as variation in raw materials, efficiency of machinery, process control, and environmental conditions. Big, important issues include fiber inconsistency, contamination, machine stoppages, improper spinning conditions, and human errors; all hence pile up to defects such as uneven thickness, breaks, and low tensile strength. Even more, implementing appropriate quality control techniques involves strikes of balance between cost-effectiveness and highly developed technologies, thus rendering the whole process complicated for the manufacturers. The study proposed aims to identify and analyze the various types of techniques in quality control of spinning mills and to evaluate their effectiveness, and identify the major challenges confronted in high-quality yarn production.

OBJECTIVE OF THE STUDY:

1. To analysis the customer preference of quality control techniques in yarn.
2. To analyze the techniques and challenges faced by the customer.
3. To know the qualities problems faced by the customer.

SCOPE OF THE STUDY:

The study is carried out in spinning mills and is geared towards understanding the different quality control measures and their impacts on customer satisfaction regarding yarn production. The study examines the entire production chain from raw material selection to final packaging of yarn, against which the study identifies critical linkages affecting quality. It explores testing methodologies according to industry standards, defect identification and redress in a bid to guarantee uniformity of yarn property. It also looks into customer expectations on strength, evenness and durability of the yarn. The study, whilst assessing where exactly the hitches are in trying to keep up quality standards such as machine efficiency, material variability and workforce training, is bound to provide some insights on improving quality control and hence enhance customer satisfaction.

RESEARCH METHODOLOGY:

Research design:

The research design may be viewed as a sole framework or plan of research for a study that guides the Collection and analysis of data. It will be descriptive in nature.

Area of study: The study is undertaken in Coimbatore city.

Sample size: A sample size for this study is set to 150 respondents.

Sampling techniques: Convenience sampling technique is used for the study.

Period of study:

The period of study is set for 4 months - that is December2024-March2025.

Methods of data collection:

Data was collected from respondents through a questionnaire.

Source of data collection:

Data was collected through both the primary and secondary sources. Primary data were collected through the questionnaire.

Primary Data:

A primary data is a data that is collected for the first time for interest about what more information needs to be gathered on it. Thus, for this study, the primary data was extracted by means of questionnaire.

Secondary Data:

In this study, secondary data was collected from other studies, articles, journals, and websites.

Statistical tools used for data analysis:

- Chi-Square
- ANOVA
- T test

LITERATURE REVIEW :

Kumar & Mehta, 2022 "Defect Analysis and Prevention in Spinning Mills for Enhanced Yarn Quality" Defect analysis of the spinning mills is of high importance for achieving the desired yarn quality, and hence for customer satisfaction. News are the small clumps of entangled fiber causing fabric imperfections. Clubs are the places where the yarn is thick, thus affecting uniformity. Contamination of foreign fibers causes rejection of quality. The methods used to detect these defects are, among others, User testing, the high-speed camera, and spectroscopic analysis. Measures for prevention shall include appropriate fiber selection, machine setting optimization, and maintenance of the machine. Issues that are solved lead to improved yarn uniformity, enhanced fabric performance, and compliance with industrial standards.

Chen et al. (2024) "Nanofiber Technologies in Yarn Fabrication: Advancements, Applications, and Future Prospects" in ACS Nano on the incorporation of nanofiber technologies during the fabrication of yarn, the advancement in spinning techniques, fiber properties, and applications in textiles has been deliberated. It further elaborates on how yarn strength, durability, and functionality could be enhanced by electrospinning, melt-blowing, and nanocomposite approaches in such a work. In addition, nanomaterials' contributions to water management, thermal regulation, and antimicrobial properties were discussed. Hence, the claimed such review notes that nanotechnology has the capacity to change the landscape of technological advancement in yarn manufacturing for high-performing and sustainable yarn production. Describing the way forward, it tackled every aspect of research challenges for next-generation smart textiles regarding their wide, real-life applications and implementations.

DATA ANALYSIS :

ANOVA:

Relationship between check textile quality and demographic profile.

Hypothesis

There is no significant difference in check textile quality across demographic factors of the respondents.

ANOVA

Variables	Group	Mean	SD	N	t-Value	F-Value	Table Value	Sig.
Age	Below 20 years	2.04	0.935	25	2.948	2.229	-	NS
	21 - 30 years	2.72	0.976	60	-	-	-	-
	31 - 40 years	2.43	1.003	46	-	-	-	-
	41 - 50 years	2.5	0.985	18	-	-	-	-
	Above 50 years	3	-	1	-	-	-	-
Occupation	Student	2.21	0.957	28	0.396	3.267	-	NS
	Employed	2.11	0.974	27	-	-	-	-
	Business	2.73	0.962	37	-	-	-	-
	Professional	2.88	1.033	26	-	-	-	-
	Other	2.47	0.915	32	-	-	-	-
Family Type	Nuclear Family	2.45	0.918	62	0.430	0.185	-	NS
	Joint Family	2.52	1.05	88	-	-	-	-
Monthly Income	Below 20,000	2	0.92	27	2.631	3.388	-	**
	21,000 – 30,000	2.58	0.892	45	-	-	-	-
	31,000 – 40,000	2.49	1.077	43	-	-	-	-
	Above 40,000	2.77	0.973	35	-	-	-	-

CHI SQUARE:

Relationship between demographic profile and Quality standards of yarn.

Hypothesis:

The Demographic profile of the respondents have no significant association with the Quality standards of yarn.

Demographic profile	Chi-square value	Sig. value
Age	30.578	*
Gender	3.834	NS
Occupation	14.937	NS

Area of Residence	4.081	NS
Family Type	2.719	NS
Monthly Income	3.865	NS

CHI SQUARE

SUGGESTION:

- To improve quality control in yarn production, several key approaches should be employed. Firstly, the use of quality control technology should be actively increased to reinforce quality with minimum defects and duplication in quality. Using monitoring systems through scanning to verify quality control parameters with real-time tracking, automated inspection technology, and artificial intelligence predictive analytics for early detection of irregular values could assist with oversight of quality control standards and application grounds for timely and effective corrective action.
- Secondly, comprehensive training of employees is essential in order to maintain acceptable and high-quality standards. Training employees in the various quality parameters, identification of defects, and acceptable industry manufacturing practices could help improve efficiency, reduce human errors or omissions, and reinforce quality control practices. Training workshops and practical training can further enlarge employees' awareness of how to be aware of the standard of quality, use of quality in every aspect of production, and set maximums for quality defect in the production process.

- In addition to these, using a combination of automation & digital monitoring systems will help reinforce quality control standards in a traditional manufacturing process. Use of automated machines reduces human reliance for error and correction - so reduce defects and wastage. Digital quality control systems, using real-time tracking, tracking defects per batch, while also being able to setup predictive maintenance could make production easier to control, produce greater on-time reliability and also reduce production-related waste on raw materials.

CONCLUSION:

In yarn production, controlled quality assurance is crucial. Statistical analyses confirm the significant effects of training, technology, and management strategies on quality. Properly trained employees, quality checks on regular intervals, and consistent procedures for the employees around defects, yield a consistent process for the quality engineer. Employing technology to manage inspections and introduce automated inspections and artificial intelligence-based inspections can reduce our the rate of errors and improve efficiency. Standardization of the raw materials, the machinery, and the process can minimize variation in the product produced. These systems help gain more control over defects, recalls, returns, and/or exchanges, increasing stakeholder customer satisfaction. There is great value in developing and improving the quality of the process to align with international production standards, as others will do the same. By implementing controlled quality assurance systems using the newest technology and further developing employees' learning and using continued employee education, the textile manufacturers can improve waste, quality, and consistency, and in addition, gain a competitive advantage over other textile manufacturers in a global market.

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