BUSITEMA UNIVERSITY

FACULTY OF ENGINEERING

DEPARTMENT OF GINNING AND TEXTILE ENGINEERING

THE STUDY OF THE EFFECT OF MOISTURE REGAIN ON YARN BREAKAGES DURING KNITTING

BY

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DECLARATION

I ISABIRYE DENIS Registration Number BU/UG/2011/1220 hereby declare that this research project is my original work except where explicit citation has been made and it has not been presented to any institution of higher learning for any academic award

Sign .....

Date....4th/06/2015.....

APPROVAL

This research project report has been submitted to the Department of Textile and Ginning Engineering for examination with approval from the following supervisors:

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DEDICATION

I dedicate this report to my beloved sister Maria Gorreti Mutesi.

ABSTRACT

Yarn conditioning is very important in textile processing since the amount of moisture in textile fibres affects the physical and mechanical properties of fibres and yarns. This eventually affects the knittability and weaveability of textiles. Though many factors affect yarn properties and quality, this research was intended to determine the effect of moisture, an inherent factor that determines the strength and elongation of cotton fibres and yarns.

In this research, physical and mechanical properties of the unconditioned yarn such as percentage elongation, count strength product, yarn evenness (thick places, thin places and neps) were tested and compared with those of conditioned yarn.

Two conditioning methods were used, i.e. the steaming method of conditioning and the conditioning in room method (conditioning by acclimatization). In the steaming method, the yarn bobbins were steamed for 30 minutes at 70°C and then cooled for 30 minutes before testing. In the conditioning in room method, the yarn packages were stored in the air conditioning room at 75% RH for three days after which the yarn properties were tested. The yarn bobbins sampled were 100% carded cotton yarns.

Yarn samples of unconditioned and conditioned yarns were each knitted on the circular knitting machine for thirty minutes at a running speed of 10 RPM and the number of yarn breakages and their possible causes were recorded for both samples. The machine efficiencies for the two knitting operations were determined. It was found that conditioned yarn presents fewer yarn breakages and a higher efficiency of knitting is achieved when knitting conditioned yarns as compared to unconditioned yarn.

The findings in this research provide empirical evidence that alerts textile mills to prioritize yarn conditioning in order to improve efficiency of knitting, increase productivity and profitability of the knitting room.

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LIST OF ACRONYMS AND ABBREVIATIONS

SRNL; Southern Range Nytil Limited

CSP; Count Strength Product

CRE; Continuous Rate of Extension

RPM; Revolution per Minute

UT3; Uster Tester 3

TM; Twist Multiplier

ISO; International Organization for Standardization

ASTM; American Standard Testing Method

RH; Relative Humidity

CVm; Coefficient of Variation of Mass

CVm (1m); Coefficient of Variation of Mass at 1m

Um; Irregularity in Mass

TM; Twist Multiplier

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CHAPTER ONE: INTRODUCTION

Preamble

This presents the general information about the research topic giving its background, problem statement, objectives, study scope and its justification.

1.1 Background

The production capacity and efficiency of textile industries varies following a lot of factors during manufacturing. In the textile manufacturing industry, the textile main processes starts from fiber preparation, cleaning and blending in the blow room. This is followed by spinning to convert the fiber to yarns. Yarns are then strengthened with sizing chemicals like starch and wax so that they can withstand vigorous movements during weaving and knitting into fabric in high speed weaving looms and knitting machines respectively (Jaya and Arumis, 2008).

However a lot of yarn wastage is encountered in the process of weaving and knitting due to poor quality yarn with poor tenacity properties caused variations in machine parameters and yarn parameters such as moisture content and this has been particularly my area of emphasis in this study. In order to improve the yarn quality and thus the efficiency of knitting without altering the raw material, it was decided to make use of the physical properties inherent in the cotton fibres (Adanur, 1995).

Cotton and fibres are hygroscopic; that is, they have the ability to absorb moisture from the environment where they are kept (Savile, 2002).

Therefore, as the relative humidity of the environment increases, the amount of moisture absorbed by these fibres rises, which results in some changes in the physical properties of the yarns made of these fibres. On the other hand, moisture levels of yarns decrease due to the modern machinery with high production speed. For example, cotton yarns contain 4-6 % moisture when they have been produced on a spinning machine (Özdemir and Dayık, 2004).

The decreases in moisture levels of the yarns are likely to bring about some difficulties in the subsequent processing steps such as weaving and knitting; also, yarns with lower moisture

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