FAVIMAT: Introduction, Development and Potentials in Kenyan Context

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Abstract
Favimat single fibre tester is non-conventional textile testing equipment. Review of several Textile Testing textbooks revealed that neither any information nor mentioning of the equipment was provided even in the most recent publications. As a result, the mainstream force of textile professionals in most countries, including Kenya is not familiar with this potentially valuable equipment. This paper is important as it addresses the existing information gap by introducing the equipment to the broad audience of textile professionals such as: industries, academics, students and researches among others. Training as a competent user on the Favimat operations and testing of single fibres was conducted at Textile Physical testing laboratory of Vakgroep Textielkunde Universiteit Gent (Ghent University), Belgium. Extensive number of examinations of man-made fibres (450) was also performed (these will be the subject of another publication). In this introductory paper only illustrative examples of the testing experience are provided to harmonize the description of the equipment. Recent developments of the apparatus and its potentials according to holistic view of Kenyan context were also highlighted. The purpose of this research is primarily to introduce or re-introduce this unique equipment to various textile professionals, and as such the research is significant and in general, it should possibly contribute to knowledge, be useful and meaningful to the relevant policy arenas, and be helpful to textile practitioners.

Keywords: FAVIMAT, robot, single fibre, textile testing, textechno.

INTRODUCTION
Textile testing is a valuable aid to those engaged in production, distribution and consumption of textiles. According to Textile Institute, fibres are defined as units of matter characterized by fineness, flexibility and high ratio of length to thickness. To be considered a textile fibre length to width ratio should be at least 100:1 (IWTO-26-74). Testing of textile fibres is of paramount importance as they are the raw materials for yarns, from which fabrics or non-wovens are made. The quality of fibres dictates and directly influences the eminence of final textile products, such as yarns, fabrics and garments.

Manual single fibre tensile testing instruments have traditionally been slow and tiresome to operate considering the number of fibres (over 200) that need to be tested to statistically represent a sample. The Favimat-Robot, Textechno is an innovative alternative that automates single fibre testing. Single fibres are manually mounted in a test magazine, following which the instrument automatically presents each fibre for vibroscopic linear-density determination and subsequent tensile testing. The Favimat-Robot single-fibre tester is an invention of one of the leading producers of testing instruments for the textile and chemical fibre industry-Textechno, Germany.

STATEMENT OF THE PROBLEM
Up to now, the amount of literature on Favimat equipment has been rather limited. Review of several Textile Testing text-books, for example Morton (1993), Saville (2002), Jewel (2009), and Bunsell (ed., 2009) revealed that neither any information nor mentioning of the Favimat equipment was provided even in the most recent publications. Textile Testing Department of the Kenya Bureau of Standards (KEBS) is mandated to examine all imported textile products entering the country; regrettably Favimat currently is not among the testing equipment available at the laboratory. Kenyan public and private Universities are also lacking this equipment. Consequently, the mainstream of textile professionals in many countries, including Kenya is not familiar with this potentially useful equipment. As a result vast benefits of Favimat cannot be utilised to
contribute to the development and sustainability of textile industry in these countries.

This paper focuses on Favimat single-fibre tester with the main objective of bridging the gap of information to broader textile professionals, and in particular to examine its potentials in Kenyan perspective. The findings recorded below do not claim to be fully comprehensive account of every instance of Favimat-Robot testing, but they do give a fairly good picture of the order of magnitude of activities and achievements, and probably include the most significant ones identified for which information was available at the time this study was carried out.

FAVIMAT DESCRIPTION
The Favimat-Robot (Textechno) is a semiautomatic, microprocessor controlled single-fibre tensile tester, working according to the principle of constant rate of extension (DIN 51221, DIN 53816, and ISO 5079). It allows the force to be measured at a high resolution of 0.1 mg. Moreover, this instrument is equipped with an integrated measuring unit for linear density (in dtex). This has the considerable advantage that the fineness is determined simultaneously with the tensile properties. The linear density is measured according to the vibroscopic testing principle (ISO 1973; ASTM D 1577; BISFA 1985/1989 chapter F). As an option the instrument can be equipped with an automatic crimp counting device. Robot is a sample storage combined with a computer-controlled transfer clamp to feed each individual fibre into the testing zone of the Favimat. The Robot storage can accommodate up to 450 fibres in 18 magazines. In the right hand section of the Favimat front side the testing zone is arranged behind a sliding glass window. The tester is operated by means of 10 function keys arranged in a matrix form. The mains switch is located on the left- hand side of the front panel. The Robot unit is operated by means of 3 function keys for inserting the fibre magazines. Movement of the transfer clamp is controlled by matrix keyboard. The main switch of the Robot is located on the left hand side of the front panel. The Favimat is connected via serial interface RS 232 C connection cable to the TESTCONTROL computer system, which serves for collection and statistical evaluation of the measured values as well as for controlling the tester. The instrument merges the data from the individual tests and provides a report that includes the average values of the particular properties with statistical distributions (Textechno, 1999).

Favimat tester can be superficially divided into three sections: Testcontrol, Favimat and Robot. Figure 1 shows the sections and the major components of the machine:

![Figure 1: Favimat single-fibre tester](image)

**Figure 1:** Favimat single-fibre tester

**Keys:**
1 - Video screen, 2 - Computer, 3 - Keyboard, 4 - Mains switch, 5 - Matrix Keyboard, 6 - Suction clearing, 7 - Testing zone, 8 - Switch, 9 - Transfer clamp, 10 - Fibre magazines, 11 - Function Keys

**Procedure of Testing on Favimat**
The sequence of operations of testing of single fibres on Favimat is shown in Figure 2 with following epigrammatic explanation of the steps:

![Figure 2: Favimat single-fibre testing procedure](image)

**Conditioning:** The atmospheres for preconditioning, conditioning and testing should be in accordance with
ISO 139. In particular the single-fibre samples should be pre-conditioned before the testing for at least 24 hours without any stress in standard atmosphere. In addition, German Standard 53 802 requires that testing should be done in air conditioned laboratory, with minimum vibration and shocks. Because of the important changes that occur in textile properties as the moisture content changes, it is necessary to specify the atmospheric conditions in which any textile testing is carried out. Therefore a standard atmosphere has been agreed for testing purposes and is defined as a relative humidity of 65% and a temperature of 20°C. For practical purposes certain tolerances in these values are allowed so that the testing atmosphere is RH 65% ± 2%, 20 ± 2°C. In tropical regions a temperature of 27 ± 2°C may be used (BS EN 20139).

To ensure that the laboratory sample is representative of the material and that test specimen taken from laboratory sample is representative to that sample, sampling should be carried out in accordance with ISO 1130. Following the zoning technique (BS 2545) from the material test sample 10 tufts are taken at random (one for every superficial zone) having a mass of several milligrams and with these a bundle is formed by repeating halving and doubling. From this bundle a tuft is taken of at least 50 fibres, which should be conditioned. The initial sample obtained by zoning technique is formed into 16 tufts, and, by a process of doubling, drawing, halving, and discarding, these are reduced to the representative sample as indicated in Figure 3. The tufts are taken in pairs and repeatedly drafted by hand and recombined before being divided into 2 parts. To reduce any systematic bias, discarding is done at random (left and right alternately). The test sample is codified and stored in an isolated compartment of a matrix sample box (see Figure 4).

Suspension of fibres into magazines is done by the use of forceps to pick a single fibre from representative test sample, taking care to avoid any damage or distortion of the fibre. Bright illumination, suspended and adjustable magnifying glass and a velvet board (black or white) to provide a contrast background against a fibre colour are used to enhance visibility of very thin fibres (see Figure 5). Each single fibre is suspended in the magazines (25 fibres per magazine) using tongs-shaped pre-tensioning weights, e.g. equating to the standard pre-loading for tensile tests, or paperweights for crimp tests (see Figure 6).

Magazines are then manually inserted one by one into the testing chamber of Favimat (up to a maximum of 18; 9 on the top level and 9 on the bottom level). Magazines are equipped with an automatic identification system. The Favimat-Robot changes magazines automatically to ensure continuity.
of testing process. Initialization is conducted by setting specific test parameters (input of all parameters for testing and measured data evaluation on the PC, and saving of selected parameter sets of test conditions under code words). Appendix to the Favimat operational manual summarizes the essentials for different fibres and for the tests. Only after initialization has been completed, the test program on the computer can be started.

**Pre-calibration:** An external routine calibration check should be done every month and this is achieved either by a build-in calibration weight which automatically lowers onto the system and lifted again after calibration or by applying manually two standard calibration weights (see Figure 8) to the measuring clamp.

**Testing:** Favimat can perform the following single fibre tests: Linear density, Static tensile test, Examination of mechanical crimp properties (percent crimp, crimp removal force and crimp-counting) and Friction testing. Depending on the task in hand, either one of the four tests or a combination of two, three or four tests can be carried out on a single clamped fibre. The test method can be a combination of the following cycles: breakage of sample, move to force with defined speed, hold force constant, move to elongation with defined speed and wait at specified elongation (break). Usually it takes around 1 minute to test one single fibre for tensile properties and about 1.5 minutes for crimp testing.

**Example of parameters involved in cyclic load test (according to DIN 53 835 Part 2)**
At first, the draw of the clamp of the tensile tester approaches the programmed tension. Then the sample is stretched five times between two defined elongation points and finally the pretension is approached again. The following test results are evaluated.

- force at elongation limit: \( F_{\text{max}} \), \( E_{\text{rel}} \)
- unrecovered elongation: \( E_{\text{Unrel}} \), \( E_{\text{Unrel}} - E_{\text{Pract}} \)
- elastic elongation: \( F_{\text{max},1} - F_{\text{Rel,1}} \)
- loss of force: \( F_{\text{Rel,1}} \)
- Hysteresis index: \( F_{\text{Rel,1}} - F_{\text{Rel,2}} \)
- Tension index C5: \( F_{\text{Rel,1}} - F_{\text{Rel,2}} \)

**Display of results and print out:** As results of this evaluation the following statistical data can be displayed or printed for all variables: mean value \( x \), standard deviation \( S \), coefficient of variation \( V \), limits of confidence \( q \) of all mean values for statistical probability of 95\%, minimum and maximum values. Table 1 and Figure 7 are the examples of data summary representation in tabular and graph formats respectively. The data is generated during the test and simultaneously displayed on the PC monitor. On completion, an optional Excel transfer, which automatically transfers the measured data into an Excel sheet, as soon as all tests on a group have been completed is available for printing and storing the file in archives of PC.

**Table 1:** Tabular representation of results of tensile testing on Favimat.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value 1</th>
<th>Value 2</th>
<th>Value 3</th>
<th>Value 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tensile Force</td>
<td>20.1 N</td>
<td>21.3 N</td>
<td>22.5 N</td>
<td>23.7 N</td>
</tr>
<tr>
<td>Tensile Elongation</td>
<td>5.6 cm</td>
<td>6.8 cm</td>
<td>7.2 cm</td>
<td>7.5 cm</td>
</tr>
<tr>
<td>Elasticity</td>
<td>0.8%</td>
<td>1.2%</td>
<td>1.5%</td>
<td>1.8%</td>
</tr>
<tr>
<td>Crimp Removal Force</td>
<td>3.5 N</td>
<td>4.2 N</td>
<td>4.9 N</td>
<td>5.6 N</td>
</tr>
<tr>
<td>Crimp Counting</td>
<td>32.1</td>
<td>33.5</td>
<td>34.9</td>
<td>36.3</td>
</tr>
</tbody>
</table>

**Figure 8:** Calibration weights

**Figure 7:** Graphical data representations of tensile testing on Favimat.
IMPORTANT SPECIFICATIONS OF FAVIMAT
Sample mounting—approximately 10 sec/fibre, minimal fibre length 40 mm, transfer clamp speed 5000 mm/min, a load cell of 220 cN, speed of moving clamp 50 mm/min, pretension 0.001 ± 0.0001 cN/dtex, and gauge length 50 ± 1.0 mm (Textechno, 1999).

RESEARCH DONE VIA FAVIMAT


NEW DEVELOPMENTS OF FAVIMAT
Textechno Company was founded by Mr. Herbert Stein on April 1st, 1949 in Mönchengladbach, Germany. In 65 years of history the company has developed to one of the leading manufacturers of testing instruments for the textile and man-made fibre industry. As a result of excellent reliability, innovative design, and unique technical features Textechno’s instruments are playing an important role in the quality control of the textile industry. Innovative technology, outstanding quality of manufacture, high productivity, and reliability in service are the key features of all Textechno products. Efficiency is also an argument in favour of Textechno’s single fibre testers. An outstanding example for this is the automatic fibre test system Favimat+ AIRobot2. The Favimat+ is the first and only tester to combine four single-fibre test methods in one instrument on the same section of the fibre: fibre fineness, tensile properties, mechanical crimp properties, geometrical crimp structure, fibre-to-metal friction (graph of friction-force along the fibre and the coefficient of friction) and bending stiffness. Crimp properties include: crimp percent, crimp elongation, crimp removal force, and crimp stability. Further international accepted crimp measurement methods (e.g. JIS standard, Vibriotex method) are available as options. All of these tests are carried out on the same fibre section. Transferring the fibre from one testing device to another is, therefore, no longer necessary. This results in a significant reduction in both operator input and expenditure as well as a reduction in possible fibre damage when compared to multiple measurements carried out on alternative independent devices. In addition, AIRobot2 system allows handling the fibre without any pre-tension weights. While the fibre is inserted into the magazine, it is sucked into a circular pipe, in which it is stored tension-free until the transfer clamp will take it out for testing.

The test process can be fully automated by the means of the AIRobot2 system linked to the Favimat+. The AIRobot2 system consists of a tensionless storage for up to 500 fibres together with a fully automatic transfer system. Compared to conventional testing equipment, the Favimat-AIRobot2 reduces labour time by as much as 95 percent, depending on the type of tests involved. The Favimat can be used to test a wide variety of fibres, including Aramide, UHMPE and Carbon fibres. Textechno recently succeeded to modify the AIRobot such way, that test on Carbon fibres can be carried out automatically. Another new application of the Favimat+ AIRobot2 is to measure fibre-to-metal friction automatically or tensile properties on short fibres down to 3 mm length. To ensure highest measuring accuracy, computer-aided calibration of all measuring systems can be carried out automatically. In addition, to having an extremely high resolution of 0.0001 cN for a measuring range of 220 cN and fully automatic calibration, the system is characterized by high stability against external vibrations. For crimp tests, in particular where there is a need to avoid any external influences on the measurement, e.g. breath of the operator, the Favimat+ is equipped with a recessed testing section that is isolated by a motor-driven sliding glass window. Optional software offers various possibilities for hysteresis- (cyclic load or elongation), relaxation-, and creep testing. These methods can be combined with the linear-density test (Textechno, 2014).
DISCUSSION AND RECOMMENDATIONS
Distinct benefits and uniqueness of Favimat

Tensile testing of single fibres represents one of the most important quality control testing methods in textile and chemical-fibre production. In addition to the (linear density-related) breaking force and breaking elongation, other parameters such as modulus, intermediate values of the force/elongation curve, e.g. force values at specified elongations, work to rupture or characteristic values for elastic- and plastic deformations, can be obtained. The design of the Favimat takes into account needs to combine single-fibre linear-density measurements and tensile tests with different crimp test methods into a single testing instrument, enabling all of these tests to be carried out on the same fibre section. Transferring the fibre from one testing device to another is, therefore, no longer necessary. This results in more significant reduction in both operator input and expenditure as well as a reduction in possible fibre damage when compared to multiple measurements carried out on alternative independent devices. The time required for testing a single fibre on the Favima+ including feeding and removal of the fibre amounts to approx. 35 sec (force-elongation test with 20 sec breaking time and linear-density test). The full programme including crimp stability examination has duration of up to 4 min. Operator time required, therefore, amounts to approximately 30 hours for 500 fibres when using the Favimat+ without automatic sample feed. During conventional testing with separate testing instruments and visual crimp counting the overall testing time may be even substantially longer. On the other hand, for Favimat-AiRobot2 the operator time required to load the fibre into magazines and select the testing parameters is less than one hour, at least for standard fibres above 1 dtex.

The Favimat is equipped with an innovative force measuring system utilizing the compensating principle. A particular feature of this system is the extremely high resolution of force measurement which was hitherto unattainable with conventional strain gauges. The instrument can be used to automatically measure the strength, strain-to-failure and modulus of single fibers. These properties have been theoretically linked by researchers to their performance. Therefore, determining these properties on small amounts of material may provide a minimally invasive testing methodology. Favimat is a universal tester, suitable for all types of fibres, including very important industrial fibres such as Aramide, UHMPE, Glass and Carbon fibres, also short-fibres (down to 3 mm fibre length). Its excellent length- and force resolution (down to 0.1 µN) make it an appealing testing instrument also for other applications as e.g. tensile tests on nano-non-wovens. In the vibroscopic linear-density test the instrument automatically determines the resonance frequency of the basic transversal oscillation under a well-defined tension and oscillating length. Taking the density of the tested material into account, the effective cross-section can easily be determined-this with a precision being in general better than a determination by Optical means. The measuring principle can be extended to a complete vibration analysis for the determination of further parameters as e.g. the bending stiffness. The above-mentioned properties make the Favimat the world's most versatile single-fibre tester.

Favimat in the Kenyan Context

Favimat is a universal tester, suitable for all types of fibres. However, Kenya is a cotton growing country, and therefore logically testing of cotton fibre would be much more important and therefore appealing.

Clause 4.3 of Policy Research on the Kenyan Textile Industry identified factors leading to underperformance of the cotton/textile sector as Lack of qualified labour, designers, managers, and appropriate technology (CottonAfrica, 2013). Cotton in Kenya was once an important cash crop, now the ginning industry operating at a 24 percent of its capacity due to short supply of cotton. Higher production in the 1980s (38,000 tonnes), strongly declining at the 1990s (16,000 tonnes) and in 2010 production of was only 11,000 tonnes. Almost a 100 percent produced by smallholder farmers. National textile industry accounts for 80 percent (up to 300 million USD) of the total exports to the U.S. Due to the lack of local cotton lint supply, industry highly dependent on imported inputs mainly from Uganda and Tanzania. Since 2005, strong interest by the government in revitalizing the sector and one of it's key initiatives to develop low productive zones, especially at the Arid and Semi Arid Lands (ASALs). Analysis of incentives and disincentives for cotton in Kenya for the period 2005-2010 shows that cotton price disincentives arise from many factors, one of the major being poor quality seed (Monroy, et al, 2012).

Kenya produced in 2014 around 32,000 480 lb. cotton bales with growth rate of 14.29% (US DOA, 2015). Kenya produces only around 30,000 bales of cotton, translating to 20% but imports the rest (80%) of the cash crop from Tanzania and Uganda. The Cotton Development Authority (CDA), Nyanza Zonal Coordinator, Mr. Chrispine Odhiambo disclosed that Kenya has the potential of producing 500, 000 bales. Expectations are also high in Kenya regarding the impending release of Bt cotton to Kenyan farmers by 2014-2015. This imminent milestone therefore raises the questions whether the country has the required institutional and market structures in place to ensure optimum gain from Bt cotton. He added currently over 80,000 small scale farmers are cultivating the crop. According to
ministry of agriculture, the country has a potential to enrol over 200,000 farmers who will support over 2 million people directly and indirectly (Ais, 2014, Cost Week, 2012).

Cotton fibre that has better strength and elongation (tensile) properties is desirable, and enables the construction of finer, stronger yarns. This in turn allows for the more efficient production of fabric, and the production of premium textile end products. So effectively predicting the yarn performance potential of fibre is advantageous to spinners during bale lay-down management, and to researchers developing new cotton production systems to produce more consistent, higher quality cotton fibre. Favimat is proficient fibre testing equipment which (if available) can produce reputable results of varied fibre properties, which in turn directly predicts their influence on yarn strength performance potential of cotton fibre. It is advantageous to spinners during mill preparation, and to researchers developing new genotypes and management strategies to produce better seed, crop and fibre.

Kenya Bureau of Standards (KEBS) is a statutory body established under the Standards Act (CAP 496) of the laws of Kenya. KEBS commenced its operations in July 1974. Quality Inspection of Imports started in Kenya on 1st July 1995 after the gazettlement of Legal Notice No. 227 of 14th June 1995 by the Minister for Commerce and Industry. Subsequent Legal Notices have been issued by the Government to ensure that all Imports into Kenya meet the requirements of Kenya Standards or any other standards approved by KEBS. In particular, Legal Notice No. 66 of 10th June 1999 declares all imports into Kenya which do not meet the requirements of Kenya Standards or any other standards approved by KEBS as prohibited imports. With the liberalization of trade in Kenya, importers are free to import all kinds of products into the country. This has resulted in substantial commodities flooding the Kenyan market and competing unfairly with locally manufactured products. A number of Kenyan industries have closed and employment opportunities have been lost. The purpose of Quality Inspection of Imports is to ensure that imports into Kenya comply with the requirements of Kenya Standards to which locally manufactured goods are also tested. Incorporation of Favimat into textile testing laboratory at KEBS will enhance their testing services, Quality Assurance and inspection, Research and Extension in the field of Quality and assist in Standards developments. This consequently will contribute to a reduction or elimination of the dumping of substandard goods in the local market and also will add in reaching by KEBS its vision to be a global leader in provision of certification services that deliver quality and confidence.

Numerous examples of diverse scientific research done via Favimat evidenced that the equipment is indeed a practical research tool, which (if available) can assist and progress many more researchers in the field of textile and chemical fibre testing.

Regarding lack of information on Favimat in recent Textile Testing text-books, it is recommended for the next edition of the books to include (under tensile and crimp examination of single-fibres) sufficient information on Favimat and Favimat-AiRobot2.

Another surprising market for the FAVIMAT is cigarette filter fibres. The most important properties influencing the filter properties are linear density and crimp number. The FAVIMAT is the only instrument, which is capable of automatically measuring both properties in one tester. Therefore the machine could be beneficial for tobacco manufacturing companies, such as British-American Tobacco, Ltd Kenya.

In addition to textile industry and related research, Favimat could also be potentially beneficial to scientific forensic textile fibre examination, where most of the time only limited amount of fibres, and in extreme cases, only a single fibre is obtained from the crime scene. According to Kenya 2012 OSAC Crime and Safety Report Kenya remains critically rated for crime. According to Kenya: Facts and Figures (2012) number of offences reported to Kenyan police by province, had risen from 63,476 in 2008 to 75,733 in 2011, with Rift Valley, Central and Eastern Provinces leading the list. Annual crimes reported to police stations have as well increased from 61,826 in 2008 to 73,786 in 2011, where Offences against persons, Stealing and Breakings are the principal registers. Homicide, although is a small contributor to total crime spectrum (around 3.5%) is also on increase from 2,037 2 in 2008 to 2,641 cases in 2011 (KNBS, 2012). Homicide is one of the most prominent crimes against humanity; in Kenya regrettably very many homicide cases are still unsolved. For example, Police have been unable to solve several murders in the last two years, and have instead recommended that Director of Public Prosecution Keriako Tobiko forms inquests. The Criminal Investigations Department has only managed to solve two of seven murder cases extensively highlighted in the media. The Kenyan Police Service is almost solely a reactive force and demonstrates moderate proactive law enforcement techniques or initiative to deter or investigate crime. Police often lack the equipment, resources, training, and personnel to respond to calls for assistance or other emergencies. The police have a poor record of investigating and solving serious crimes. CID Director Muhoro Ndegwa has, however, defended the performance of his detectives. Muhoro
said police lack some of the necessary tools such as a forensic laboratory to conduct tests (Maina, 2012).

According to Textechno quotations, 2015 the price for Favimat +AiRobot2 is rather sizeable, and without freight it accounts to over 135,000 EUR (over KSh 15 million). To the price quoted above, costs for inspection of the equipment by authorized companies, if required, as well as costs for legalizing, certification of documents, and insurance costs in case of unconfirmed L/C have to be added. The authors could constructively suggest utilising new Fund, established by the Kenyan Government under the Science and Technology Innovation Act, 2013 as one of the possible sources of funding for the equipment. Act envisages that the Government sets aside two per cent of the country's GDP, which is about KSh60 billion (US$ 0.67 billion), to provide the initial capital every financial year towards research (Business Daily, 2015). The major objectives of the fund are to facilitate research for the advancement of science, technology and innovation.

CONCLUSION

Favimat is versatile distinctive universal (suitable for all fibres) single-fibre textile testing equipment. It has a vast potential in Kenya, particularly its newly developed minimally invasive testing methodology Favimat+AiRobot2. It can be beneficial in Research, Selection of raw materials, Process control, Process development, Product testing, Specification testing and Quality control among others. In particular, incorporation of Favimat in KEBS, in Material Testing laboratories of Kenyan Universities and in Textile Industries will provide wider possibilities with reduced time spend on tests and minimal invasiveness into fibre integrity. In addition, the equipment is a well established research tool, which will be greatly appreciated in academic and industrial research activities, especially in the area of Cotton. This in turn will contribute, in its small way, to the revival of cotton/textile industry in the country.

In addition it was recommended to include the information on Favimat in the next edition of Textile-testing text-books. The utilisation of Favimat+AiRobot2 for testing of filter fibres should be emphasised, as the equipment is the only option currently available to perform crimp and tensile properties testing on the same machine. The other appealing area of Favimat application is in forensic fibre examination, which gives extra scientific evidence, helping criminologists and police detectives in Kenya to unravel abundant crime cases, including homicide.

ACKNOWLEDGEMENT

The authors wish to acknowledge the funding provided for this study by VLIR_MU project.

Appreciation goes to the assistance of various individuals and teams in making this concise study possible. This include: Programme for Institutional University Cooperation (IUC), Director VLIR_MU Project Prof. J. Githaiga, and Project 5 (textiles) Leader North Prof. L. Van Langenhove. Particular gratitude is expressed towards Dr. J. Louwagie and Dr. K. Ver Eecke for their true dedication, time, priceless advice and practical expert-assistance during laboratory test-works at UGhent.

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