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Fall 1957
TEXTILE ENGINEERING

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COVER: Rowena Janell Cummings.

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While the textile industry is bedeviled by many vexing problems, there are some positive things that can be done to help the situation. Three of the things are:

1. Marketing development
2. Inventory and cost control
3. Sensible pricing policies

All of these items are basic and are of paramount importance. Unless we develop markets we can’t make sales. If we fail to control our inventories and costs we bring about a chaotic situation that will ultimately result in bankruptcy, liquidation, and more mergers. If we fail to establish a sensible pricing system, we are unfair to our stockholders, our employees, our communities, and ourselves.

While a good bit can be said about each of these three matters, I intend to concern myself principally with the third item, sensible pricing policies. As sensible men in a basic industry, we cannot fail. We must have the wisdom, the foresight, and the cooperative spirit to win a battle against overwhelming odds. We should help each other in every way possible to establish sound markets, to control our costs and inventories, and price our yarns and fabrics in a sensible manner. Now, let’s see what we can do about it.

Let us assume that a prominent mill manager had an appointment to meet a good volume cutter to go over a new line of goods and place some business with the cutter for his spring line. We assume that he boards a DC-7 in Atlanta and that two hours and forty minutes later the plane is on the ground at Amon Carter Field. After the plane lands the mill manager rushes over to a nearby livery stable, mounts a burro, and three hours and a half later arrives, sweating and smelling slightly of a quadruped, at the Adolphus Hotel for his appointment.

This is a ridiculous and absurd example, I can assure you. No one would use modern plane transportation and then make the final lap of the journey on a primitive burro; however, many textile mills do things just as ridiculous. Some of them Micronaire their cotton, maintain strict quality control within the plant, use modern and up to date machinery, and combine all of this with crude and obsolete methods of pricing and merchandising the final product. This might be a shock to a good many people in the industry, but it is absolutely true that quite a few mills, even in this atomic age, are pricing yarns and goods on an average plant poundage cost, with rule-of-thumb differentials for various yarns and fabrics. Some of them use the auction, or “What’ll you gimme” method. Some of them depend on commission salesmen for establishing prices. I do not mean to imply that commission salesmen or salaried salesmen are not good, well-meaning, conscientious people. I know for a fact that most of them are. However, mill management seldom, if ever, insists and holds out for reasonable profits.

Take a look at page 16 of the Journal of Commerce, dated Thursday, November 1, 1956, and look at the yarn quotations. Note that 8s, 10s, and 12s carded yarns are offered at the same price for singles as for two-ply. Anyone familiar with the principles of cost accounting knows that it does cost some money to ply yarns.

Now, let’s go down the list a little bit further and look at 18s carded. It is reported here that 18s two-ply carded costs one cent more than 18s singles carded. Anyone familiar with twisting costs knows that a differential of 1¢ between 18s singles and 18s two-ply is ridiculous.

Go down the page just a little bit further and look at 18s single combed and 18s two-ply combed; 18s two-ply combed is being offered at 8¢ per pound more than 18s singles combed. It doesn’t cost any more to
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twist 18s two-ply combed than it does to twist 18s two-ply carded, yet in one instance we see a difference of 8¢ per pound. It admittedly costs more to twist 38s two-ply than it does 18s two-ply; however, we note a differential of 6¢ per pound for 38s two-ply combed over 38s singles combed, whereas the differential between 18s singles combed and 18s two-ply combed is shown as 8¢ per pound.

People in the yarn business, of course, admit that this is asinine and ridiculous, but what do the people do who offer fabrics for sale? They'll beat 'em to a nub on their home grounds and let 'em offer their own odds.

Recently a grey goods mill was offering for sale a number of different constructions. All of these constructions were being offered at the same poundage price. This was being done despite the fact that the average yarn counts in some of the fabrics ran in the vicinity of 8s singles, and in other fabrics ran approximately 20s singles. It is needless to say that these people were losing money. They went to one of their customers and told him that they could no longer offer him goods at the same poundage price and would have to discontinue making two numbers that they were furnishing him.

The customer went out and found a new source of supply for the two numbers that he was running with this poundage price-quotation mill. In the meantime, the mill installed a cost system which gave it a cost on each fabric made. Much to their alarm, management found that on the two numbers that they had dropped, they were actually making money. These numbers of course, happened to be coarse-yarn, low-sley, and low-pick goods.

They went to their former customer to see if they couldn't get back in the picture, but the customer had a new source of supply and saw no reason to go back to his original supplier for the goods. This mill actually lost a good account because of inadequate cost information.

Recently a well known textile firm was offering for sale two constructions. Both of these were made using the same warp counts; however, in the filling one fabric had nine picks more than the other fabric, and the filling yarn was half the size in one with the higher package. Furthermore, the high-pick, fine-yarn filling goods weighed 1¾ ounces per square yard less than the low-pick, coarse goods.

Sound cost accounting would indicate that the cost per pound would be a good bit more for the lighter yarns, higher package and lighter weight material, but imagine their chagrin when they found that the lighter weight goods with more picks, with finer yarn were actually selling at slightly less per pound than the heavier goods with coarse yarns and low package. The matter was checked and it was found that the mill could come out on the coarse goods, but would sustain a substantial loss on finer goods. Of these fabrics, the light-weight one with the higher package and the finer counts in the filling was, of course, the better seller. The buyers know a bargain when they see one, and they go for it. This situation was not at all humorous to the mill's salesmen. They immediately wanted to know why the mill couldn't meet competition.

The average man managing a textile mill is a good man. In most respects he is better than an average man. He tries to do what he can to serve his customers, his employees, his stockholders, and his community. He is intelligent, well-educated, and his pride and joy is in the capital improvements that he has made in his plant facilities.

The average buyer is another good man. If you make a close check into the situation though, you will find that he is certainly no more intelligent, and for the most part is not as well educated as the mill manager. All he wants to do is to make the best buy possible for his firm.

What happens when the mill manager and the buyer get together to arrive at a price for goods? With-
out going into all of the gory details of happenings during the negotiations, the final chapter in the play leaves the buyer stalking out looking like the cat who had just devoured the canary, with the mill manager shivering in his socks and his underwear (that is, if he is lucky).

Let's take a look at the mill manager when he makes a purchase. I wonder just how much he would pay for vat jade or sulfur black. How much would he pay for 75-denier nylon? How much would he pay for starch? How much would he pay for caustic soda? Can he negotiate a trade? I don’t think that there is any doubt in the mind of anyone that Mr. Mill Manager buys dye, starch, chemicals, and numerous other items irrespective of the vendor. Check the stream of salesmen offering dyestuffs, chemicals, and starches that come by your mill. You must admit that there is competition. Compare the financial statements of the textile mills with those of the dyestuff industry, chemical industry, the automotive industry, the steel industry, or perhaps any other industry and observe the results.

A mill is a place where purchases are made on a more or less fixed-price basis, and sales are made on a basis of rumor, hysteria, panic and—the economists say in some instances on supply and demand.

Can we drive into a Gulf service station and drop a hint that Standard Oil down the street is selling for 10c per gallon less, and strike terror to the soul of the service station operator?

Can a small hole-in-the-wall jobber with $25,000 in net assets create a panic in the textile market by a few well-placed rumors?

How can men of good will engage in the vicious, cut-throat competition that is employed in the textile industry? Why do they look at each other like strange bulldogs when someone is so rash as to suggest that a price increase is in order due to advances in labor costs, cotton costs, chemical costs, etc.? An unlettered farmer with a truck load of highly perishable produce can actually price and market his products to better advantage than a mill manager with a Ph.D. degree.

A wise general evaluates the situation before he deploys his forces. Do we evaluate the situations before we make decisions? Do we actually know what we are doing? Before proceeding further, let’s ask ourselves a few questions to see if we know where we stand.

Before we can compute a cost, it is necessary to have the information on hand to do the job:

- Are our loom speeds up to standard?
- Are our front roll speeds up to standard?
- Are our efficiencies up to standard?
- Do we check to see that it is within our standard?
- How often do we check this?
- What are our standard package weights?
- Do we check to see that our package weights are up to standard?
- How often do we check package weights?
- Do our frames produce sliver, roving, and yarn?

No, I’m not trying to be funny. Go out in the plant and count the idle deliveries and spindles and get a shock. How often do we count our idle spindles and deliveries?

- What standards have we set up for them?
- Are our plants heavy?
- Do our fixers always change the pick wheels when styles are changed on our looms?

A close-out is generally the result of an unsound inventory policy. Do we run our mills on bona fide orders, or on hopes of orders? Other things can cause a close-out, but in the end inventory policy, or rather lack of inventory policy, brings about a sale commonly known as a close-out. Some close-outs stay in the market and depress it considerably for more than a season. The prevention of close-outs by inventory control would do a good bit to solve some close-out do we write “close-out” on our salesnote? When we make a close-out do we write “close-out” on each and every invoice.

Mr. Mill Manager, did a buyer ever approach you with a copy of a salesnote or an invoice from one of

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GREENVILLE, S. C.
your competitors? Sometimes the prices on these prize exhibits are so low as to cause some doubt as to whether the prize exhibit constitutes a bona fide sale for the coming season, or a close-out lot from the last season. If sales notes and invoices are properly labeled, the prize-exhibit price negotiator would have some of his fangs drawn.

"A little knowledge is a dangerous thing." In quoting fabrics do we use reasonable differentials between fabrics? Do we give information to price negotiators that will enable them to beat us to death with our own figures?

Few mills realize how much seconds, remnants, and close-outs cost them. Do our sales records show the amount of yardage sold in each style as first quality, as second quality, as remnants, and as close-outs?

For selling costs do we include selling salaries, with applicable group insurance, social security, unemployment compensation and retirement benefits; for sales offices, commissions, trade discounts, travel, entertainment, advertising, dues and subscriptions applicable to selling, allowances for seconds, remnants, and close-outs and, in some instances, designing and sample expense?

Did mill management, in the recent flurry, pass on to customers the wage increases, increases in dyes, chemicals, metal parts, cotton, and other items? You know as well as I what happened. They ran to the telephone just as fast as they could and let large pet customers cover at the old prices for a period of from four to six months. If management is not going to take advantage of a strong market, just what will it take to make management insist on a fair and adequate mark-up on each and every yarn or fabric?

Is there any reason why we can't determine what our goods cost us and add a legitimate profit? Are we slaves to an antiquated method of pricing fabrics? Do we have an adequate and up-to-date system for computing costs?

Do we make a reconciliation for each department or cost center, as well as for our entire operation?

Do we figure individual costs for each fabric that we manufacture?

In pricing yarns and fabrics, do we make each item stand on its own record?

When we price goods for less than 6% on our investment are we being fair to our stockholders?

Why should we wear out our machinery for less than a nominal return?

Does our equipment need the exercise?

What type of pricing policy do we have?

Do we price the fabrics ourselves?

Does the person assigned to price the fabrics have a financial interest in the mill? Or are our fabrics priced by salesmen? Are they priced by commission agents?

It is all right to say "We meet the market." The (Continued on page 13)
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During 1957, Dan River Mills is celebrating the 75th anniversary of the founding of the company in Danville, Virginia, in 1882. The ceremonies commemorating this historic year have not emphasized that there is great virtue in age; rather, they have stressed that past is merely prologue for a big and challenging future. This is as it should be, for what lies ahead for our company and our industry will almost surely over-shadow anything that has come before.

Dan River Mills was chartered at a time when Danville was struggling to extricate itself from the destruction caused by war and its unfortunate aftermath, Reconstruction. It was founded by men who confessed they had “limited means, no trade, and no experience in the business by any of its promoters.” Its beginnings were humble, but it prospered mightily.

The first plant, completed in 1883, had 100 looms and 2,240 spindles and employed less than 100. From this tiny beginning emerged the Dan River Mills of today, a corporation whose products are known across the nation and in all the free countries of the world.

Progress has not always been steady for, in over three-quarters of a century, there have been periods of discouragement, times when the future looked dark, as the company struggled to overcome the problems stemming from cyclical fluctuations of business and the intense competition typical of our industry. Always the difficulties were overcome. The company expanded and gathered strength so that by 1956 its plants in Danville had become one of the world’s largest textile operations, employing more than 10,000 persons and having almost 9,000 looms and over 450,000 spindles.

In August, 1956, in a major expansion to develop a more highly diversified product line, Dan River acquired two textile companies whose production differed from and therefore complemented the fabrics being manufactured in Danville.

One of these companies was Woodside Mills in South Carolina, whose seven plants manufacture print cloth and synthetic fabrics. The other was Alabama Mills with seven plants in Alabama and one in Georgia, producers of corduroys, denims, gabardines, and industrial fabrics. In addition, Dan River, acquired at the same time Iselin-Jefferson Company, Inc., prominent and long-established textile selling agency, along with its factoring subsidiary, Iselin-Jefferson Financial Company, Inc.

With this expansion, Dan River is provided with far greater flexibility in meeting shifts in consumer demands and an increased ability to utilize its equipment more effectively, now at an all-time high with more than 18,000 looms and 840,000 spindles. Employment is up to almost 18,000.

According to Fortune Magazine’s recent annual survey of the 500 largest industrial companies in the United States, Dan River in 1956 ranked 207th on the basis of assets, 289th on the basis of sales. For 1957, with the sales of the newly-acquired companies reflected in total volume for the full year, our ranking on the basis of sales will probably step up considerably.

These facts — Dan River’s recent expansion and its high ranking in American industry — have a special significance to those aspiring to a career in the textile industry. At this point in its long history, Dan River requires more college trained personnel — young men and women such as yourselves — than at any time in its past. And Dan River is not alone. While I hesitate to name our competitors, it is certainly the fact that other companies in our industry are expanding and are also searching for personnel with potential for management responsibility. When you consider this, you begin to realize that the vista of the future opens up wide.

According to a recent survey, textile companies in South Carolina will need over 4,000 college men in the next ten years. This figure exceeds the entire production of all the nation’s textile schools in the same period. The textile industry in South Carolina is not especially different from that in North Carolina, Georgia, Alabama, and other textile producing states, with respect to the need for college trained personnel. The requirement, as you see, is great and where the requirement is large, opportunity usually beckons. It certainly beckons in the textile industry.

Our national economy is expanding and changing at unprecedented speed. The complexities of manufacture and distribution are increasing. Industry’s greatest need is for managers with perspective, im-

(Continued on page 12)
agination, daring, and judgment, managers capable of hard decisions. This is no less true in textiles than in other major sectors of the economy. This too should have special significance for you.

Our industry, despite what you may hear to the contrary, is changing rapidly. Twenty-five years ago, synthetics were in their infancy. Dacron, Orlon, Acrilan, and other such fibers were unknown. Twenty-five years ago, wash and wear finishes for cottons were but a dream for the future. Twenty-five years ago, non-woven fabrics were unknown. The development of new products has been accompanied by the development of new technology. Rest assured that our industry has been changing rapidly, and that the pace is likely to quicken in the future.

Change brings with it difficult and challenging problems. The rewards for those who attack and solve such problems in our industry can be great. I sincerely hope you will be in the vanguard of those who will share in these rewards in the future.
POUND FOOLISH
(Continued from page 9)

problem is can we afford to meet the market?

In order to price goods intelligently, it is necessary that we first have a sound system of cost accounting. Our own accounting staff might be able to do the job. Even if they do a good job in determining our cost, do we actually know how we stack up with our competitors? A good cost consulting firm for a fee will be glad to let you know how you stack up with your competitors. Of course, the consultants do not name your competitors, but they can at least tell you what is par for the course.

Let us suppose that we have a jam-up standard cost system adjusted in accordance with a reconciliation made between standard and actual costs. Let us further assume that we have net assets of $10,000,000 in a plant with 1200 looms. To simplify the situation, we will assume that all looms are the same type.

If we are to return to our stockholders 6% on net assets in a year, then we should pay them not less than $600,000. In order to pay the stockholders $600,000, we must assume that 52% of our profit before taxes will go to the Federal Government, 2% of our profit before taxes will go to the State Government and for the sake of example only, consider that we want to put 6% in our surplus. That means that we would have 40% of the profit before taxes left to go to the stockholders.

Dividing this 40% into the $600,000 that we want to pay the stockholders as a bare minimum, we find that we would have to earn $1,500,000 before taxes. This would be distributed as follows: $780,000 to the Federal Government, $30,000 to the State, $90,000 to surplus, and $600,000 to stockholders.

Dividing our $1,500,000 by 1200, our number of looms, we find that we will have to earn $1,250 per loom per year before taxes. If we consider our manufacturing year at 50 weeks, we would divide the $1,250 per loom by 50 to give us a minimum of $25 per week that we would have to earn in order to pay our stockholders a fair return. On a two-shift operation we would have to earn $12.50 per loom per shift, and on a three-shift operation we would have to earn $8.33 per loom per shift.

The hard goods industries have launched an all-out effort to get more and more of the consumer’s dollar. Heavy expenditures are allocated for consumer research and market development. Despite the fact that the population is increasing, the market for textile products seems to be diminishing rather than expanding. The textile industry needs men with energy, foresight, and determination to develop new markets and get more of the consumer’s dollar. Large segments of the industry have resisted these needed changes to such an extent that the industry actually has a bad name in the eyes of young potential employees.

Capital improvements are wonderful things. If a mill doesn’t spend its depreciation figure plus perhaps a little more for improvements, it is equivalent to eating out of the pantry. If we eat out of the pantry long enough the cupboard will soon be bare. All of us agree that this is good business, but do we consider first things first? What happens when the sales department asks for $15,000 for consumer research and market development? What happens when the accounting department asks for $15,000 additional budget expenditure for modernizing the cost system and setting up controlled inventories? What happens when manufacturing asks for $300,000 to buy some new machinery?

The chances are that the $30,000 requested by sales and accounting would yield far more than the $300,000 requested by manufacturing. Most likely, however, manufacturing would be granted the $300,000 before sales and accounting could get the $30,000 they wanted. In a good many instances aren’t we letting the tail wag the dog?

Imports are definitely disturbing our domestic market, and it might be well to inject this matter into our catalog of textile troubles. Since Honduras imports no bananas, Brazil no coffee, Germany no harmonicas, Spain no olives, Norway no sardines, Rus-

(Continued on page 28)
Causes and Detection of Damage in Raw Cotton

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In one of the previous articles of this series, the microbial damage caused in raw cotton by fungi or molds has been discussed. The present article deals with a study of the bacteria present on raw cotton and the degradation of the fiber which may be caused by these organisms. The article reports on original investigations recently carried out by the author. The results have been published in greater detail in the August issue of the Textile Research Journal.

INTRODUCTION

The study of microorganisms active in the deterioration of raw cotton has been mainly concerned until the present time with fungi. The present article is a short account of an investigation carried out by the author during the last two years with field cotton from Clemson and other locations in South Carolina and Georgia. It deals with bacteriological observations on field cotton and the role which bacteria may play in the degradation of the cotton fiber.

It is a well known fact that a number of species of bacteria are able to decompose cellulose. These bacteria have been, so far, only isolated from soil and were found to play an important part in the decomposition of plant wastes.

Figure 1. Vegetative cells and microcysts of cellulose bacteria a, b, c, Sporocytophaga ellipsospora, a, fiber in final stage of decomposition with conglomerations of spore on both sides. Magnification, 520 X; b and c same bacteria, magnification 1040 X; typical arrangement and conglomerations of microcysts in b. d, e, and f, Sporocytophaga myxococcoides. d, e, vegetative cells and microcysts; concentrations of chromatin are seen inside the bacteria in f.
The only work carried out concerning the role of bacteria in the decomposition of textile materials has been concerned with weathered cotton fabrics. In the Quartermaster research program of the deterioration of cotton fabrics, for instance, various bacteria were isolated, but none of the spore-forming species was found to possess the ability to decompose cellulose. Various investigators have assumed, however, the presence of cellulose decomposing bacteria on such fabrics.

With regard to raw cotton, the role of bacteria is even more of a question. The number of bacteria per gram of raw cotton has been determined and found to vary from 220,000, to 520,000,000 bacteria per gram of ginned cotton; 1 to 100 million bacteria per gram of cotton would be the average degree of contamination to be expected in a good grade of raw American cotton. These bacteria have not been identified, however, and nothing is known about their role of importance in fiber degradation.

The only bacteria isolated from baled cotton which have been identified so far, is Aerobacter cloacae. This bacteria is not able to decompose cellulose, and is only of importance from the medical standpoint since it may cause certain diseases of the respiratory tract.

In conclusion it can be stated that the role of cellulose bacteria in the degradation of raw cotton has often been assumed, but no actual research data have been reported at all.

**METHOD**

In the present study, the bacteria were isolated from field cotton by placing the cotton locks for a very short period of time on pure sterile filter paper, soaked in an inorganic salt solution. Since the only organic material present in this substrate is cellulose, this method would be suitable for isolating cellulose decomposing organisms from the cotton. Colonies which developed were investigated and the degradation of the filter paper was observed. A special staining technique was used for observing the bacteria under the microscope.

**CELLULOSE DECOMPOSING BACTERIA ISOLATED FROM FIELD COTTON**

With the above medium, various bacteria were isolated from field cotton. After some time, the filter paper became soft and transparent, and was totally dissolved, so that large holes were formed at the place of the colonies. The colonies were generally colored; mostly brown, pink, yellow, or reddish.

The bacteria isolated were all found to belong to the Myxobacteria. This is a very remarkable order of bacteria of which certain representatives are known to be able to decompose cellulose. Bacteria of this group, form typical resistant fruiting bodies which consist of large conglomerations of shortened bacterial rods surrounded by membranes. Five species were obtained from the field cottons investigated.

For a full description of the species in question, the reader is referred to the original, more detailed pub-
Different favorable bacteria on surface of fiber; c, Final stage; fiber completely filled with bacteria, little cellulose being left. Note spiral orientation of bacteria parallel to spiral structure of fiber; f, Same bacteria on flax. Note orientation parallel to the longitudinal axis of fiber. Winogradsky staining; magnification 1040 X.

Figure 1 shows some of these bacteria at high magnification. Figure 2 shows fruiting bodies in cotton fiber.

DECOMPOSITION OF THE COTTON FIBER BY THESE BACTERIA

A special study was made of the disintegration of raw cotton fiber by these bacteria. For this purpose, sterile cotton fibers were inoculated with the pure cultures, isolated from field cotton in Clemson. At subsequent intervals, samples of the fiber were investigated for the presence and development of bacteria and the degradation of the fiber was determined. Figure No. 3 illustrates the growth of bacteria on the fiber and figure 4, the subsequent disintegration of the fiber. The bacteria are arranged along the spiral structure of the fiber and develop very rapidly. In the final stage, the complete cotton fiber is transformed in a spiral-like arrangement of bacteria as shown in photomicrograph No. 3, e.

DIRECT OBSERVATION OF BACTERIA ON COTTON FIBER

If raw cotton fibers are treated with the proper bacteriological stains, bacteria in larger or smaller number can always be found (figure 5). Especially in discolored cotton of yellow, pink, tan, or brown color, many bacteria were observed and in certain instances, some of these bacteria could be identified from their fruiting bodies, and were found to be identical with the above cellulose decomposing species. Many non-cellulose decomposing species will also be present.

CONCLUSION

From the above observations it may be concluded that cellulose decomposing bacteria do not only occur on field and baled cotton, but may also cause disintegration of the fiber. Some authors have assumed this without further investigation. The present results have not only ascertained this assumption, but the bacteria that may be involved are also identified for the first time.

The importance of these findings for the cotton manufacturer will be clear. In cases where fungi cannot be detected as a cause of the degradation, one should count with the activity of bacteria which can grow inside the fiber and which at great dryness can form their typical resistant fruiting bodies which allow them to become active again at any moment that a favorable degree of humidity returns. The special bacteriological staining techniques could be used on the side of the stains used for detecting fungi, for checking the broken ends during the spinning of yarns from suspected cottons.
For many years textile machine engineers have sought a practical method of supplying bobbins to looms automatically, thereby eliminating the tedious and costly job of “plugging the bobbins” by hand. The Draper Corporation has pioneered in this line of research and in recent years has developed an Automatic Filling Magazine which promises to accomplish this end. At the present time there are several small installations of the Automatic Filling Magazine undergoing extensive mill tests under a variety of actual operating conditions.

The magazine track is built to accommodate two full magazines when the loom is started up; a third may be added when the first magazine is half empty. The capacity of each magazine is 96 - 1 1/4” package diameter bobbins, or 80 - 1 7/16” bobbins, equally distributed in eight vertical compartments. A filling hauler with a hand truck designed to carry a quantity of loaded magazines eliminates the battery hands required by present rotary battery-loading methods. The filling hauler’s sole function will be to transfer full magazines from his truck to the feed track, and remove empty magazines from the return track.

Special bobbins with a 3/4” plain tip are needed in order to accommodate a tip bunch. The bobbins are prepared and loaded automatically into the magazine by a standard quiller adapted for this purpose. This operation is carried out in the yarn preparation room, after which the magazines are delivered by truck direct to the weave room.

Manufacturers of automatic bobbin winding machinery are working to adapt existing winders to prepare the tip bunch and automatically load the loom magazine. Also, development work is now progressing to prepare direct spun loom bobbins for use in this device.

The magazine track is tilted slightly, and the magazine moves forward by gravity and vibration. It progresses and empties one vertical compartment at a time by means of an indexing device controlled by the presence or absence of bobbin supply. When a magazine is empty, it is released automatically, shifted to the return track, and a loaded magazine slides down into feed position.

At the transfer a pneumatically-operated rod with a split spring collar pulls off the bobbin tip bunch,

---

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FALL ISSUE 1957
and a vacuum, created by a Venturi tube, is utilized simultaneously to hold and clear the filling ends from ingoing and outgoing bobbins. A mechanical timer, actuated by the bobbin transfer system, controls accurately the period of airflow in order to minimize air waste. The airflow remains on only during the transfer and while the temple is cutting the ends of ingoing and outgoing bobbins at the selvage.

To sum up the foregoing, the entire sequence of moves and operations after the full magazine has been placed in the feed track is completely automatic.

Development work on the Automatic Filling Magazine is progressing steadily in the light of results of the mill tests. When the magazine is finally released to the trade, the Draper Corporation believes it will offer the following positive advantages:

1. It will eliminate completely the conventional rotary type battery
2. It will greatly reduce labor costs
3. It will yield cleaner yarns and fewer cloth seconds as a result of less handling by mill hands.
4. The pneumatic thread clearer will remove loose filling ends automatically
5. The thread clearer will reduce drag-ins and other imperfections caused by filling waste being drawn into the weave.

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THE BOBBIN AND BEAKER
Outstanding Textile Seniors

By Wayne Freed, TE ’59

Richard K. Hall, better known as “Dick” around the Textile School, is a Textile Manufacturing major from Greenwood, S. C. Dick has gotten that much-needed experience in the textile industry from his four years work at the Matthews Plant in Greenwood and two summers of work in the Utica-Mohawk plant here at Clemson. This experience will be of great value to Dick as he enters the production phase of the industry, as well as helping to put himself through school. An impressive fact about Dick is that he was the recipient of two scholarships: the Keever Starch Company Scholarship in his Sophomore year and the American Enka Company Scholarship in his Junior year. He has also been a member of Phi Psi and the National Textile Manufacturers Society for the past two years. Dick, who is married, lives with his wife and son in Pendleton.

Louis T. Runge, from Greenville, S. C., is a Textile Manufacturing major. Louis, who spent four years in the Air Force, is married and now resides here in Clemson. He has been outstanding scholastically in that he has received honors in his school work during each of the three and a half semesters and two summer schools that he has attended. Outstanding among Louis’ campus activities is the fact that he was President of Phi Psi Fraternity in his Junior year. He is also a member of the Clemson Chapter of the Society for the Advancement of Management. Louis has plans to enter the production phase of the textile industry upon graduation.

William Austin Rush, is a Textile Manufacturing major from Greenwood, S. C. Bill, as he is better known around the campus, lives with his wife and son in Clemson while attending school. Bill’s list of honors includes scholastic honors 2nd semester of the ’55-’56 year, summer of ’55 and summer of ’57. As a member of Phi Psi his Junior and Senior years, Bill was elected Senior Warden this year. He is also a member of the National Textile Manufacturing Society and the Veterans Club. Bill has done summer work in the textile industry and was recently employed by the J. P. Stevens Company to help with part of his school expenses. Using this experience, Bill plans to enter the production phase of textiles.
Changes in Density of Cotton Fibers During Progressive Stages of Maturity

Charles V. Wray, Associate Professor of Textiles
School of Textiles, Clemson Agricultural College
Clemson, South Carolina

Introduction

The report that follows constitutes a derivative finding that resulted from a study initiated in an attempt to formulate a rapid and economical procedure for determining fiber density. The original study was prompted by a desire to improve upon fiber density determination methods which have been practiced and are quite time consuming as well as requiring an abundant amount of apparatus.

To cannon a few of these methods: Floating [2], Piconometric [3], Bone Dry State [4], In Water [5], and Helium Gas [6].

Under “Preliminary Experimentation” and “Materials and Methods” sections that follow will be found the various steps that lead to the true purpose of this report. Neither absolute correctness of density findings nor a new and improved method of density determination is hereby claimed as a result of the study. Rather than these, the purpose is to show the change in density of cotton fibers during progressive stages of maturity.

As experimental work progressed it became apparent that the seven varieties of cotton being used, each at four stages of maturity, gave somewhat similar graphic results and especially in the change in density from 30 days to 35 days after flowering. Also, as will be shown, density-maturity curves of the seven varieties grouped themselves into four rather distinct patterns as far as similarity was concerned.

Preliminary Experimentation

1) The study was begun with the idea of using Archimedes’ principle [6] to find fiber density. This, of course, requiring the use of the basic formula

\[ \frac{W - W_1}{W} = \frac{d_1}{d} \]

with \( W \) = weight of body in air
\( W_1 \) = weight of body in liquid
\( d_1 \) = density of the liquid
\( d \) = density of the body

This led to the necessity of finding the best wetting agent for the sample and also one that would not cause air bubbles either to cling to or be present within the fibers. Extensive tests were run with Charlab 154’, Dref’ and Victawet 35B No. E 5651’. 45 cc of Charlab 154 to 400 cc water proved to be the best mixture to use. With both Dref and Victawet 10 grams to 400 cc water gave best results.

The 3 above agents were eventually discarded because of various reasons. Those being: Wetting not accomplished properly, variation in sample density for long periods of time, some fibers separating themselves from the sample and because of air bubbles clinging to the samples. In addition to regular cotton, purified cotton was used with these agents and this too gave undesirable results.

2) Methyl alcohol was next tested as an agent. It was tried: (a) alone (b) following a Victawet treatment (c) followed by distilled water treatment and (d) on purified cotton in addition to non-purified. This agent proved unreliable because of a great deal of weight, thus density, change of the sample over long periods and that change being quite erratic. It was discarded because of poor results in a majority of the great number of tests run.

3) Following the tests with methyl alcohol quite a variety of tests were made with sec. butyl carbinol to determine if it would be a suitable agent.

(a) The first of these tests was to see to what extent this alcohol affected the density of cotton samples and the time lengths involved in a change if such materialized. Unlike methyl alcohol the sec. butyl carbinol did not change sample density over long periods of time. Rather, what change did occur was later reversed with the density of most all samples returning in approximately 2 hours to the same density found shortly after submerging them in this alcohol. Weighings were taken every 10
minutes while the samples were submerged. Other samples were left in the alcohol over night and still another group left 18 hours—weighed and found to retain the original density. During these tests a Mohr’s balance was used to check often the sec. butyl carbinol density.

(b) Small samples of cotton were dropped on the surface of sec. butyl carbinol 2 inches deep in a beaker. These samples all took very close to 3 seconds to sink and rest on the bottom. There were no signs of air bubbles on the outer surface of these samples.

(c) The next series of tests was to check further for air bubbles on and also in the samples. Results were that samples lowered slowly into the sec. butyl carbinol did not have air bubbles clinging to the outer surface of the fibers. Some sixty odd different samples were allowed to remain in the alcohol for a 2 hour period. These samples, each composed of some 200 to 300 fibres, were then examined under a microscope. In most instances the fibres were free of internal air bubbles or pockets. In cases where there were air pockets these were confined to only 1, 2 or 3 of the total 200 to 300 fibres being examined. These few air pockets ranged in size from almost the width of the fiber down to a very, very small fraction thereof. As to length—the pockets were apparently 1/40 to 1/100 the total fiber length.

(d) Tests were run as to the effect of change of temperature on the sec. butyl carbinol density. The results are shown in Table I.

Table I. Effect of Change of Temperature on sec. Butyl Carbinol Density  

<table>
<thead>
<tr>
<th>Temp. (°C)</th>
<th>Density</th>
</tr>
</thead>
<tbody>
<tr>
<td>22.0</td>
<td>.8190</td>
</tr>
<tr>
<td>22.6</td>
<td>.8176</td>
</tr>
<tr>
<td>25.2</td>
<td>.8140</td>
</tr>
<tr>
<td>27.5</td>
<td>.8130</td>
</tr>
</tbody>
</table>

(e) Next, it was decided to see to what extent sec. butyl carbinol would evaporate when allowed to stand open in a container in the testing laboratory. For this test 50 cc of the alcohol was used. The results are given in Table II.

Table II. Evaporation of sec. Butyl Carbinol  

<table>
<thead>
<tr>
<th>Hours after placed in open container</th>
<th>cc Remaining</th>
<th>Total Evaporation Loss in cc</th>
<th>Total Percent Loss From original 50 cc</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>50.0</td>
<td>0</td>
<td>0.4%</td>
</tr>
<tr>
<td>23</td>
<td>49.8</td>
<td>0.2</td>
<td>0.4%</td>
</tr>
<tr>
<td>48</td>
<td>49.1</td>
<td>0.9</td>
<td>1.8%</td>
</tr>
<tr>
<td>121</td>
<td>49.0</td>
<td>1.0</td>
<td>2.0%</td>
</tr>
<tr>
<td>143</td>
<td>48.8</td>
<td>1.2</td>
<td>2.4%</td>
</tr>
</tbody>
</table>

(f) A sec. butyl carbinol solution that had been used to wet several small samples was also used to wet a 3.5 gram sample of cotton. The larger

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sample was allowed to remain in the solution for 2 hours duration—the same length of time as the smaller samples. The sample was then removed and the solution was poured onto a water glass and this placed over a steam bath. When the sec. butyl carbinol had evaporated the only residue that could be observed was very, very few quite short wire-like fibers. It was felt that such fibers were from the 3.5 gram sample which was in a fluffy loose state. This decision was reached because not any isolated fibers had been observed during the many tests where small samples, held by a fine wire, had been suspended in breakers of sec. butyl carbinol.

(g) In order to increase the number of tests in sec. butyl carbinol per unit of time 5 samples at a time were placed in a 400 cc beaker of the alcohol for the established two-hour preparatory stay. This preceded transferring the samples one at a time from the 400 cc bath to a smaller beaker for weighing in the alcohol on a chainamatic balance. In order to determine the feasibility of transferring samples from one container of the alcohol to another, several tests were run. The procedure followed in the tests was to let samples remain in a small beaker of the alcohol for two hours and then weigh the samples while still submerged in this first bath. The samples were then transferred into a second beaker of the alcohol—allowed to remain two hours and weighed. After this weighing the samples were transferred to a third beaker and allowed to remain two hours submerged. The weighings at the end of the two hour period in the first, second and third beakers were the same for any one sample to the .0001 of a gram. It was established through further experimentation that a sample returned to the same weight, as was found at the end of two hours in the first beaker, after eight minutes time in the second beaker and also after only eight minutes in the third bath. There were no bubbles clinging to samples after these transfers.

(h) Density was determined of several samples of each of two varieties of cotton by use of the sec. butyl carbinol. Additional samples of the same varieties were run through the Shirley Analyser twice thus removing the foreign matter. After the Shirley Analyser runs the density of the samples was again checked. With one variety the density had been reduced by an average of 3.93% and with the other an average of 1.73%.

(i) Several cotton samples were run through the Shirley Analyser twice and then allowed to remain in a sec. butyl carbinol bath for two hours. These samples were then examined under the microscope for the presence of air bubbles or air pockets. There were none.

TWENTY-TWO

THE BOBBIN AND BEAKER
Materials and Methods

Seven cotton varieties were tested and each of these at 30, 35, 40 and 45 days after flowering maturity stages.

Samples that were to be run the following day were left open over night in a testing laboratory. These samples had previously been run through the Shirley Analyser twice. The laboratory was kept within standard atmospheric testing conditions at all times. In addition to the samples the sec. butyl carbinol to be used was left open in the laboratory.

As the first step of the test fine wires that were to be used later to suspend fibers in the alcohol were weighed. These were individually weighed in air and also in a suspended state in the alcohol.

Fiber samples were attached to the sample holding wires. These samples were not weighed before being attached but most were later found to weigh between .02 and .04 grams. After attachment each wire with its sample was weighed in air. The wired samples were then placed in 400 cc of sec. butyl carbinol and allowed to remain for 2 hours. The sample wires were cooked over the lip of the 400 cc beaker at such a point that all samples in all runs were the same depth in the liquid. The 400 cc was a constant throughout the project also. At the end of a 2 hour period the samples were transferred one at a time to a beaker of 150 cc of sec. butyl carbinol. This transfer was necessitated by lack of space for any larger beaker in the chainamatic balance cabinet. The transferred sample remained in the 150 cc for 12 minutes. After this period of time the 150 cc beaker was placed on a small platform within the chainamatic balance cabinet, and the weight of the fine wire with its sample suspended in the alcohol was taken.

During the days of testing the density of the sec. butyl carbinol was checked with a Mohr's balance. A sling psychrometer was used to check the laboratory recording hygrometer. The relative humidity and the temperature of the dry bulb were used as reference point on a Parks-Cramer Company cotton regain table to determine the proper regain to use during the various runs of the many tests.

Results

To determine the density of each of the 10 samples of the 7 varieties at each of the 4 different maturity stages the following was used:

\[ D = \frac{(W - W_t) \times \left( \frac{100 - R}{100} \right)}{(W - W_t) \times \left( \frac{100 - R}{100} \right) - (W_2 - W_3)} \]

where

- \( D \) = density of sample
- \( W \) = weight of wire plus sample in air
- \( W_t \) = weight of wire in air
- \( R \) = regain from Parks-Cramer table
- \( W_2 \) = weight of sample plus wire in sec. butyl carbinol
- \( W_3 \) = weight of wire in sec. butyl carbinol
- \( D_t \) = density of sec. butyl carbinol

The 10 density findings of any one variety at any one particular maturity stage were subjected to Chauvenet's criterion of rejection treatment. The mean density results after applying the criterion of rejection are shown in Table III.

---

*All weighings during this project were made on a chainamatic balance equipped with magnetic damper.*
Table III. Mean Density After Criterion of Rejection Applied

<table>
<thead>
<tr>
<th>Variety</th>
<th>30 Days After Flowering</th>
<th>35 Days After Flowering</th>
<th>40 Days After Flowering</th>
<th>45 Days After Flowering</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coker 100 Wilt</td>
<td>1.381</td>
<td>1.595</td>
<td>1.643</td>
<td>1.617</td>
</tr>
<tr>
<td>Rowden 4-1</td>
<td>1.510</td>
<td>1.627</td>
<td>1.655</td>
<td>1.623</td>
</tr>
<tr>
<td>Acala 4-12</td>
<td>1.525</td>
<td>1.625</td>
<td>1.628</td>
<td>1.613</td>
</tr>
<tr>
<td>100-2-3-1-7</td>
<td>1.472</td>
<td>1.568</td>
<td>1.524</td>
<td>1.650</td>
</tr>
<tr>
<td>Coker Wilds</td>
<td>1.342</td>
<td>1.556</td>
<td>1.641</td>
<td>1.660</td>
</tr>
<tr>
<td>Half and Half</td>
<td>1.499</td>
<td>1.605</td>
<td>1.633</td>
<td>1.624</td>
</tr>
<tr>
<td>200-1-3-3</td>
<td>1.550</td>
<td>1.613</td>
<td>1.528</td>
<td>1.606</td>
</tr>
</tbody>
</table>

The mean densities listed in Table III are shown in graphic relation, by variety, in Figures 1 through 7.

Because of similarity of the density—maturity curves of Coker 100 Wilt and Rowden 41 B they are shown together in Figure 8. This also holds true for Acala 4-12 and Half and Half in Figure 9 as well as 100-2-3-1-7 and 200-1-3-3 in Figure 10.

Summary and Conclusions

1. Density, as found in this study, did not increase or decrease in a definite pattern with progressive stages of maturity of cotton fibers.
2. Of the 7 varieties tested there were 4 rather distinct patterns of change in density established.
3. The most pronounced and reoccurring fiber density change was the increase which took place between the 30 and 35 days after flowering maturity stages.
4. Sec. butyl carbinal gave strong indication of being a suitable agent to use if a method for determining fiber density similar to the one in this study is employed.
5. Further extensive research using quite a large number of samples at several maturity stages would better establish what change in fiber density does really transpire. This work, of course, would have to be performed using a fiber density determination method that could definitely be considered accurate in every respect.

Acknowledgment

The author wishes to express his sincere thanks to Dr. Hugh M. Brown for his guidance in this study.

LITERATURE CITED


THE BOBBIN AND BEAKER
Woodside Mills Foundation Awards

Scholarship to John T. White, Jr.

John Thomas White, Jr., of 305 O’Neal Dr., Anderson, has been awarded a scholarship of $750 annually up to four years College by Woodside Mills Foundation, according to Wm. H. Beattie, President.

Woodside Mills Foundation is offering one scholarship each year until there are four in effect at textile colleges. They are available to employees of Woodside Mills or to close relatives and are issued by the Woodside Mills Foundation. Each scholarship has a value of $750 for each academic year.

The first scholarship winner is employed at the Haynsworth Plant of Woodside Mills, Anderson, S. C., where he is presently employed as a Loom Fixer. He has had 10 years of textile experience and has taken a correspondence course in textile design. An honor graduate of Pendleton High School he plans to enter Clemson College this fall where he will major in textile engineering. He was an honor student throughout high school. He has been employed at Haynsworth Plant since 1952, where he takes an active part in church and civic affairs.

Mr. John White being congratulated by Mr. Wm. H. Beattie. Left to right: Mr. T. B. Phillips, superintendent of Haynsworth plant; Mr. White, scholarship award winner; Mr. Beattie, President; and Mr. J. H. Mason, General Manager. Synthetic Division.
New Scholarships Available for Textile Freshmen

By Wayne Freed, TE '59

This year for the first time the Textile School of Clemson College has been able to offer scholarships to incoming Freshmen. These scholarships are a great stride toward recreating the interest and enthusiasm of entering students in the Textile School. This enthusiasm, which had declined in recent years in our school, is picking up, as evidenced by our increased enrollment for the 1957-58 terms.

These awards to entering students are based on high school records, entrance examination scores, and other conditions specified by the committee making the selections. Applications for these awards should be received each year by May 1, and the College Entrance Examination should be taken by May 15 for a student to be considered.

The scholarships for entering students are as follows:

1. Leon Lowenstein Foundation Scholarships. Two $2000 awards are available annually for male freshmen who enroll in the School of Textiles, to be paid equally during four years of satisfactory undergraduate study. Selection will be limited to applicants whose families have an income of $10,000 or less.

2. South Carolina Textile Manufacturers Association. Two $2000 awards available for freshmen for four years. These awards will be based on high school records, entrance examination scores, and conditions specified by the scholarship committee.

3. Texize Chemicals, Inc. One $1000 award available for freshmen for four years. This award will be based on the high school record and other conditions specified by the committee making the selection.

Leon Lowenstein Foundation scholarship winners at Clemson College pause during registration and matriculation schedules in Student Center lounge. Left to right—(seated) Charles Woodhurst, Williamson; William Reynolds III, Decatur, Ga.; Melvin Caldwell, Rock Hill; Harold Pryor, Columbia; (standing) Bruce Evans, Anderson; Charles Eubanks, Lyman; and William Kennedy, Manning. Freshmen are distinguished by their shaven heads. Absent were Gary Patterson, Anderson, and Gene Phillips, Gaffney.
In addition to the freshmen awards, the Textile School maintains an impressive scholarship program for undergraduate students. Recipients for these awards are picked by Clemson College in the spring for the coming school year. Applications for the awards should be returned to the Student Aid Office by February for consideration by the appropriate committees.

1. American Viscose Scholarship. A $500 award is available annually to a rising junior or senior majoring in Textile Chemistry or Textile Engineering.

2. Blackman-Uhler Scholarship. A $1000 award is available annually to a rising junior majoring in Textile Chemistry, to be paid equally during the last two years of satisfactory undergraduate study. Selection is based on need, ability and evidence of good character.

3. Burlington Industries Foundation Scholarship. A $1000 award is available annually to a rising junior majoring in Engineering or Textiles, to be paid equally during the last two years of satisfactory undergraduate study. Selection is based on leadership, scholarship and financial need.

4. CIBA Scholarship. A $1000 award is available annually to a rising junior majoring in Chemistry, Physics or Textile Chemistry, to be paid equally during the last two years of satisfactory undergraduate study. Selection is based on scholastic ability, personal traits and financial need.

Robert Barker, 19, (right) a junior in textile chemistry, and Donald Logue, 25, senior in textile chemistry, are 1957-58 recipients of CIBA Textile Scholarships at Clemson College. Barker from Washington, D.C., is the son of Henry D. Barker, with the United States Department of Agriculture. Logue, from New Wilmington, Del., is the son of John C. Logue, with J. P. Stevens and Company, Pendleton.

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6. Owens Corning Fiberglas Scholarship. A $1200 award is available annually to a rising junior majoring in Engineering or Textiles, to be paid equally during the last two years of satisfactory undergraduate study. Selection is based on scholastic ability, leadership qualities and financial resources.

7. Seydel-Woolley Company Scholarship. A $250 award is available annually to a rising junior or senior male student majoring in Textile Chemistry or Textile Engineering. Selection is based on scholastic ability, evidence of leadership potential to the southern textile industry, and financial need.

There are also three fellowships awarded under our present scholarship program. The list of scholarships and fellowships includes the following:

1. Celanese Fellowship. A $1500 award plus tuition, fees and research materials is available annually to an outstanding student for graduate research in Textile Chemistry.

2. Dow Corning Fellowship. A $1500 award plus tuition, fees and research supplies is available annually to an outstanding student for graduate research in Textile Chemistry.

3. Institute of Textile Technology Fellowships. One or more $1125 awards are available annually to outstanding students in the School of Textiles for further study at the Institute.

The students of the Textile School who have received these awards join hands with the College officials in thanking those people and firms who have made these scholarships available. We hope that these and more groups will continue to help us so that we might continue our educations in a way that might otherwise be impossible.

8. Keever Starch Scholarship. A $400 award is available annually to a worthy rising sophomore majoring in textiles.

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POUND FOOLISH
(Continued from page 13)

sia no furs, Cuba no sugar cane, and France no champagne, why in the name of common sense do we sit back and let a bunch of star-gazing, bubble-headed, satchel-mouthed mountebanks flood this nation with textiles from overseas?

The answer to this, of course, is very simple. The strong prey upon the weak. If we let our own customers push us around, isn't the Government going to push us around too? If ever an industry needed men of intelligence, skill, ingenuity, and just plain, old-fashioned guts, the textile industry needs those men now. If the petroleum industry, the steel industry, and other industries can take care of themselves, why can't we take care of ourselves.

The time for action is now! The house of textiles can and must be placed in order. While sharp trading buyers and an unfriendly government are working us over with the one-two punch, it is not beyond the realm of possibility for organized labor to step in and deliver the coup de grace that will leave this nation entirely dependent up imported textiles.

Let's review our methods. If we are not up-to-date, we had better take steps to get that way in a hurry. If our staff can do the job, let's get them started on it at once. If they can't, we had better call in a consultant. It is better for us to call in doctors than for our wives to call in undertakers.

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