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Clemson Textile School

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SONOCO PRODUCTS COMPANY
DECISIONS

by

W. W. Pate, Jr.
Vice President
Wunda Weve Carpet Co.

If you're looking for responsibility and a chance to exert your own individuality, there's a place for you in the textile industry. If it's challenge you want, it's rampant right now in every phase of textile activity. But if the pessimistic headlines of the current business and trade journals scare you, summon up enough courage to change your curriculum.

Although the production of carpet should correctly be considered in a category of its own, we certainly have a constant liaison with the general textile industry, and are affected by the same factors which influence all segments of the industry.

It's time for us to come out of our cocoons and realize that we have a battle to wage. Many of our policy makers have predicated their thinking on the belief that the textile products are so basic to our economy that they have to succeed. During days of increasing demand, this may be true; however, when money tightens and consumer purchases are made more carefully, we find ourselves in competition with everyone from automobile and appliance manufacturers to yo-yo distributors.

At this moment in the history of our business, there are too many mills for the amount of merchandising and marketing being accomplished. The future will be determined by our ability to convince customers of the advantages of the products made by the textile industry. The record to date is spotty, to say the least. Therefore, anyone intending to pursue a career in textiles should carefully evaluate their own ability and determine if they really have ideas and ideals and are willing to stick by them. If your answer is affirmative, this industry needs you vitally.

We were able to break into the century-old carpet business twelve years ago, and have succeeded in establishing reasonable demand for our product in a relatively short period because the policies of the floor covering world were clouded with old-hat production and merchandising techniques. In 1945, almost all the carpet manufactured in the United States was made by eighteen companies, and over 90% was constructed from wool or animal fibres. The business was sufficient for all and consequently no emphasis was placed on research and development.

They were stagnant when they should have been searching.

Today at least one third of all the carpet produced is by companies not in existence at the end of World War II, and wool accounts for no more than 50% of total production. New techniques of production deserve a share of the credit for this change. For example—tufting, the process of multi-needle sewing used primarily to make bedspreads and quilted robes, was transferred to the manufacture of carpet. This method substantially cut labor costs over loom weaving, even though some quality would be sacrificed.

We considered the quality factor as too precious, and took another route. We were aware that upholstery manufacturers in this country and some weavers in Europe had successfully conducted double plush weaving on certain types of goods; however, no-one had successfully applied the idea to carpet weaving. We decided to try. It took a tedious three years of trials and failures, and then it worked!

This initial investment in experimentation resulted in our ability to weave two 12' or 15' rolls of carpet simultaneously. Almost instantly, we were able to double our production with the same work effort; and more important, we had the first real improvement in carpet weaving in a hundred years.
This certainly improved our competitive position production-wise; however, we still had a lot of convincing to do in order to gain sales acceptance for our carpet, so we turned our attention to the marketing procedures of the floor covering field.

We became increasingly aware that many of the quality department stores were distressed by the fact that the giants of the carpet industry offered little protection to their dealers, and in some cases, were selling to hardware stores and gasoline filling stations. This seemed rather naive to us, so we strengthened our selective dealership policy, strictly limiting the number of accounts we would serve, and were able to persuade the best known and respected stores throughout the country to become Wunda Weve dealers. This step added a great deal of prestige to our product.

Our next move was to develop the first cooperative advertising program to be offered in our industry. This enhanced our position with the aggressive minded merchants and soon forced compliance by some of our competitors.

Selling itself, the key to continued success for competitive companies, required patient study and intention. As a stimulant, we brought into the floor covering field top sales representatives from other endeavors and simultaneously introduced planned selling. This program, which we still pursue, includes careful observance of a dealer’s inventory so he is continually displaying the fastest moving lines in an attractive fashion. The salesmen communicate this information to our mill daily so we are also producing the rapidly moving merchandise instead of building up huge investments in inventory.

These have been examples of moments in our humble history which have required definite action. Naturally, there are many times when the best course is more conservative and requires a “wait and see” attitude. One of our most important decisions fell into this category. As you can imagine, all manufacturers of carpet have been besieged in the last several years by the producers of the new “miracle” fibres. It was tempting not to initiate immediate production of these fibres, particularly when we were offered a potent advertising and promotional program by the producing company. However, we knew that over a long period of time, it was more important to maintain a complaint-free product. Otherwise, we couldn’t insure proper maintenance and prestige. Therefore, we set an important precedent to which we still cling tenaciously. We have refused time after time to jump on the “promotional wagon” for a new test tube fibre.

Instead, we have emphasized three tried and proven fibres in our lines of carpet. They are cotton, which still offers the most for the money to the American consumer; nylon, the oldest and mightiest of the man-made fibres; and wool, the traditional, classic carpet fibre. Our entrance into nylon came after a comprehensive testing program. We have been experimenting and developing wool and wool blends for nearly five years. It wasn’t until late in 1957 that we were satisfied that we had wool carpet which would have the distinctive finish and qualities comparable to those we would be able to achieve in both cotton and nylon. We could have marketed our wool much sooner, which would have added a substantial percentage to our year-end statements. However, again we felt it was imperative that our product be capable of maintaining and possibly advancing our reputation for quality.

I believe that these examples of problem solving are applicable to other companies throughout the textile industry. I have used our company simply because it’s my source of primary knowledge, and because the problems we have faced in our first 12 years are analogous to the general industry and may be representative of the situations you will face as an individual planning a career in textiles.

If you feel that you have ideas, can stand by your thoughts, and can present them to management with conviction, you are needed and your services will be in demand. If you seek only a retirement policy, please mail your applications to Detroit.
Mills to Battle U.S. Policies

by
Don Oberdorfer
Observer Staff Writer

The cotton textile industry, beset by lean years, has hung a “Made in Washington” label on its troubles.

The coming year will see intensive efforts to solve those problems in the halls of Congress. The spindles and looms in the Carolinas may dance to the result.

It may be true, as Fortune Magazine once said, that the textile industry is “the last uncleared jungle of free enterprise.”

But the textile men have been looking around them in the jungle since the drums of adversity began beating about two years ago. And they find government brambles everywhere.

"Intolerable" Policy
The biggest one is the "intolerable" government cotton policy, to use the adjective of L. G. Hardman, Jr., president of the American Cotton Manufacturers Institute.

About 50 per cent of the ultimate cost of most cotton textile products goes for purchases of the fluffy raw material.

The textile industry needs plenty of cotton, much of it good quality, at what it calls "competitive" prices.

Under the government agricultural program, the industry is now getting scarce cotton, particularly scarce in the better grades, at high government-supported prices.

The last bitter lump in this boll of trouble is that the local industry’s competitors overseas are buying American cotton from the U. S. government at special low cut-rate prices.

Drastic changes in the cotton policy are top goals for the textile manufacturers this year.

C. A. Cannon of Cannon Mills, chairman of the ACMI’s cotton policy committee, advocates increased U. S. production with a single "competitive" price for both U. S. and overseas mills.

The textile men acknowledge that something must be done for the cotton farmer. The "something" would probably be direct subsidy payments in the much-maligned Brannan plan several years ago.

Direct Pay Plan
Under this system, the farmer would sell his bale of cotton to the mill at market prices, then receive a direct government payment to bring the total return on the bale up to some agreed-upon government level.

Another government-inspired trouble, as the textile manufacturers see it, is the threat of foreign imports slopping across lowered American tariff walls.

Textile area congressmen are fast dropping their traditional Southern “free trade” policies for the shelter of textile protectionism. There is sure to be a battle royal in Congress over President Eisenhower’s plan to extend the tariff-cutting Reciprocal Trade Pact for five years.

The government has aided the textile industry by securing Japanese agreement to a voluntary limit on textile shipments from Tokyo to the U. S. department stores. So far, the Japanese have kept their word on the voluntary agreement, but U. S. textile men would like a rigid U. S. textile import quota substituted for the Japanese courtesy.

Another less publicized textile industry woe, from the manufacturers view, is the government tax policy on textile machine depreciation.

The mills must take 25 years to charge off the investment for new machinery, although they are often economically obsolete in about 10 years. The textile men demand a change.

Machines Cut Costs
The new machinery is vitally important to them because it represents the only practical way of cutting costs. The minimum wage (again a Washington product) and the threat of unionism act as a floor under wages.

But new machines can do less than fewer workers. One big Carolinas spinning firm cut employment 10 to 15 per cent in the last three years, without cutting production a bit!

Though there have been charges of a textile "stretch-out" (workers doing more actual work without increased pay), management experts say most of the widespread progress is due to the use of new machines that do everything but talk.

A more liberal depreciation policy would make financing the new machines much easier.
The Department of Research

by
W. T. Rainey, Jr., Head
Department of Textile Research

As indicated in recent news releases, the School of Textiles has established a Department of Research to coordinate the research activities in the School.

In the past, some fundamental research has been carried out in the School, financed mainly by the academic budget, Kress funds and the Sirrine Foundation. However, the major portion of the research has been developmental or applied research financed by industries on a contract basis. The contracts have ranged from several years duration, involving up to $20,000.00, to small, short-term projects. In many cases industries have been assisted with small problems which would not warrant research contracts, but, nevertheless, were important to the industries concerned.

It is proposed for the future that all research activities of the School be coordinated in the Department of Research with the main interest at present resting in sponsored research. It will be the responsibility of the Department to assist in obtaining and to administer the research contracts. In most cases the contracts will be for work desired and specified by the contracting organization. However, projects originating in the School of Textiles, may be of sufficient interest to one or a group of industries to warrant the Department's request of sponsorship by those concerns. The contracts may be open-end or for specified time or funds. In some problems involving mainly processing it is possible to estimate the total cost, but in others research could be carried out almost indefinitely. In the latter type on open-end contract is usually more satisfactory, since the industry can continue sponsorship until the desired results are obtained.

Funds of the Department are to be used to finance fundamental research and research of applied nature when no sponsor is available, if such research is of interest to the School or industry in general. Funds will naturally be used for purchase of equipment necessary in research, and such equipment will be available for instructional use also. It is proposed that all equipment in the School be used jointly by research and academic personnel, realizing that the primary purpose of the School is educational.

It is felt that the Department of Research will be of value to the educational program in several ways. As mentioned previously, the purchase of new equipment by the Department of Research would help the academic program to keep abreast of the times without expenditure of academic funds. It is hoped that students, in particular graduate students, can be used part time in the research program, as a means of supplementing income as well as developing research experience. In addition it should be possible for graduate students to carry out their thesis research under sponsorship of the Department. Certainly one intangible but valuable result of increased research endeavor should be development of a research atmosphere in the School. If the training of students takes place under such conditions, they should be much more valuable to the industry in their every-day jobs.

As frequently pointed out, an inquisitive mind is more valuable than one trained in a set pattern.

The personnel of the Department are to be full-time, permanent employees. This is certainly necessary if research is to be accomplished efficiently, and economically. The faculty of the School of Textiles (and other Schools of the College) will be used as consultants and part-time employees when necessary or advisable. However, it will be necessary to maintain a staff of technicians for the routine processing and testing work. Research can not be carried out satisfactorily when routine work consumes the time of professionally trained personnel.

As pointed out in an editorial in The Greenville News of January 22, 1957, research is the key to the future of textiles. Those firms which stress research as an investment, not just another expense, are the leaders in the field. In the United States during 1957 slightly over $7 billion was spent on research. This means that the average big business spends almost 2% of its gross sales on research. In some industries, particularly chemical, the expenditure for research often reaches 7% of gross sales.

To those familiar with the textile industry the impossibility of such expenditures is apparent. If profits of an organization amount to only 2% of gross sales, research expenditures must be low. It has been estimated that the textile industry spent last year only 0.1% of gross sales on research. This amounted
to about $15 million or only 1/4 of 1% of the total research expenditure in the United States.

In the past few years of lowered profits it has become apparent that many textile organizations have felt that research was an unnecessary expense. Several organizations have disbanded or cut back their research groups in attempts to cut down costs. One of the prerequisites of a research mind is that the answer to the problem is the important point, not the dollars and cents available today as a result of the research. No one is naive enough to believe that an industry will engage in research with no hope of monetary return in the future, but all should realize that the acquisition of knowledge from research will lead to a better industry eventually if not now.

What would be the state of the atomic energy program today if millions had not been spent on fundamental research with no foreseeable profit at the time? Would the transistor and other electronic marvels have been developed without tremendous effort in the research lab with no profits in sight? It is a bit difficult to understand how our industry can improve its position without a more determined research effort.

Certainly one of the major reasons for organizing the Department of Research is to increase the research opportunities for the industry. Since many of the textile organizations are small and are unable to finance research staffs, much of the research must be left to the educational institutions and research organizations. It is possible to carry out research more economically in a research organization than in a mill and, in many cases, the necessary diverse training is not available in the mill even if the money is.

As has been proven elsewhere, one of the most economical methods for carrying out research is in cooperative contracts. This type contract should be encouraged in the industry. If several mills jointly sponsor a research contract, all will profit from the results but none will bear a large financial burden. The textile organizations should be interested in upgrading the industry as a whole. Certainly competition between organizations is an essential in our form of business, but this competition should not be such that the industry suffers. The industry as a whole should profit from such cooperative research efforts.

The School of Textiles is interested in improvement of textiles in the nation-wide economy, and, therefore, will encourage research of both fundamental and applied nature. With the realization that research is necessary for a continuing industry and that many textile organizations are unable to support research facilities or personnel, the Department of Research should be able to render service to the industry as well as improve the quality of instruction in the School.

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SPRING ISSUE 1958
Causes and Detection of Damage in Raw Cotton vs Damage by Tar Contamination

Dr. A. N. J. Heyn, Professor of Natural and Synthetic Fibers
School of Textiles, Clemson, S. C.

Previous articles, Numbers 1-4, dealt with damage in raw cotton caused by the action of microbes. The present article deals with a chemical damage; namely contamination by tar spots.

In August, 1954, data were collected by the author of this article from thirty mills in South Carolina concerning the occurrence and importance of various types of damage to raw cotton under normal conditions in the mill. Of thirty mills, twenty three reported damage by tar and oil spots and indicated that they considered this damage as very serious.

In the following years the author received many samples of cotton and cotton cloth for examination, which were found to be damaged by tar. This type of damage is apparently quite general in the State. An important conclusion which followed from this survey, is that the presence of a small amount of contaminated cotton in a bale is greatly multiplied during processing, especially in the carding process. During this stage of the manufacturing process, the contaminated cotton fiber and tar particles are widely spread out and distributed over a large portion of the uncontaminated cotton. In later stages of processing, especially in hot calendering, fine particles of tar, which would be harmless as such, can develop into larger spots by a diffusion process. Microscopic investigation showed that the tar spreads over the surface of the fiber in close relation with the cuticle. This explains the excessive effect, which a slight contamination by tar may have.

With the introduction of new finishes of cotton apparel, such as; embossing, polishing, and glazing, the tar spot problem has still become more widely recognized and troublesome in recent years. The following survey may be useful in connection with this problem.

Historical—Tar spots in cotton have been reported in literature since 1939. The occurrence of tar spots has probably increased from that year until 1948, in which year various investigations were undertaken, especially by the National Cotton Council. The cause of the trouble at that time was universally ascribed to the coating of bale ties with tar. As a result of these findings, this coating practice was generally abolished and a substantial reduction of the tar spots actually resulted and the problem appeared solved. In 1950, however, a recurrence of tar spots was reported throughout the industry. Since clean banded cotton bales had been universally adopted, new causes apparently played a part.

Source—A systematic investigation of the origin of the new tar spots was published by Mangum and Buck of the National Cotton Council in 1952, as a result of the cooperative study with twenty mills. Their most important finding was that the exterior tar spot concentration was ten times that inside the bale. With this finding, it was concluded that the major source of contamination occurs after the cotton leaves the bale press at the gin and before the bale reaches the mill opening room; that is during transportation. It was further found that cotton bales shipped by rail and truck were heavily contaminated on the exterior surface. Inspection by railroad box cars and trucks revealed further in many cases the presence of tar substances on the floor and on the walls of these conveyances.

The following sources of tar in cotton have been suggested: Cotton fields bordering on freshly tarred roads (thrown by truck or car wheels); tar treated picker sacks; tar dropped from air plane wheels while dusting cotton; wagon wheels while hauling cotton to gin; thrown by tractor wheels at gin; loading platforms at gins, warehouses, or mills; melted roofs at gins, warehouses, or mills; re-used bagging and bale ties; thrown up by truck or trailer wheels in hauling; inside of railroad cars; start switches of fluorescent lights; belt dressings, or hard greases; “resin sacks” in cotton burls (ITT); and black honey dew (causes similar spots).

In a survey of South Carolina mills, the author learned that in 1955, tarred bale bands and tarred picking bags were still definite sources of tar spots. The latter cause could, for instance, be tracked back for certain cottons originating from the Arkansas region.

Structure and appearance—Tar spots may occur in raw cotton and in almost any type of cotton product. They show up particularly in bleached white cloth; and cloth dyed in light shades. Several authors have described the appearance of these tar spots. In finished cotton goods, they usually appear as small black pin head spots which are not removed during scouring, especially in the warp yarns; sometimes larger spots are found. Too little attention has been paid, however, to the spreading and diffusion effect described above.
The tar spots consist of tarry substances or asphalt, of petroleum or coal origin, soluble in petroleum solvents. Many other substances, such as oils, products of honey dew and even leaf and seed coat fragments. have been erroneously also classified under tar spots; microscopic examination clearly shows the difference.

**Test**—A testing method for tar spots consist of pressing a piece of filter paper soaked in a suitable solvent to the cotton bale to be investigated, so that some of the tar is taken up by solvent transfer. The transferred tar shows a halo under ultra violet light. It should be recognized that certain oils will do the same.

**Prevention**—A close inspection of cotton bales for contamination and removal of contaminated outside layers of the bale is common practice now in many mills.

The National Cotton Council has recently carried out an extensive investigation of the covering and packaging of cotton bales in connection with the prevention of tar spots. The American cotton bale is indeed most unsatisfactorily packed. A considerable quantity of the cotton is unprotected. Some hangs loose outside the bale so that also hazards of weather and fire are increased. Spinners have often protested against this practice, especially in view of the resulting contamination. Experiments have been carried out by industrial tapes and using all kinds of wrapping materials, such as: plastics, cardboard, polyethylene, vinyl, paper, saran screening, and especially non-woven fabrics appear of great interest because of the potential use of 120,000 to 200,000 bales of low grade, short staple, low micronaire cotton, which might be utilized for such covers. A great factor in considering a special wrapping, is the fact of moisture concentration inside the bale which may result in microbial damage.

**Tar spot removal during finishing**—The Institute of Textile Technology worked out special techniques for removal of tar spots. The spots can be removed during or after finishing.

A very effective solvent in spotting tar contaminated finished fabrics consists of four parts of Monopole oil, one part isopropyl alcohol, and ninety five tetra chloroethane; also soap immulsions in organic solvents can be used.

Removal of tar spots during finishing is possible by treatment in a pressure kier. A mixture of sulfonated oil and xylene is added to a 1% caustic charge.

**Conclusion**—Tar and asphalt contamination has been a problem in the cotton industry for many years and has had its periodic flare-ups. The observations made at Clemson College have shown that the effects of this type of damage are not always recognized by the mills, so that proper measures for prevention and correction cannot be made. Only a constant watchfulness and awareness can keep this evil down.

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Donald H. Logue is one of the many veterans enrolled in the Textile School of Clemson College. He is majoring in Textile Chemistry. Donald’s home is located at Cheraw, S. C., but at present, he and his wife are living on the college campus.

Donald has already worked several years in the textile field. He was employed for five years by J. P. Stevens at Cheraw, S. C. Since living at Clemson, he has worked two summers at the Utica-Mohawk Mill near Clemson.

He has been attending Clemson with the aid of a Ciba Scholarship for the last two years, and has received high honors two semesters. Donald is now serving as President of Phi Psi, the textile honor fraternity. He is also a member of Phi Eta Sigma, the Society for the Advancement of Management and the Veterans’ Club. He is serving as chairman of the AATCC.

Upon graduation, Donald would like to enter a sales career with a chemical company which is related to the textile industry.

Bobby L. Estridge is a textile manufacturing major who came to Clemson from Kershaw, S. C. A scholarship from Leroy Springs Scholarship and Loan Foundation has helped Bob to finance his education.

He is a member of Phi Psi, Alpha Phi Omega, and is serving as secretary of the National Textile Manufacturing Society. Bobby has been outstanding in the ROTC program and now holds the rank of Cadet Captain. He received honors both semesters his Junior year and has maintained a high scholastic standing throughout his entire four years.

Bobby hopes to enter some phase of sales in the textile industry after graduating and has gained much experience by working 12 months for Springs Cotton Mills.

Daniel S. Bratkowsky, better known as “Dan” or “Brat”, is a textile manufacturing major from Bridgeport, Connecticut.

Dan has received his experience in the textile field by working in several different mills. He worked one summer for Gerrish-Milliken Mill, Pendleton, S. C., and is now employed there part-time. Previous experience was obtained by working for Robertson and Son, Kobe, Japan.

Before enrolling at Clemson, Dan attended N. C. State where he was active in many school activities. He was a member of the Thompkins Textile Council and Secretary of N. C. State Veterans Association. After transferring to Clemson, Dan served as treasurer of the Phi Psi Fraternity and Secretary of the Society for Advancement of Management, Clemson College Chapter.

Dan plans to enter the production or research phase of the textile industry.
Industry Salute Proves Helpful

Another Salute to the Textile Industry, like the one just concluded at Efird’s Department Store in Charlotte, N. C., is in the making. Belk-Simpson of Greenville, S. C., is planning a display of textile manufacturing equipment and products for March.

The Efird’s display, which ran from January 6 through 18, was a decided success, according to store management. Thousands of people saw the operating equipment and the static displays. The store showed a substantial increase in business.

The textile industry went all out to make the show a success and many citizens of Charlotte have a far better understanding of the textile processes than they did before the Salute.

Halbert M. Jones, president of Waverly Mills, Laurinburg, N. C., and first vice president of the American Cotton Manufacturers Institute, had this to say about the Efirds exhibit:

“This exposition gave our industry an opportunity to put the textile processing story before the public at the point of sale and at the point of consumer interest. We realize the importance of making our industry known in all of its phases to the public if we’re to win wide support.

“Naturally, we’re grateful to Efird’s for giving us this splendid opportunity to tell the story of textiles and congratulate their management upon a wonderful idea. And, too, the exposition gives the public an opportunity to understand the complexity of the industry and the wide variety of remarkable skill of those who work in the industry.”

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Degree of Correlation Between Imperfection Counter Results and
(A) Yarn Appearance Grade  (B) Card Web Nep Count

by
Charles V. Wray
Associate Professor of Textiles
School of Textiles

INTRODUCTION
With the passing of time there is an ever increasing number of textile testing instruments of various sorts being placed on the market. These serve as working tools for the textile industry in its continuing effort to properly evaluate and improve the quality of raw stock, stock in process and the finished product. Some of these instruments measure properties which before went unexplored. In other cases, lengthy "hand" methods of testing a particularly property have been replaced by rapid automatic or semi-automatic operating instruments. This, obviously enough, has brought about a reduction in cost per unit tested.

One of the more recently developed testers is the electronic yarn imperfection counter. With this, one is able to determine the number of imperfections per unit length of yarn. The imperfections counted are neps, naps, mutes and other common yarn imperfections.

Decision was reached that it would be helpful to know what correlation existed between the results of an imperfection counter and the yarn appearance grade of yarn samples. After this project was under way, the scope of the study was increased by also seeking the degree of correlation between neps per 100 square inches of the card web and the yarn imperfection counter results. With results from these two divisions of the project, it was hoped to be able to establish the following:

(a) The degree to which the neps, naps, mutes and other common yarn imperfections affect the classifying of yarn samples into the various yarn appearance grades as developed jointly by The American Society for Testing Materials and The Agricultural Marketing Administration, United States Department of Agriculture. (1)

(b) The degree that card web neps count per 100 square inches will indicate the imperfections to be expected in the subsequent yarn.

MATERIALS AND METHODS

(A) Materials
With very few exceptions, 300 yards of yarn were run on the imperfection counter from each bobbin involved.

Yarn from the same lots as the imperfection counter runs of yarn had previously been graded by winding of yarn on black boards and comparison made with the photographic yarn standards developed by the laboratories of the U.S.D.A. Cotton Division and later adopted by the American Society for Testing Materials.

(2) The following descriptive designations will aid in evaluating the results that will follow:

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<th>Yarn Appearance (2)</th>
<th>Designation</th>
<th>Index</th>
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<tbody>
<tr>
<td>A</td>
<td>Excellent</td>
<td>130</td>
</tr>
<tr>
<td>B+</td>
<td>Very Good</td>
<td>120</td>
</tr>
<tr>
<td>B</td>
<td>Good</td>
<td>110</td>
</tr>
<tr>
<td>C+</td>
<td>Average</td>
<td>100</td>
</tr>
<tr>
<td>C</td>
<td>Fair</td>
<td>90</td>
</tr>
<tr>
<td>D+</td>
<td>Poor</td>
<td>80</td>
</tr>
<tr>
<td>D</td>
<td>Very Poor</td>
<td>70</td>
</tr>
</tbody>
</table>

The Yarn appearance index provides a means of averaging the appearance grade of two or more yarn numbers and for comparing yarn appearance values obtained in the testing of a specific sample with those of the general average of cotton. A yarn appearance index greater than 100 indicates higher than average yarn appearance, whereas, a yarn appearance index smaller than 100 indicates lower than average yarn appearance. This appearance of the yarn in many
types of woven or knitted materials is a very important quality factor. (2)

Records were available of the card web nep counts that had been taken as the stock for the yarn used was passing through the carding process.

A desirable feature of any cotton is its relative freedom from neps, because they may be a source of trouble in manufacturing yarns and fabrics. The occurrence of neps in appreciable numbers detracts from the appearance of these products. This is especially true when they are to be dyed or printed because neps absorb dyes differently and appear as spots on the material. A determination of the number of neps per 100 square inches of card web provides a measure of the nep content. The determination is based on 10 specimens of card web totaling 360 square inches. (2)

The following adjective descriptions based on standard weight card sliver of 40 grains per yard and the standard carding rate for the particular cotton served to classify cottons from the standpoint of nepliness:

<table>
<thead>
<tr>
<th>Number of Nepes</th>
<th>Descriptive Term</th>
</tr>
</thead>
<tbody>
<tr>
<td>15 and below</td>
<td>Low</td>
</tr>
<tr>
<td>16 to 30</td>
<td>Average</td>
</tr>
<tr>
<td>31 to 45</td>
<td>High</td>
</tr>
<tr>
<td>46 and above</td>
<td>Very High</td>
</tr>
</tbody>
</table>

(B) Methods

The bobbins of yarn were conditioned at least 48 hours prior to being run on the imperfection counter. This conditioning took place in a controlled testing laboratory having a standard atmosphere relative humidity of 65 per cent at 70 degrees F., with a tolerance of plus or minus 2 per cent in relative humidity and plus or minus 2 degrees F. in temperature. The imperfection counter was run in the laboratory under these same conditions.

The imperfection counter was allowed to warm up for at least an hour each day before any samples were run. Calibration was made rather often so that there would be no chance of error from this source.

In all tests run, the counter figure was read and recorded every 50 yards giving a total of 6 readings for the 300 yard bobbin run.

It must be added that the tester remained in calibration quite well during the running of the study.

RESULTS

(A) Imperfection Counter Results vs. Yarn Appearance Grade

The figures that follow are broken down by yarn counts with carded distinguished from combed.

In order to better present results the imperfections per 300 yards of yarn were reduced to imperfections per 50 yards of yarn by dividing the 300 yard figure by 6. The imperfection count per 50 yards of yarn is used in the remainder of this report except where stated otherwise.

Figure 2 shows the imperfections per 50 yards of 22’s carded yarn plotted against the yarn appearance grade. The median value at each of the appearance grades was calculated and they are shown connected. The same holds true for the arithmetic mean values. The line of least squares was calculated by using the two normal equations:

\[ \sum Y = Na + b \sum X \]
\[ \sum XY = a \sum X + b \sum X^2 \]  

Also shown on figure 1 is the value for r, the coefficient of correlation, between the imperfection counter results and the yarn appearance grade of the bobbins of 22’s carded yarn. This coefficient of correlation was determined with the formula:
\[ R = \frac{\text{\(\sqrt{\frac{\Sigma XY - (\Sigma X)(\Sigma Y)}{\text{\(\Sigma X^2\)}}\) \text{\(\Sigma Y^2\)}}}}{\text{\(\Sigma X^2\)}} - \frac{(\Sigma X)(\Sigma Y)}{\text{\(\Sigma X\Sigma Y\)}} - \frac{(\Sigma X)(\Sigma Y)}{\text{\(\Sigma X\Sigma Y\)}} \]  

(3)

Table I shows the actual figures of results of the 22's carded yarn imperfections vs. yarn appearance grade.

<table>
<thead>
<tr>
<th>Grade</th>
<th>Range</th>
<th>Arithmetic</th>
<th>Number of Bobbins Involved</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>High</td>
<td>Low</td>
<td>Median</td>
</tr>
<tr>
<td>C+</td>
<td>100</td>
<td>322</td>
<td>109</td>
</tr>
<tr>
<td>B</td>
<td>110</td>
<td>240</td>
<td>95</td>
</tr>
<tr>
<td>B+</td>
<td>120</td>
<td>147</td>
<td>111</td>
</tr>
<tr>
<td>A</td>
<td>130</td>
<td>69</td>
<td>54</td>
</tr>
</tbody>
</table>

*300 Yards Run on Imperfection Counter from each bobbin. Coefficient of Correlation = -.33

Line of Least Squares Data:

(1) \( b = 2.785 \)  
(2) \( a = 440.442 \)

Table II shows the actual result figures for Imperfection Counter results vs. Yarn Appearance Grade for the 22's Combed yarn and window prepared in the same manner as outlined above for the figure for 22's carded.

<table>
<thead>
<tr>
<th>Grade</th>
<th>Range</th>
<th>Arithmetic</th>
<th>Number of Bobbins Involved</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>High</td>
<td>Low</td>
<td>Median</td>
</tr>
<tr>
<td>C+</td>
<td>100</td>
<td>206</td>
<td>118</td>
</tr>
<tr>
<td>B</td>
<td>110</td>
<td>250</td>
<td>95</td>
</tr>
<tr>
<td>B+</td>
<td>120</td>
<td>177</td>
<td>41</td>
</tr>
<tr>
<td>A</td>
<td>110</td>
<td>97</td>
<td>46</td>
</tr>
</tbody>
</table>

*300 Yards Run on Imperfection Counter from each bobbin. Coefficient of Correlation = -.82

Line of Least Squares Data:

(1) \( b = -3.656 \)  
(2) \( a = 554.146 \)

Table III shows the results of 50's carded yarn perfection vs. yarn appearance grade.

<table>
<thead>
<tr>
<th>Grade</th>
<th>Range</th>
<th>Arithmetic</th>
<th>Number of Bobbins Involved</th>
</tr>
</thead>
<tbody>
<tr>
<td>D+</td>
<td>80</td>
<td>206</td>
<td>118</td>
</tr>
<tr>
<td>C</td>
<td>90</td>
<td>250</td>
<td>95</td>
</tr>
<tr>
<td>C+</td>
<td>100</td>
<td>177</td>
<td>41</td>
</tr>
<tr>
<td>B</td>
<td>110</td>
<td>97</td>
<td>46</td>
</tr>
</tbody>
</table>

*300 Yards Run on Imperfection Counter from each bobbin. Coefficient of Correlation = -.67

Line of Least Squares Data:

(1) \( b = -2.700 \)  
(2) \( a = 370.79 \)

Table IV shows the results of 50's combed yarn perfection vs. yarn appearance grade.

<table>
<thead>
<tr>
<th>Grade</th>
<th>Range</th>
<th>Arithmetic</th>
<th>Number of Bobbins Involved</th>
</tr>
</thead>
<tbody>
<tr>
<td>C+</td>
<td>100</td>
<td>140</td>
<td>50</td>
</tr>
<tr>
<td>B</td>
<td>110</td>
<td>101</td>
<td>26</td>
</tr>
<tr>
<td>B+</td>
<td>120</td>
<td>63</td>
<td>19</td>
</tr>
<tr>
<td>A</td>
<td>130</td>
<td>27</td>
<td>17</td>
</tr>
</tbody>
</table>

*300 Yards Run on Imperfection Counter from each bobbin. Coefficient of Correlation = -.90

Line of Least Squares Data:

(1) \( b = -2.635 \)  
(2) \( a = 361.728 \)

In this table will be found the highest imperfections per 50 yards for any one bobbin and the lowest imperfections per 50 yards at each yarn appearance involved. Also is shown the actual median value and the actual arithmetic mean for each grade. Given, too, is the number of bobbins that were run of each yarn involved. In addition, the "b" value is given to indicate the steepness or slope of the least squares whereas, the shown value of "a" is the value of Y when X is zero (3). The coefficient of correlation is also stated.

Figure 2 shows the plotting of Imperfection Counter results vs. Yarn Appearance Grade for 22's Combed Yarn and was prepared in the same manner as the table for 22's carded previously explained.

Attention is called to Figure 3 and to table III which give results of 50's carded. Also Figure 4 and table IV which contain the 50's combed yarn results. These cover imperfections per 50 yards vs. yarn appearance grade and they too were prepared in accordance with methods as outlined for 22's carded yarn.

(B) Neps Per 100 Square Inches Card Web vs. Imperfection Counter Results

Figure 5 shows the neps per 100 square inches of the card web plotted against the imperfections per 50 yards of 22's carded yarn bobbins. The arithmetic means at the multiples of 5 neps in the card web points are connected. In this instance, the multiple of 5 figure was used as the mid point value of a cell and all card web nep counts falling within a cell were considered as having the value of the mid-point. In calculating the line of least squares, the mid-point value technique was also applied. Figure 5 also shows...
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the coefficient of correlation, \( r \), existing between the nep count on 50 yards of yarn and the imperfections per 50 yards of yarn. Method of finding coefficient of correlation has been explained elsewhere in this report.

### Table VI

(See Figure 6)

22's Combed

<table>
<thead>
<tr>
<th>Nep Per 100 Square Inches Card Web vs. Imperfections Per 50 Yards of Yarn</th>
<th>Imperfections Per 50 Yards of Yarn</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Range of Cell</strong></td>
<td><strong>Arithmetic Mean</strong></td>
</tr>
<tr>
<td><strong>Means</strong></td>
<td><strong>Highest</strong></td>
</tr>
<tr>
<td>10*</td>
<td>248</td>
</tr>
<tr>
<td>15</td>
<td>252</td>
</tr>
<tr>
<td>20</td>
<td>240</td>
</tr>
<tr>
<td>25</td>
<td>352</td>
</tr>
<tr>
<td>30</td>
<td>311</td>
</tr>
<tr>
<td>35</td>
<td>220</td>
</tr>
<tr>
<td>40</td>
<td>277</td>
</tr>
</tbody>
</table>

*Mid-Point Value of Cell
***500 Yards Run on Imperfection Counter from Each Bobbin
coefficient of Correlation = \( +.45 \)

Line of Least Squares Data:
(1) \( b = 1.644 \)  
(2) \( a = 138.664 \)

### Table VII

(See Figure 7)

50's Combed

<table>
<thead>
<tr>
<th>Nep Per 100 Square Inches Card Web vs. Imperfections Per 50 Yards of Yarn</th>
<th>Imperfections Per 50 Yards of Yarn</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Range of Cell</strong></td>
<td><strong>Arithmetic Mean</strong></td>
</tr>
<tr>
<td><strong>Means</strong></td>
<td><strong>Highest</strong></td>
</tr>
<tr>
<td>5*</td>
<td>146</td>
</tr>
<tr>
<td>10</td>
<td>160</td>
</tr>
<tr>
<td>15</td>
<td>194</td>
</tr>
<tr>
<td>20</td>
<td>229</td>
</tr>
<tr>
<td>25</td>
<td>280</td>
</tr>
<tr>
<td>30</td>
<td>184</td>
</tr>
<tr>
<td>35</td>
<td>141</td>
</tr>
<tr>
<td>40</td>
<td>177</td>
</tr>
<tr>
<td>45</td>
<td>210</td>
</tr>
</tbody>
</table>

*Mid-Point Value of Cell
***500 Yards Run on Imperfection Counter from Each Bobbin
coefficient of Correlation = \( +.60 \)

Line of Least Squares Data:
(1) \( b = 1.538 \)  
(2) \( a = 74.927 \)

### Table VIII

(See Figure 8)

50's Combed

<table>
<thead>
<tr>
<th>Nep Per 100 Square Inches Card Web vs. Imperfections Per 50 Yards of Yarn</th>
<th>Imperfections Per 50 Yards of Yarn</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Range of Cell</strong></td>
<td><strong>Arithmetic Mean</strong></td>
</tr>
<tr>
<td><strong>Means</strong></td>
<td><strong>Highest</strong></td>
</tr>
<tr>
<td>5*</td>
<td>76</td>
</tr>
<tr>
<td>10</td>
<td>86</td>
</tr>
<tr>
<td>15</td>
<td>111</td>
</tr>
<tr>
<td>20</td>
<td>128</td>
</tr>
<tr>
<td>25</td>
<td>137</td>
</tr>
<tr>
<td>30</td>
<td>99</td>
</tr>
<tr>
<td>35</td>
<td>113</td>
</tr>
<tr>
<td>40</td>
<td>140</td>
</tr>
<tr>
<td>45</td>
<td>97</td>
</tr>
</tbody>
</table>

*Mid-Point Value of Cell
***500 Yards Run on Imperfection Counter from Each Bobbin
coefficient of Correlation = \( +.77 \)

Line of Least Squares Data:
(1) \( b = 1.594 \)  
(2) \( a = 46.934 \)

Table V shows the actual values of the 22's carded results for card web nep count vs. imperfection counter results. The mid-point cell values, highest and lowest imperfection count at each value, arithmetic mean of imperfections and bobbins involved at each value are shown. Also given is the coefficient of correlation as well as the "a" and "b" values found in the calculations for the line of least squares.

Figure 6 and Table VI show the results for 22's combed yarn card web nep count vs. imperfection counter results.

Figure 7 and Table VII show results for 50's carded.

Figure 8 and Table VIII show results for 50's combed.

**DISCUSSION OF RESULTS**

22's carded, 22's combed, 50's carded and 50's combed were handled individually for two reasons. First, each of the 4 requires a different sensitivity setting on the imperfection counter. Secondly, 22's and 50's are compared against a different set of standards for yarn appearance grading. 22's fall into the 16.5's to 32.0's group while 50's fall into the 32.0's to 65.0's group (1).
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GREENVILLE, S.C.

TWENTY

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TWENTY-TWO
In Figures 1 through 4 the line of least squares has a descending slope, whereas in Figures 5 through 8 this line has an ascending slope. The directions of slope are as were expected. In the case of Figures 1 through 4, the horizontal scale, Yarn Appearance Grade, improves in grade from left to right. Therefore, these figures 1 through 4 show the decrease in the number of yarn imperfections as the yarn appearance grade improved. In figures 5 through 8 can be seen, by the line of least squares, the rate the imperfections counted in the yarn increased as the neps in the card web increased.

As can be seen in Figure 2, the line of least squares at B+ yarn appearance grade is somewhat lower than the median or arithmetic mean values. This is caused by the small number of bobbins run of this grade having little effect on the line of least squares. Another reason is the lowness of imperfection values of the bobbins in grade A.

In Figures 1 through 4 the coefficient of correlation is negative. This is because in straight-line relations if the line has a negative slope then the correlation is said to be negative and actually works out as a negative figure. In Figures 5 through 8 the coefficient of correlation is positive because the line has a positive slope and the correlation actually works out as a positive figure (4).

At least 500 yards samples should be run on the imperfection counter and better still 500 yards. This is because quite a variation in imperfections was found from one 50-yard length to the next, so short length runs would not give representative results. A coefficient of variation ran as high as 18.31% on one bobbin from which twelve 500 yard runs were made on the imperfection counter.

A summary of the coefficients of correlation follows:

<table>
<thead>
<tr>
<th>Yarn</th>
<th>Yarn Appearance Grade vs. Imperfection Counter Results</th>
<th>Card Web Neps vs. Imperfection Counter Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>22's carded</td>
<td>-.53</td>
<td>+.47</td>
</tr>
<tr>
<td>22's combed</td>
<td>-.82</td>
<td>+.45</td>
</tr>
<tr>
<td>50's carded</td>
<td>-.67</td>
<td>+.60</td>
</tr>
<tr>
<td>50's combed</td>
<td>-.90</td>
<td>+.77</td>
</tr>
</tbody>
</table>

The coefficient of correlation is a number varying from +1, through zero, to —1. The sign indicates whether the slope is positive or negative, while the magnitude of the coefficient indicates the degree of association. Most authorities agree that a correlation coefficient of .9 or higher indicates close association between the two variables (3). When the coefficient of correlation is +1 or —1 then there is perfect correlation. When it is zero there is complete absence of correlation (4).

With the coefficient of correlation, the coefficient of determination may be found by squaring the coefficient of correlation:

\[ d = r^2 \]  (4)

Therefore, the coefficients of determination for the above summary of coefficient of correlation would be:

<table>
<thead>
<tr>
<th>Yarn</th>
<th>Yarn Appearance Grade vs. Imperfection Counter Results</th>
<th>Card Web Neps vs. Imperfection Counter Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>22's carded</td>
<td>.28</td>
<td>.22</td>
</tr>
<tr>
<td>22's combed</td>
<td>.67</td>
<td>.20</td>
</tr>
<tr>
<td>50's carded</td>
<td>.45</td>
<td>.36</td>
</tr>
<tr>
<td>50's combed</td>
<td>.81</td>
<td>.59</td>
</tr>
</tbody>
</table>
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There is no adequate substitute for the engineering supervision of your construction project by the firm of professional engineers who prepared the plans for it. Their resident engineer, with undivided loyalty to you, represents your best interests in every respect.
To explain the results just above:

We find from the table that the coefficient of determination for 50's combed yarn appearance grade vs. imperfection counter results is .81. This shows that about 81% of the variance in the selection of the yarn grade for these samples could be accounted for by the differences in the imperfections in the yarn. In like manner, the coefficient of determination for 50's combed yarn card web neps vs. imperfections counted in yarn is .59. This shows that about 59% of the variance in the imperfections counted in this yarn could be accounted for by the difference in the neps in the card web per 100 square inches (4). Since this leaves 41% of the variance to be accounted for by other factors, it would appear that the card web neps, for the stock of this yarn, was the most important factor which was associated with the imperfections found in the yarn (4).

Covering the yarns of the study:

<table>
<thead>
<tr>
<th>Yarn</th>
<th>Per Cent</th>
<th>Per Cent</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Card Grade*</td>
<td>Card Web Neps**</td>
</tr>
<tr>
<td>22's carded</td>
<td>28%</td>
<td>28%</td>
</tr>
<tr>
<td>22's combed</td>
<td>67%</td>
<td>20%</td>
</tr>
<tr>
<td>50's carded</td>
<td>45%</td>
<td>36%</td>
</tr>
<tr>
<td>50 s combed</td>
<td>81%</td>
<td>59%</td>
</tr>
</tbody>
</table>

*About the percent the variance in the selection of the yarn grade for the samples could be accounted for by the difference in the imperfections in the yarn.

**About the percent the variance in the imperfections counted in this yarn could be accounted for by the difference in the neps in the card web per 100 square inches.

From the above table it can be seen that with 22's combed and 50's combed the imperfections in the yarn were more important than all other factors in the selection of yarn appearance grade. With 22's carded and 50's carded this is not true.

Also, the number of card web neps per 100 squares inches was not more important than all other associated with the imperfections found in 22's carded, 22's combed and 50's carded.

The imperfection counter method used doesn't pick up uniformity or non-uniformity of long duration, fuzziness, general surface sheen, slubs or color. These would no doubt be some of the other factors in selection of the appearance grade of yarn samples.

The tension device both on the imperfection counter and the observation board winder knock from the yarn some trash, neps, etc. This could be at least a small factor in preventing close correlation between card web neps and yarn imperfections counted.

It is felt that a greater degree of correlation would have resulted had the raw stock for all the yarns been the same. As it was, different bobbins of the same count carded, or same count combed, were made up of cottons of various varieties, grown at various localities, had different staple lengths, were of various cotton grades, of various crop years and in some instances were run at different pounds per hour production on the card. With all these variables, the magnitude of correlation was more than might be anticipated under conditions such as these.

**SUMMARY**

(1). The approximate per cent the variance in the selection of the yarn grade for the samples could be accounted for by the differences in the imperfections in the yarn:

<table>
<thead>
<tr>
<th>Yarn</th>
<th>Per Cent</th>
</tr>
</thead>
<tbody>
<tr>
<td>22's carded</td>
<td>28%</td>
</tr>
<tr>
<td>22's combed</td>
<td>67%</td>
</tr>
<tr>
<td>50's carded</td>
<td>45%</td>
</tr>
<tr>
<td>50 s combed</td>
<td>81%</td>
</tr>
</tbody>
</table>

(2) The approximate percent the variance in the imperfections, counted in this yarn, could be accounted for by the difference in the neps in the card web per 100 square inches:

<table>
<thead>
<tr>
<th>Yarn</th>
<th>Per Cent</th>
</tr>
</thead>
<tbody>
<tr>
<td>22's carded</td>
<td>22%</td>
</tr>
<tr>
<td>22's combed</td>
<td>20%</td>
</tr>
<tr>
<td>50 s carded</td>
<td>36%</td>
</tr>
<tr>
<td>50 s combed</td>
<td>59%</td>
</tr>
</tbody>
</table>

(3) The degree of correlation was greater than was expected with raw stock and card production rate variables being what they were.

(4). A similar study made with raw stock and card production rate variables eliminated should show a much higher correlation.

**LITERATURE CITED**

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Developed primarily for dyeing tricot knitted fabrics, wound on perforated dye beams, at temperatures above the boiling point, this machine can also be used for dyeing at conventional temperatures below boiling. For the latter, lid may be removed or left in place.

Available for cloth 120" wide, up to 3,000 yards in length. Has been used successfully for dyeing woven as well as knitted fabrics.

Also available—open-type machine for dyeing open-width woven or knitted fabrics, laces, marquisettes and open-weave cloth, up to 72" wide and 8,000 yards in length.

OUTSTANDING NEW FEATURES

COMPLETELY AUTOMATIC FLOW CONTROL
Flow control valve is always closed when dye pump is not running. Desired pressure is preset on control panel, pump is started and pressure is then maintained at set point throughout the entire dyeing cycle. Thus a constant flow without surges is assured.

AUTOMATIC BEAM REVOLVING DEVICE
The dye beam is revolved by a constant speed driving mechanism and this assures even penetration during the scouring and dyeing cycles. This feature minimizes shading and produces level dyeing from end to end of the dye beam.

ROLLER TYPE BEAM SUPPORTS
If the automatic revolving mechanism is not purchased the dye beam can be rotated manually in open-type machines.

HIGH TEMPERATURE-HIGH PRESSURE CLOTH DYEING MACHINE
This machine is designed to dye open width woven fabrics made of synthetic fibers and blends of natural and synthetic fibers that require high temperature-high pressure procedures for good dyeing results. Certain synthetic fabrics are heat set during dyeing thus eliminating an additional process for this purpose.

Machine can be supplied with one-way or two-way flow according to customer specifications.

Machine capacity is for cloth up to 120" wide and up to 3,500 yards in length.

OUTSTANDING NEW FEATURES

AUTOMATIC HEATING AND COOLING
The exchanger is equipped with automatic steam and water valves so that the temperature controller maintains temperature setting at all times.

STATIC PRESSURE CHAMBER
Compressed air is injected into dyeing vessel to provide a static pressure cushion which allows the dye pump to maintain a constant flow.

RUNNING WASH SYSTEM
Clean water is fed to the dye pump from the expansion tank through large pipe line. The wash water is forced thru the dye beam and exhausted to drain sewer.

COMpletely AUTOMATIC FLOW CONTROL
Desired dyeing pressure is pre-set on control panel, pump is started and pressure is then maintained at set point throughout the entire dyeing cycle. Flow control valve is always closed when dye pump is not running and it is also closed during reversal periods. The valve closes slowly before the flow is reversed from 'outside-in' to 'inside-out' or vice versa, by the 4-way reversing valve. After the flow is reversed the flow control valve opens slowly. This eliminates surges which disturb the position of the cloth on the dye beam.

AUTOMATIC BEAM REVOLVING DEVICE
The dye beam is revolved by a constant speed driving mechanism and this assures even penetration during the scouring and dyeing cycles. This feature minimizes shading and produces level dyeing from end to end of the dye beam.

GASTON COUNTY DYEING MACHINE CO.
STANLEY, NORTH CAROLINA

Gaston County Dyeing Machine Co.
Terminal Bldg., 68 Hudson St.
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A. R. Breen
80 E. Jackson Blvd.
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The Rudel Machinery Co., Ltd.
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VATROLITE® - Use this powerful concentrated reducing agent for brighter vat dyed colors on cotton, linen and rayon...for faster, cleaner stripping results on silk, cotton and rayon.

DISCOLITE® - A concentrated reducing agent, highly stable at high temperatures, outstanding for discharge and vat color printing. Employed successfully wherever the reducing agent must dry into the fabric and retain its reducing power.

PAROLITE® - A dust-free white crystalline reducing agent. Soluble, colorless, excellent for stripping wool piece goods and rags, shoddy, acetate or nylon fabric.

NEOZYMÉ® - Concentrated low temperature desizing enzyme. Removes starch and gelatine. Excellent for eliminating thickeners from printed goods at low temperatures.

DISPERSALL - Effective retorder for dyeing vat colors, dispersing and leveling qualities, for dyeing naphtho and vat colors, useful in wool and acetate dyeing. Valuable auxiliary in stripping vat colors, naphthols.

NEOWET - Permits effective wetting at all temperatures - particularly useful with enzymatic desizing agents. No reaction to soft or hard water. Not affected by dilute acids or alkalis. Non-ionic. Not suitable for use in peroxide baths.

NEOWET X - Effective wetting agent at all temperatures from cold to boiling. Does not inhibit enzyme action in desizing bath. Good for use with resin finishes, and hydrogen peroxide bleaching liquors. Good rewetting properties. Anionic.

VELVORAY® - A blend of sulphonated vegetable oils and selected soaps for a superior, non-foaming finishing oil. High in combined SO₃ and stability. Excellent for compressive shrinking, will not smoke off at high temperatures.

VELVO SOFTENER #25 - Economical creamy white paste softener derived from highly sulphonated tallow. Gives softness and body without stiffness or affecting whites.

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