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UNIVERSITY OF MINNESOTA
Seoul National University of Korea Cooperative Project
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Minneapolis 14, Minnesota

November 14, 1956

TO: Korean Advisory Committee
FROM: Tracy F. Tyler
SUBJECT: Report of Dr. Chapin A. Harris

At the meeting of the Korean Advisory Committee on October 30, 1956 it was agreed that the report prepared by each staff member serving in Korea would be made available to each member of the Korean Advisory Committee.

The attached report, prepared by Dr. Chapin A. Harris, is the seventh of several reports which were filed earlier and which will be made available as fast as they can be dittoed in my office.

Tracy F. Tyler

Att.

TEXTILE ENGINEERING
IN
SEOUL NATIONAL UNIVERSITY OF KOREA

A Report By

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July - August, 1956

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TEXTILE ENGINEERING AT SEOUL NATIONAL UNIVERSITY

I. TEXTILE INDUSTRY

A fairly comprehensive study has been made of the textile industry from Seoul to Pusan. Twelve mills (nine cotton, one silk, one nylon, and one woolen) were visited. Although a number of suggestions for improvement are made below, it should be pointed out that the industry has done a remarkable job in reconstructing with limited facilities and under adverse conditions since the recent war. The determination and ingenuity of the people concerned should go a long way in helping the industry become important in world commerce in the years to come.

The major textile production of the country is cotton fabric of medium weight - sheetings, poplins, bagging and some shirting. Not much real fine cotton yarn is made. Some circular knit cotton fabrics, jacquard-woven silk fabrics, fine nylon and rayon dress fabrics and cotton and nylon men's socks are also manufactured. The woolen industry has just started, and there is very little worsted production.

The quality of the textile products appears to be fair. In the case of some of the finer fabrics such as the silk jacquard-woven ones, the quality is poor.

Most of the cotton used is medium to low grade, from which it would be difficult to manufacture fine, high quality yarns. It is understood that the Korean Government regulates the grade of cotton that is imported, and that most of it is below 1" staple length. No mill can get greater than a two-months supply of cotton at one time. This often leads to shortages and shut-downs in the mills.

As might be expected, the quality of the product varied with the house-keeping, the condition of the machinery and the interest of the management in quality control. The greatest needs are for

- 1) better machinery, or at least considerably better machinery maintenance and adjustment

- 2) technically-trained men
- 3) better equipped control laboratories and particularly with respect to temperature and humidity control, qualified men to operate them with adequate quality control programs.

The dyeing and finishing area needs more attention. Much of the dyeing and finishing observed was not as carefully done as should be and the products showed it.

The industry could get much help from Seoul National University. By employing its graduates to cover the critical areas, by using its faculty as consultants, by uniting and supporting research programs and by donating equipment and/or scholarship funds, it would further its own advancement immeasurably. The Engineering College would do well to initiate an educational program to stir up interest along this line. The free interchange of ideas between industry and the faculty is a necessary part of the development of both.

The outlook for the textile industry is good. The will to succeed is strong, and with the potential market and general upgrading of the material standard of living, the future growth is assured. The greatest danger lies in insufficient use of technical help. The UNKRA and other aid that the industry is receiving has done much to put it back on its feet.

II. TEXTILE ENGINEERING CURRICULUM

A. General Comments:

1. Curriculum contains too many different subjects.
2. A division of the curriculum into two fields, Textile Engineering and Textile Chemistry, is indicated.
3. There should be a reduction in miscellaneous subjects to reduce the pressure and confusion on the students.
4. In order to release time for the inclusion of laboratory work some general reduction in the number of lecture hours is necessary.
5. There should be a greater emphasis on home and library work.
6. Greater use of hour-long and short (5-15 minute) exams and quizzes is recommended.

7. More classroom discussion to develop independent thinking in the students is desirable.
8. The level to which mathematics is pursued is farther than need be for the undergraduate textile engineer.

B. Specific Recommendations

1. Division into Two Areas.

Because of the difficulty of educating one person, both as an engineer and as a chemist, the curriculum could be made more efficient and effective by making a split into two divisions - Textile Chemistry and Textile Engineering. One division would train men to go into the wet processing part of the industry (bleaching, dyeing and finishing). The other division could cover the dry processing (fiber manipulation, yarn and fabric manufacture and the engineering of textile structures).

Such a division would relieve the subject load tremendously. It would eliminate the necessity of textile engineers taking as much chemistry and the need for textile chemists taking as much mechanical engineering. Each division would be able to give a more complete and balanced program in its own field.

2. Subjects which might be dropped from present program or reduced in extent are:

- a) German. If English is to be retained, another foreign language would appear to be quite a burdensome load.
- b) Algebra and Geometry. It would be better to take only those students who had had these subjects in high school. If this is impracticable, provision might be made during a winter or summer vacation to bring the students up to the necessary level previous to freshman registration.

- c) Descriptive Geometry. This is, of course, a very desirable subject; but should not be absolutely essential to a textile engineer or chemist.
- d) Qualitative and Quantitative Analysis should be dropped from the textile engineers' program. The textile chemist would have great use for these subjects. And they should be taught with textile applications in mind.
- e) Organic Chemistry is very essential to the textile chemist; but it could be shortened by at least one credit hour for the engineer. This, then could be the terminal course in chemistry for engineers.
- f) Physical chemistry could be eliminated from the textile engineering program.
- g) Theory of Functions. This is more advanced mathematics than required by most textile men and should be dropped.

There are, perhaps, some other areas where subjects or hours could be dropped effectively. However, the ones mentioned above are the more obvious ones, and, furthermore, it is not the intent to design curricula in detail, since the Seoul National University faculty is certainly more familiar with the specific needs.

3. Expansion of the Curriculum

In certain areas of the curriculum, there is need for expansion:

- a) Textile Testing needs to be developed further, particularly in laboratory practice and the evaluation of results from the standpoint of utilizing them in quality control and in the detection and location of faulty materials and, also, the development of techniques for use in fundamental research.
- b) Fibers, Yarn Preparation, Fabric Manufacture, Dyeing and Finishing should be taught as an introduction to the principles

involved and supplemented by laboratory demonstrations and experiments. No attempt should be made to make the laboratory a place in which the student becomes entirely familiar with the running of machines - rather he should become acquainted with the relation between the theories learned in lecture and actual practice. Laboratory work should be carried out as practical problems which will induce the student to think through the various relationships and draw conclusions with carefully-planned experiments.

Since it will probably be impossible to supply machinery to every area of textile processing, only those supplied may be covered by laboratory work. However, in some cases, the similarities and differences between one area and another can be pointed out and explained (eg: cotton carding vs. woolen carding vs. worsted carding).

- c) If at all possible, an increase in the time devoted to the humanities in the last two years would be desirable. This is a perpetual problem with technical colleges; but it is mentioned here so that it will not be neglected in adjusting the program to include laboratory practice.
- d) The great need for quality control programs in industry indicates the desirability of stressing this subject in the curriculum.

III. LABORATORY EQUIPMENT

The limited budget available for laboratory equipment means that only part of the original list of items can be obtained. In view of the present state of the textile industry in South Korea and the present equipment at this university, it is recommended that laboratory equipment be ordered as follows:

- a) Complete the cotton yarn processing laboratory, building upon the present adequate machinery. Include grading and classing equipment, opening and picking, and whatever yarn manufacturing machinery as appears justified up through twisting.
- b) Expand the fabrics section to include design equipment, winding, warping, slashing (if possible - rather expensive) and representative weaving and knitting machines.
- c) Add dyeing and finishing equipment for cotton and synthetic fabrics.
- d) If the budget allows (which is doubtful) filament and/or woolen yarn processing equipment could be added. The filament yarn machinery would be the least expensive. Because of the many expensive units needed for worsted yarn manufacturing, it is not recommended that any machines be added at this time. It is also doubted that either the University or the industry is ready for this as yet. However, because of the desirability of eventually getting into this field, future plans should be drawn accordingly.
- e) Although the textile testing equipment has been approved and some of it ordered, attention should be given to the integration of testing with manufacturing and evaluation.

The list of equipment recommended for approval will be contained in a separate memorandum.

IV. LABORATORY SPACE

The question of space for the Textile Engineering Department has arisen. Although it has been difficult as yet to compare the space needed with the available space, it is expected that there will be sufficient space for the equipment which will be procured and for reasonable expansion. With the location and the type of construction of Building 4, it should be a fairly simple matter to make additions to it for any necessary expansion of area.

V. FACULTY

The faculty in Textile Engineering appears to be quite adequate for handling the present program. However, with the expansion that will be brought about by the proposed equipment and the greater emphasis on laboratory work, it will be found that a larger staff will be necessary.

The training that some of the staff are getting in the U.S.A. should be invaluable in the development of the laboratory instruction program, since the men participating will have the opportunity to learn the American laboratory method of teaching.

ARRANGEMENT OF TEXTILE MACHINERY IN TEXTILE ENGINEERING AREA

Although the details of the arrangement of the textile processing machinery in the Textile Engineering area will take a great deal more planning than can be done in the short period that the writer will be here, and should also be worked out by the Seoul National University staff, there are some suggestions that might help at this time.

In order to make for the best possible arrangement, it would seem that many of the existing walls in Building No. 4 should be removed so that the large machinery can be so placed that an efficient flow of material can be realized. It may be desirable to build new walls in other locations if the need arises.

Section A of 5258 sq. ft. should be sufficient for the cotton grading, spinning picking, carding and drawing machines. It might also be possible to arrange the combing, roving, spinning and twisting machines in this area.

Section B of 4200 sq. ft. would then take the combing, roving, spinning and twisting equipment (if it is not feasible to put it in Section A), the warp preparation and slashing machines, the winding machines, and the weaving equipment.

Section C would house the cotton finishing and small scale dyeing equipment.

The last three rooms on the second floor of Building No. 4 (when combined into one) should be able to house the knitting machinery and still leave room for two small offices (or combined, as a classroom).

The area allotted to textiles in Building No. 1 should be adequate for the testing laboratories, beaker dye laboratory and design rooms.

It may be found that in some areas there will be less room than needed. In this case a slight shifting of machinery in another area should relieve the problem.

It is suggested that scale floor area cards be cut for each machine and positioned in logical arrangement in the various areas before any of the machines are installed. In this way the most efficient use of the space will be made.

Building No. 4 offers excellent opportunity for expansion as the Textile Engineering Department grows. An addition could also be made in a westerly direction on the southwest corner and/or on the northwest corner. If expansion with filament yarn processing, woolen, worsted and wool finishing is contemplated such area enlargement will be necessary.

CARE OF TEXTILE EQUIPMENT

Observation of the care and maintenance of textile equipment in the majority of the textile mills visited and also of the equipment at Seoul National University has led the writer to be somewhat concerned about the equipment being ordered for the Textile Engineering Department.

It was easily seen that many of the textile mills did not give the critical care with respect to cleanliness, adjustment, or repair of their machines, which is common practice in America. In this damp climate, and as a matter of fact in the moist atmosphere of any textile mill, it is difficult to prevent rust. However, in many mills more rust than should be allowed was present.

At Seoul National University the card clothing of the cotton card, as an example, is badly bent. Sliver cans had been placed on top of the card. Although the weight of the cans is not enough to bend the card clothing, placing and removing the cans could cause them to catch on the wires and bend them. Such practices should be discouraged.

Parts of the loom under construction have been left on the floor of the room.

These will probably be left until September when the faculty returns. At present, there is a large puddle of water on the floor, surrounding the card and is very close to the loom parts. Regardless of the difficulties brought by all the troubles, shortages and so on, this equipment is too valuable and important to let deteriorate in this manner.

The writer perhaps should not be personally concerned with these things; but it would be discouraging to see the new equipment we are making arrangements for ordering treated in a like manner.

Whatever the reason for this state of affairs, be it lack of faculty, maintenance help or general attitude, something should be done about it before very much of the machinery is received. It is hoped that the training received by the faculty members sent to America will help to alleviate this condition.

SUMMARY AND RECOMMENDATIONS

All of the subjects commented upon have been thoroughly discussed with Dean Hwang and Professor Bum Shik Woo. Both of these men have agreed with the writer with respect to the general recommendations made. There are, of course, some very practical difficulties that stand in the way of immediate implementation. For instance, it will be no small matter to convince some members of the Textile Engineering faculty to change their habits or methods of teaching to a more efficient and practical way. However, in spite of the many difficulties, it has been recommended that the entire staff meet often and regularly to plot the course of the necessary changes in the curriculum which will be brought about by the added laboratory time. Whether or not the results exactly follow the writer's suggestions is not important. What is important is that the very heavy and theoretical curriculum be lightened, instructive laboratory work be included and more thought-provoking homework be given to the students. Such a major change will require a great deal of thought and discussion by every staff member.

The list of equipment to be submitted for the FY 1957 budget will mark the third phase in the rehabilitation of the Textile Engineering Department. The first list included books and textile testing equipment. The present list, which because of difficulties in obtaining specific information on several items from the States, will be delayed until about the first of October, 1956. This delay has been discussed with Dean Hwang and Dr. Schneider, and it was agreed that this is the only thing to do.

In a letter from Professor Lund (August 13) it appears that another list of equipment submitted by Dean Hwang's committee for the 1956-57 procurement was approved. The writer was not aware that such a list had been approved and that the ordering was about to begin. In this case, an adjustment will be made in the list now being prepared to delete the items already contained on the 1956-57 list. Before this 1956-57 list is ordered, the writer would like to review it carefully to see if it fits in with the overall plan being developed for expanding laboratory equipment.

The 1957-58 list in preparation covering cotton yarn preparation, design, weaving, knitting and cotton and synthetic dyeing and finishing fits in well with the present state of the industry and will be adequate for use by the present staff. The equipment should prove to be sufficient to fill the educational needs in these areas for years to come, since the major basic machines and a fair number of special or more advanced machines have been included. As in any specialized field as this, it will be desirable to add to this equipment from time to time. The filament yarn, woolen yarn, worsted yarn and woolen and worsted finishing areas have been neglected entirely. Later expansions should take care of these, and it would not be wise to add one or two machines at this time. If, on completing the list, it is found that all of the 1957-58 budget is not used, the filament yarn area could be partially covered.

A request for an appropriation of \$350,000 for FY 1958, if approved, will advance the next step in the development as noted above. At present, it is a little

difficult to say what should be done in 1959. It would be well to wait and see what develops in the next year. But, if the progress equipment-wise and faculty-wise goes as it normally should, the 1959 budget should include the more specialized and advanced testing and processing machines. Seventy-five thousand dollars should be adequate.

Along the line somewhere, there will be a need for an expansion in the Textile Engineering faculty to handle the highly specialized laboratory work. It would seem that recent promising graduates could be screened as possible additions to the staff. Possibly some of the Seoul National University Textile Engineering graduates now doing graduate work in the States might be available.

Further help from the U.S.A. should be two-fold. More Seoul National University faculty men should be sent to textile schools in our country. I believe that Professor Woo has already suggested sending a man in cotton spinning. It would be well to send one for woolen and worsted and perhaps one for knitting. It is also believed that sometime shortly after the equipment arrives that a man (or possibly more) be sent to Seoul National University from the U.S.A. to help in organizing and perhaps actually guiding one class through the laboratory work. Unfortunately, most textile people are so specialized that more than one man would be needed. Such men should spend at least one Seoul National University semester and should be scheduled to arrive when the equipment in the particular area of specialization of the man is ready to be used for laboratory work.

Since there are American textile machinery erectors working on new machinery being set up in Korean mills, they would undoubtedly be available for erecting the machinery at Seoul National University.