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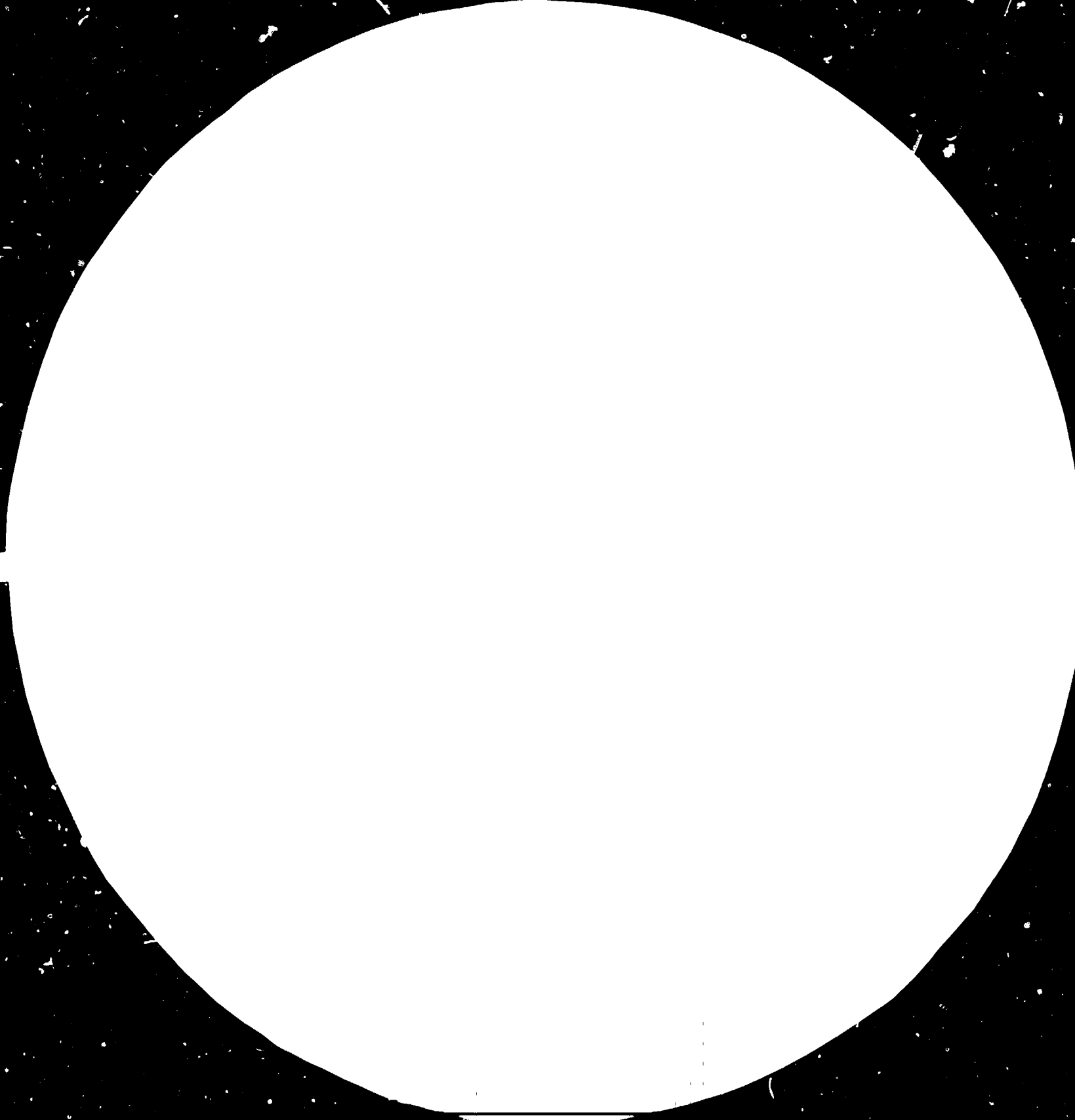

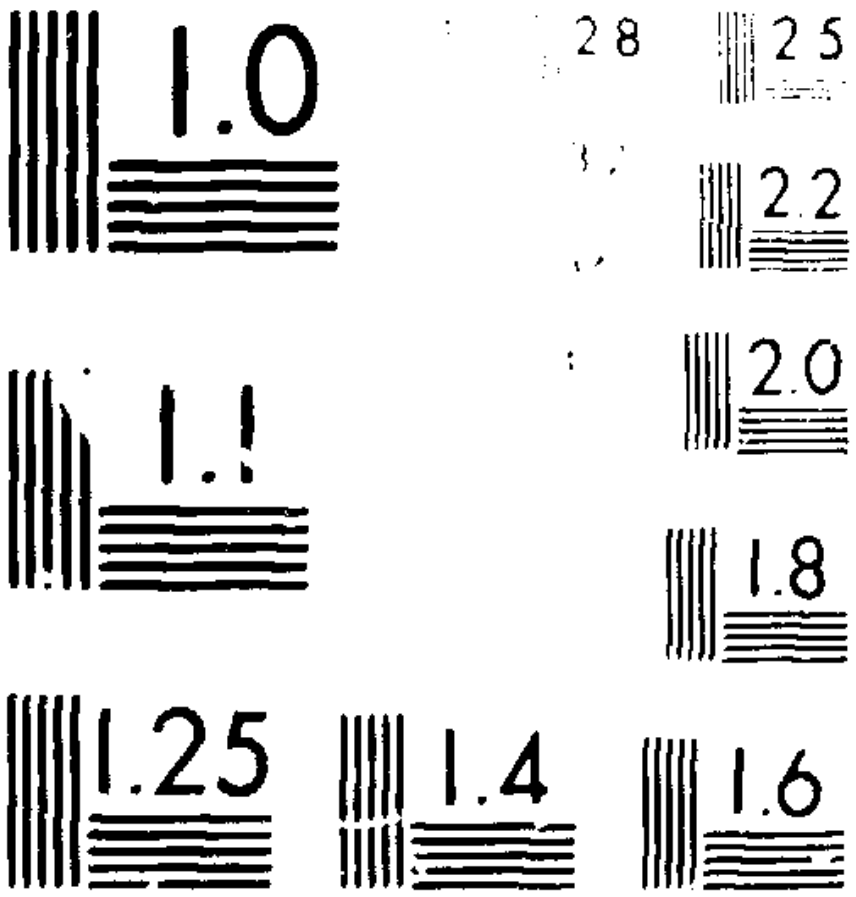
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LEATHER AND LEATHER PRODUCTS INDUSTRIES DEVELOPMENT

DP/URT/78/010/11-03

UNITED REPUBLIC OF TANZANIA

Technical report: Assistance in footwear manufacture to the Tanzania Shoe Company Limited

Prepared for the Government of the Republic of Tanzania by the United Nations Industrial Development Organization, acting as executing agency for the United Nations Development Programme

Based on the work of Jan Bek, footwear technologist

United Nations Industrial Development Organization

Vienna

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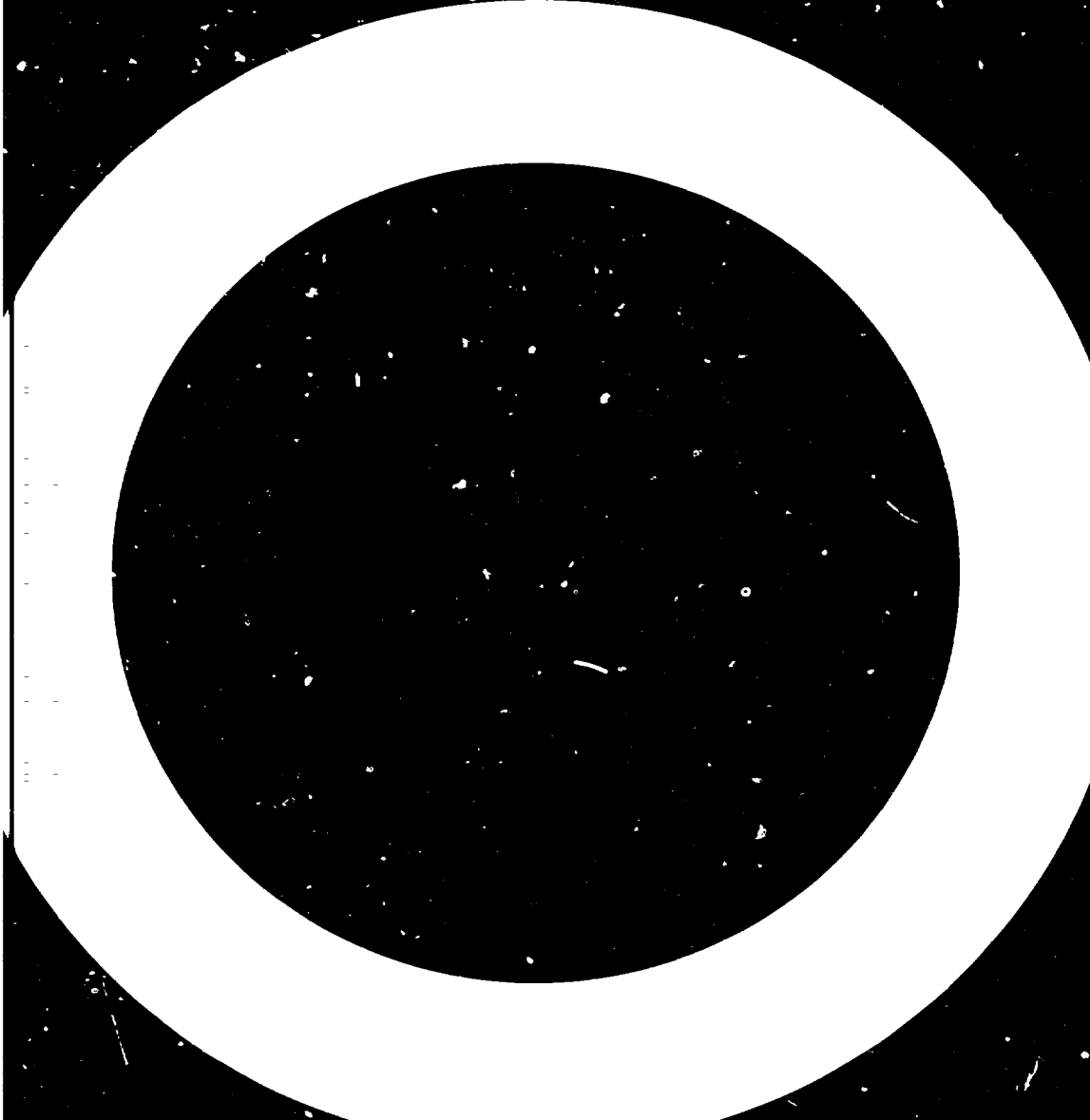
Explanatory notes

References to dollars ($) are to United States dollars.

The monetary unit in the United Republic of Tanzania is the shilling (TSh).

Besides the common abbreviations, symbols and terms, the following have been used in this report:

DABCO	Domestic Appliances and Bicycle Co.
PU	Polyurethane
SIL	Service Industries Limited (Pakistan)
TLAI	Tanzania Leather Associated Industries Corporation
TSC	Tanzania Shoe Company limited (Bcra)



ABSTRACT

As part of the on-going project "Leather and leather products industries development" (DP/URT/78/010) which was approved in May 1979, a footwear technologist was sent to the United Republic of Tanzania by the United Nations Industrial Development Organization (UNIDO) acting as executing agency for the United Nations Development Programme (UNDP). His mission of two years began on 30 June 1980.

The expert studied the Tanzania Shoe Company's (TSC) operations, prepared a report on the areas which could be improved during his assignment and established a work plan which met the agreement of all parties concerned.

The Company's economy could be improved by a stricter control over the PVC, rubber and leather wastes. Under the expert's guidance considerable savings were already achieved and recognized by the management. Cost consciousness has been put into the proper perspective in TSC and this should contribute to further considerable savings.

In-plant training received the maximum attention; over 200 staff at supervisors' and workers' levels were trained in technical subjects. The importance of in-plant training has been recognized by the management and it will continue on a regular basis.

The expert further elaborated a rehabilitation and modernization plan for TSC, which includes all necessary machinery and equipment, and assisted the Marketing Director in formulating a marketing plan for the next five years.

The expert's recommendations for a continued improvement of operational efficiency include the establishment of a master sample room in the Designing Department, the production of wooden lasts and an increased effort in the design of canvas and plastic footwear.

In the manufacturing section the expert recommends to increase the production to 1,000 pairs per day on the assembly lines, to improve quality control by establishing proper specifications, and to monitor outputs and inputs more rigorously.

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INTRODUCTION

The United Republic of Tanzania is one of the East African countries that has a large livestock population. According to the most recent estimates, the livestock consists of about 12.5 million head of cattle and 9.5 million sheep and goats. Taking into account the off-take reject rates applicable to the local conditions and estimating 50 per cent collection, this amount of raw hides and skins could produce 10 million pairs of leather footwear.

Realizing the importance of this natural resource, the Government of the United Republic of Tanzania has made considerable efforts to develop the leather and leather products industries: three mechanized tanneries have been erected within the last 15 years, a large footwear factory and a medium-sized leather goods factory were installed and a leather-board plant is under construction at Morogoro. Other plans to further expand the leather products industry are under consideration. Besides the new factories, the Tanzania Shoe Company (TSC) at Dar-es-Salaam produces leather, canvas and plastic shoes for the local market, which are sold in their own retail outlets under the trade mark Bora.

The overall capacity utilization in the tanning sector is about 50 per cent, while in the shoe industry it is well under 20 per cent. The main problems in the footwear industry are the lack of know-how, operational training and experience, poor marketing and maintenance and the technical and production management methods used.

As the shoe manufacturing units under the control of the Tanzania Leather Associated Industries (TLAI) are facing serious difficulties, the Government of the United Republic of Tanzania requested assistance by the United Nations Development Programme (UNDP). The project "Leather and leather products industries development" (DP/URT/78/010) was approved in May 1979 and the United Nations Industrial Development Organization (UNIDO) designated as executing agency.

The footwear technologist was assigned to the project for a period of two years and started his mission on 30 June 1980.

SUMMARY OF RECOMMENDATIONS

Designing Department (Chief Designer)

1. A master sample room, covering footwear, rubber components and basic materials should be established. This will be of great value in:

(a) Production planning
(b) Material planning and advance ordering
(c) Quality control
(d) Financial planning

Manufacturing (Production Managers)

2. Raw material control, especially that of leather, should be improved.

3. The quality of products should be monitored on hourly basis according to production samples.

4. The capacity of the conveyors should be increased to 1,000 pairs in eight hours.

Overall economy (Cost Accountant)

5. Waste control, especially on PVC and leather should be carried through.

6. The purchase of a crumbing plant for the re-utilization of waste from rubber products, tyres and tubes should be followed up.

7. The shoe cost should be monitored every six months and the variance be checked monthly.

8. A "war on waste" campaign should be organized.

Manpower planning (Director of Administration)

9. The planned in-plant training courses should be carried out and followed up regularly.

10. In addition to the supervisors pointed out by the expert, promotable staff should be identified and given the opportunity for further training.

11. Seminars on technical subjects should be organized for the top management.

Engineering (Chief Engineer)

12. The modernization programme, as prepared by the expert, should be pursued and the suggested new lay-out followed.

13. Arrangements should be made to improve the general lighting system throughout the factory.

14. New moulds should be used, especially for canvas footwear.

Expertise (Chief Technical Adviser, TLAI)

15. Assistance should be sought and the following experts requested:

(a) Rubber/canvas technical designer;

(b) Maintenance mechanic for injection-moulding machines and moulds;

(c) Rubber compounder (chemist) for tyres and tubes;

(d) Technical manager who should work on development and the introduction of new equipment, gadgets and materials.

I. FINDINGS

The Tanzania Shoe Company (TSC), previously known as the East African Bata Shoe Company (Twiga Factory) was incorporated in 1959. The Company was nationalized in 1967 and renamed the Tanzania Shoe Company Limited (Bora). It is owned by the Government, represented by TLAI, and the Treasury.

In 1973 the Company has signed an agreement with Service Industries Ltd. (SIL) of Pakistan for the management of TSC and SIL fielded the general manager and the top management team. The agreement was later changed to a technical and advisory contract and three SIL experts, the production manager, the chief designer and a chemist are at present working at TSC with the aim of keeping the Company profitable and technically sound.

The management of TSC is aware of the strengths and weaknesses of the Company's five-year plan. The following constraints hamper an increase of production, productivity and quality:

(a) Lack of production planning
(b) Shortage of materials
(c) Existence of a communication gap
(d) Rapid labour turnover
(e) Lack of proper maintenance

The expert noted that in the last few years TSC has considerably expanded the factory, among others by adding a polyurethane (PU) soles unit and a high-fashion workshop.

The strong points of TSC are:

(a) A large market with a great potential for all types of footwear;

(b) An attractive range of leather shoes and sandals with PU soles;

(c) The availability of labour trained in basic shoe-making;

(d) An excellent young and enthusiastic top management.

Improvements are required in the areas of designing, material management including waste utilization, production planning, manufacturing, maintenance, and personnel management and management development, which are explained in the following sections.

A. Designing

Designing is at present production oriented whereas it should be market oriented. The canvas line should be modernized and the selection of PVC shoes should be broadened.

It would be advisable to put the Designing Department directly under the marketing manager. Such a set-up would ensure standardization and better selection of attractive footwear throughout the country, irrespective of where the shoes are produced, as the Designing Department would act as TLAI Directorate's design centre for footwear and all other leather goods. A quality control laboratory for new materials and for finished products should also be attached to the design centre.

In the shoe production there should be a clear distinction between various price ranges. The canvas line should be enlarged to include sports shoes and special footwear for the army, for farmers and miners. The PVC range has been neglected and PVC micro-cellular sandals should be introduced. An emergency range should be established based solely on indigenous materials or having a very small import component.

The expert who closely collaborated with the manager of the Designing Department made during his assignment the following recommendations which were accepted:

(a) To establish a sample room;
(b) To introduce new articles into production;
(c) To use suitable types of wood for last-making (see annex II).

The expert observed that due to the non-existence of a master sample room some of the designs made by the shoe designer go to the office of the General Manager, some to the office of the Marketing Manager, while some others get lost. In order to stop that confusion the management of TSC agreed to the following:

(a) Once a design has been made by the designer and approved by the managers concerned i.e. the marketing, the production (leather) and the planning managers by initialling a tag attached to the model, one pair will be placed in the master sample room (or model room) and another identical pair in the office of the General Manager. The latter would be known as the "master sample";

(b) According to the master sample the Production Department will produce another copy which will be referred to as the "production sample." The production sample will be compared with the master sample and subsequently approved by the Designer and the manager concerned;

(c) Any variation to be made on the production sample, e.g. due to lack of certain raw materials, will be done in consultation with the Designer and the overall approval of the Factory Manager will be sought.

It was further observed that the existing specification sheets (e.g. production guide) did not give some important details. It was decided to improve the existing guide and the Designer was requested to give more details on the type, quality etc. of the raw materials used. The Designer was also asked to modify and improve the existing specification sheets.

Finally it was agreed that the quality checkers should be given production samples to assist them in checking the quality of the shoes produced.

Furthermore, a copy of the production guide is to be given to the Cost Accountant, the Quality Controller, the Production Manager, the Designer and the Factory Manager.

Introduction of a new article

A new article, MEC 2, has been put into production recently without proper pilot tests and wear tests and had to be withdrawn after 4,000 pairs had been cut and 600 pairs produced. Upon examination and a fitting test it was decided to postpone its production until the Designing Department would

have sufficient time to carry out a proper production test and make the necessary adjustments to the pattern, in accordance with the material used. In the absence of a production guide and a production sample it was difficult to determine the cause of the poor fitting and ugly appearance. Generally the upper leather was of uneven thickness, hard and dry. The uppers were not stitched on the mark. The shoes which were hand-lasted appeared to be better.

A considerable loss had been incurred due to loss of production for one week and the waste of 4,000 pairs of uppers which will not make good shoes. In order to avoid similar costly mistakes in the future, it is recommended to adopt the following procedure:

(a) Carry out fitting and wear tests with prototype shoes;

(b) Prepare a production guide (specification sheet) for the Costing and Production Department;

(c) Make a pilot run of 250 pairs of all sizes from those materials which will eventually be used for their production;

(d) Prepare a production sample and have it approved for actual production by the Production Manager.

Organization

The expert recommends to separate the High-Fashion Department from the Designing Department and to place it under the direct control of the Production Manager (leather), or the Production Director.

The Designing Department should concentrate more on development work, particularly on the creation of new articles with a maximum content of indigenous material. Its major tasks should be the follow-up of instructions contained in the production catalogue, equipment control and the production of knives and moulds.

Establishment of a master sample room

A master sample room should provide an overview of interesting footwear from all over the world, including the Company's production. It will therefore consist of a permanent display of the Company's footwear which will be produced and marketed during a given year and samples of such shoes and components which are interesting from the fashion and technological point of view for the development of new ideas and features for the Company's own shoe line.

The master sample room would also serve the purposes of:

(a) Having an acceptable standard of all footwear duly approved by the General Manager for Production;

(b) Providing samples for costing purposes;

(c) Constituting a basis for the Company's budget and annual plan, including purchasing and marketing.

The samples should be produced in the following way:

(a) Several mock-ups are prepared for selection by the Sales Department;

(b) A prototype of each of the selected samples is discussed with heads of the departments concerned to ascertain the production possibilities and the preliminary production cost;

(c) After scrutiny and acceptance by all concerned a final sample is produced for approval by the General Manager and this sample, referred to as the "master sample" will form the basis of the Company's shoe line;

(d) A production sample is then prepared by the Production Department according to the master sample, checked by the Chief Designer and approved for production by the Production Director;

(e) The Quality Inspector checks the shoes against the production sample.

B. Material management

The Purchasing Department needs more information from the factory on the current requirements; in view of import controls etc., the time needed to obtain certain materials is more than six months in many instances. It is therefore recommended:

(a) To prepare, on an annual basis, a list of the overall requirements for the shoe line and to break them down for each month according to sales forecasts;

(b) To set up a cardex system for ordering and follow-up;

(c) To establish weekly production schedules based on sales requirements;

(d) To ensure that all purchases go through the Purchasing Department (cars, spare parts etc.);

(e) To improve stock control by:

(i) Identifying non-moving items (for 6 months, 12 months and more) and to arrange for their utilization in the factory or their disposal by auction;

(ii) Taking a monthly inventory and making checks on stock-out;

(iii) Establishing a salvage yard for the sorting of wastes to be re-used or auctioned.

A salvage yard for wastes, if properly administered and used, could lead to savings of about TSh 10 million per year. Sorting should be according to type of material, such as:

(a) Upper leather. This should be kept on stock and issued to the Manipulation Department when children's or men's sandals are planned for production;

(b) Rubber. The Company has already started to save the waste from Hawaii chappals by re-cutting large sizes into children sizes, which should bring in a saving of TSh 200,000 per year. The rest of the rubber waste should be stored and kept for the crumbing plant, the setting-up of which is absolutely essential in order to conserve imported materials;

(c) Plastic. All plastic waste should be sorted according to colour, then granulated and re-used. If the Company's machinery is out of order, the waste should be granulated by an outside firm;

(d) Bottom leather. All vegetable-tanned leather should be stored and later used for leather board production, since there will always be a shortage of such cuttings.

C. Production planning

Rubber factory

The annual production of the rubber factory comprises the following items:

Hawaii chappals - 2.5 million pairs
Tyres - 360,000 pieces
Tubes - 590,000 pieces
Micro-sheets - 155,000 pieces
Unit soles - 200,000 pairs
Desmocol adhesive - 60,000 kilograms.

The average machine utilization is only 60% due to lack of maintenance and material shortages.

To increase the efficiency of the rubber factory it is recommended that:

(a) Hoods be affixed over the mixing mills to avoid dust spreading all over the building and to also reduce compound wastage;

(b) A system of process control be introduced;

(c) A water bath be introduced for the cooling of the compounds;

(d) The productivity of all machines be examined and improvements made;

(e) Objectives be established for the laboratory, which is part of the rubber factory. At present there is no qualified rubber technologist who would ensure economy and quality. The purpose of the laboratory should be:

(i) To test all incoming materials in order to establish whether they meet laid-down specifications before making any payment to the suppliers and authorizing production;

(ii) To ensure that process control is carried out throughout the Production Department, properly monitored and recorded;

(iii) To make two-hourly checks on all adhesives used in the factory;

(iv) To check the finished products at random for minimum quality specifications;

(v) To encourage import substitution, to monitor and review it regularly with the management;

(f) The laboratory staff be encouraged to obtain further training in rubber technology.

Footwear production

In the Leather Shoes Division of TSC shoes of four different constructions are produced: injection-moulded shoes (IMS), veldtschoen (VS), shoes with stuck-on unit soles or microcellular rubber soles, and directly-moulded shoes (DMS). The ranges of shoes being produced under the four basic constructions are as follows:

(a) Injection-moulded shoes

Football boots
IMARA line, gents, range 6-10
IMARA line, ladies, range 3-8

(b) Veldtschoen with stuck-on microcellular rubber soles

Msafiri, gents, range 6-10
Msafiri, youth, range 2-5
Army boots

(c) Shoes with stuck-on unit soles

MODERN, children/youth, range 5-11
KIBO, children, range 1-11
MODERN, gents, range 6-10
MODERN, ladies, range 3-8
TOTO, children, range 4-10
TOTO, children, range 1-11
Training shoes
Sandals, gents, range 6-10

(d) Directly-moulded shoes

No production at present.

The factory manufactures shoes of stuck-on construction with PU, PVC, rubber unit soles, and leather unit soles for mocassins.

D. Manufacturing

Description of manufacturing stages

Clicking and cutting

The leather or other materials is received according to the weekly production plan from the stores, checked for quality and quantity and then issued to the individual cutters. The materials may be divided into upper components (consisting of upper, lining, stays, tongues, decorations and reinforcements) and bottom materials (such as soles, heels, insoles, counters,

toe-puffs, insole covers and socks). All these components are cut by hand on the machine. In the modernization plan provision has been made to purchase some clickers to improve quality and productivity.

Closing and stitching

This department has a big problem due to old machines, lack of spare parts and an inadequate production system.

The UNIDO closing-room consultant, who was on a short assignment to organize this department, has significantly improved the quality of production and the monitoring system.

Assembly and lasting

This operation is performed on conveyors with an average daily output of 500 pairs. The expert recommends to establish this line for 1,000 pairs per day, which is the norm in any organized shoe factory in Europe or the United States of America.

Various types of soles are used such as rubber unit soles; PVC soles, stuck-on or injected; PU; leather; and rubber, moulded or directly-vulcanized to the uppers.

Finishing

This section is well organized and all operations such as cleaning and checking of the shoes, pasting of socks, are performed in one area.

Packaging

The shoe boxes are marked with brand name and item number. It is recommended to combine the finishing and packing operations.

Existing manufacturing facilities

The total area of land of the TSC plant is approximately 35,000 m^2 which includes both the Rubber and Leather Divisions. The covered building area of the leather factory is difficult to identify, except for the main production block, because there are many facilities which are shared by the Leather and the Rubber Division. The area of the main production block housing the Leather Division is approximately 3,900 m^2 and that of the new high-fashion factory is some 1,000 m^2.

The Leather Shoes Division comprises the following technical sections: clicking or cutting, closing making or lasting, finishing, packing, raw materials and finished products storage. To facilitate planning, the production lines of the various sections have been numbered; the same conveyors are allocated different numbers for each shift. The production is planned on the basis of individually-numbered lines.

In addition to the above, the plant has the following common utility and service facilities: compressor room; pumphouse and water supply system; electrical substation and power distribution; engineering workshop; fuel oil storage; training area; and a canteen.

E. Maintenance

Great difficulties are experienced by the Engineering and Maintenance Department due to lack of spare parts, poor layout, diverse machinery and complete lack of basic maintenance such as cleaning and greasing. The workshop is reasonably equipped, and the staff is sufficiently qualified.

The four DESMA injection-moulding machines should receive priority in overhauling. When funds are available, the following should be bought:

Crumbing plant
Internal mixer
DESMA "704" injection moulding machine for plimsolls
5 sets of 7 pairs each of moulds for DESMA (canvas and leather)
Cambering equipment for 3 bowl-colanders
8 cutting presses for uppers

An inventory of all machinery should be made and a label affixed to the machines giving the year of purchase, makers' name, operational efficiency and date when replacement is needed. The Engineering Department should prepare a ten-year plan showing the consumption of electricity, water and steam.

A similar procedure should be followed with regard to moulds and other equipment.

F. Personnel management and management development

The objective is to have an effective management and supervision at all levels; to induce professionalism in footwear technology; and to encourage training to improve the workers' skills.

Considering the present management structure, the following development programmes are suggested:

Seminars

One-day seminars should be organized by the Training Department for the management and for supervisors on the following subjects:

(a) Shoeline development
(b) Footwear technology
(c) Waste utilization
(d) Import substitution
(e) Adhesives in footwear
(f) Economic appraisals of new projects, machines and equipment
(g) Basic data for costing of footwear.

Courses for supervisors

The following courses should be offered for supervisors:

(a) Basic shoe making - 8 weeks
(b) Basic rubber technology - 8 weeks
(c) Factory production planning - 4 weeks
(d) Quality control - 4 weeks

Skill improvement

Workers should receive training in the following areas:

(a) Upper cutting - 4 weeks
(b) Lasting - 4 weeks
(c) Skiving - 4 weeks
(d) Stitching and binding - 4 weeks
(e) Adhesive application - 4 weeks

Other measures to improve management and supervision

In order to improve management and supervisory standards, introduction of the following measures is recommended:

(a) Prepare for each staff member a job description and a work programme;

(b) Assign specific tasks to each manager and supervisor and review them periodically;

(c) Arrange visits to various factories and to the university of Dar-es-Salaam;

(d) Send staff on professional training courses abroad;

(e) Organize meetings at operators' and supervisors' levels;

(f) Organize weekly "quality meetings" which are chaired in rotation by senior managers;

(g) Prepare a list of all factory operators which are to be trained as instructors;

(h) Identify potential management supervisory personnel;

(i) Assign the following projects as tasks:

Crumbing plant, reclaiming plant, adhesive manufacturing, mixing rubber compounds, dry blend lining, and import substitution.

II. MEASURES FOR COST REDUCTION

A. Overall economy

The production of TSC has dropped to 40% due to the non-availability of essential raw materials. This will effect the economy of the whole Company and it is expected that considerable strain will be put on the cash flow. A careful monitoring of income and expenses is therefore essential.

Bora's major objective must be to produce high-quality articles from available raw materials. To this end, the production plan should be reviewed every week by the management. The Marketing Director should have a close look on stocks of footwear and identify any slow-moving articles in each shop or depot so that goods may be transferred either to other shops where they will sell, or be returned to the central depot for re-allocation. Since the reserves of all types of materials for shoe production have been exhausted, this will reduce the flexibility of substitution and create difficulties in the future.

The UNIDO expert recommends that the following measures be implemented:

(a) Monitor stocks of footwear in shops and depots to ensure a fast realization of cash;

(b) Identify fast-moving, profitable articles which should be given priority in production;

(c) Identify local purchasers of footwear (Morogoro, Mbeya, Simba Plastics etc.);

(d) Appoint a supervisor in charge of material waste control and monitor on monthly basis;

(e) Delegate to the directors the control over major expenditures for which they will be solely responsible, such as: salaries, electricity, transportation, travel, donations, telephone, stationery, civil engineering work, and other expenditures over 5 thousand TSh;

(f) Up-grade the shoe line with new unit soles in order to realize better prices;

(g) Organize the work and reduce the indirect personnel to the level of 1978;

(h) Appoint a team of staff from purchase and laboratory to develop materials from local sources;

(i) Activate development in canvas shoes and prepare designs for ladies and children's shoes from textile uppers or from a combination of canvas/leather split;

(j) Make full utilization of splits for lining as well as for uppers, since there is a good supply of it in the tanneries.

B. Introduction of calculation tickets and an incentive scheme

One major problem in the shoe factory is the excessive wastage of leather. Several systems have been tried by the management, including an incentive system for the cutters, but they were not successful for various reasons. During the production course for leather supervisors and cutters, held in August and September 1981, the salvage yard was inspected and it was observed that too much leather waste is being dumped. After consultations with the Manager of Planning and the Cost Accountant, the expert suggested to adopt a system currently used in major shoe factories under which cutters and supervisors receive a monetary incentive when real savings against targets are achieved.

With that new system, which has been explained to and is understood by all participants of the production course, it is expected that savings of TSh 4 million per year can be achieved.

Table 1. Yearly requirements of upper leather

Type of leather	Quantity (ft^2)	Price (TSh/ft^2)	Value (million TSh)
Suede	560 000	14	7 900
Plain	60 000	15	10 500
Printed upper	1 240 000	12	18 500
Total	2,800 000		36 900

Bora's waste rate used in calculations is 20%, but the actual waste is more than 30%.

To introduce the new scheme, it is recommended to proceed as follows:

(a) Start in the High Fashion Workshop with the introduction of the calculation ticket to observe actual waste on a daily basis. The trial should run for three months;

(b) Decide on a financial incentive to be granted to individual cutters and supervisors, based on cost savings. This cash incentive should not be more than 10% of the respective basic wages;

(c) Analyse in the Designing Department each article for possible savings and establish percentage of acceptable waste;

(d) The percentage of acceptable waste, once established, should not be adjusted upward unless very valid reasons exist.

With an incentive of 10% the cutters would earn some TSh 100 extra per month and the Company would benefit greatly by conserving valuable raw materials.

C. Utilization of regranulated PVC waste

TSC has also an excessive PVC waste due to worn out or poorly-adjusted moulds and old machines. Usually only fresh PVC material was used, and the waste, which is approximately 35% of the total requirement, was dumped. Only a small percentage of regranulated waste had been used on the GUSBI for the DESMA 704 machines to make black PVC soles for plimsolls and leather shoes.

During August and September 1980 a series of tests has been carried out on all four PVC injection moulding machines using different percentages of regranulated PVC waste. The GUSBI machine could cope only with 35% of waste, the DESMA 704 with about 50%, and the DESMA 700 could use up to 70% of waste.

The waste of the new PVC compound has also been regranulated and used. However, twice granulated waste has to be specially compounded and reprocessed with the addition of a plasticizer. As TSC has no such compounding facilities, all reprocessed waste should in the meantime be sold to Simba Plastics, who are willing to purchase it.

The figures of the test carried out in September 1980 are given below:

Quantity of regranulated PVC waste (from fresh compound)	23,400 kg
Shoes produced from that waste	135,000 pairs of PVC straps 38,000 pairs of DMS canvas
Cost of 1 kg fresh PVC compound	TSh 14.55
Savings of foreign exchange in one month	TSh 340,000

Considering that the minimum quantity of recoverable waste is 20 t per month, the annual saving is 240 t of PVC material or TSh 3.5 million.

Subsequently the expert recommended that:

(a) The maximum percentage of regranulated waste to be used be 30% on the GUSBI machine, 50% on DESMA 704 and 70% on DESMA 700. The percentage of waste may be less, but should never exceed the indicated amount;

(b) The overflow of the PVC straps production be controlled by adjusting the temperature on the machine and by mould adjustment. As a priority new moulds should be ordered;

(c) A heel filler be introduced, even if it has to be imported, as an excessive amount of PVC is used for heels;

(d) The waste from each machine be sorted daily according to colour;

(e) Machine moulds be cleaned, oiled and adjusted weekly;

(f) PVC waste be regranulated and re-used on a weekly basis;

(g) D.O.P. plasticizer for the reprocessing of the waste be ordered;

(h) Caution be exercised with the maintenance of machine motors, as the regranulated material will put extra strain on the machine.

These recommendations, which were accepted and introduced in January 1981, contributed to savings of more than $500,000.

III. IN-PLANT TRAINING

The UNIDO expert was closely associated with the in-plant training programme at all the levels, i.e. of management, supervisors and workers. The middle management badly needed professional training in the technical field as well as in administration. The expert organized courses of six weeks duration for the staff of the rubber and the leather factory. In addition, courses were held for quality checkers and second-line management.

Heads of departments were trained by involving them in the in-plant training programme: they took part in the courses or gave lectures in their field of specialization.

During the two years of the expert's assignment more than 200 people had undergone training in various fields (see annex IV). The following were the major courses:

A. Refresher course on quality control in footwear production

Objectives

To acquaint participants with the latest developments in footwear technology and material testing.

To improve professional knowledge in statistical quality control.

To improve shoemaking techniques.

Participants, after finishing the quality control course will introduce the following:

(a) Hourly analysis of factory rejects to ensure improvements;

(b) Establish production samples for each article produced on individual lines; these will be approved by the Marketing Manager.

Conclusions

In-plant training is essential, especially for staff having a long practical experience and no academic background. The participants were hardworking, punctual and eager to learn.

The expert noticed a big gap in "know-your-Company". The heads of departments have been extremely helpful in presenting an overview of Bora and their individual departments. This presentation should be repeated during subsequent courses.

Recommendations

The expert recommends further training for selected participants at the Tanzania Technical Institution and follow-up courses for the other participants.

B. Production course for rubber factory supervisors and chemists

Objectives

To up-grade professional competence and skills in the rubber factory.

To increase awareness of the need for economy in compounding and waste utilization.

To increase self-confidence and improve ability to communicate.

The course leaders were R. Mlembe and B. Mollel.

C. Production course for leather factory supervisors

This course was held at Bora under the auspices of the Directorate of Manpower Planning and Development and with the assistance of the UNIDO expert. It was conducted every morning, from 27 April to 29 May 1981. The attendance was very good and all participants took written tests at the end of the course.

Objectives

To build up basic technical knowledge in shoemaking.

To increase the understanding of the job.

To increase self-confidence and improve motivation and communication skills.

To develop team spirit.

Subjects covered during the course

Subject	Speaker
Bora's objectives for 1981	Y.J. Mwailolo
Leather factory objectives	A.A. Mwasyoge (DPM) L.
Footwear technology	Jan Bek, UNIDO expert
Production planning	S.O. Sabaya, Planning Manager
Employees morale in relation to productivity	N.S.K. Tumbo
Store-keeping	A.S. Ibrahim, Store Officer
Electrical maintenance	W.S. Rwiza
In-plant training	DMD, Ministry of Industry
Shoeline development	E.K. Shiyo, Designer
Productivity	Jan Bek
Quality control	A. Khalfani, Quality Manager
Production set-up for 1,000 pairs/8 h by direct-vulcanizing process	Jan Bek
First aid and fire precautions	H.L. Kadege
Designing of shoes	E.K. Shiyo
Wages preparation	B.N. Kiyuga
Value of quality circles system	J.P. Parker, UNIDO consultant
Role of the supervisor	J.P. Parker
Research/development in footwear	Jan Bek
Minimum quality specifications	Jan Bek
Basic costing	Jan Bek

Laboratory control	R. Miembe
War on waste	B.N. Kiyuga
Bora management organization	N.S.K. Tumbo
Manpower planning	E. Hanti
Shoemaking	H. Kambagha
Stitching uppers	APL(L)
Dry blend	Jan Bek
Sales organization	S.S.K. Lyimo
Role of WETO	M. Abraham
Role of CCM	M. Jeuri

Conclusions

Some of the lectures were attended also by particpants of the marketing course. Ideas were exchanged and there is now a better understanding between the participants of the production and marketing courses.

The lectures were held in Swahili for better and easier communication. Mr. Moshi, the course leader, was particularly helpful with translations on footwear technology.

D. Course for leather supervisors and cutters

This course was organized at Bora under the guidance of the footwear advisor. Twenty people attended throughout this six-week course, held from 7 August to 18 September 1981 and giving a total of 105 hours of tuition.

Objectives

To increase professional competence in clicking departments.

To reduce waste.

To build self-confidence and increase motivation and communication skills.

To introduce calculation cards for better control of leather quality.

E. Management course

A course for the senior management of TSC was held from 26 January to 20 March 1982. Nineteen managers participated and took a final examination. The course was extremely useful as it not only dealt with footwear technology but also with factory administration and general management.

Visits were made to the Morogoro shoe factory and tannery where the participants could see the leather complex, which, when on stream, will be one of the finest in Africa.

Objectives

To give the participants relevant knowledge of shoe technology and competence in shoemaking.

To broaden their professional knowledge in factory administration.

To identify those who would benefit by additional training at a university, at home or abroad.

IV. REHABILITATION AND MODERNIZATION OF TSC

The expert elaborated several proposals and suggestions for the modernization of the rubber and the leather factory. Upon request of the General Manager an overall rehabilitation project was prepared, approved by the management of TSC, and submitted to the Tanzania Investment Bank for financing. As it is the Government's policy to assist industry with rehabilitation, it is hoped that the proposal will be favourably considered by the Bank.

A. Summary of required capital expenditure

	£ FOB
Leather Section	189,000
Closing Section	131,700
Canvas Shoes Section	602,000
Tyres and Tubes Section	602,000
Engineering Section	140,700
Sub-total	1,665,400
10% freight	166,600
Total	1,832,000

B. Recommended machines and equipment for the various sections

Leather Section

The listed machinery is mainly needed for the modernization and balancing of work in the leather factory. It would meet TSC's requirements up to 1986.

Type of equipment	Quantity	Price (£)
Upper leather bandknife splitting machine (400 mm)	1	15,000
Marking and stamping machine	1	1,500
Sole activating unit	2	2,500
Shank lasting machine	1	15,000
Backpart stretching and moulding machine	1	5,000
Heel seat lasting machine	2	24,000
Sole attaching press	1	14,000
Hydraulic cutting machine, 13"	4	16,000
Bridge hydraulic cutting machine	2	15,000
Uppers perforating machine	1	6,500
Press for reconditioning PVC discs for perforating machine	1	3,000
Vickers wire stitching machine	1	5,000
Uppers embossing machine	1	2,500
Upper parts cement applying machine	2	2,500

Upper margin cement applying machine	1	2,500
Lockstitch outsole stitching machine	1	15,000
Clicking board planing machine	1	9,000
Bottom ironing machine	1	25,000
Twin eyeleting machine	1	10,000
Total		189,000

Closing Section

The listed sewing machines are mainly needed as a replacement for old and worn-out machines; with new, modern equipment both the quality, work and productivity will improve.

Type of Equipment	Quantity	Price (£)
Single needle, post bed under edge trimmer sewing machines (as Pfaff 791-755-103)	6	24,000
Single needle post bed roller pressure sewing machine (as Pfaff 493-755/03-726/04)	6	22,000
Binding machines post bed (as Pfaff 335-N3-17/01)	3	9,000
Two-needle post bed 2/16 gauge (as Pfaff 474-755/01-725/04)	6	18,000
Flat bed taping and two-needle machines (as Pfaff 442-0-63/01) gauge 5/16"	3	9,500
Cylinder bed type (as Pfaff 346-H/3-653/01) gauge 5/16"	1	3,200
Single needle flat bed machine (as Pfaff 141-703/03)	1	3,000
Flat bed two-needle (as Pfaff 244-944-10) gauge 3/16"	3	12,000
Post two-needle (as Pfaff 194/01)	3	13,000
Regenta eyelet machine	1	6,000
Epoch eyelet machine	1	4,500
Intacking machine special system (as Pfaff 3232)	2	7,500
Total		131,700

Canvas Shoes Section

The existing machines are obsolete, worn out and due to a lack of spare parts 80% of them are not working. All moulds are obsolete for the production of shoes for exportation. Since extrusion exceeds 30% it is essential to replace them. A careful selection has been made to obtain the most suitable machines, and particular importance was given to new and modern moulds for improved quality and appeal.

Type of equipment	Quantity	Price (£)
Twin-station vulcanizing press	12	170,000
Moulds, 3 sets	12	92,000
Injection moulding machine	1	160,000
Moulds for injection moulding machine	24	180,000
Total		602,000

Tyres and Tubes Section

Type of equipment	Quantity	Price (£)
3D Banbury mixer	1	216,000
Steam boiler	1	21,000
Vulcanizing chamber	1	40,000
Rubber granulator set	1	40,000
Vulcanizing press with pump, 24" x 24"	2	120,000
Press for cycle tyres	10	150,000
Bicycle tube press	6	15,000
Total		602,000

The Banbury mixer will improve the quality of rubber compounds for tyres and tubes and also will increase productivity. The vulcanizing chamber is for post-tempering of Hawaii sheets to improve shrinkage, and the granulator is for greater economy, i.e. to save rubber waste which is being thrown out at present. The latter machine will pay for itself within six months.

The vulcanizing presses and the cycle tyre presses are intended as replacements, as with the existing equipment the rejection ratio is too high. Splicers and tube presses are needed to improve the quality of tube production.

Engineering Section

Type of equipment	Quantity	Price (£)
Centre lathe, centre height 450 mm, distance between centres 220 mm	1	40,000
Radial drilling machine, drilling capacity 60 mm	1	5,000
Hydraulic press	1	6,000
Universal grinding machine	1	6,000
Thickness planer	1	1,500
Pipe bending machine	1	700
Power hacksaw	1	1,500
Pantograph	1	80,000
Total		140,700

V. MARKETING

The UNIDO expert assisted the Marketing Director in formulating a five-year marketing plan. The forecast for the shoe factory was based on:

(a) The market trend, which is moving from cheap to more sophisticated designs with a higher profit;

(b) Sales statistics. The sales figures compared to last year have dropped due to the concentration of production on high-fashion shoes. It would seem that in 1982 the trend will be the same and even in case of increase in units, there will be a very small margin of profit in the next four years;

(c) Fashion. Many designs are on a declining cycle. New designs are to be developed, particularly in children's and canvas shoes.

A. Sales of footwear

From recent shoe fashion magazines it would seem that PVC material is not as fashionable as it used to be and platforms are definitely out of style. It is forecast that a similar trend will develop eventually on the domestic market. It is therefore recommended that Bora product development efforts concentrate on ladies high-fashion footwear without platforms.

The sales of plimsolls have marginally increased and it is believed that the technology used will have no bearing on sales figures, as long as the shoes are attractive and durable.

It is difficult to meet the existing demand for canvas shoes which has been increasing steadily. The large number of school children, and the increased use of canvas shoes in recreation centres have contributed to the higher demand.

The production of leather footwear, especially childrens' school shoes in sizes 5 to 11, should be increased as it is felt that it is Bora's responsibility to provide good-quality low-cost footwear of attractive designs for children.

PVC footwear should be modernized and a better selection of colours provided. This type of footwear is always in demand, on the local market as well as for export.

Bora used to sell imported gum boots and there is still a big demand for them. Since their importation has been stopped, it is proposed to buy them from a local manufacturer, even if Bora would have to supply to him its own PVC waste.

It was planned to market PVC gum boots, but since rubber boots are being imported the matter had been dropped.

Finally, the selling ratio of retail to wholesale should be re-considered as it is felt that Bora's own stores are well supplied.

B. Purchase of footwear for retail

Bora may not be in a position to satisfy its needs in footwear, especially in fashion articles, and it is proposed to purchase, on a pilot basis, leather footwear from local manufacturers. Such footwear would be based on Bora's own design, have Bora's brand and be inspected by Bora's Quality Control Department. This experiment should be introduced at Dar-es-Salaam, so that it can be properly supervised.

C. Sales of bicycle tyres and tubes

Since there is no importation of tyres and tubes, they are in very high demand. The current production satisfies only one third of the domestic market and there would be great potential for exportation.

Domestic Appliances and Bicycle Co. (DABCO), the only distributing agent, seemed to have failed to meet the needs of the people, especially in rural communities where bicycles are the major means of transportation. It is therefore proposed to distribute these items through the Bora outlets.

Bora are selling to DABCO with a 15% discount and giving them credit facilities (15-30 days). If Bora were to distribute tyres and tubes directly, many more people would be able to afford them.

Bora bicycle tyres have reached the international standard while the quality of the tubes needs to be improved and, if possible, the joint eliminated. Since prices for tubes are going up, they should also become more durable.

The expected demand for the various types of footwear, as well as for tyres and tubes is summarized in table 2. It is hoped that during the modernization of the factory the suggestions put forward will be considered.

Table 2. Expected demand for footwear, tyres and tubes for 1980 to 1984 (in thousands)

Item	1981	1982	1983	1984
Hawaii slippers	3 500	4 000	4 200	4 200
Two-colour Hawaii	200	300	400	500
Canvas plimsoll	1 500	1 500	1 500	1 500
Canvas sport	300	500	750	1 000
PVC sandals	400	600	800	1 000
Leather shoes (men and ladies)	1 200	1 400	1 500	1 800
Children's sandals	500	500	600	800
Boots (PVC or rubber)	60	100	120	150
High-fashion shoes	100	120	150	150
Total footwear	7 760	9 020	10 020	11 100
Tyres	1 000	1 200	1 400	1 600
Tubes	1 200	1 400	1 600	1 800
Total tyres and tubes	2 200	2 800	3 000	3 400

Annex I

JOB DESCRIPTION

Post title: Shoe technologist

Purpose of the project: To enhance the capabilities of Tanzania Leather Associated Industries Corporation to discharge the responsibilities entrusted to it in further developing and strengthening the leather and leather products sector of the economy.

It will aim at the best possible utilization of the valuable raw materials, hides and skins, abundantly available in the country.

Duties: The expert will be attached to the Tanzania Leather Associated Industries Corporation which administratively falls under the Ministry of Industry.

Under the supervision of the international team leader, the expert will specifically be expected to:

1. Provide assistance to existing shoe factories in all aspects of footwear manufacturing, including determining capacities, and improving productivity and product quality.
2. Organize and implement training programmes for manpower and technical staff at various levels, in the short-term as well as in the long-term.
3. Assist in the developing and implementing of possible new shoe factory projects.
4. Train national counterparts in shoe technology.

The expert will also be expected to prepare a final report, setting out the findings of his mission and his recommendations to the Government on further action which might be taken.

Annex II

SUITABLE KINDS OF WOOD FOR LAST MAKING

In view of Bora's problem with wooden lasts, enquiries were made as to identify the most suitable types of indigenous wood for last making. The following types of wood may be suitable for Bora's purpose, and it is suggested that the Purchase Department contacts the Tanzania Timber Marketing Co. Ltd., Dar-es-Salaam, to obtain samples with prices:

Newtonia (H) (Newtonia buchanaii)

Description: Sapwood, grey-white, and distinct from brown heartwood on exposure to golden brown. Texture medium to coarse; grain interlocked with some stripes of ribbon figure. Lustrous.

Characteristics: Air dries satisfactorily with little degrade in standard building sizes. Works easily but is inclined to produce a somewhat rough finish unless a small cutting angle is used. Strength properties and durability comparable to Camphor. Peels well and may be used for plywood.

Uses: Construction, joinery, furniture.

Properties: Density 450 kg/m^3; modules of rupture 92 N/mm^2; modulus of elasticity 10 600 N/mm^2; movement: rad. 0.9% tang. 2.2%; hardness 1040.

Podo (S) (Podocarpus spp.)

Description: Light yellow to yellow-brown, usually uniform colour. Texture very fine and even, and grain straight. Growth, rings usually indistinct. Non-resinous; with no scent or taste.

Characteristics: Air-dries fairly rapidly with moderate differential shrinkage but liable to distort unless carefully stacked. Saws easily, machines well and takes an excellent finish. Strength properties comparable to, or slightly better, than those of pine cypress. Not resistant to insect attack but can be treated by pressure impregnation.

Uses: Construction, internal joinery, plywood, containers.

Properties: Density 510 kg/m^3; modulus of rupture 78 N/mm^2; movement rad. 1.0%, tang. 1.4%; hardness 830.

Cypress (S) (Cypress lusitanica)

Description: Sapwood usually paler than heartwood which is pinkish-brown or straw-coloured. Texture fine and even, and grain usually straight. Knots are smaller and more evenly distributed than in pine.

Characteristics: Air-seansons rapidly with minimum degrade. Saws and machines well. Strength properties comparable to or slightly under those of Podo. Treatable with pressure impregnation. A utility softwood often marketed together with pine.

Uses: General construction, shuttering, internal joinery, furniture.

Properties: Density 410 kg/m^3; modulus of rupture 65 N/mm^2; modulus of elasticity 8 500 N/mm^2; movement rad. 0.6%, tang. 1.1%; hardness 610.

It is suggested to send samples of these woods to last manufacturers in the Federal Republic of Germany or in the United Kingdom for evaluation and advice as to which is the best suitable kind for Bora's purposes.

Annex III

MATERIAL SPECIFICATIONS

To simplify the purchase and receipt of footwear materials, it is essential to have material specifications based on internationally-accepted testing methods. The leather testing methods of the International Union of Leather Technologists and Chemists Societies and the recommended quality requirements for the main types of leathers as published in United Nations publication, Sales No.E.76.II.B.6 Acceptable quality levels in leathers, are reprinted below for easy reference.

LEATHER TESTING METHODS OF THE INTERNATIONAL UNION OF LEATHER TECHNOLOGISTS AND CHEMISTS SOCIETIES

Most of the test methods listed below have been declared binding. Most of the DIN leather test methods brought out by the Standards Committee for the Federal Republic of Germany were brought into conformity with the IUC and the IUP methods.

Methods of chemical leather analysis (IUC)

IUC/1 General remarks and representation of analysis results
(Das Leder 14, 95-96 [1963])
(JSLTC 49, 6 [1965])

IUC/2 Sampling (same as IUP/2)
(Das Leder 14, 96-97 [1963])
(JSLTC 49, 6 [1965])

IUC/3 Preparing the test material by disintegration
(Das Leder 14, 98 [1963])
(JSLTC 49, 8 [1965])

IUC/4 Determination of substances extractable with methylene chloride (fats and other soluble substances)
(Das Leder 14, 150 [1963])
(JSLTC 49, 10 [1965])

IUC/5 Determination of moisture in leather
(Das Leder 14, 167-168 [1963])
(JSLTC 49, 11 [1965])

IUC/6 Determination of organic and inorganic substances in leather removable by washing (loss by washing)
(Das Leder 15, 168-169 [1963])
(JSLTC 49, 13 [1965])

IUC/7 Determination of ash and water-insoluble mineral substances
(Das Leder 14, 169 [1963])
(JSLTC 49, 15 [1965])

IUC/8 Determination of chromium content
(Das Leder 14, 170 [1963])
(JSLTC 49, 17 [1965])

IUC/9 Determination of water-soluble magnesium salts in leather (epsom salt)
(Das Leder 14, 200-201 [1963])
(JSLTC 49, 20 [1965])

IUC/10 Determination of nitrogen and skin substance
(Das Leder 14, 201 [1963])
(JSLTC 49, 23 [1965])

IUC/11 Determination of pH and difference value of aqueous leather extract
(Das Leder 14, 202-203 [1963])
(JSLTC 49, 25 [1965])

Methods of physical leather testing (IUP)

IUP/1 General remarks
(Das Leder 10, 14 [1959])
(JSLTC 42, 382 [1958])

IUP/2 Sampling
(Das Leder 10, 14-15 [1959])
(JSLTC 42, 382-386 [1958])

IUP/3 Conditioning
(Das Leder 10, 15-16 [1959])
(JSLTC 42, 386-387 [1958])

IUP/4 Measurement of thickness
(Das Leder 10, 16 [1959])
(JSLTC 42, 387-388 [1958])

IUP/5 Measurement of apparent density (volume weight)
(Das Leder 10, 16 [1959])
(JSLTC 42, 388-389 [1958])

IUP/6 Measurement of tensile strength and elongation
(Das Leder 10, 16-18 [1959])
(JSLTC 42, 389-392 [1958])

RECOMMENDED QUALITY REQUIREMENTS FOR THE MAIN TYPES OF LEATHER (29)

	Shoe upper leather								*Sole leather*				*Lining leather*		
Requirement	*Box and willow calf*	*Box and willow side*	*Corrected grain side*	*Glazed kid*	*Waterproof (combination-tanned a.o.)*	*Waterproof (chrome tanned)*	*Vegetable-tanned upper leather*	*Suede (cattle, calf, goat, split)*	*Sole leather modern tannage*	*Sole leather old pit tannage*	*Insole leather*	*Insole, sock lining (sheep), combination tanned*	*Vegetable tanned*	*Combination tanned*	*Chrome tanned*
Max. ash (%) (after subtracting tanning oxides)	2.0	2.0	2.0	2.0	2.0	2.0	1.0	2.0	3.0 (epsom salt 4.0)	0	2.5 (epsom salt 4.0)	2.0	2.0	2.0	2.0
Min. chromium compounds (Cr_2O_3) (%)	2.5	2.5	2.5	2.5	0.5	2.5		2.5				0.8		0.5	2.5
Fatty substances (%)	2-6	min. 2.0	min. 2.0	4-8	17-23	8-15	16-23	2-6	max. 3.0	max. 0.7	max. 4.0	max. 4.0	3-12	3-12	3-12
Max. loss by washing (%)					6.0		6.0		16.0	6.0	10.0	10.0	6.0	3.0	
Degree of tannage (%)					min. 30		min. 50		60-95	60-95	60-95	min. 50	min. 50	min. 40	
pH difference value	aqueous extract (1.20) not below 3.5 at pH values below 4.0 difference value not above 0.70														
Min. tensile strength (kgf/cm^2)	200	200	200	200	250	300	250	200	200	200	200	100	150	150	150
Max. elongation at break (%)	80	80	80	80	80	80	70	75	30	35	35	40	70	100	150
Min. stitch-tear strength (kgf/cm)	80	100	80	60	100	120	100	80	100	130	100		40	40	40
Min. split-tear strength (kgf/cm)	30	40	25	25	40	40	40								
Water absorption (%)															
after 2 hours	max. 60	max. 60	max. 60	max. 60	max. 30	max. 30	max. 35		max. 40	max. 40	min. 25	min. 100	min. 100	min. 100	min. 100
after 24 hours	max. 85	max. 85	max. 85	max. 85	max. 45	max. 45	max. 45		max. 50	max. 50					
Max. volume weight (g/cm^3)									1.15	1.15	1.05	1.00			
Min. air permeability value (cm/min per cm Hg)	80	80	80	80	80	80	80	80	20	20	20	250	250	250	250
Min. water-vapour permeability value (mg/cm^2)	250	250	250	250	180	200	200	250	200	200	200	250	300	300	300
Max. wear coefficient (%)									3.0	4.0					

	Upholstery and fancy leather				*Clothing leather*				*Technical leather*						
Requirement	*Harness, bag and upholstery leather (vegetable tanned)*	*Harness, bag and upholstery leather (combination tanned)*	*Harness, bag and upholstery leather (chrome tanned)*	*Fancy leather (vegetable tanned)*	*Clothing leather (chrome tanned)*	*Glove leather (chrome tanned)*	*Glove leather (alum tanned)*	*Hat sweat band leather (vegetable tanned)*	*Oil-tanned leather*	*Harness and belt leather (vegetable tanned)*	*Harness and belt leather (chrome tanned)*	*Football leather (chrome tanned)*	*Leather for workers protective articles (chrome tanned)*	*Raw hide and transparent leather*	*Chamois leather*
Max. ash (%) (after subtracting tanning oxides)	2.0	2.0	2.0	2.0	2.0	2.0	8.0	2.0	6.0	2.0	2.0	2.0	2.0	1.5	5.0
Min. chromium compounds (Cr_2O_3) (%)		0.8	2.5		2.5	2.5	Al_2O_3 min. 2.0		Al_2O_3 ...in. 1.0		2.5	2.5	3.0		
Fatty substances (%)	3-12	3-12	3-12	3-8	4-10	4-10	max. 10	3-8	max. 35	10-25	10-25	4-10	4-15	–	max. 10 (fixed 0.5-3.0)
Max. loss by washing (%)	6.0	6.0		6.0				4.0		6.0					
Min. degree of tannage (%)	50	30		50				50		50					
pH difference value	aqueous extract (1:20) not below 3.5 at pH values below 4.0 difference value not above 0.70													4.0-8.5	max. 8.0
Min. tensile strength (kgf/cm²)	above 2 mm 250 below 2 mm 100	above 2 mm 250 below 2 mm 100	above 2 mm 250 below 2 mm 150	100	100	100	100	100	350	250	250	300	200	600	100
Elongation at break (%)	max. 50	max. 50	max. 100	max. 50	max. 60	min. 50	min. 50	max. 50	max. 90	max. 50	max. 75	max. 70	max. 75	max. 35-60	min. 50
Min. stitch-tear strength (kgf/cm)	above 2 mm 100 below 2 mm 30	above 2 mm 100 below 2 mm 30	50		25	60	40			100	100	120			40

	Harness, bag and upholstery leather (vegetable tanned)	*Harness, bag and upholstery leather (combination tanned)*	*Harness, bag and upholstery leather (chrome tanned)*	*Fancy leather (vegetable tanned)*	*Clothing leather (chrome tanned)*	*Glove leather (chrome tanned)*	*Glove leather (alum tanned)*	*Hat sweat band leather (vegetable tanned)*	*Oil-tanned leather*	*Harness and belt leather (vegetable tanned)*	*Harness and belt leather (chrome tanned)*	*Football leather (chrome tanned)*	*Leather for workers protective articles (chrome tanned)*	*Raw hide and transparent leather*	*Chamois leather*
Min. split-tear strength (kgf/cm)	above 2 mm 40 below 2 mm 15	above 2 mm 40 below 2 mm 15	20	10	15	25	25	–	10	40	40	40	15		15
Water uptake (%)								after 5' min. 100 after 2h min. 130				after 2h max. 35 after 24h max. 70			
Water-vapour permeability value (mg/cm^2)					min. 250										

IUP/7 Measurement of absorption of water (static)
(Das Leder 12, 36-37 [1961])
(JSLTC 44, 367-368 [1960])

IUP/8 Measurement of tearing load
(Das Leder 12, 37 [1961])
(JSLTC 44, 368-370 [1960])

IUP/9 Measurement of distension and strength of grain by the ball burst test (Lastometer)
(Das Leder 12, 37-38 [1971])
(JSLTC 44, 371-373 [1960])

IUP/10 Dynamic waterproofness test for boot and shoe upper leather (Penetrometer)
Das Leder 12, 38-40 [1961])
(JSLTC 44, 374-379 [1960])

IUP/11 Dynamic waterproofness test for boot and shoe sole leather
(Das Leder 12, 64-65 [1961])
(JSLTC 44, 495-497 [1960])

IUP/12 Measurement of resistance to grain cracking
(Das Leder 12, 65-67 [1961])
(JSLTC 44, 380-383 [1960])

IUP/13 Measurement of two-dimensional extension (Tensometer)
(Das Leder 12, 304-306 [1961])
(JSLTC 45, 311-313 [1961])

IUP/14 Measurement of the waterproofness of gloving leathers
(Das Leder 12, 85-86 [1961])
(JSLTC 44, 498-502 [1960])

IUP/15 Measurement of water-vapour permeability
(Das Leder 12, 68-88 [1961])
(JSLTC 44, 502 [1960])

IUP/16 Measurement of shrinkage temperature
(Das Leder 15, 85-87 [1964])
(JSLTC 47, 122 [1963])

IUP/17 Determination of resistance of air-dried insole leather to heat, particularly during direct vulcanization
(Das Leder 19, 130-131 [1968])
(JSLTC 50, 379 [1966])

IUP/18 Determination of the resistance of air-dried lining leather to heat, particularly during direct vulcanization and in moulding on soles during shoe production
(Das Leder 20, 161-163 [1969])
(JSLTC 53, 151 [1969])

IUP/19 Determination of resistance of dry upper leather to heat, particularly in direct vulcanization and in moulding on soles during shoe production
(Das Leder 20, 39-41 [1969])
(JSLTC 52, 378 [1968])

IUP/20 Measurement of the flexing endurance of light leathers and their surface finishes (dry and wet)
(Das Leder 15-20, 87+163 [1964, 1969])
(JSLTC 47, 126 [1963])

IUP/21 Measurement of set in lasting with the dome plasticity apparatus (Plastometer)
(Das Leder 15, 294-295 [1964])

IUP/22 The assessment of surface damage by use of the viewing box
(Das Leder 15, 295-298 [1964])

IUP/23 The measurement of damage caused by scuff
(Das Leder 15, 298-299 [1964])

IUP/24 Measurement of surface shrinkage by immersion in hot water
(JSLTC 48, 369 [1964])

Annex IV

IN-PLANT TRAINING ORGANIZED BY THE EXPERT

Course	Date	Weeks	Hours	Number of participants	Course leader
Quality checkers	6 October - 28 November 1980	6	60	13	A. Khalfani
Management	26 January - 20 March 1981	6	135	20	A.A. Mwasyoge
Production leather supervisors	27 April - 27 May 1981	6	75	16	P.J. Moshi
Production leather supervisors	7 August - 18 September 1981	6	90	18	W. Shillinde
Production rubber supervisors and chemists	12 October - 20 November 1981	6	90	25	H.K. Nderekio
Secretaries	17 August - 20 August 1981	1	38	19	D. Moshi
Marketing	11 May - 6 June 1981	4	160	25	Mang'ondi
Drivers	20 October - 26 October 1981	1	16	20	H.L. Kadege
Safety	2 November - 13 November 1981	2	28	10	Rugaimukamu
Maintenance	2 November - 11 December 1981	6	60	24	G.N. Budili
Rubber technology	1982	6	60	24	B. Mollel