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SMALL-SCALE INDUSTRY GRANT YEAR III

SOONG JUN UNIVERSITY ACTIVITIES

Grant Period: January 10, 1976 to January 9, 1977

A PROGRAM FUNDED BY THE U.S. AGENCY FOR
INTERNATIONAL DEVELOPMENT

FINAL REPORT
YEAR III

SOONG JUN UNIVERSITY
SMALL-SCALE INDUSTRY GRANT

by

Yoon Bae Ouh

and

Donald E. Lodge

Contract No. AID/ta-c-1062

International Programs Division
Economic Development Laboratory
Engineering Experiment Station
GEORGIA INSTITUTE OF TECHNOLOGY
January 1977

Table of Contents

* * *

Figures

Page

Tables

INTRODUCTION

On January 31, 1976, the Agency for International Development (AID) funded, for the third consecutive year, Contract No. AID/ta-c-1062, through which the Georgia Institute of Technology (GIT) was to make available $45,000 grants for small-scale industry development programs to four institutions of higher learning in different geographic regions of the world. Three of the four grants would be for the continuation of existing programs with counterparts selected in 1974 and 1975; the fourth grant would be for a new counterpart to be selected in 1976.

Of the three grants for the continuation of existing programs, one went to Soong Jun University (SJU) in Seoul, Korea. This document is the final or end-of-the-year report for the work jointly performed by the staff of SJU in Korea and GIT in Atlanta, Georgia.

When the grant was initiated in 1974, the administration of GIT and the sponsor established the following criteria for the selection of grantee institutions:

1. Suitability of the national macroeconomic framework for local business conditions.
2. Existence of practicing or potential entrepreneurs.
3. Community concern over unemployment.
4. Existence of potential markets for additional products.
5. Linkages (current or potential) with educational, financial, and business communities.
6. Quality of the staff.
7. The institution's potential for utilizing the grant effectively.
8. Potential multiplier effects.
9. Host government commitments.

After an initial worldwide search, Soong Jun University was one of the first two institutions selected and the corresponding grant was established. The final report for the first year of the program was published in 1975 under the following title: Yoon Bae Ouh and Nelson C. Wall, Final Report -- Soong Jun

University, Small-Scale Industry Grant (January 10, 1974 to January 9, 1975), Industrial Development Division, Georgia Institute of Technology, Atlanta, Georgia, January 1975. The final report for the second year of the program was published in 1976 under the title, Yoon Bae Ouh and Nelson C. Wall, Final Report Year II, Soong Jun University, Small-Scale Industry Grant (January 10, 1975 to January 9, 1976), Economic Development Laboratory, Georgia Institute of Technology, Atlanta, Georgia, January 1976.

At the end of Year III of this program, the following immediate results are indicative of the work performed:

1. A survey of 17 firms receiving technical assistance from SJU during 1976 shows an increase of 159 jobs, or a 24% increase over the 12-month period.

2. Thirty-three companies were provided with technical assistance during the year -- 10 in Seoul and 23 in the Taejon area.

3. One member of the SJU team participated in a four-week training program conducted by GIT at its facilities in Georgia.

4. Audiovisual documentation of this Small Industry Grant program was continued with coverage of both old and new cases.

5. Three case histories in technical assistance were prepared.

6. A Methodology for Case Study and Case History Preparation was compiled.

7. A training and development seminar for small manufacturers of communication instruments was held with 48 in attendance.

8. A member of the GIT team assisted in a review of the SJU Department of Industrial Engineering.

9. Gaps existing in the industrial engineering reference and textbook collection at SJU were identified and a substantial number of books were subsequently donated by GIT faculty members.

10. The SJU/GIT team emphasized appropriate technology. During Year III, an additional five pieces of appropriate technology hardware were developed and eight software applications were recorded.

11. The Small-Scale Industry Information Center (SSIIC) was incorporated into the SJU Engineering Library and reactivated with the appointment of a Data Manager.

12. The Data Manager for the SSIIC received five weeks of training at the East-West Center regarding data collection management for small-scale industry libraries.

13. One new organizational linkage was formed during the year -- with the Korea Communication Instrument Manufacturers Association.

14. SJU received almost $70,000 in research grants from five organizations during Year III, the largest, for $50,000, to be spent over 1½ years.

PROGRAM PLANS FOR YEAR III

Background

Soong Jun University (SJU) is a prominent Korean institution of higher learning with strong programs in science, engineering, and management-oriented fields. This university was formed in 1970 when Soong Sil College united with Taejon College to form a new cooperative venture in the field of Christian education. Soong Sil College, in turn, was formed in Pyeng Yong (North Korea) in 1897 and reopened in Seoul in 1954, after being closed in 1938 during the Japanese occupation. Taejon Presbyterian College was founded in 1956 by the Southern Presbyterian Mission in the city of Taejon.

Shortly after Dr. Hahn Been Lee became President of Soong Jun University in 1973, he was contacted by Mr. Ross W. Hammond, Director, Economic Development Laboratory (EDL) of the Engineering Experiment Station at the Georgia Institute of Technology. As a result of these contacts, both institutions established an agreement of mutual cooperation on July 30, 1973.

SJU then presented a proposal to the Georgia Institute of Technology for a program of development for small-scale industries. It was implemented by a grant funded under an existing contract provided to the Georgia Institute of Technology by the Agency for International Development (AID) for this purpose. In 1974, the EDL, in cooperation with SJU, initiated Year I of a program of small-scale industry development. This program was expanded in 1975 (Year II) and continued in 1976 (Year III) under funding by the same sponsor.

The terms of the $45,000 grant permitted the grantee to use half of the grant funds for personnel, travel, materials and supplies, conferences, etc. The remainder of the funds was to be used by the grantee to obtain training and consultation from U. S. technical assistance organizations.

The Georgia Institute of Technology and the Technology and Development Institute, East-West Center, subsequently contracted with the grantee to provide training services and an audiovisual documentation of the project.

The Integrated Development Center (IDC) of Soong Jun University was assigned the responsibility for all program activities for Year III and served as a counterpart to the International Development Branch of EDL (now the International Programs Division).

At the time the Year III program was initiated (on January 10, 1976), the SJU organizational structure was as presented in Figure 1.

Dr. Hahn Been Lee, President of Soong Jun University (SJU), named Dr. Yoon Bae Ouh, Head of the Integrated Development Center (IDC), to serve as Counterpart Project Director. Mr. Nelson C. Wall is Project Director and Mr. Richard Johnston is Project Coordinator for Georgia Tech's portion of the program.

Objective

It is the continuing objective of this project to build a program of industrial extension for small-scale industries at Soong Jun University. Three main areas of activity were considered for Year III: (1) provision of technical and managerial assistance to small-scale industries in defined geographic areas of the Republic of Korea, (2) development of simple solar energy devices, (3) strengthening the relevancy of the existing educational program of the university, and (4) provision of training activities for small-scale industry.

At the end of this multi-year project, the sponsor anticipates that SJU will have in operation a well-trained staff that will be fully capable of continuing the provision of technical assistance services to small-scale industries in the area. This service will be provided by the then technically competent members of the SJU indigenous staff trained under this program.

Total Project Goals of the AID/ta-c-1062 Contract

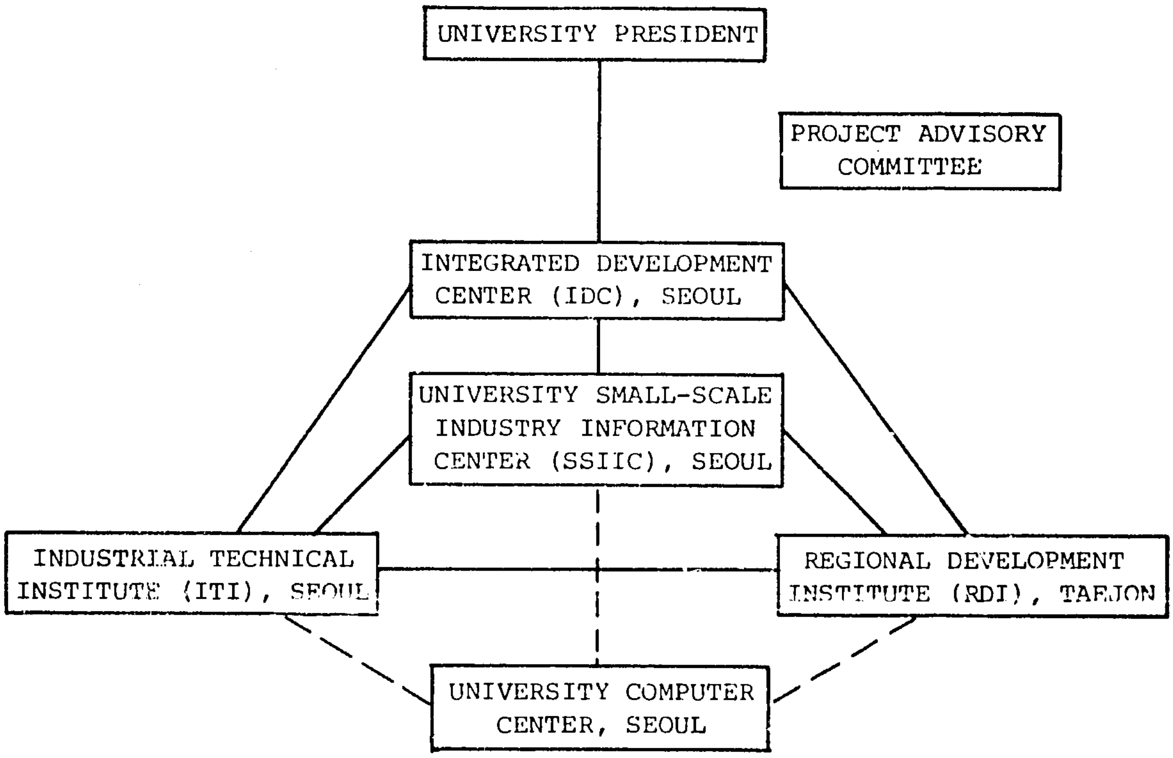
At the start of the Small-Scale Industry Grant on January 23, 1974, the following total goals had been established by the Agency for International Development for the Georgia Tech grant, to be achieved over a period of four years:

> The general objective of this contract is to generate employment in developing countries, particularly outside the metropolitan centers, by: (a) strengthening the capability of a selected institution in each country to provide effective technical assistance to local small industry, (b) demonstrating and documenting the impact of alternative approaches to technical assistance to small industry, and (c) infusing the governmental, industrial, and financial sectors of the local community selected to provide employment with an understanding of the techniques of generating jobs. The above objectives will be carried out through the use of grants to selected Lesser Developed Country (LDC) organizations.

Once the total project goals are reached, the sponsor anticipates the following outputs:

Figure 1

ORGANIZATIONAL STRUCTURE OF SOONG·JUN UNIVERSITY
(January 1976)



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1. Increased job opportunities in four countries.

2. Increased viability of indigenously owned enterprises.

3. Improved capability of four LDC institutions to serve small industry.

4. Tested methodologies for strengthening LDC institutions.

5. Evaluation reports on successes and failures in assisting small industry.

All the established goals for Year III were met, plus several additional accomplishments which were listed in the Introduction and will be amplified in the balance of this final report.

Program of Work

The Year III proposal presented a program of work on the basis of the work that had been implemented and evaluated during the second 12 months of the project. The following activities were then scheduled for the third 12-month sequence (Year III), most of which have been implemented:

1. Industrial Training and Education. The successful short-term training programs conducted during Year II will be followed by others during this year. They will be offered to small industry managers, engineers, and to entrepreneurs in general. These programs will include:

a. Continued training seminars involving an interchange of SJU and EDL professional staff.

b. An assessment of the joint program on science and engineering education at SJU.

c. Continuation of the written and audiovisual case histories initiated during Year I.

d. Management seminars on site for interested small industries, managers, and administrative staff.

e. Additional staff training in accordance with needs.

2. University Training and Education. As a result of activities initiated in Year I and continued through Year II, a new Industrial Engineering Department has been established at SJU. The further development of this department will be a priority during this program year.

The professional staff of EDL will be made available as needed for further consultation in areas such as:

a. Continued preparation of classroom material and course work for the Department of Industrial Engineering.

b. Continued review and modification of the departmental curriculum.

c. Identification of specific effects on university education policies and practices as a result of these industry-oriented educational programs.

The on-site EDL staff will be made available to the academic staff of SJU for consultation on additional matters that may arise.

3. Industrial Extension and Research Service. The past two years have placed SJU in a position of leadership in this area of activity. It is proposed that EDL assist the SJU staff in carrying out the following activities:

a. Chemical and electrical engineering capacity for industrial extension activities will be developed further.

b. The industrial engineering and management assistance facilities at both the Seoul and Taejon campuses will be expanded.

c. Emphasis will be placed upon the areas of quality control, general plant and production management, and marketing assistance.

d. Special emphasis will be placed on effective energy management by Korean small-scale industry. The joint SJU/EDL staff will seek, review, and implement, if possible, the use of solar energy applications in behalf of small-scale industry users. It is anticipated that this activity may eventually evolve into the development of appropriate Korean technology in solar energy applications.

Use of Grant Funds by SJU

For the 1976-1977 grant year, the grantee was funded in the amount of $45,000. These funds were disbursed in the following manner:

Expenditures	Funds by Source (dollars)			Total (dollars)
	AID 1/	Ind.-Univ. Foundation 2/	SJU 3/	
Direct Salaries and Wages	$ 9,952	$5,250	-	$15,202
Travel				
International	4,500		-	4,500
Local	2,474	750	-	3,224
Materials/Supplies	3,647	-	-	3,647
Conferences/Seminars	1,927	-	-	1,927
Contracted Services (GIT/IDC)				
SJU Personnel Training	10,500	-	-	10,500
EDL Consulting	10,000	-	-	10,000
TDI (East-West Center)				
Audiovisual Documentation	2,000	-	-	2,000
SJU Indirect Expenses				
General Overhead	-	-	$ 8,000	8,000
Technical Service Support	-	-	3,000	3,000
Totals	$45,000	$6,000	$11,000	$62,000

1/ From AID Small-Scale Industry Grant.
2/ The Industry-University Cooperation Foundation is an organization in Korea designed to promote mutual cooperation from which SJU applied for and received a grant.
3/ Normal overhead allowance plus depreciation allowance for use of university labs and workshops.

SOONG JUN UNIVERSITY ACTIVITIES DURING PROGRAM YEAR III

The SJU staff, on both the Seoul and Taejon campuses, carried out the major portion of the work programmed for Year III. The following sections highlight some of the activities for the year.

Industrial Training and Education

As part of the program of work in this area, a four-week training program was scheduled and presented, beginning on July 10, 1976, at the EDL headquarters in Atlanta, Georgia. SJU sponsored one participant in this program -- Mr. Byoung-Kyu Choi, Acting Chairman of the Department of Engineering.

The four weeks of training included two weeks in Atlanta and two weeks of visits to industrial plants and rural small-scale industries in the state of Georgia. Appendix 1 of this report provides a listing of subjects covered during the training, as well as an outline of the week of activity in Atlanta. Through this exposure to EDL's industrial extension service facilities and the methodology presented during the training program, the participant will be able to increase his input to the SJU small-scale industry development program.

Under the program for Year III, the audiovisual documentation was continued by a staff member of the East-West Center, Hawaii, from September 19 to September 24, 1976. The audiovisual for Year III covers some of the technical assistance cases and some selected new cases. These audiovisual materials are available to other interested organizations.

Three case histories dealing with technical assistance were prepared: The Sam-Ho Woodworking Machine Manufacturing Company, Low-Cost Tensile Strength Tester and Immersion Pyrometer, and Sam-Shin Sewing Machine Company. (See appendices 4, 5, and 6.) Dr. David E. Fyffe of GIT compiled a Methodology for Case Study and Case History Preparation for use by the SJU/GIT staffs. (See Appendix 3.) Dr. Fyffe also counseled and advised Mr. Choi during the time Mr. Choi was preparing the case on the Sam-Shin Sewing Machine Company.

A significant event during Year III was the Training and Development Seminar for Small Firms in the Communication Instrument Manufacturing Industry. This seminar was jointly conducted by the Korea Communication Industry Cooperative Union and the Industry Development Institute, SJU, on August 16-20. Forty-eight participants -- engineers, owners, and managers -- attended, representing

24 firms. The seminar presented both the engineering and management aspects of this industry. Indicative of the success of this program is the fact that 80% of the participants stated that this seminar assisted them in solving company problems and that they wished to see more programs made available to them.

University Training and Education

When this program was initiated in 1974, it was determined that since SJU was a technologically oriented institution, it would be desirable to assist it in expanding its engineering programs to include industrial engineering. It was anticipated that through such an extension, future SJU graduates could participate more usefully in the industrial development of the nation.

As a result of this action, by the end of 1974, the appropriate national authorities allowed SJU to establish the Department of Industrial Engineering as part of the College of Engineering at SJU. The Dean of Engineering, Dr. Clarence E. Prince, has worked closely with the EDL academic staff during Year III to enhance the existing program being offered by the Department of Industrial Engineering.

Dr. David E. Fyffe, Professor in the School of Industrial and Systems Engineering, GIT, was in South Korea for three weeks during Year III. During his stay he was able to provide assistance in a review of the SJU Department of Industrial Engineering. He also identified gaps in the available industrial engineering text and reference books on campus and subsequently shipped a number of books which had been donated by GIT faculty members to SJU.

Industrial Extension and Research Activities

This continues to be the main portion of the joint program of work. It was planned originally to provide technical assistance to small-scale industries using the industrial extension service approach. This part of the program also covers instances of applied research activities which have been incorporated into the total project. According to the records of the SJU staff, during Year III, 10 different companies were provided technical assistance in the Seoul area and another 23 companies in the Taejon area were so served. A listing of the companies serviced, with particulars on each case, is presented as Appendix 2 of this final report.

Effective energy management was one area to be emphasized by the SJU staff during Year III. Appendix 2 contains a number of cases in which suggestions were made concerning energy-saving techniques. Many involved the use of exhausted heat for some in-plant operation, thereby utilizing what otherwise would have been wasted.

Employment Generation

Another interesting development in the Year III program conducted by the SJU staff was a survey of 17 companies (7 in Seoul and 10 in Taejon) that had received technical assistance at some time during 1976. The survey's purpose was to determine the employment changes within the selected assisted industries. It shows a gain of 133 new jobs in the Seoul area companies and 26 in the Taejon area companies for a total of 159 jobs, or a 24% increase over the original 651 jobs at the start of the year. A summary of the survey results, as reported by SJU, appears as Tables 1 and 2 of this report.

Appropriate Technology

The Year III program continued to emphasize the area of appropriate technology, particularly those technologies relevant to the needs of the Korean communities involved in the project. Although Korea is an industrial society, much of the production continues to be small-scale by international standards. The unique conditions of the Korean culture and the need for intensive labor solutions to the individual problems make it mandatory that appropriate technology choices be made in providing a solution to a given situation.

Since the start of this program, the joint staff has been able to design, build, and field test nine devices which are considered by the staff to be appropriate technology for the small-scale industry sector of the host country.

These devices are:

- A low-cost tensile strength tester
- A sizing or shaving die for truing up metal rod cross sections
- A low-cost immersion pyrometer
- A wheeled version of the "chegae," the traditional means of backpack transport of materials
- A flat-plate solar collector
- A multi-tapping machine
- A drilling fixture

Table 1

SUMMARY OF EMPLOYMENT CHANGES OF SURVEYED COMPANIES
ASSISTED BY SOONG JUN UNIVERSITY, SEOUL, 1976

Technical Assistance Case No.	Employment, End of 1975	Employment, End of 1976	Variance
B	14	21	+ 7
D	14	29	+15
E	142	155	+13
F	36	40	+ 4
G	30	43	+13
H	52	74	+22
J	39	98	+59
Total	327	460	133

Source: Soong Jun University, Survey Data, Fourth Quarter, 1976.

Table 2

SUMMARY OF EMPLOYMENT CHANGES OF SURVEYED COMPANIES
ASSISTED BY SOONG JUN UNIVERSITY, TAEJON, 1976

Technical Assistance Case No.	Employment, End of 1975	Employment, End of 1976	Variance
A	38	14	-24
C	32	23	- 9
D	77	95	+18
F	56	60	+ 4
H	25	26	+ 1
I	13	18	+ 5
J	3	5	+ 2
K	5	12	+ 7
L	45	66	+21
M	30	31	+ 1
Total	324	350	26

Source: Soong Jun University, Survey Data, Fourth Quarter, 1976.

- o A filter press
- o A testing device for bicycle brakes

The last five were developed during Year III.

In addition, a number of software items of appropriate technology were developed, applied, or suggested during Year III. These include:

- o An improved plant layout and a system for process control and production planning for use in a machinery plant
- o A cost accounting system for a metal products producer
- o A quality control chart system for a machinery plant
- o A method for controlling the tensile strength in textile production
- o Time standards for machining and assembly operations in a metal products plant
- o The use of an organic solvent to remove fluorescent substances from waste paper, enabling conversion to wrapping paper for use in export shipments
- o A method for using acid clay to decolorize rice bran oil
- o A way of utilizing sodium hydroxide and sodium carbonate to reduce the acidity of rice bran oil

Small-Scale Industry Information Center (SSIIC)

This unit was established in 1974, Year I, during which time the EDL on-site staff assisted in establishing guidelines for the classification of the collection and determining the future acquisitional needs. Unfortunately, during Year II, the SSIIC did not meet the original expectations, because the person on the SJU staff responsible for the SSIIC left the SJU campus and the Center was not active during that year.

During Year III, the SSIIC was relocated to the Department of Industrial Engineering, where it became part of the Engineering Library and ceased to be a separate unit. Mr. Chang, Chief Librarian at SJU, was given the responsibility for maintaining the collection. He traveled to the East-West Center for five weeks of training in the collection, documentation, and dissemination of materials related to small-scale industry and the SJU/GIT joint program before becoming the Data Manager for the SSIIC.

Other Activities

A formal agreement for technical assistance and educational programs was signed by SJU and the Korea Communication Instrument Manufacturers Association.

The Korean Economic Planning Board sought SJU's advice and suggestions on small-scale industries for use in the preparation of the Fourth Five-Year Economic Development Policy.

Although it is not possible in every case to verify that any particular program at SJU has caused the school to be invited to participate in other programs or activities, the following can reasonably be cited as possible spin-offs:

1. The Korean Ministry of Education gave the Integrated Development Center a $2,000 grant for the conduct of basic research on community development through technical innovation.

2. The Korean National Federation of Small Industry Cooperatives paid $4,000 toward Dr. Ouh's travel costs and registration fees for the U. S. Small Business Administration's International Symposium on Small-Scale Industry, held in Washington, D. C., on November 15-18, 1976.

3. The Asian Foundation provided a $7,500 grant for the continuation of the development of an improved version of the "chegae."

4. The Southern Presbyterian Church and the United Presbyterian Church gave $50,000 for a 1½-year rural development project to be directed by the Regional Development Institute on the Taejon campus.

5. SJU received $6,000 during 1976 from the Industry-University Cooperative Foundation for its part in a five-year small-industry development program which involves three neighborhood universities. SJU has been designated as the lead institution for this project.

6. Two SJU faculty members were asked to be technical consultants to the Korean National Federation of Small Industry Cooperatives.

7. Dr. Ouh was invited by the Technology and Development Institute of the East-West Center to participate in a week-long RATC Program Evaluation Workshop.

8. The Konrad Adenauer Foundation has expressed interest in funding SJU faculty and student training and education in Germany to expedite the present small-scale industry program.

9. The Industrial Development Research Centre funded Dr. Ouh's attendance at a Pre-Research Meeting on a Regional Comparative Study on Small-Scale Industrial Entrepreneurship which was held in Hyderabad, India. The meeting was conducted by the Association of Development Research and Training Institutes of

Asia and the Pacific (ADIPA), of which the SJU Integrated Development Center is a member.

GEORGIA INSTITUTE OF TECHNOLOGY ACTIVITIES DURING PROGRAM YEAR III

The EDL activities under Year III of the program were initiated by the Project Director on January 10, 1976, when the sponsor advised the Georgia Institute of Technology that the small-scale industry project for Korea would be extended another year. During mid-February to early March, Mr. R. A. Manoff visited Korea to provide on-site assistance in the project. This visit was followed by those of Mr. Edwin L. Lewis, Mr. Ross W. Hammond, Mr. Howard Dean, Mr. Donald E. Lodge, Dr. David E. Fyffe, Mr. Daniel de Castro, and, again, Mr. Donald E. Lodge in October-November. Each of these staff members had a specific task assigned to him within the total goals of the program. Each was funded by this project or by other AID-sponsored programs. A brief summary follows:

February 11-March 12 (Mr. R. A. Manoff)

This staff member had the responsibility of setting up the GIT program of work for the year, as designed by the Project Director, in consultation with the Counterpart Project Director Dr. Yoon Bae Ouh. Different EDL staff members were tentatively assigned to carry out individual tasks. The Project Plan for Year III was prepared, as shown in Figure 2.

May 24-June 12 (Mr. Edwin L. Lewis)

Mr. Lewis was assigned to assist SJU staff members in the design and construction of an experimental flat plate solar collector. During his stay plans were completed, materials were purchased, and the collector was built and set up on the Seoul campus for the purpose of gathering data on its effectiveness. A report on this solar collector appears as Appendix 7.

June 1-June 9 (Mr. Ross Hammond, Mr. Howard Dean, and Mr. Donald E. Lodge)

Mr. Hammond provided administrative guidance and counseling to the Counterpart Project Director and his staff. The other two GIT staff members received orientation regarding the various programs of SJU, including this Small Industry Grant program.

July 10-August 8 (Counterpart Training)

Mr. Byoung-Kyu Choi, Acting Chairman of the Department of Industrial Engineering, participated in a four-week training program at the EDL headquarters in Atlanta and various EDL extension offices around Georgia.

Project No. B-426

Project Title Small-Scale Industry Program SJU

Project Director N. C. Wall

Figure 2

PROJECT PLAN

SIG-SJU, YEAR III

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Preparation of Final Report Year II	■	■										
Planning Year III Program	■											
EDL Staff on Site		■	■		■	■		■	■		■	
Industrial Training and Education		■	■					■				
University Training and Education		■	■					■				
Selection of Participants for Train. Prog.		■	■									
Training Program in Atlanta							■	■				
Audiovisual Filming on Site								■				
Staff Support to Project -- Atlanta	■	■	■	■	■	■	■	■	■	■	■	■
Annual Review											■	
Data Gathering, Final Report											■	
Quarterly Reports			■			■			■			■

LEGEND

The training program, as designed by the EDL staff, incorporated various training modes, including classroom activities, on-the-job situations, guidance and counseling, industrial tours, and general small industry exposure within the state of Georgia. The training program also provided information regarding current solar energy technology and experimentation being conducted at Georgia Tech. (See Appendix 1.)

August 23-September 11 (Dr. David E. Fyffe)

Dr. Fyffe was assigned to visit South Korea to assist in the development of a methodology to be used in case histories which were to be prepared by the SJU staff, to provide support to the SJU Industrial Engineering faculty in their development of ongoing industrial extension activities, and to provide assistance in the review and modification of the SJU departmental curriculum. Appendix 3 presents the Methodology for Case Study and Case History Preparation.

September 19-24 (Mr. Daniel de Castro, TDI/EWC)

Mr. de Castro came to South Korea to prepare the Year III audiovisual documentation of the SJU Small Industry Grant program, under a separate AID contract. In addition, Mr. de Castro provided instruction in the operation of audiovisual equipment to Mr. Chang, Chief Librarian, SJU.

September 25-October 31 (Counterpart Training)

Mr. Chang, Chief Librarian at the SJU library and Data Manager for the SSIIC, received five weeks of training on the collection, documentation, and dissemination of materials related to small-scale industry and the SJU/GIT joint program.

October 31-November 7 (Mr. Donald E. Lodge)

This was the last on-site contact by GIT for Program Year III. Mr. Lodge, together with Dr. Ouh, Counterpart Project Director, prepared annual report data for this program year.

November 16-19 (Dr. Hahn Been Lee)

Dr. Hahn Been Lee, President of SJU, visited the EDL headquarters in Atlanta to confer with the GIT Project Director and Project Coordinator regarding the Small Industry Grant program and their matters of mutual interest.

RESULTS AND CONCLUSIONS

The third year of this small-scale industry development program has had many positive results, a number of which were briefly listed in the Introduction of this final report. In this section, the major accomplishments of Year III will be highlighted.

1. The professional staff at SJU conducted an in-depth survey of 17 small-scale industries that are presently in this program. These companies have been recipients of the technical assistance service during 1976. In summary, the SJU survey reports that 159 new jobs have been created, for a 24% increase in employment.

2. The joint SJU-GIT team was able to provide technical assistance to a total of 33 small-scale industries, of which 10 were in Seoul and 23 in the Taejon area.

3. Three case histories in technical assistance were prepared, covering assistance provided to a woodworking machinery manufacturer, a sewing machine manufacturer, and to a group of foundries.

4. A member of the GIT team developed a Methodology for Case Study and Case History Preparation.

5. An additional five pieces of appropriate hardware have been designed, built and tested:

- o a flat plate solar collector
- o a multi-tapping machine
- o a drilling fixture
- o a filter press
- o a testing device for bicycle brakes

6. Eight software items of appropriate technology have been developed, applied, or suggested by the joint SJU/GIT team.

7. A very successful training and development seminar was held, attended by 48 persons from small-scale industries that manufacture communication instruments.

8. The Small-Scale Industry Information Center was incorporated into the SJU Engineering Library and reactivated with the appointment of a Data Manager.

9. The Data Manager of the SSIIC attended a five-week training course at the East-West Center, covering the development, maintenance, and operation of a small-scale industry data collection.

10. Another member of the SJU team participated in a four-week training program conducted by GIT in Georgia. This staff member was able to observe several of the GIT industrial extension offices and to visit firms which have received assistance from these offices.

11. Audiovisual documentation of Year III was filmed during the year, covering several of the technical assistance cases which are described in Appendix 2.

12. SJU received some $70,000 from five organizations, to be used in various development studies and programs. The university's participation in this Small Industry Grant program is believed to be a significant factor in its growing ability to attract support from other sources.

13. A member of the GIT team provided assistance in a review of the SJU Department of Industrial Engineering.

14. The number of engineering reference and textbooks available on the SJU campus was increased through the efforts of the GIT team in identifying gaps in the collection and in securing book donations from GIT faculty members.

15. SJU formed a linkage with the Korea Communication Instrument Manufacturers Association and plans to work closely with that group on matters affecting small-scale firms in that industry.

During the year, not only have these achievements taken place, but more important, the participating small-scale industries in the selected areas have been provided with a service in the technical assistance field which was previously unattainable.

Appendix 1

SCHEDULE OF TRAINING PROVIDED FOR MR. BYOUNG-KYU CHOI BY GIT

SCHEDULE OF TRAINING PROVIDED FOR MR. BYOUNG-KYU CHOI BY GIT

Day	Date	Hours	Activities
Mon.	7/12	0830-1200	EDL Introductory Tour/Welcome - GIT Campus Orientation
		1300-1400	Training Program Review and Planning
		1400-1700	Review GIT Data Facilities - IDDC/BD/PG Libraries Research Assignment Presented
Tue.	7/13	0800-1700	Research Assignments - Complete and Submit Assignment Concerning Solar Literature
Wed.	7/14	0800-1700	Rome Area Industry Visits
Thu.	7/15	0800-1700	Solar - GIT Staff Interaction
Fri.	7/16	0800-1700	On-Site Visits to Local Solar Facilities
Sat.	7/17	0800-1500	Guided Tour - Atlanta Area
Sun.	7/18		Open
Mon.	7/19	0900-1700	Lectures: Factors in Plant Layout/Production Planning and Control for Small-Scale Manufacturing/ Inventory Control - Small-Scale Production
Tue.	7/20	0800-1700	Lectures: Extension Services to Small-Scale Industry/Generation and Evaluation of Venture Ideas/Appropriate Technology
Wed.	7/21	0800-1700	Lectures: Cottage Industries/Development Techniques
Thu.	7/22	0800-1700	Area Plant Visits, Small-Scale Industry, Macon, Georgia
Fri.	7/23	0800-1200	Area Plant Visits, Macon Area
		1300-1700	Independent Research
Sat.	7/24		Open
Sun.	7/25		Open
Mon.	7/26	0800-1700	Depart Atlanta for Douglas, Georgia - Review Industrial Extension Activity and Visit Industrial Plants
Tue.	7/27	0800-1700	Plant Visits, Douglas Area
Wed.	7/28	0800-1700	Depart for Albany, Georgia - Review Extension Activity and Visit Plants

Day	Date	Hours	Activities
Thu.	7/29	0800-1700	Plant Visits - Albany Area
Fri.	7/30	0800-1700	Return to Atlanta for Debriefing and Independent Research
Sat.	7/31		Open
Sun.	8/1		Open
Mon.	8/2	0800-1700	Depart Atlanta for Augusta, Georgia - Briefing and Plant Visits
Tue.	8/3	0800-1700	Plant Visits - Augusta Area
Wed.	8/4	0800-1700	Depart Augusta for Savannah, Georgia - Briefing and Plant Visits
Thu.	8/5	0800-1700	Plant Visits, Savannah Area
Fri.	8/6	0800-1700	Return Atlanta - Debriefing and Independent Research Evaluation
Sat.	8/7		Open
Sun.	8/8		Open
Mon.	8/9		Depart Atlanta

Appendix 2

SUMMARY OF TECHNICAL ASSISTANCE CASES

SUMMARY OF TECHNICAL ASSISTANCE CASES 1976

Seoul Area

Name of Firm	No. of Visits
Sam Shin Sewing Machine Company	32
Yoo Jin Telephone Company	4+
Sam Ho Machine Manufacturing Company	12
Ki-Hung Ironworks Company	2
Yoo-Sung Refined Salt Manufacturing Company	2
Kyung Chang Company	Not Available
Yoo-Jin Textile Company	Not Available
Sam A. Textile Company	Not Available
Dong Seu Electronic Company	Not Available
Sam Hongsa Company, Ltd.	4

Taejon Area

Sam-Sung Industrial Company	Not Available
Yusing Industrial Company	Not Available
Sinsung Paper Mill	Not Available
Sam Won Food Industrial Company	Not Available
Jeil Feed Company	Not Available
Chang-Ik Industrial Company	Not Available
Noun Mining Company	Not Available
Yu-Jun Industrial Company	Not Available
Hyun-Dao Food Company	Not Available
Huk-Shin Chemical Company	Not Available
Sam Won Barium Chemical Company	Not Available
Taejon Oil Industrial Company	Not Available
Sidae Food Industrial Company	Not Available
Ilkwang Vinegar Company	Not Available
Sang Jin Dang Company	Not Available
Hyosung Industrial Company	Not Available
Samil Chemical Company	Not Available
Kookil Trading Company	Not Available
Hapsung Textile Company	Not Available
Iljin Industrial Company, Ltd.	Not Available
National Carbon Company, Ltd.	Not Available
Taepim Food Industrial Company	Not Available
Sona Trading Company, Taejon Branch	Not Available

CASE NO. 5 MAIN PRODUCT: REFINED SALT

Municipality: Seoul

Brief Description of Problem

The plant has experienced filtering problems, resulting in undesirable colors and clustered crystals in the refined product.

Applied Solution

The filtering equipment has been replaced with an improved design, on the advice of the SJU team.

CASE NO. 6 MAIN PRODUCT: BICYCLE PARTS

Municipality: Seoul

Brief Description of Problem

The firm was experiencing problems in bending metal tubing, with weak aluminum castings, and in testing bicycle brake assemblies.

Applied Solution

The SJU team was able to suggest a method for the mechanical bending of metal tubing and ways of producing stronger castings and to develop a testing device for the bicycle brake.

CASE NO. 7 MAIN PRODUCT: TEXTILES

Municipality: Seoul

Brief Description of Problem

The firm was having problems in producing textiles with uniform tensile strength, had some unrecognized hazards in the plant, and needed assistance with a costing system.

Applied Solution

The SJU team was able to advise the plant management on ways of producing a more uniform product through better control of ambient temperature and

(Continued)

CASE NO. 7 (Continued)

Applied Solution (Continued)

humidity and through the use of product testing, and to point out hazardous situations present within the plant.

CASE NO. 8 MAIN PRODUCT: TEXTILES

Municipality: Seoul

Brief Description of Problem

This firm was experiencing problems in producing material having a uniform tensile strength and in eliminating or coping with static electricity generated by the machinery.

Applied Solution

The SJU team suggested ways in which the tensile strength of the material could be made more uniform and the generation of static electricity could be minimized.

CASE NO. 9 MAIN PRODUCT: ELECTRONIC COMPONENTS

Municipality: Seoul

Brief Description of Problem

The firm had experienced problems in controlling the speed of direct current electric motors and in locating technicians who could set up and operate a production control system and carry out production planning.

Applied Solution

The SJU team suggested the utilization of a silicon control rectifier for motor control and assisted in the selection of technicians qualified to handle the production planning and control functions.

CASE NO. 10 MAIN PRODUCT: SCALE MODEL LOCOMOTIVES

Municipality: Seoul

Brief Description of Problem

Management wished to determine whether a more expensive type of electric motor was more powerful than the motor they were then installing in the models. The quality of the models was poor because of the employees' lack of understanding of how the finished product should appear. The employees' morale was low, and the firm lacked a good system for production scheduling and control.

Applied Solution

The SJU team provided middle management with training in process control, methods improvement, and performance evaluation. Using torque measuring equipment on the SJU campus, the team determined that the proposed electric motor produced 50% to 140% more torque than did samples of the motor then in use.

CASE NO. 11 MAIN PRODUCT: NATURAL BRISTLE BRUSHES

Municipality: Taejon

Brief Description of Problem

The firm was experiencing problems in the bleaching of pig bristles and in the cutting of the wooden brush handles. The rate of output was reduced by the latter problem.

Applied Solution

The SJU team suggested that the pig hair be bleached using hydrogen peroxide and liquid paraffin, and that the process of cutting the brush handles be speeded up by utilizing a machine rather than using a hand operation.

CASE NO. 12 MAIN PRODUCT: BRAKE FLUID, GREASE AND LUBRICANTS, AND ANTIFREEZE

Municipality: Taejon

Brief Description of Problem

This company was having difficulty in producing an antifreeze that would meet Korean Standard Regulations. Management also was desirous of developing new products for their line of grease and lubricants.

Applied Solution

The SJU team provided an analysis of the automotive grease and suggested quality control procedures by which the firm could meet the Korean Standard Regulations.

CASE NO. 13 MAIN PRODUCT: PAPER

Municipality: Taejon

Brief Description of Problem

This plant needed a chemical analysis of the water it used in its boiler and wanted to attempt to utilize the waste paper resulting from the production of one product. Later in the year, the firm experienced a contamination problem in attempting to use its waste paper for the production of export packaging material.

Applied Solution

The SJU team conducted a chemical analysis of the water, suggested a potential use of the waste paper, and located a method for removing a fluorescent material from the waste paper through extraction, using an organic solvent.

CASE NO. 14 MAIN PRODUCT: SOYBEAN-BASED FOOD PRODUCTS

Brief Description of Problem

Contamination of micro-organisms utilized in the products and related problems.

(Continued)

CASE NO. 14 (Continued)

Applied Solution

The SJU team was able to suggest suitable antiseptics which would permit the production of Chinese-style soypaste during the warmer summer months, moving the packing operation into the polyvinyl chloride building in order to prevent the contamination of the micro-organisms, and a classification control system for the various micro-organisms stored in the plant.

CASE NO. 15 MAIN PRODUCT: POULTRY FEEDS

Municipality: Taejon

Brief Description of Problem

Because most of the materials utilized in mixing these feeds are imported into Korea, the firm wishes to find local materials for substitution in these products.

Applied Solution

The SJU team has developed a research proposal for the investigation of the use of the water-nut in the production of chicken feeds.

CASE NO. 16 MAIN PRODUCT: MOTORCYCLE ACCESSORIES

Municipality: Taejon

Brief Description of Problem

The firm plans to shift production from motorcycle accessories into the manufacture of shoe inner parts and was seeking data on various aspects of the new product.

Applied Solution

The SJU team was able to propose a method for utilizing the by-products of a leather company as a raw material for this plant, to provide information on adhesives and various production processes, and to furnish a method for producing adhesives from urea and aldehyde resins.

CASE NO. 17 MAIN PRODUCT: CHEMICALS

Municipality: Taejon

Brief Description of Problem

The management sought techniques for quality control and ideas concerning the potential markets for the chemicals.

Applied Solution

The SJU team provided suggested methods of quality control and two potential markets for the firm's products -- cosmetic manufacturers and producers of surface coating materials.

CASE NO. 18 MAIN PRODUCT: GREASES

Municipality: Taejon

Brief Description of Problem

The plant management wished to determine the free fatty acid content of automobile grease.

Applied Solution

The SJU team was able to provide an analysis of the free fatty acid content of the grease.

CASE NO. 19 MAIN PRODUCT: FRUIT JELLIES

Municipality: Taejon

Brief Description of Problem

The firm had experienced a problem regarding the drying of a raw material and was also concerned about reducing the amount of wheat flour (an imported item) which goes into the jelly.

Applied Solution

The SJU team provided specific data on drying the raw material and suggested that the firm try using potato or barley flour in place of the wheat flour.

CASE NO. 20 MAIN PRODUCT: PIGMENTS

Municipality: Choongnam

Brief Description of Problem

The firm was concerned about increasing the productivity of ferric oxide from a given quantity of inputs.

Applied Solution

The SJU team suggested several steps which relate to the control of acidity of the solution, which is the key to this process. The suggestions included an investigation of the relationship between acidity and yield, the analysis of the residual solution for ferric ion concentration, an investigation of the relationship between temperature and the reaction rate, and the possibility of utilizing a continuous system reactor rather than the present batch system.

CASE NO. 21 MAIN PRODUCT: BARIUM SULPHATE

Municipality: Choongnam

Brief Description of Problem

The firm desires to increase its output by increasing its efficiency.

Applied Solution

The SJU team proposed that a filter press be used to collect the precipitates rather than the traditional but less effective drying on an iron plate. It was also suggested that a pure grade of barium sulphate be made for use by the medical profession.

CASE No. 22 MAIN PRODUCT: RICE BRAN OIL

Municipality: Choongnam

Brief Description of Problem

The firm wanted to reduce the acidity of its product to below 0.5%, remove the wax from the oil, and decolorize it.

(Continued)

CASE NO. 22 (Continued)

Applied Solution

The SJU team recommended the use of sodium hydroxide and sodium carbonate to reduce the acid content, the use of acid clay and active carbon to decolorize the product, and a way of removing the wax from it.

CASE NO. 23 MAIN PRODUCT: BREAD AND CAKES

Municipality: Taejon

Brief Description of Problem

This firm wanted information on making a variety of breads and cakes and was experiencing problems in preventing its supply of beanjam from spoiling.

Applied Solution

The SJU team provided recipes, a bibliography of books on making breads and cakes, and suggested a method for the sanitary preservation of beanjam.

CASE NO. 24 MAIN PRODUCT: VINEGAR

Municipality: Taejon

Brief Description of Problem

The firm was seeking a way of distilling technical-grade glacial acetic acid and of analyzing vinegar.

Applied Solution

The SJU team was able to provide solutions for both of these problems.

CASE NO. 25 MAIN PRODUCT: BREADS

Municipality: Taejon

Brief Description of Problem

This bakery wanted to locate a method for determining the ratio of various ingredients used in making breads and cakes. It also sought a substitute ingredient for wheat flour, which must be imported.

(Continued)

CASE NO. 25 (Continued)

Applied Solution

The SJU team provided a methodology for determining mixing ratios and suggested that Irish and sweet potatoes might be used to replace a portion of the white flour normally used in bread and cakes.

CASE NO. 26 MAIN PRODUCT: STARCH AND NOODLES

Municipality: Choongnam

Brief Description of Problem

The firm was experiencing difficulty in drying acorn starch.

Applied Solution

The SJU team suggested the use of a vacuum drying process and also that the firm remove the tannin from the acorn for sale as an additional product.

CASE NO. 27 MAIN PRODUCT: PLASTIC DUSTBINS

Municipality: Taejon

Brief Description of Problem

The firm was having problems with the quality of its product and was concerned about the air pollution it was causing.

Applied Solution

The SJU team was able to suggest the use of additives for polymer which would improve the quality of the polyethylene being utilized and the use of inorganic pigments for coloring to prevent the air pollution.

CASE NO. 28 MAIN PRODUCT: POLYETHYLENE FILM

Municipality: Taejon

Brief Description of Problem

The firm was experiencing a problem in the removal of lettering from used polyethylene fertilizer containers which it melts down for the production of polyethylene film. There was also concern that the life of the film, used in making hothouses, was short.

Applied Solution

The SJU team provided the firm with a process for the decolorization of the lettering and with the suggestion that additives for polymer be added to the scrap material in order to improve the strength of the film.

CASE NO. 29 MAIN PRODUCT: TOWELS

Municipality: Taejon

Brief Description of Problem

This firm expressed the need for information as to how they could soften the material from which the towels are made, what they might use as an ink binder that would be less expensive than the present item, and a better way to bleach the threads from which the towels are woven.

Applied Solution

The SJU team was able to suggest a suitable softening agent, a more economical ink binder, and a means for bleaching thread.

CASE NO. 30 MAIN PRODUCT: ACTIVATED CARBON

Municipality: Choongnam

Brief Description of Problem

The firm wished to increase its productivity from a given level of input and to reduce its heating expenses.

(Continued)

CASE NO. 30 (Continued) MAIN PRODUCT: ACTIVATED CARBON

Applied Solution

The SJU team was able to suggest that the relationship between reactor temperature and the air flow rate be studied to determine optimum productivity, that the washing process be improved by using a continuous process, and that heat from the reactor be utilized in other processes within the plant.

CASE NO. 31 MAIN PRODUCT: CARBON BARS

Municipality: Choongnam

Brief Description of Problem

The firm was interested in improving its quality control procedure and in economizing on fuel costs.

Applied Solution

The SJU team suggested that the possibility of using nondestructive, continuous quality control methods be investigated, that the entire production process might be standardized, that binders might be used to improve the quality of the bars, and that the combustion heat of graphite might be utilized in other processes.

CASE NO. 32 MAIN PRODUCT: CHINESE VERMICELLI

Municipality: Choongnam

Brief Description of Problem

The firm was experiencing a problem with the growth of micro-organisms and wished to speed up the drying time for the product and to reduce heating costs.

Applied Solution

The SJU team was able to suggest the use of a sterilization lamp to prevent mold and other micro-organisms, the use of a hothouse in place of the traditional drying process using the wind and the sun, and the addition of a combustion-additive to the fuel oil to increase the Btu output.

CASE NO. 33 MAIN PRODUCT: TOYS

Municipality: Taejon

Brief Description of Problem

The firm was experiencing a problem in the screen-printing process and had excessive acrylic fiber dust present in the air.

Applied Solution

The SJU team was able to suggest the use of a low-concentrated printing ink composed of water soluble pigments in the screen-printing process and the use of a dust-removing machine to eliminate the acrylic fiber dust from the air.

Appendix 3

METHODOLOGY FOR CASE STUDY AND CASE HISTORY PREPARATION

METHODOLOGY FOR CASE STUDY AND CASE HISTORY PREPARATION

For our purposes there is a difference between case histories and case studies.

Case History

The case history is used both for instruction and documentation. The case history for instructional purposes records in detail a chronology of events. It should begin with background information concerning the historical development of the firm, its products, markets, management, and the current operating situation (including the listing of problems perceived by management). In effect, this portion of the case history should serve as a baseline against which to place the improvement activity. Data, illustrations, and other graphic material should be used where appropriate.

Following this background presentation, the particular problems with which SJU faculty became involved should be discussed in detail and the solution development should be described. It is important to describe in candid detail the complete process through which the solution was reached. False starts and failures should be included so that as far as possible the case history accurately presents professional practice. This permits the student an opportunity to come as close to personal involvement in professional practice as is possible prior to actual field experience. The key point, it should be emphasized again, is to factually describe the baseline situation in detail and then to present the activities leading to problem solution, including, if possible, the experiences of implementation. Photographs, drawings, and illustrations enhance the presentation.

The use of the case history for instructional purposes permits the students to "look over the shoulder" of a professional while he solves a problem. Classroom discussions focus on the problem analysis, the completeness of the set of alternatives which were considered, the procedure by which the choice among alternatives was made, and the correctness of the choice. The student assignment is to critique the professional performance as described in the case history.

If the case history is intended to serve only as documentation to inform others of project activities and accomplishments, it should follow the format described above except that the detail in professional practice is not desirable. Since the purpose is to describe extension activities, the actions taken and the results achieved are the priority elements. Sufficient detail should be provided to make the case history realistic and interesting.

Case Study

The case study (case problem) for instructional purposes is a situational description. Its purpose is to provide a realistic unstructured problem situation representative of that which the student will face in professional practice.

The greatest benefit from case study instruction is obtained from broad assignments requiring analysis of existing systems (as described in the case study) and recommendations for improvement. In particular, the case study is used to stimulate group discussion of the problem situation, identification of underlying causes, the stated or implied constraints which limit the alternatives for change, the enumeration of alternative solutions, the choice of a best solution, and recommendations for implementation. The instructor should guide such discussion to make certain that important ideas are brought out, that the student approach to analysis and identification of alternatives is correct, and that all appropriate alternatives for improvement are enumerated. However, each student draws upon his own background of knowledge and experience, which is then integrated with that of others until the subject is thoroughly explored. There is very seldom a final, uniquely correct solution to a good case problem.

The usual case study format is to provide a "setting" which places the student in an assumed professional role such as:1/

1. A newly hired engineer or manager who has been given the responsibility to correct the problem.

2. A consultant whom the company has hired to analyze the situation and aid in the problem solution.

1/ See the attached case study for an example of the use of a responsibility role for the student.

Note: This case study was given to Mr. Choi, Byoung-Kyu.

Next, considerable background information on the company, its products, and current operating results is given. Such information, in addition to its relevance to the problem, adds realism to the case study. Following this discussion, detailed information, illustrations, and data related to the problem area of interest are provided to enable the student to understand the problem, identify possible causes, enumerate alternative solutions, and formulate recommendations for the best solution. The nature of the information and the amount of detail provided depend upon the problem area for which the case study is to be used. If, for example, the case is to be used for instructional purposes in quality control systems design, detailed information should be presented as follows:

1. A description of the present quality control system (organization, functional responsibilities, personnel, position descriptions, procedures, information flow, equipment, etc.)

2. Quality performance (percent defective, quality costs, quality problems, measurement data, etc.)

3. Purchased material quality control system (procedures, vendor performance, vendor relationships, specific problems, etc.)

4. Factors which relate to quality problems (process descriptions, handling methods, design problems, etc.)

The amount of detail and specific data depends on the assignment for which the case study is intended.

CASE HISTORY OUTLINE

The content of a case history depends upon the purpose for which it will be used. A case history prepared specifically for instructional purposes in business management should have very different content than one intended for use in a plant layout course. A case history intended to document industrial extension activities will be different from either of the above. Because of these necessary differences, it may be misleading to present a case history outline. However, the following is offered as a general guide for the preparation of case histories. It is intended to indicate the proper format and serve as a detailed checklist of information which may be included in the baseline portion of the case history. It is likely that in the preparation of a particular case history some items will be stressed more than others and some will be omitted. No attempt has been made to outline the portion of the case history which presents problem-related information or the portion which describes the problem solution activities and results.

Outline

1. Situation Description (Optional)

   This paragraph is to tell who was involved in the technical service activity and how this activity came to be.

2. Background Information

   2.1 History of the company

   A brief historical account of the company which states what products it produces, when it was founded, by whom, and what has happened to it since it was founded.

   2.2 Organization structure

   A description of the formal organization of the firm which shows how functional activities are organized and the number of persons employed in the various functional departments. If it is important to the purpose of the case history, this section may describe the background of key people in the organization.

   2.3 Market information

   An overview of the market picture. How is the product sold (i.e., salesmen, direct mail advertising, etc.)? What is the geographic area served? How is the product distributed? Who are the purchasers (i.e., consumers, other manufacturers, government)? What are the current market trends and problems?

2.4 The competition

A brief discussion of the amount of competition and the competitive strength of this firm. What are its competitors' strengths and weaknesses? What is the future threat from competition?

2.5 Sales and profit history

A discussion of sales trends and profitability in recent years (or months), with a brief explanation of these trends.

2.6 Problems perceived by management

A discussion of the company's most pressing problems, according to top management, and steps which are now being taken or planned to reduce these problems.

3. Product Information

This section should provide appropriate information related to the product(s) produced by the company. The outline given below is for a case history that is intended to be used for instructional purposes in which product design plays an important role. This section need not be so detailed for other cases.

3.1 Product description and uses (each product)

Although the products made by the company were discussed briefly in Section 2.1, it may be desirable to provide more detail here.

3.2 Product design

This section may be inappropriate for a process-type industry. It is likely to be important for a mechanical industry. Who does the design work? Are drawings and specifications available? Include copies of drawings or sketches if the product design is an important aspect of the case history.

3.3 Product design problems

What are the product design problems which are related to product function? What are the product design problems which are related to production (manufacturing)?

4. Manufacturing Information

This section provides information on inputs to the manufacturing process, the processes themselves, and the production facilities. In brief, it discusses the materials and components used in manufacturing, how the products are manufactured, and the buildings and equipment for manufacturing.

4.1 Purchased materials and components

A description of purchased materials and components, sources, and problems related to these.

4.2 Manufacturing processes

Manufacturing processes are best described by process charts and flow diagrams. However, these must have some detail in order to be useful. It is not sufficient to describe an operation as "machine on lathe." A more complete description of the operation, such as "cut-off and turn 0.3mm radius on ends," is necessary. The equipment used also should be specified. Similar details should be given for moves, inspections, and storages.

4.3 Manufacturing facilities

Manufacturing facilities are best described with a plant layout or sketch. The amount of detail depends upon the importance of manufacturing facilities to the extension services which were provided and the intended instructional use of the case history.

5. Problem-related Information

The content of this section should provide all the details which are relevant to the professional activities performed by SJU faculty so that students will have the necessary information to critique the professional practice. If the case history is to be used as a case problem for instructional purposes, this section should contain the information which the students need in order to identify problems, generate alternatives for improvement, and complete the assigned tasks. If the problem involves a topic which was discussed in some detail in one of the preceding sections, it may be best to expand that section rather than attempt to repeat the previous discussion.

<u>The Industrial Machine Products Company Case</u> (Attachment B)* is a case <u>problem</u> rather than a case <u>history</u> and, therefore, does not conform to this outline. However, it provides an example of the detail which should be provided for problem analysis and solution. (The problem assignment is given on page 10 of the case study.)

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* This case study was given to Mr. Choi, Byoung-Kyu.

6. Professional Assistance Activities and Results

   This is a documentation of the professional work of SJU faculty. It should be illustrative of professional practice and attempt to present, in detail, the logical processes used. Solutions which were considered and rejected should be discussed with the reasons for rejection given. Finally, if solutions were implemented, results should be reported.

Sections 2, 3, and 4 have approximately the same content regardless of the instructional purposes of the case history. However, the amount of detail and emphasis may differ according to the intended use of the case history. Section 5 is problem oriented and its content depends on the problem with which the case history is concerned. That section must present sufficient detail to permit the student to recognize problem causes and apply his knowledge to their solution. Section 6 reports the professional assistance activities. If the case history is to be used for instructional purposes, it must be very detailed. If the case history is documentary, much of this detail should be omitted.

INDUSTRIAL ENGINEERING COURSES FOR WHICH CASE STUDIES MAY BE USED

Since many of the courses in the industrial engineering curriculum at SJU are not yet developed, the following list is undoubtedly incomplete.

1. Quality Control

   The quality control course deals primarily with statistical methods in quality control (e.g., control charts, lot-by-lot sampling procedures, continuous sampling, and process analysis techniques.) In order to bring interest and realism to these applications, appropriate problems may be in the form of case problems. More interestingly, the case study can describe the quality problem but omit data and give no indication of which statistical methods should be used. The students can then identify needs for statistical applications, determine which techniques to use and request data from the instructor to actually apply these techniques.

   The case study also may be used to teach quality control systems design. For such use, the case study completely describes the problem situation, including the present quality control system (if any). The student is required to assume the role of a newly hired quality control manager who must identify quality control system needs and design a quality control system for the company.

2. Methods Study, Work Measurement

   Professional industrial engineering practice in methods improvement and work measurement can be taught by the use of detailed case histories. For effective instruction, detailed process charts, motion pictures, and sample parts must be available.

3. Facilities Planning

   A case study, along with product samples, materials, and components, is an excellent approach to teaching facilities planning and plant layout. The case study must include samples and/or drawings of the product and all components. If the course covers only plant layout, process charts showing each move, operation, delay, inspection, and storage in the production of components, subassemblies and final assemblies must be provided. The student assignment is to make an efficient layout of machines and equipment in the present building(s) or, if appropriate, design a complete new plant.

1. Cost Control

Case studies for teaching cost control may be difficult to obtain -- particularly those which describe an existing cost system which the students can study and critique. Most firms will not disclose their cost data. However, a very good learning experience is to present a case problem situation and ask the students to design an appropriate cost system for the firm. For such an assignment, actual cost data are unnecessary.

5. Production and Inventory Control

This course is quite commonly taught using case problems.

Possible student assignments are:

a) Design the system for production planning, scheduling, and control.
b) Based upon projected sales during the next three months, develop a complete production schedule.
c) Determine least-cost inventory policies for raw material and finished goods.

6. Small Business Management

The case study method has long been used by business schools to teach such courses and has been demonstrated to be very effective.

Appendix 4

CASE HISTORY IN TECHNICAL ASSISTANCE

THE SAM-HO WOODWORKING MACHINE MANUFACTURING COMPANY SEOUL, KOREA

by

SOONG JUN UNIVERSITY
IN COLLABOFATION WITH THE
GEORGIA INSTITUTE OF TECHNOLOGY

INTEGRATED DEVELOPMENT CENTER
SOONG JUN UNIVERSITY
SEOUL, KOREA

MAY, 1976

(1) First Contacts

A team of Soong Jun University engineering professors, carrying with them a simple questionnaire, entered the Youngdungpo Machine Industrial Estate in southern Seoul, Korea, in the early part of 1974.

The object was to distribute the questionnaire and see if any companies would reveal problems and seek assistance. There were over 60 small-scale companies in the Estate.

Some companies replied and others did not. The Sam-Ho Woodworking Machine Company was one that did not show any interest at the outset in the offer of our technical assistance.

The engineering professors, however, went ahead and began work with those who were interested. In ensuing weeks, word spread throughout the Estate that something was happening. The owner and operator of Sam-Ho, Mr. Youngho Chae, heard about it. One day, while the SJU engineers were visiting a nearby company, Mr. Chae came over, introduced himself, and invited the SJU team over to his own small machine shop.

(2) Sam-Ho's Problem as Seen by the Owner

Mr. Chae showed his visitors around and explained his operations. The Sam-Ho Company produced single surface planers, jointers, universal circular saws, spindle molders, router machines, knife grinders, and wood lathes.

Very few employees were high-school graduates; most were middle-school graduates. There was one woman doing clerical work. The company was producing about 100 machines in an average month, all custom-made as orders were received.

Mr. Chae explained his problem. Labor costs were going up, as were taxes and raw material costs. National defense needs required all employees to take reserve training at least two days each month. The number of official holidays was up. Official enforcement of the labor act became strict. Competition was getting fiercer daily. All of these factors were causing him to wonder if he was really making any profit. So the problem came out: the owner-manager of Sam-Ho wanted some help in determining actual production costs of each item. He did not know what it really cost to produce.

Mr. Chae explained further his financial status. The accounting system essentially consisted of two pockets -- one, A, for money to be paid out in a short while; the other, B, for incoming funds. As long as B contained a good deal more money than A, all was well. Most of the orders and bills, etc., were kept, not on paper, but in Mr. Chae's head.

During 1969-1971, said Mr. Chae, business had been booming. Housing and high-rise apartment construction in the neighboring area had been so intense that Sam-Ho's entire production was snapped up. Even though many machines quickly failed, Sam-Ho's customers made no complaints. It had been a manufacturer's paradise. Projects rolled in. But, suddenly, construction largely ceased and Mr. Chae's anxieties rapidly set in as marketing shrank up and costs rose.

(3) Problems as Seen by the SJU/Georgia Tech Team

In March, 1974, as the SJU engineers looked at Sam-Ho's operations, it became quickly apparent that certain basic problems had to be solved before product cost analysis could be done. Later in the spring of 1974, when Georgia Tecn personnel joined the project, an SJU/GIT joint technical assistance team presented to Mr. Chae their diagnosis and made recommendations which, it was carefully stipulated, would have to be carried out before product cost analysis would even be attempted. Mr. Chae listened to the diagnosis and recommendations and agreed, reluctantly, to the conditions imposed.

(4) Preliminary Observations by SJU/GIT Team

Problem areas identified by observation and questioning were:

1) Lack of inventory control of raw materials and tools. Raw material metal sheeting or steel bars, etc., were scattered about the plant and outside in the yard. Tools were lying around here and there. It seemed that when an order for a certain machine was received, much rummaging around was necessary before needed materials and tools were located. Often, a needed piece was not in stock, and production was held up until it could be purchased.

2) There was no close inspection system for incoming raw materials. Visual observation was about the only checking done; physical testing for hardness, tensile strength, etc. was not done due to lack of testing equipment and skilled personnel.

3) Machines were being manufactured in such a way that nearly every one was a unique creation. There were no blueprints or production drawings with

accurate dimensioning. Individual parts were made and then a machine was assembled by different workers working without standard drawings. Assembly of parts often was possible only by brute force and hammering. Consequently, when a machine broke down, it was also disassembled by force or not at all!

Since standardization of hole locations, diameters, angles, screws, nuts and bolts, etc. was lacking, an extraordinary amount of time was spent in trial-and-error methods of assembly.

4) There was a noticeable lack of good record keeping and accounting.

5) Plant working conditions were poor. Illumination was particularly bad, even on benches or machines where fine work was done.

(5) Recommendations and Actions by SJU/GIT and Sam-Ho in 1974

1) Because of the variety of machines made by Sam-Ho, it was decided to choose only one, a handpress wood planer, and draw up process charts for it. Production drawings were to be made, parts numbered, and employees instructed in reading drawings. This smaller item was to be used as an example to show the prerequisites for a cost analysis as well as the analysis procedure itself.

2) Numbered bins for inventory control of raw materials, parts and tools were recommended. A system of stock numbers was devised. The junkyard-like inventory system was to be eliminated.

3) Sam-Ho was advised to assign a responsible person to take care of tools, jigs, and other equipment.

4) Production drawings of the planer and other products were made. A drawing numbering system was evolved (see the attached). Fundamental principles of clear dimensioning and tolerances were explained to workmen.

5) The use of fixtures and jigs for accurate location and standardization of drilled holes and parts was concretely illustrated by developing a fixture and demonstrating its use (see the attached).

6) SJU/GIT's technical assistance team urged and Sam-Ho adopted a better record-keeping system -- orders, sales records, inventory, etc.

7) Concepts and usage of simple dimensioning and testing calipers and gauges were demonstrated.

(6) Progress in Early 1975

Early in 1975, the SJU/GIT staff was able to see a more orderly and rational system at Sam-Ho. Worldwide economic conditions in this time period being adverse, the company did not expand employment, but production held up fairly well -- an achievement in itself. Product quality and uniformity had improved.

Specifically, Mr. Chae now estimated that machine component part interchangeability had increased from 20% to 80%. Formerly, much production time (about 30%) had been spent in switching parts back and forth to fit together (sometimes forcing the assembly); now only 10% of the total production time was spent so doing. More orderly balancing had been achieved in the production of different parts for a given machine; Mr. Chae felt there had been a 10-20% improvement in balancing his parallel operations.

It should be noted, however, that drawings provided to the company were filed away quietly in his desk drawers and largely ignored. This technology proved to be too high for the educational levels in the plant.

On the other hand, the use of jigs and fixtures had tremendously decreased material loss due to hand finishing. Records began to be kept and inventory brought under control. It began to be possible to follow a machine through the various stages of production to get times needed for cost analysis. Mr. Chae now came to understand the conditions of production processes under which his original problem -- cost analysis -- could be solved. Consequently, the SJU/GIT team felt that the project had proven worthwhile, witnessing so many improvements since Mr. Chae had received its joint technical assistance.

(7) Owner Chae Visits Georgia Small-Scale Industry in Summer, 1975

Mr. Chae had visited Indonesia many years ago on a market research tour. Since two Soong Jun faculty members were scheduled to visit Georgia Tech's Industrial Development Division (now Economic Development Laboratory), the idea occurred to him to accompany them and observe similar industry in Georgia.

Paying all his own expenses, Mr. Chae did go to Georgia and, with the guidance of Georgia Tech team, visited numerous small-scale machine plants. He accompanied a Soong Jun University mechanical engineer who, along with Georgia Tech people, pointed out production methods, procedures, plant layouts, inventory systems, etc. in U. S. plants, about which Mr. Chae had been told but which he had not seen in action. This visit to the United States made a big impression.

(7) Post-U. S.-Visit Changes at Sam-Ho

While in the United States, Mr. Chae saw the extensive use of measuring and dimensioning instruments and purchased several thousand dollars worth of high-grade gauges upon his return to his plant. He also had seen in each plant he visited that there were certain basic machine tools. He decided to purchase similar basic items for Sam-Ho and about $100,000 was spent for these major acquisitions in 1975.

He also observed the extensive use of professional production drawings, accurately dimensioned with tolerances, and so he felt the need of raising the educational level of employees.

Plans were made for expansion of the plant, using new purchased machine tools, since economic conditions in Korea were improving.

(8) Results of SJU/GIT Assistance as of May, 1976

Visits by SJU/GIT personnel continued in spring, 1976. Although Mr. Chae's original requests for detailed cost analysis on all his products had not been met, progress in this direction and other matters was evident.

1) Plans for plant expansion were being made. Installation of newly acquired machine tools required fresh thinking on matters of plant layout and production processes. This kind of task will involve an SJU industrial engineer, first faculty in SJU's new Industrial Engineering Department, granted to SJU by the Korean Ministry of Education and planned with Georgia Tech's assistance.

2) Production had increased from about 100 units per month to about 130.

3) Stock bins for inventory and parts and use of stock numbers had brought some order and efficiency into a formerly chaotic situation.

4) More uniform or standard machines were being produced as a result of the use of various jigs and fixtures. Time wasted in custom-assembling each machine was largely eliminated.

5) A full set of testing and measurement devices had been purchased for inspection of incoming raw materials and work in progress. Machine quality had

improved greatly. This made possible an export of some $80,000 worth of machines to Australia in 1975.

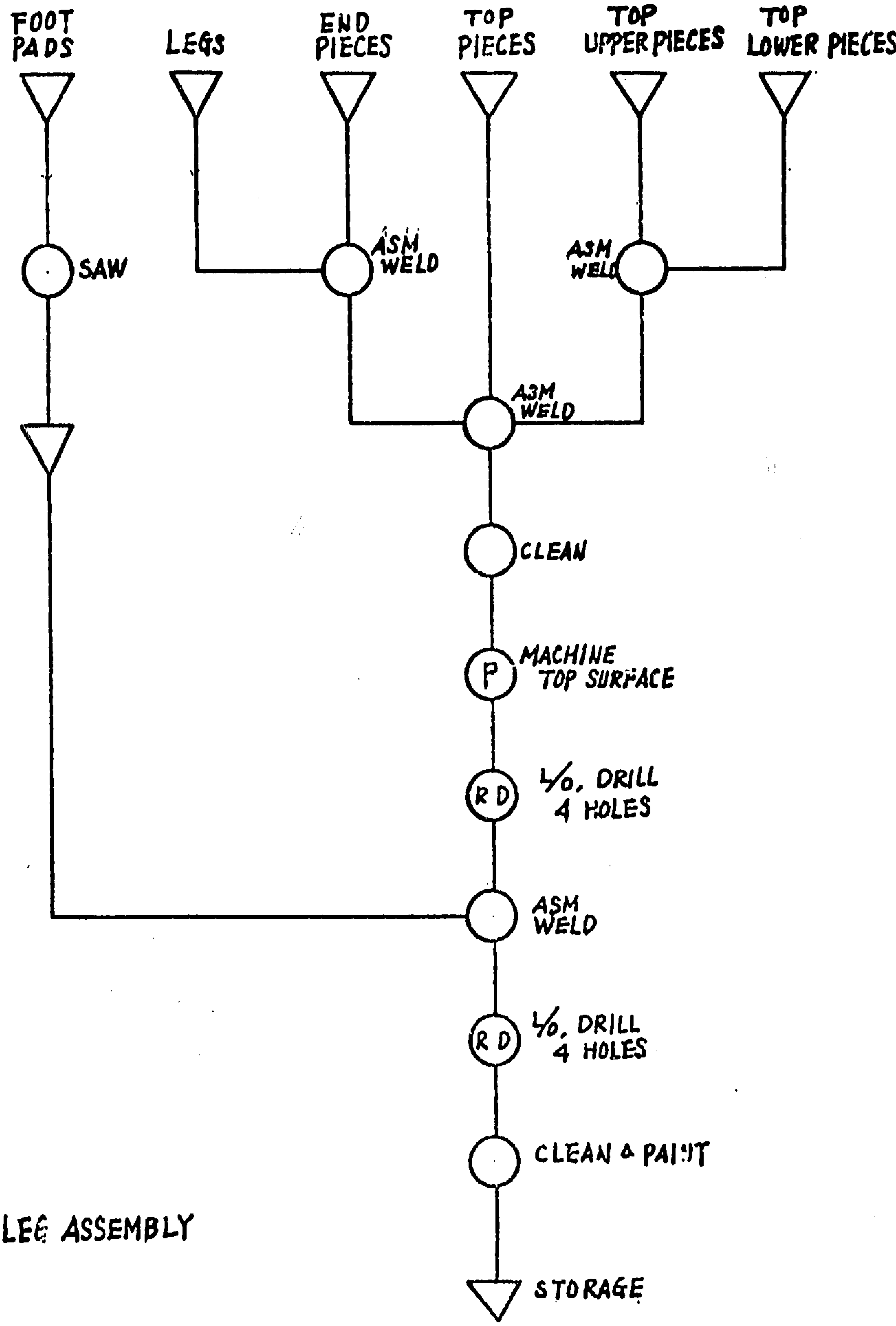
6) The educational level of employees was raised. Owner Chae had employed three young college graduate engineers, five graduates of technical high schools, and five other employees. With this support, plans were made to institute an in-plant training program.

7) Sam-Ho was projecting a need for employment of about 50 additional persons as a result of plant expansion -- a doubling of the original work force.

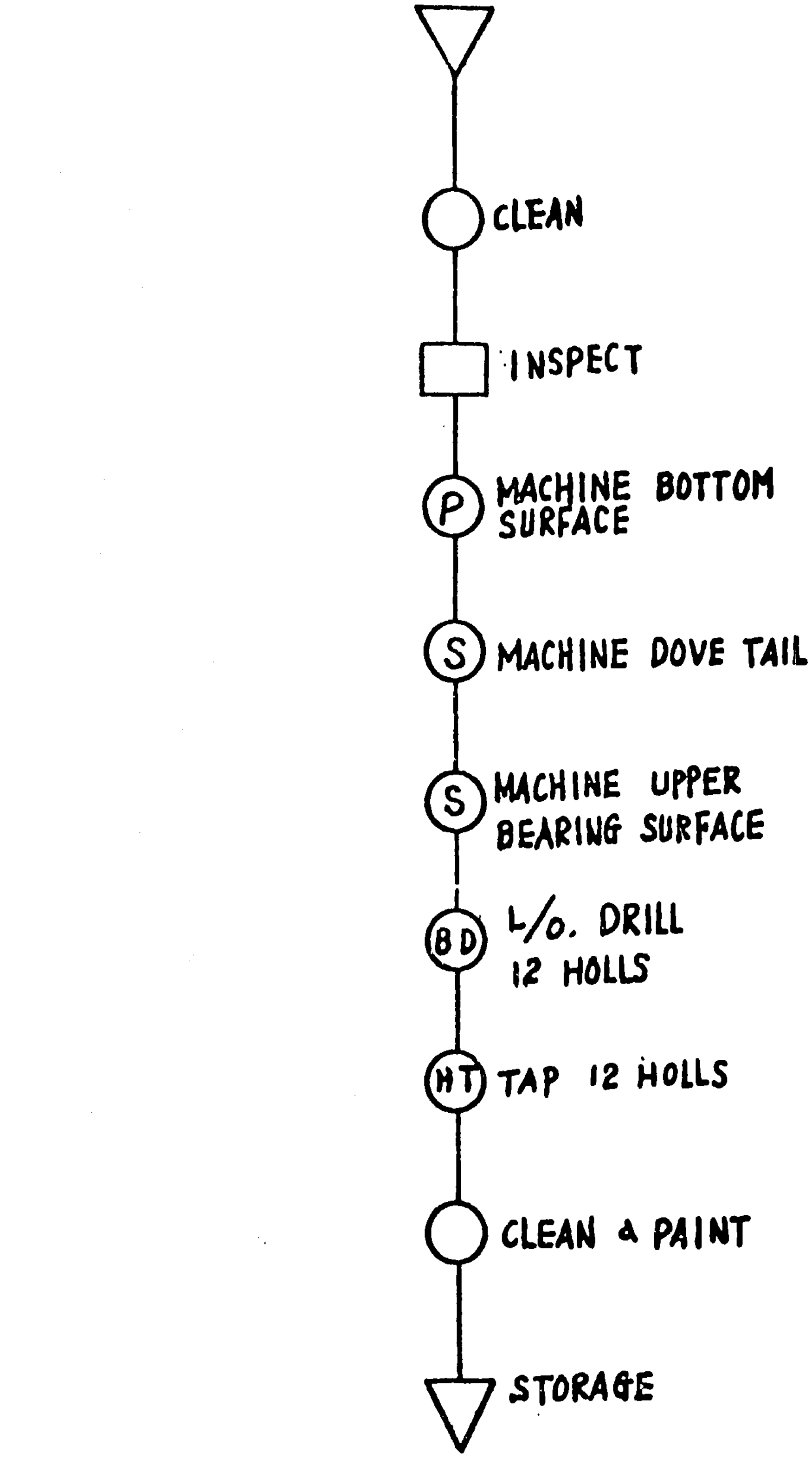
(9) Future Assistance at Sam-Ho

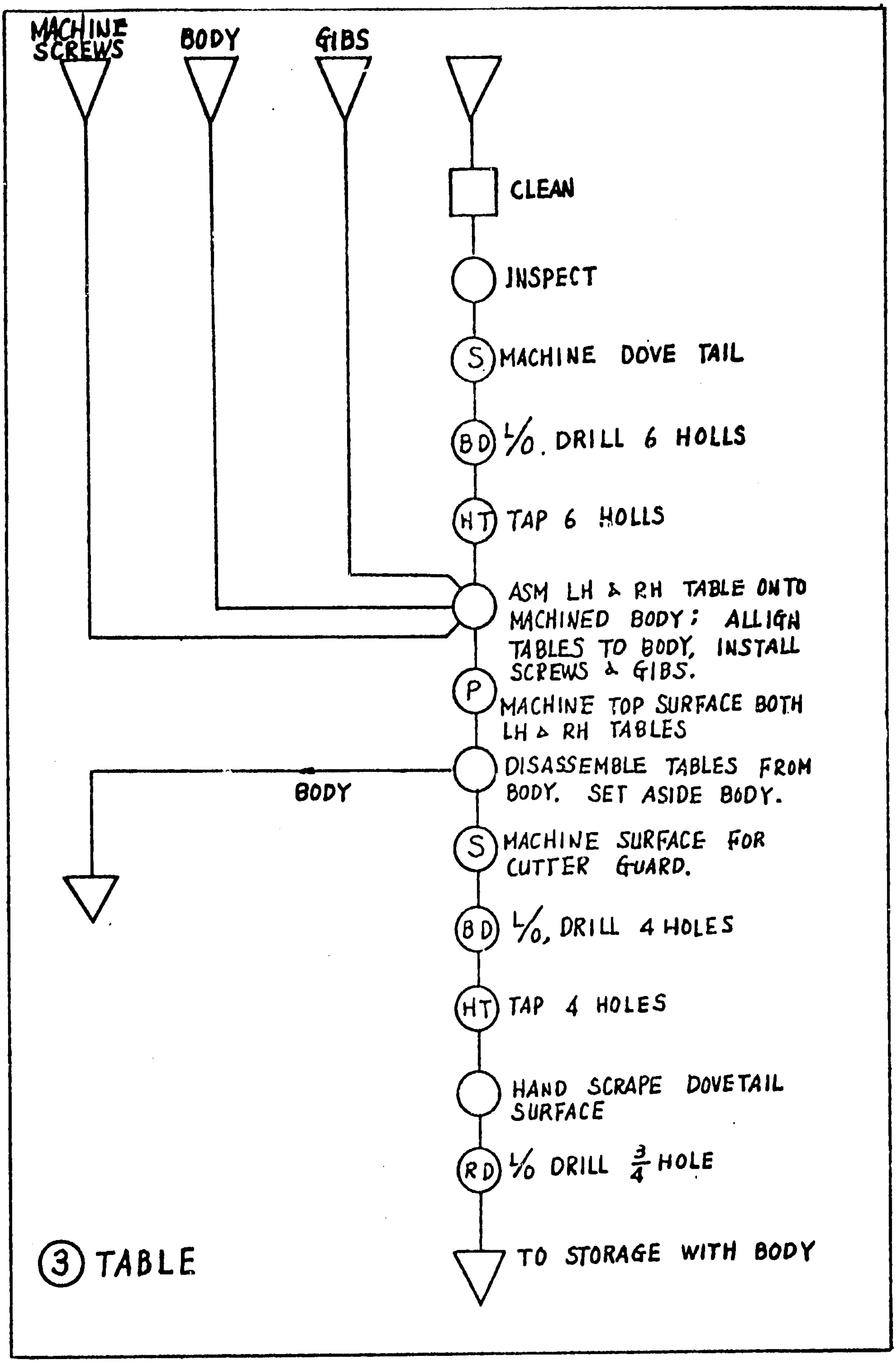
Good results have been achieved at Sam-Ho and owner Chae is pleased with his relationship with the SJU/GIT technical assistance project.

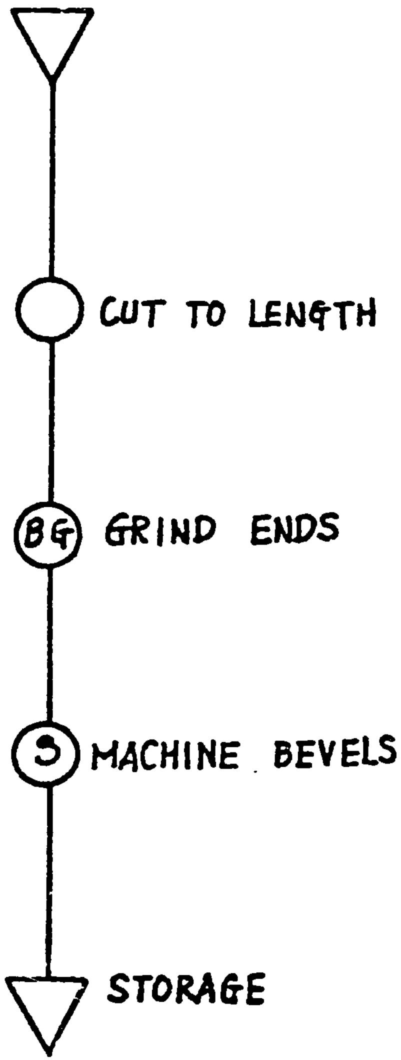
Largeness brings its new challenges, and Mr. Chae has begun to meet difficulty in controlling all aspects of his operations, which he could do formerly. At this point, the SJU/GIT teams feels Mr. Chae is facing the difficult matter of delegation of responsibility and authority. Mr. Chae is considering the kind and number of additional managers needed. He thus is looking to Soong Jun for guidance in the management area. The transition from a one-man operation to a larger management system, with delegation of authority and mutual trust, may be an anxiety-producing experience for Mr. Chae.



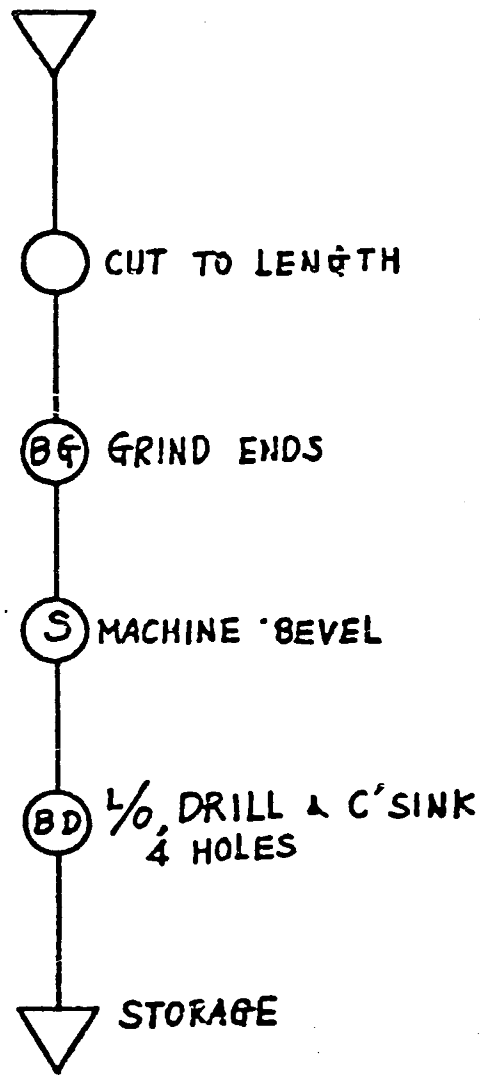
(1) LEG ASSEMBLY


CLEAN
INSPECT
MACHINE BOTTOM SURFACE
MACHINE DOVE TAIL
MACHINE UPPER BEARING SURFACE
L/O. DRILL 12 HOLLS
TAP 12 HOLLS
CLEAN & PAINT
STORAGE
2 BODY

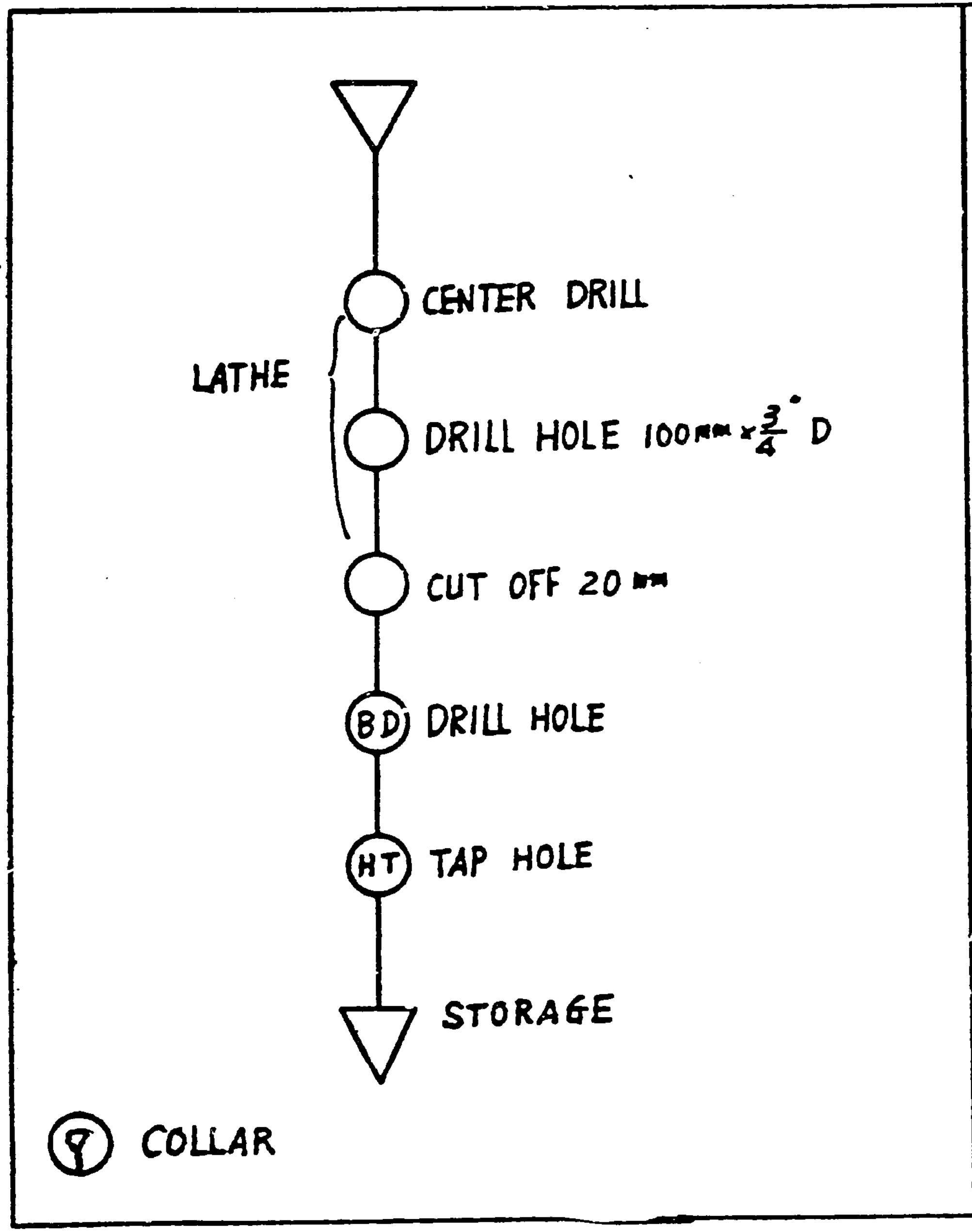

MACHINE SCREWS
BODY
GIBS
CLEAN
INSPECT
S MACHINE DOVE TAIL
BD L/O. DRILL 6 HOLLS
HT TAP 6 HOLLS
ASM LH & RH TABLE ONTO MACHINED BODY; ALLIGN TABLES TO BODY, INSTALL SCREWS & GIBS.
P MACHINE TOP SURFACE BOTH LH & RH TABLES
DISASSEMBLE TABLES FROM BODY. SET ASIDE BODY.
BODY
S MACHINE SURFACE FOR CUTTER GUARD.
BD L/O, DRILL 4 HOLES
HT TAP 4 HOLES
HAND SCRAPE DOVETAIL SURFACE
RD L/O DRILL 3/4 HOLE
TO STORAGE WITH BODY
3 TABLE

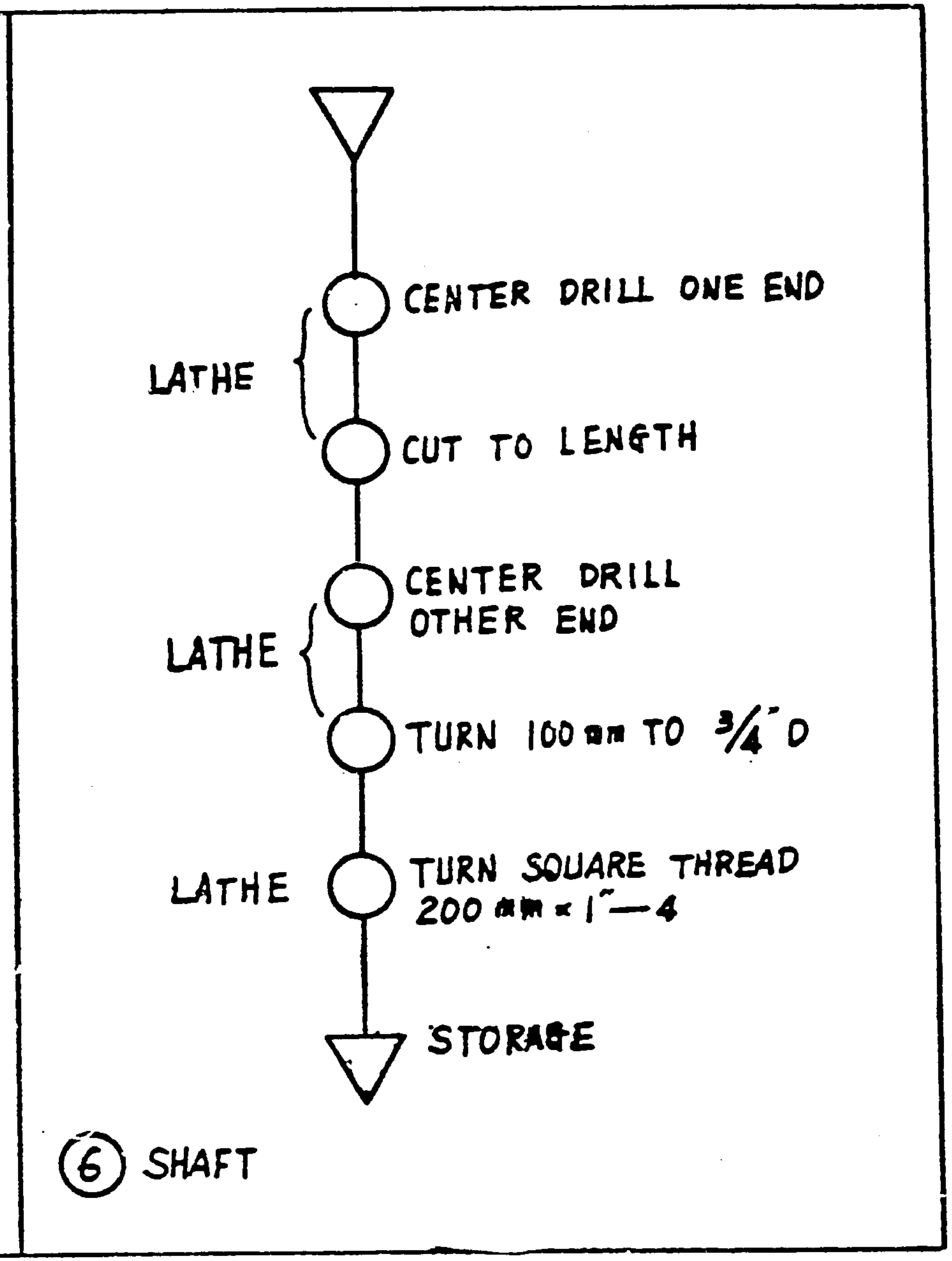


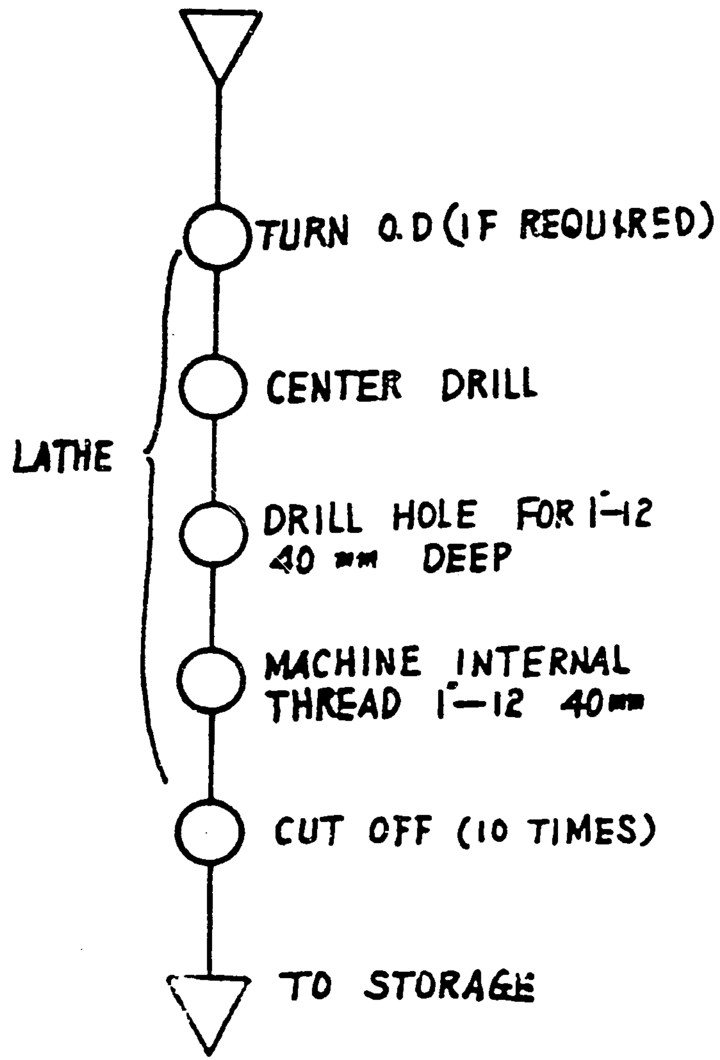
(5) GIB



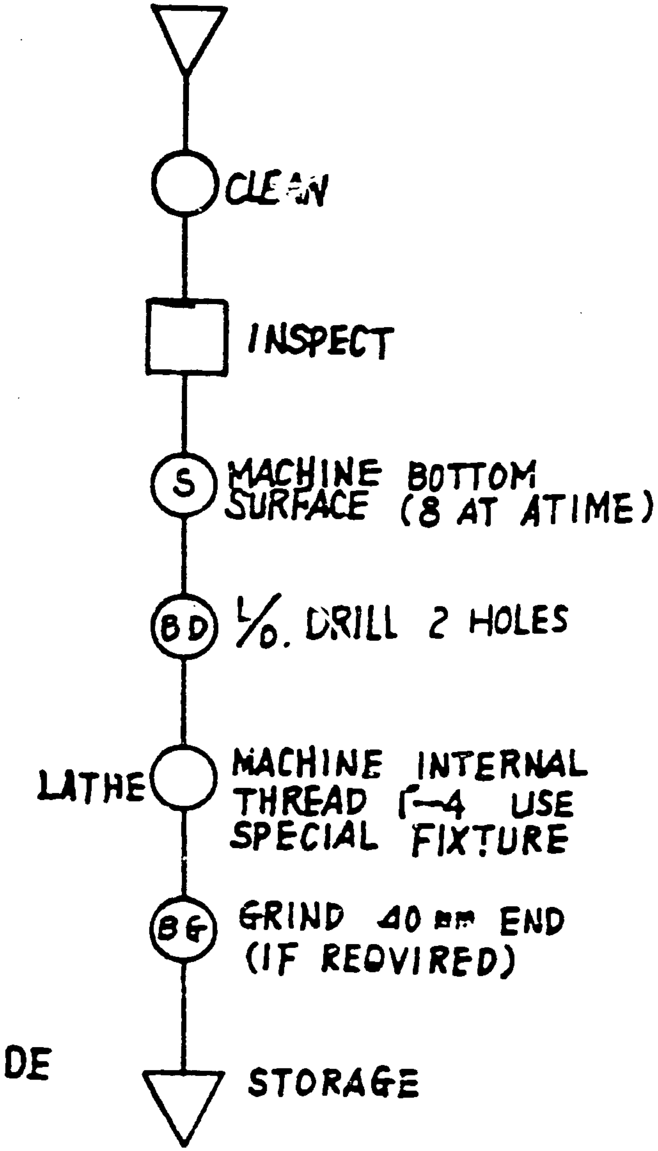
(4) CUTTER GUARD


CENTER DRILL
LATHE
DRILL HOLE 100mm × 3/4" D
CUT OFF 20mm
BD
DRILL HOLE
HT
TAP HOLE
STORAGE
(9) COLLAR

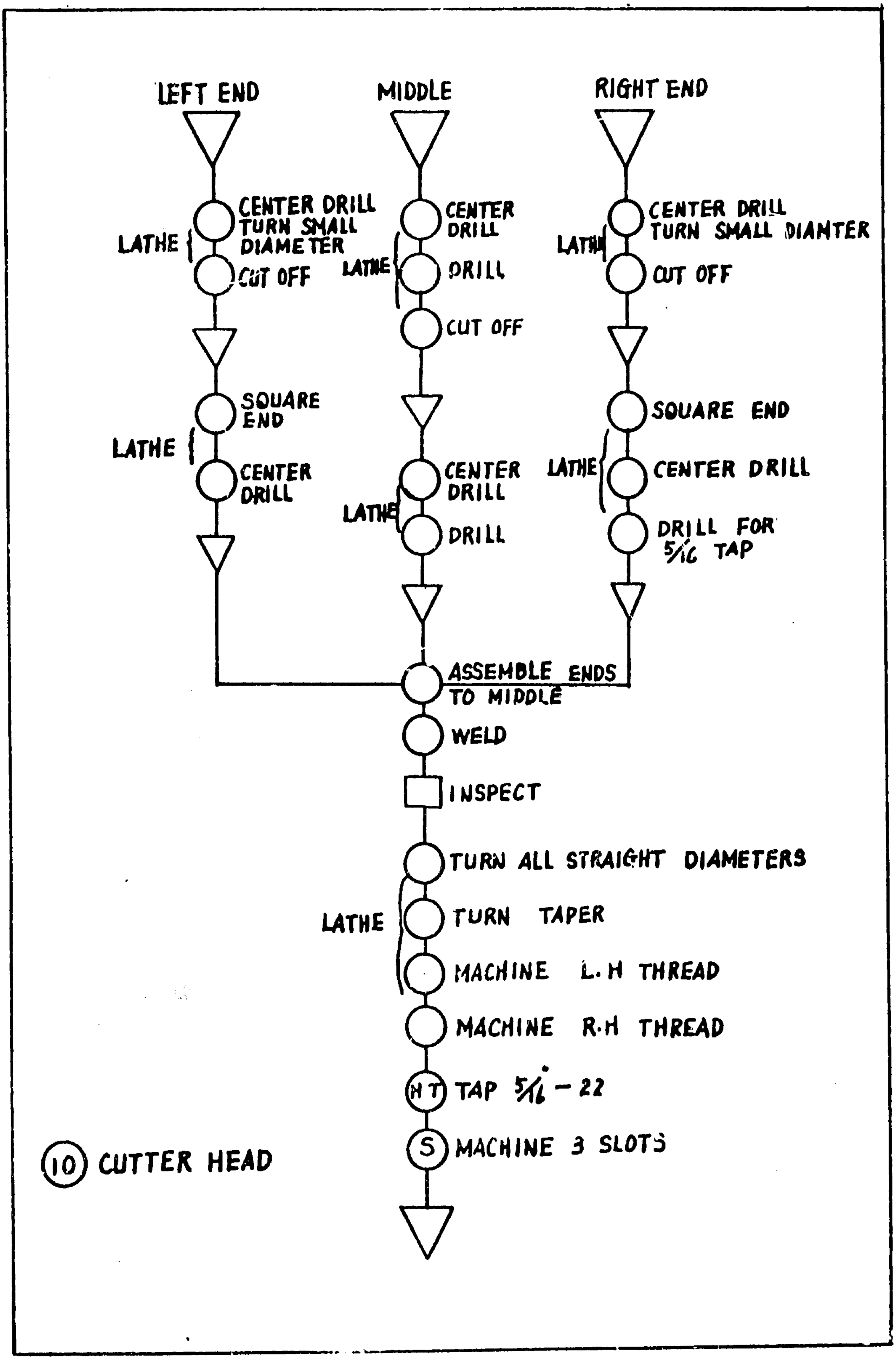

CENTER DRILL ONE END
LATHE
CUT TO LENGTH
CENTER DRILL OTHER END
LATHE
TURN 100mm TO 3/4" D
LATHE
TURN SQUARE THREAD 200mm × 1"—4
STORAGE
(6) SHAFT

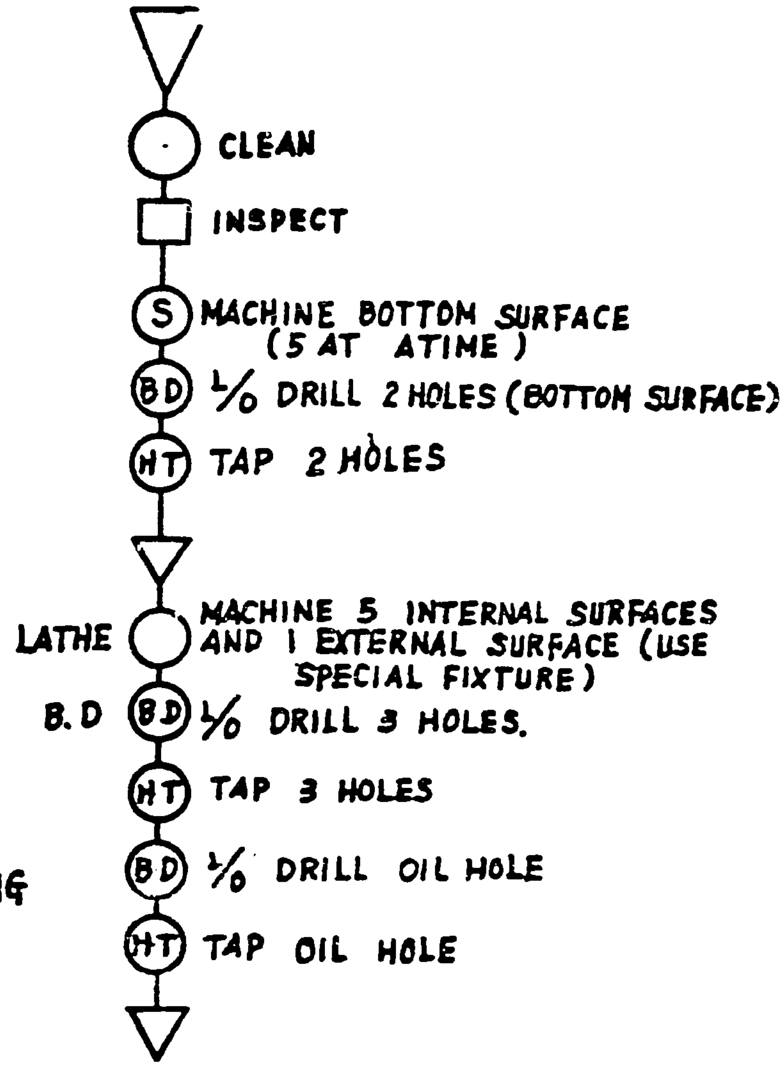


(11) BEARING RETAINER NUT

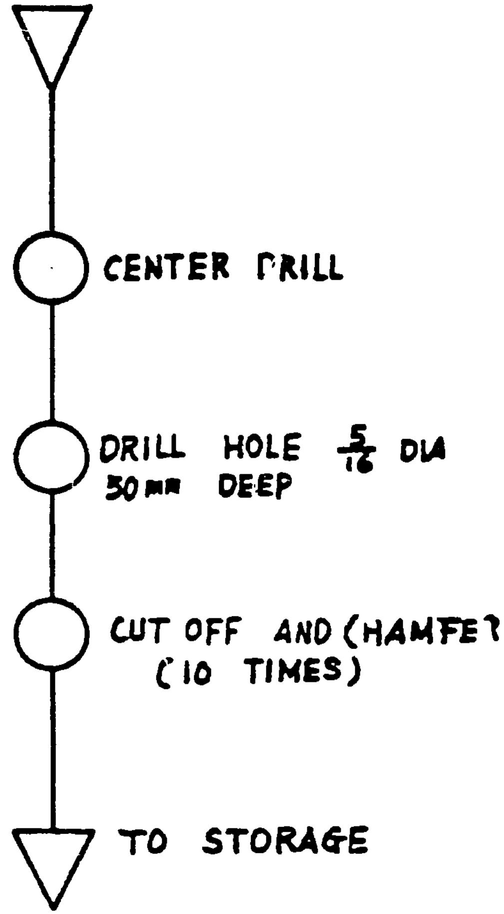


(8) GUIDE

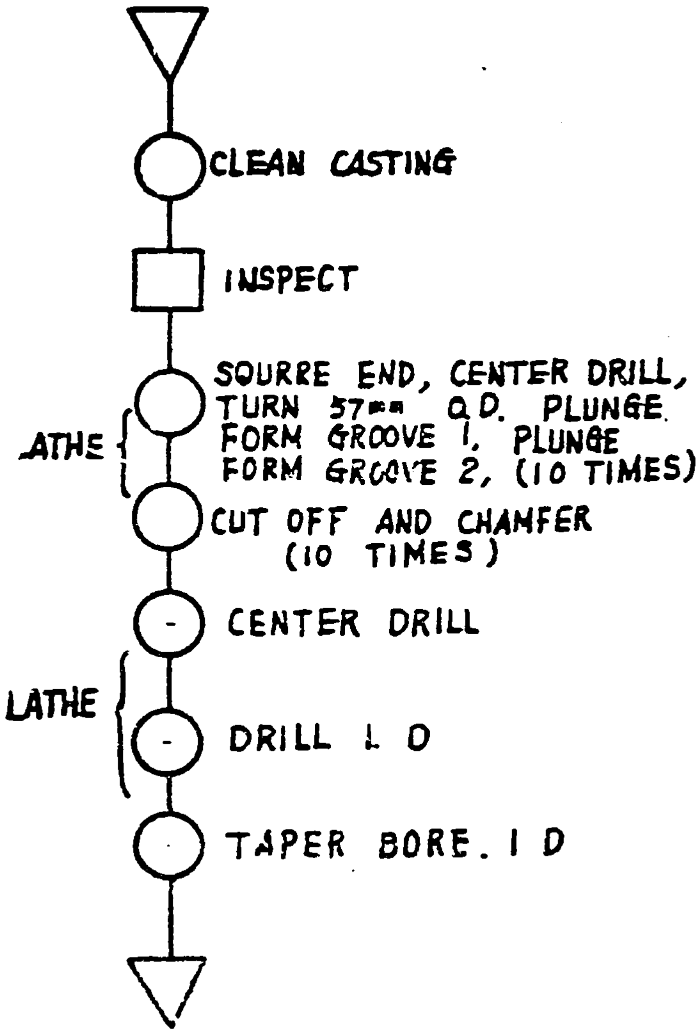

LEFT END
MIDDLE
RIGHT END
CENTER DRILL TURN SMALL DIAMETER
LATHE
CUT OFF
CENTER DRILL
LATHE
DRILL
CUT OFF
CENTER DRILL TURN SMALL DIAMTER
LATHE
CUT OFF
SQUARE END
LATHE
CENTER DRILL
CENTER DRILL
LATHE
DRILL
SQUARE END
LATHE
CENTER DRILL
DRILL FOR 5/16 TAP
ASSEMBLE ENDS TO MIDDLE
WELD
INSPECT
TURN ALL STRAIGHT DIAMETERS
LATHE
TURN TAPER
MACHINE L.H THREAD
MACHINE R.H THREAD
H T
TAP 5/16 - 22
S
MACHINE 3 SLOTS
10
CUTTER HEAD



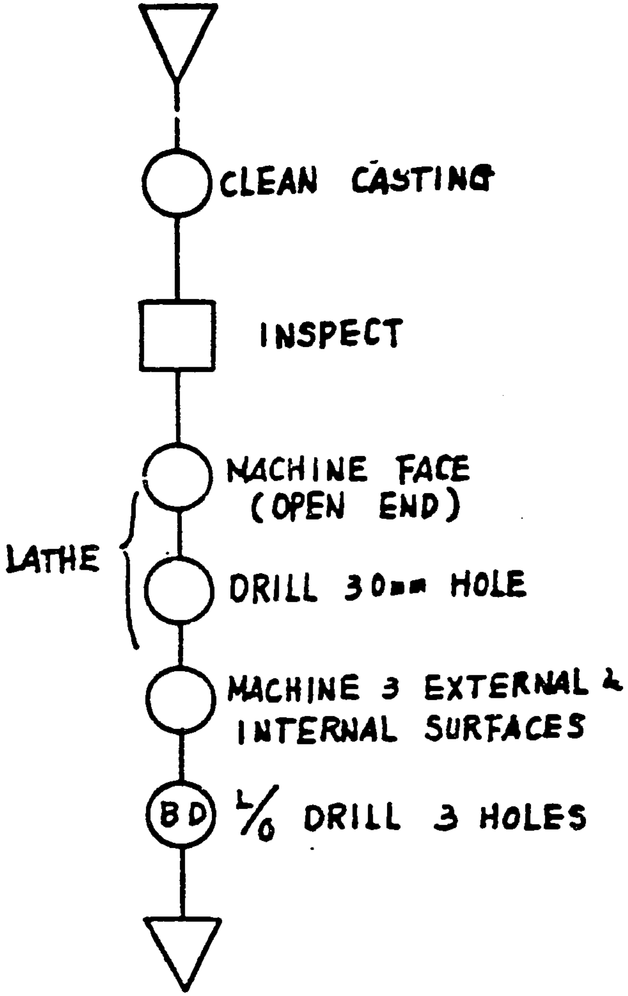
(13) BEARING CASE



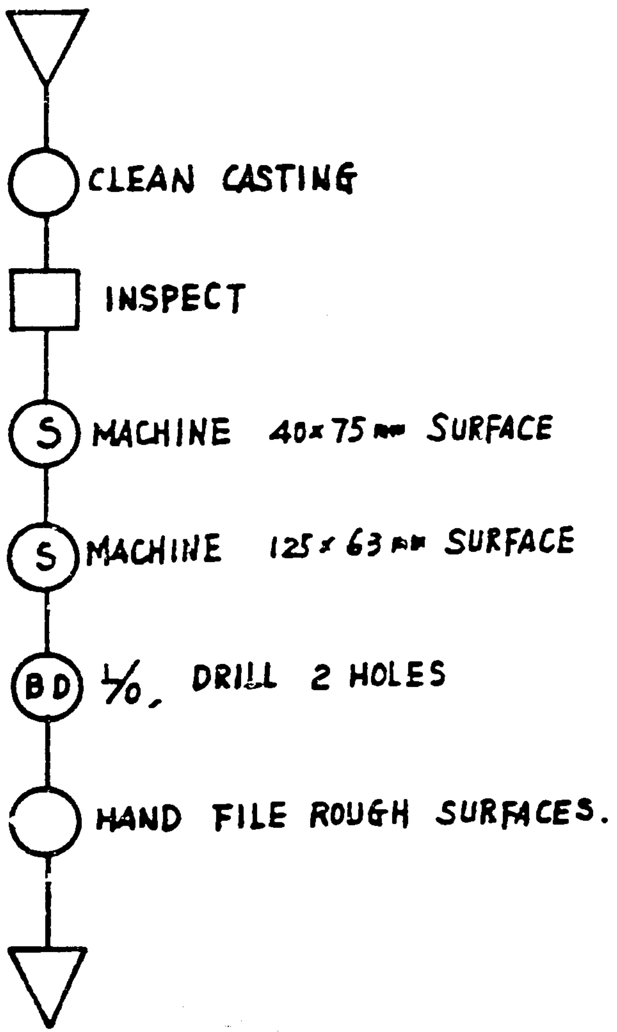
(12) RETAINING WASHER



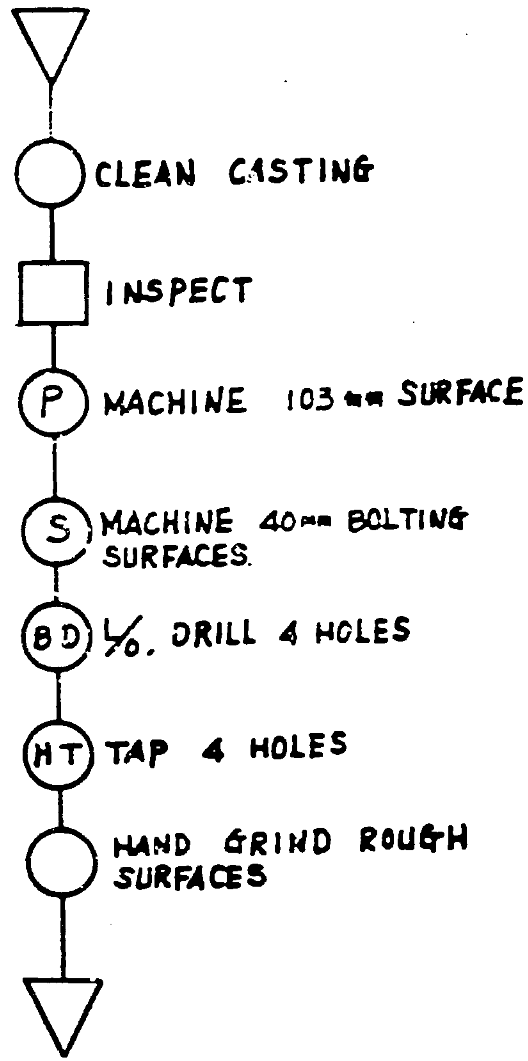
(15) AXLE PULLY



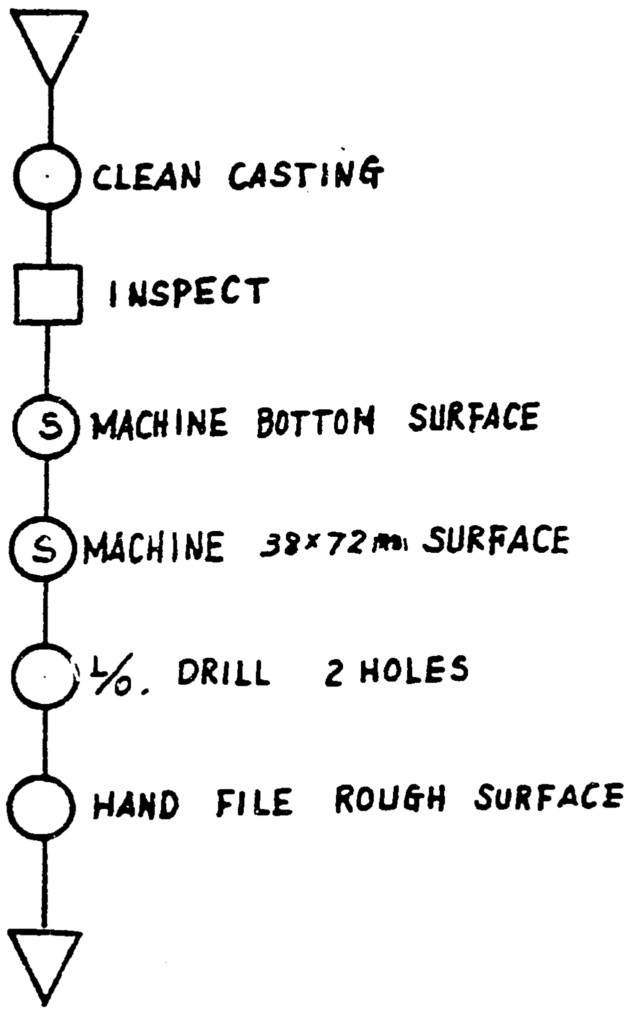
14 BEARING CASE COVER



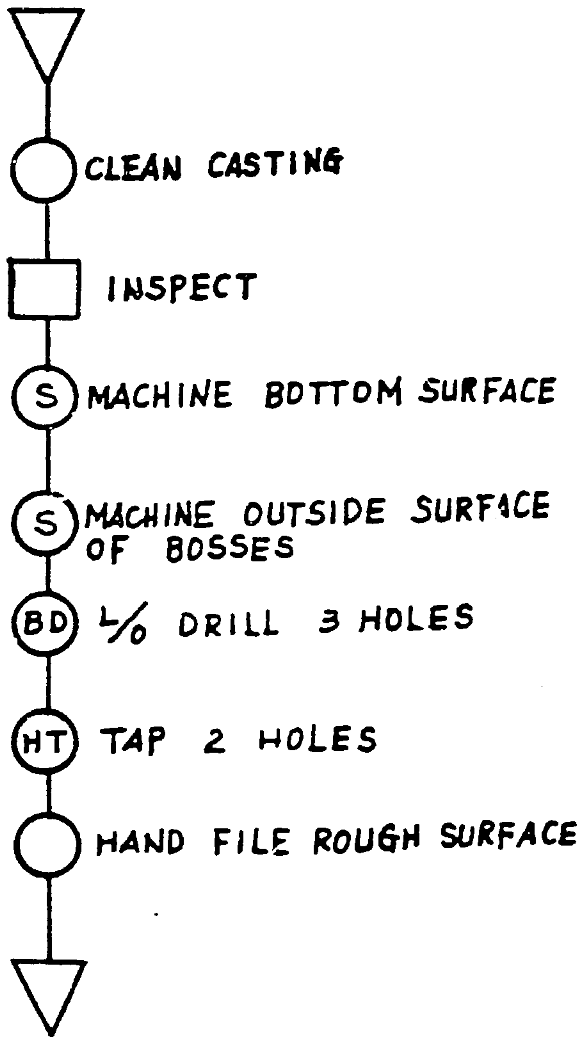
(17) FIXED SQUARE ARM



(16) ADJUSTABLE SQUARE ARM

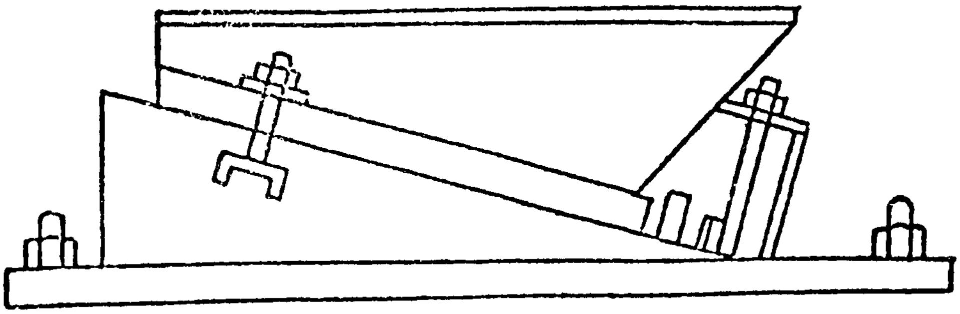


(19) FIXED HORIZONTAL SQUARING ARM CONTROL

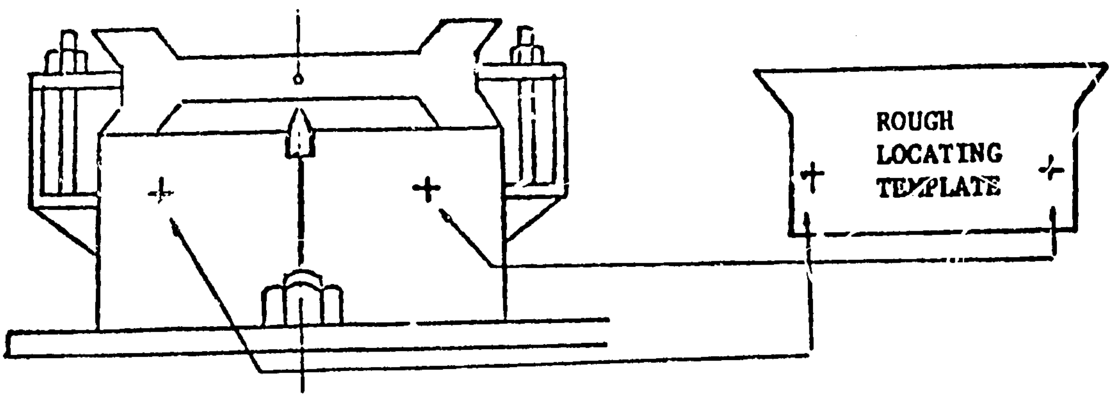


(18) ADJUSTABLE HORIZONTAL SQUARING ARM CONTROL

FIXTURE DEVELOPED BY SJU STAFF FOR
SAM-HO MACHINE INDUSTRIES COMPANY, KOREA



1. Locate raw casting on slant top fixture. 520 x 280 is first reference surface.
2. Machine 355 x 325 surface.
3. Locate and on boss by using 230 dimension.
   Locate center of boss by reference 355 x 325 surface.
   Punch center. Outer surface of boss is reference surface; punch mark is other reference point.



4. Locate casting on slant top fixture. Slide punch mark to stop. Use 230 dimension to align. Machine male dovetail surfaces.
5. Locate casting on slant top fixture. Slide mail dovetail into dovetail fixture. Machine female dovetail surfaces.
6. Locate casting on drill fixture using mail dovetail as clamping surface. Drill 20 mm hole.

Appendix 5

LOW-COST TENSILE STRENGTH TESTER
AND
IMMERSION PYROMETER

by

SOONG JUN UNIVERSITY
IN COLLABORATION WITH THE
GEORGIA INSTITUTE OF TECHNOLOGY

INTEGRATED DEVELOPMENT CENTER
SOONG JUN UNIVERSITY
SEOUL, KOREA

JUNE, 1976

Adaptive Technology

(1) Basic Concept

When technical problems are encountered in small-scale industries, techniques and solutions that are commonplace in large-scale industries very often cannot be used. The most common reason for this is lack of funds to purchase ready-made tools and machinery and lack of skills and training necessary to implement solutions requiring advanced technology. In small-scale industry, the solutions to problems must be compatible with available skills and funds.

Technical assistance personnel consisting of engineering faculty from Soong Jun University and engineering staff from Georgia Tech made several contributions during 1974-1975 to Korean small-scale industry in adaptive technology.

(2) An Inexpensive Tensile-Strength Tester

In the Youngdungpo Machine Industrial Estate are several foundries which produce grey iron sand castings. Customers of these foundries order castings which are required to have certain strength requirements. In order to test the strength of cast iron accurately, very expensive testing equipment is required which these small foundries cannot afford to buy.

The usual results of this lack of test equipment are that the customer's specifications are exceeded, thereby losing profit for the foundry and wasting valuable high-strength material, or that the customer's specifications are not met, causing him either to reject the castings or to experience casting failure because of low strength.

The Mechanical Engineering Laboratory at Soong Jun University has a tensile tester of high quality which cost about $12,000. Keeping in mind the above two constraints -- lack of funds and lack of skilled testing operators, the SJU/GIT technical assistance team designed and manufactured a prototype tensile tester sufficiently precise for a foundry's need, yet not complicated or expensive.

Essentially the tester operates as a 2nd-degree mechanical lever in which the load, which is a specimen iron bar to be pulled apart, is located between a hinged fulcrum and the applied force, which is a 25 KG weight hung from the bar, movable along the bar much like a common weight scale. The tester was calibrated using as a standard reference the professional tensile tester in SJU's laboratory.

As is common in engineering, the simple design went through several iterations. The first one (see Appendix 1) proved difficult to move the weight by hand along the lever bar and so a worm screw was added (see Appendix 2). Further testing then showed that when the specimen finally was pulled apart, the lever arm collapsed with its heavy weight with a large force. Therefore, springs were placed below the weight as shock absorbers. Finally, the whole steel assembly proved heavy to move around so that a wheeled-carriage was added.

Cost now reaches about $300, about 1/40th the cost of SJC's laboratory tester.

(3) A Simple High-Temperature Thermocouple

The SJU/GIT technical assistance team, observing the various foundry and other metalworking small-scale plants in the same Estate, noticed that product quality was probably being adversely affected by lack of temperature control over melts in process. Temperatures of molten metals were determined largely by sight or color, in truth not an uncommon method but one which lacks sufficient precision for many applications.

Since D'Arsonval meter movements, the basic component of inexpensive volt-ohm-ammeters, are readily available on the Korean market, a Georgia Tech engineer brought from the United States some chromel-alumel wires. He devised a simple thermocouple-ammeter arrangement, where the DC voltage generated at the Ch-Al junction is proportional to the temperature (Ch-Al has a high coefficient of thermal e.m.f., which makes the less-sensitive (inexpensive) meter movements useable).

The calibration of this simple thermometer was done by comparison with readings given by a commercial thermocouple brought from the United States by the Georgia Tech engineer.

The cost of the Korean-made thermometer is about $20, as against the commercial instrument's cost of about $100.

(4) Application Difficulties

By summer, 1976, use of the tensile strength tester at a company has been suspended due to the company's moving to a distant location. However, other small foundries in the Estate have shown interest in the device.

The SJU/GIT team feels that eventually the tester will be widely used.

A belt and handbag manufacturing company, which is also one of the industries in the Estate, has at any moment numerous melts of different alloys in process, all demanding temperature monitoring. These are small metals, yielding small quantities of metal having different colors and other physical properties to make multitudinous kinds of belt buckles and other metal attachments.

Use of the thermocouple thermometer has met with some resistance by the employee, who by long experience has built up his skill in recognizing temperature by color. This person is an older man whom the owner-manager does not wish to offend - a Korean cultural aspect.

However, the owner feels that in time, the employee will begin to see the convenience and other advantages of the simple thermometer and is proceeding with plans to make several gauges.

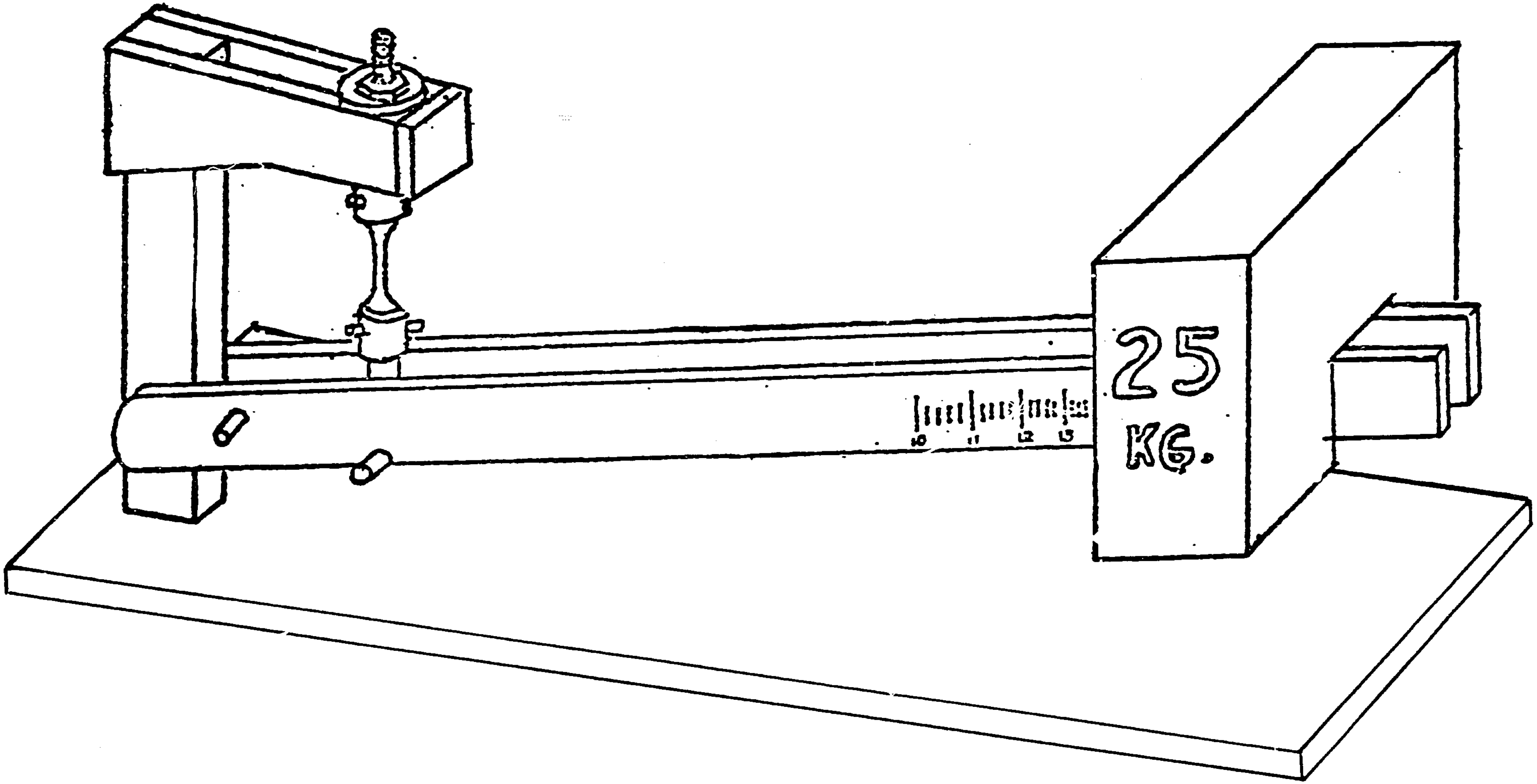
(5) Adaptive Technology Principle

In both the cases above, the underlying principle is that by using precise university lab instruments as reference standards for calibration purposes, technicians can make inexpensive devices, sufficiently precise to raise the quality of small-scale industry products in developing countries significantly.

This constitutes an important contribution to Korean small-scale plants and opens new vistas for use of precise university laboratory equipment.

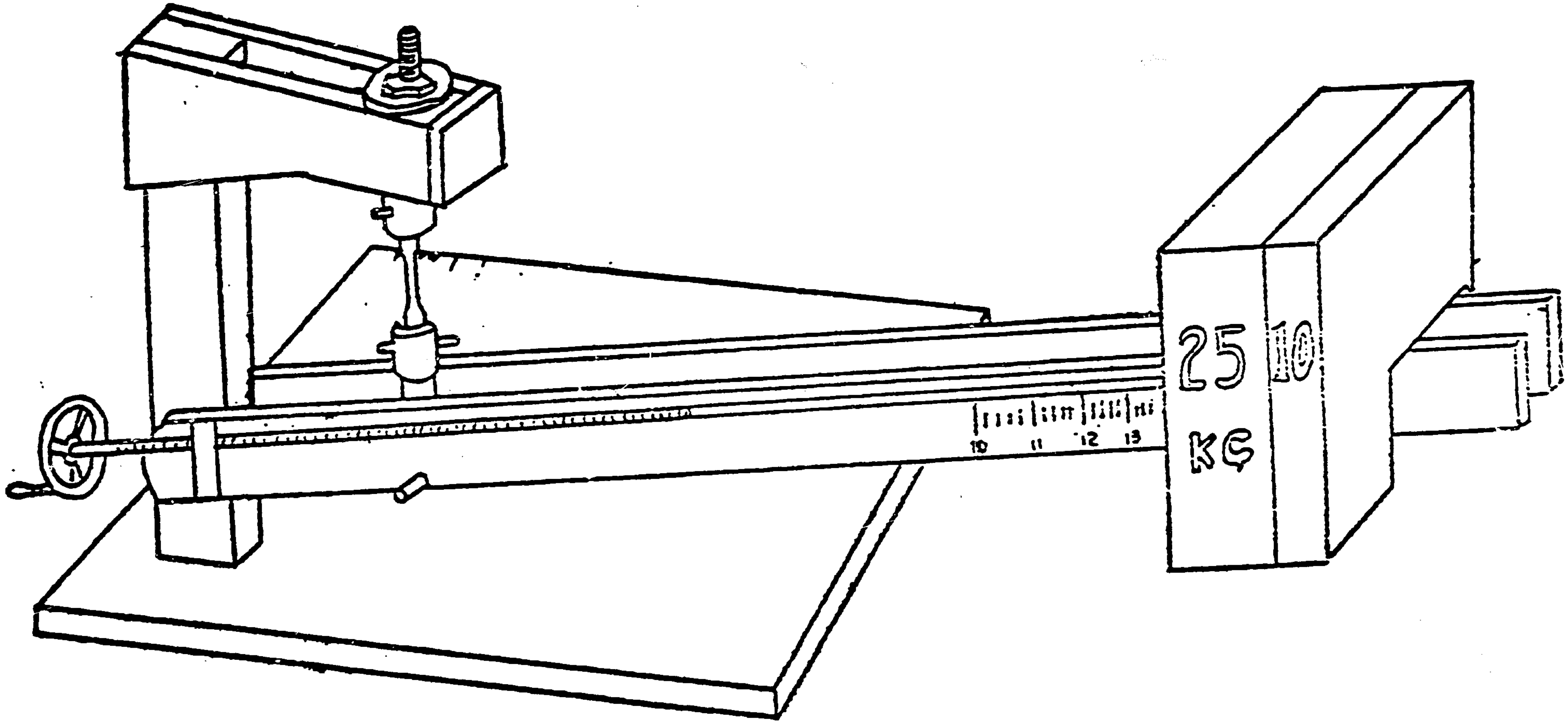
Perfect measurements are not the objective nor would such equipment be useful since so many other production variables have not yet been brought under control. But statistically important improvements can be made anyway, and cheaply.

Appendix 1



CAST IRON TENSILE TESTER – CONCEPT

Appendix 2



CAST IRON TENSILE TESTER - CONCEPT

Appendix 6

SAM-SHIN SEWING MACHINE COMPANY

A Case History
of
Industrial Extension Services

Prepared by

Choi, Byoung-kyu

October 1976

Soong Jun University
Seoul, Korea

I. Introduction

Sam Shin Sewing Machine Co. is located in Youngdong-Po Machinery Industrial Estate, which is composed of about 60 small companies. During the summer vacation in 1974, Soong Jun University had prepared a short-term training program (three weeks) especially for the machinists and middle managers in the Estate, and one of the trainees from Sam Shin asked for technical services from SJU. Upon their request, Prof. Yoon and Prof. Lim, both mechanical engineers, started extension work for this company in 1975. However, the extension work became more intensified and diversified from early 1976 onward, when Mr. Choi, an industrial engineer, and Mr. Kim, a mechanical engineer, joined the extension service.

II. Background of the Company

Sam Shin produces mainly one type of domestic sewing machine (Model 15K) and sometimes an industrial sewing machine (Model 103K). This company was founded formally in 1966 by Mr. Lee, who is the present president, as a sewing machine manufacturer. However, at the beginning this company was mainly engaged in assembling of sewing machines with partial machining of minor parts. In 1969 it purchased a set of facilities for arm and bed (of sewing machines) machining, which made this company a sewing machine manufacturer in fact as well as in name.

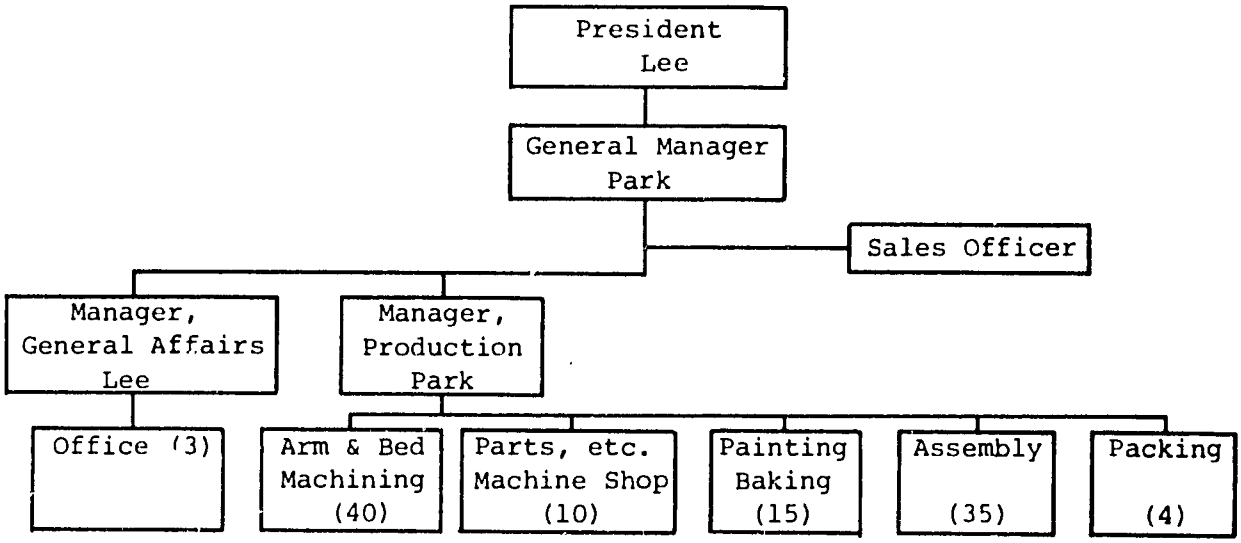
After this expansion, this company moved to the Estate from its original site, Daebang dong (another Youngdong Po area) in 1970. Up to the end of 1971 it was able to maintain its sales volume at about 2,500 units a month in spite of the growing competition and unstable domestic market. From early 1972, however, its sales began to be cut down seriously as a result of the economic depression in Korea, and to make things worse, the "8.3 Measure," which was a government regulation prohibiting private loans, made this company shut down from mid-1972, owing to the paralyzed financing.

After this difficult period, the company found a means of survival by initiating exports to Japan in 1973, and it did a good job in 1974. At this time this company sold the domestic sewing machine, which was the only product it produced, only to Japan. They introduced a type of industrial sewing machine (Model 103K) for the domestic market in February 1975, which made it possible to survive when exporting was completely blocked in late 1975.

Fortunately, orders from Japan and Iran have been increasing since early 1976, and now (September 1976) this company is unable to keep up with its total orders even with its increased manpower (currently 95 production workers) and with extended working hours (sometimes 12 hours a day). It is now producing about 6,000 sewing machines a month, working at maximum capacity.

III. Organization Structure

As can be seen in most small companies in Korea, this company has no formal organization as far as the functional activities are concerned. All the managers are carrying out their jobs somewhat interchangeably, although they have their main responsibilities or duties in its organization structure. However, its functional activities can be depicted as follows:



Background of Managers

1) Mr. Lee, President, has a considerable amount of experience in production as well as in sales of sewing machines. Now in his middle fifties, he spends most of his time in the factory and makes frequent trips to Japan. He seems to have a good relationship with Japanese buyers and even with domestic competitors.

2) Mr. Park, General Manager, had been working for a small trading company for about three years before he moved to this company in 1974. He was originally a schoolteacher.

2) Mr. Lee, Manager of General Affairs, graduated from a mercantile marine college and then became a sailor. He is a close relative of the

president of this company and joined it last year (1975). Although he has little experience in this type of business, he has an earnest character.

4) Mr. Park, Manager of Production, is an industrial high school graduate and has been working in this company for a long time (about six years). He is mainly responsible for the arm and bed machining as well as general production management.

IV. Market and Sales

4-1 Market Information.

This company has no domestic market. It receives sales orders from Japan (Model 15K and Model 103K) and from Iran (Model 15K), mainly through a big trading company. However, this company has a very close and direct relationship with the Japanese buyers; moreover, it receives some technical assistance and information from a company in Japan. Recently orders have been rising so rapidly that this company has had to cancel some of the L/C, and it is generally believed that this trend will continue for a while. But the price of sewing machines in the export market is too low to make a satisfactory profit.

4-2 The Competition.

There are two big companies and about six small companies in the sewing machine industry in Korea. Among them, the two big companies are not so interested in the Japanese market because of the tight margin, and this company has the exclusive position among these small companies as far as the Japanese market is concerned. Currently, this company does not feel any threat from competition.

4-3 Sales and Profit History.

The domestic market is shared almost wholly by the two big companies because of their strong sales forces and name values. After giving up domestic sales and starting export in 1973, this company was able to sell a small volume of industrial sewing machines in the domestic market only in 1975.

Following is the sales history of this company.

Year (Month)	Export	Domestic	Total
1973	$ 80,000	-	$ 80,000
1974	200,000	-	200,000
1975	40,000	60,000*	100,000
1	-	-	-
2	8,000	-	8,000
3	20,000	-	20,000
4	30,000	-	30,000
5	50,000	-	50,000
6	55,000	-	55,000
7	80,000	-	80,000
8	90,000	-	90,000
9	85,000	-	85,000

* In 1975 the company imported a type of industrial sewing machine semifinished, and sold it in Korea. However, this import is not allowed now.

This company believes that current trends in sales will continue for a while. However, the export price is so low that the company still has a hard time in making enough profit with its present productivity and production cost.

V. Problems Perceived by Top Management

Except for the low selling prices in the export market and the irregular quality of incoming materials, this company has few difficulties in sales as well as in purchasing raw materials.

Even with the increased demands from abroad, however, the president of this company says that they are facing a serious cost burden, due mainly to the low productivity of both labor and machines.

Top management considers the following two points to be its most pressing problem:

1) Increasing the rate of production to meet the increased sales orders, and

2) Reducing labor cost by minimizing waste of man-hours and improving labor productivity.

To achieve these goals, top management is trying to take measures as follows:

1) Remove some of the bottleneck operations (three in milling, one in tapping, one in boring, and the thread-hole cleaning operations).

2) Optimize cutting speeds and feeds.

3) Improve the control of production and processes as well as methods.

Furthermore, top management has a plan to invest about $80,000 in purchasing a set of semi-automated machines for arm and bed machining from a company in Japan.

In connection with this investment, they have a plan to introduce a more advanced type of industrial sewing machine for the domestic market.

In both cases above, however, they feel serious difficulties in securing funds and a lack of relevant technology.

VI. Product Information

One type of domestic sewing machine (Model 15K) and a type of industrial sewing machine (Model 103K) are the only products it produces, and both are well known and standardized.

Model 15K constitutes more than 90% of the production volume, on the average, and they sell Model 15K in semifinished form as well as in finished form (about 30% in semifinished form). The semifinished product is a sewing machine with only machining and assembling of the arm and bed completed, without painting.

No design work is done on the products themselves in this company, and drawings and specifications are already available from the beginning. At this point, the company has very few product design problems even without any design engineers.

Figure 1 is a sketch showing the main specifications for the domestic sewing machine, Model 15K.

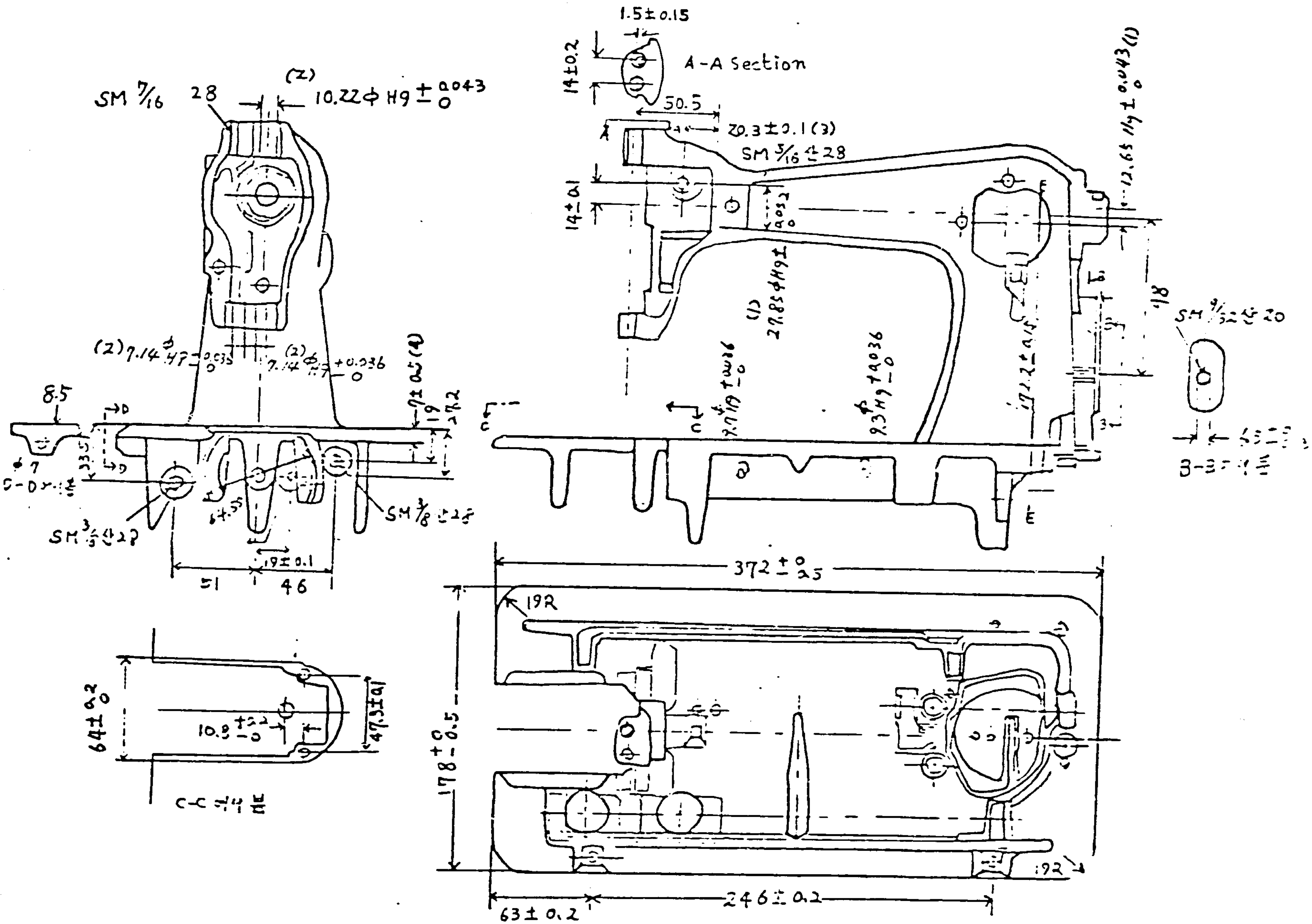
VII. Manufacturing Information

7-1 Purchased Materials and Components.

Iron castings of arm and bed, which are the most important raw materials, bolts and nuts of various sizes, and numerous parts and components except the main shafts and pulleys that are made in the company are

Figure 1

MAIN SPECIFICATIONS OF DOMESTIC SEWING MACHINE (MODEL 15K)

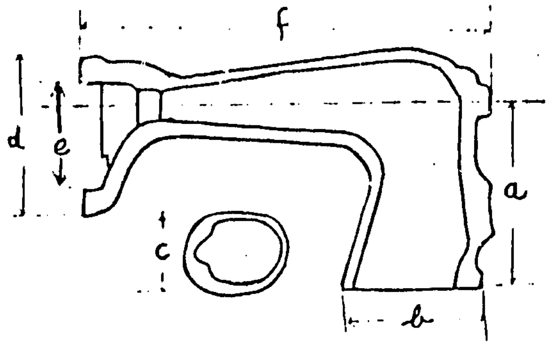


purchased from domestic suppliers. However, a few parts or components are acquired through import from Japan. Except for the unsatisfactory quality of the iron castings, material acquisition has given rise to little trouble up to now.

Figure 2-1 and Figure 2-2 show the sketches for the arm and bed, and their dimensional requirements.

Figure 2-1

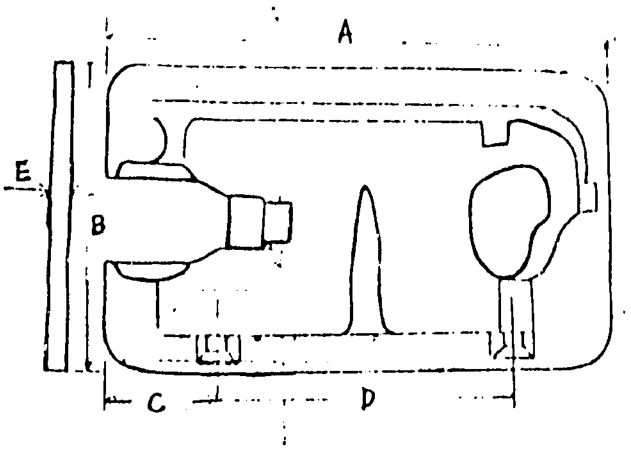
IRON CASTINGS OF ARM



Symbol	Dimension (mm)
a	147± 1
b	108± 1
c	93± 1
d	131.5± 1.5
e	89± 1.5
f	303± 2

Figure 2-2

IRON CASTINGS OF BED



Symbol	Dimension (mm)
A	376± 1
B	182± 1
C	65± 0.5
D	246± 1
E	8± 0.5

Other specifications are as follows (for both arm and bed)

Material; GC 15 (gray cast iron) in KS-D 4301
Tensile Strength; over 19kg/mm^2
Hardness; 241 HB at most
Deflection; 2.0mm at most
Surface Finish; 70-S in KS-BD161

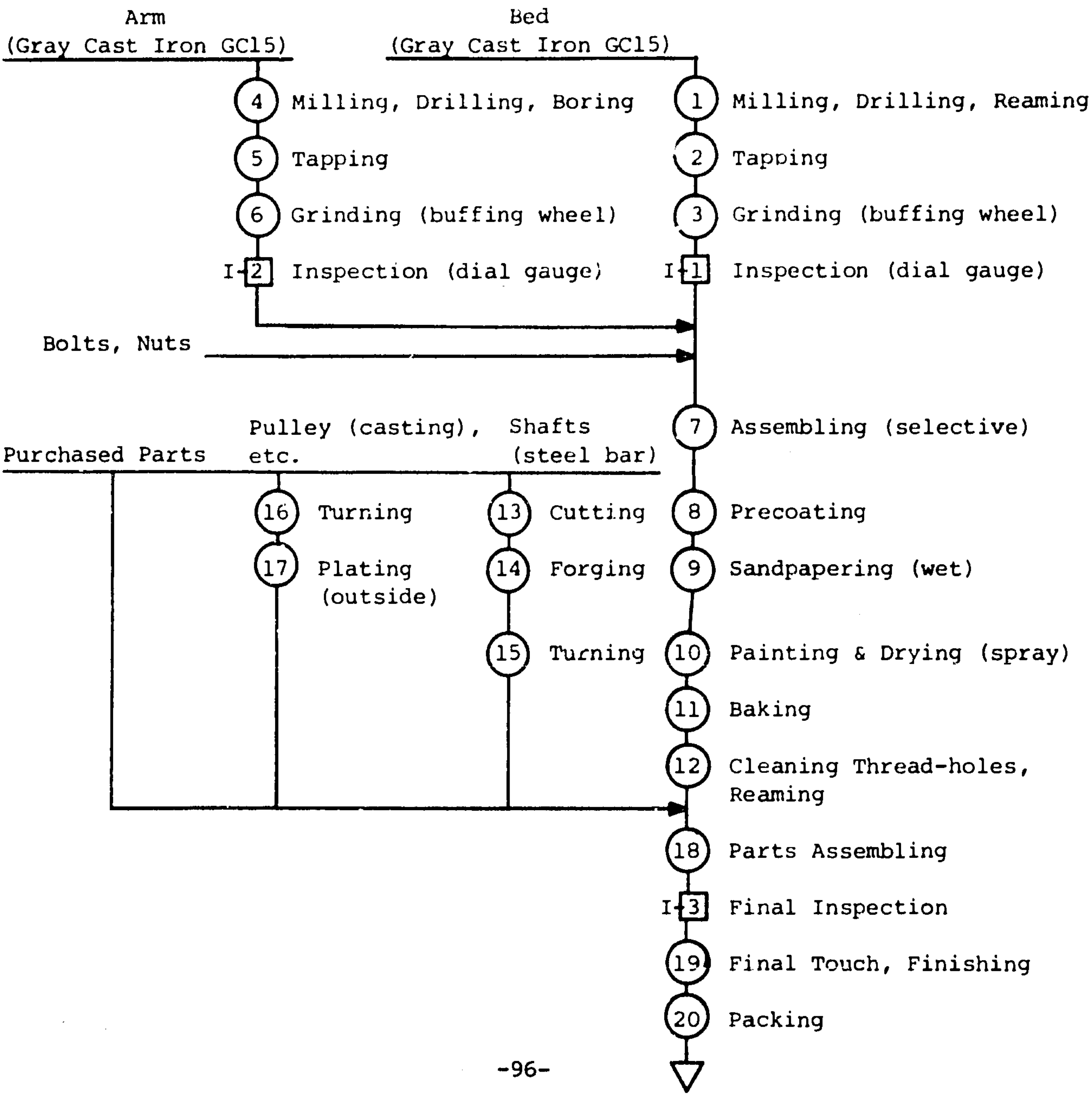
Among the above quality characteristics, hardness, surface finish and some of the physical dimensions are frequently found to be out of control during the manufacturing processes. However, this company relies mostly upon visual inspection, although it had provided a written set of standard practices for the inspection of incoming materials. This company does not have sufficient facilities or testing equipment and has no qualified personnel for this purpose.

7-2 Manufacturing Processes.

From the first milling operation to the final packing, there are more than a hundred separate operations. However, the manufacturing processes can be depicted by an Operation Process Chart, simplified as follows:

Figure 3

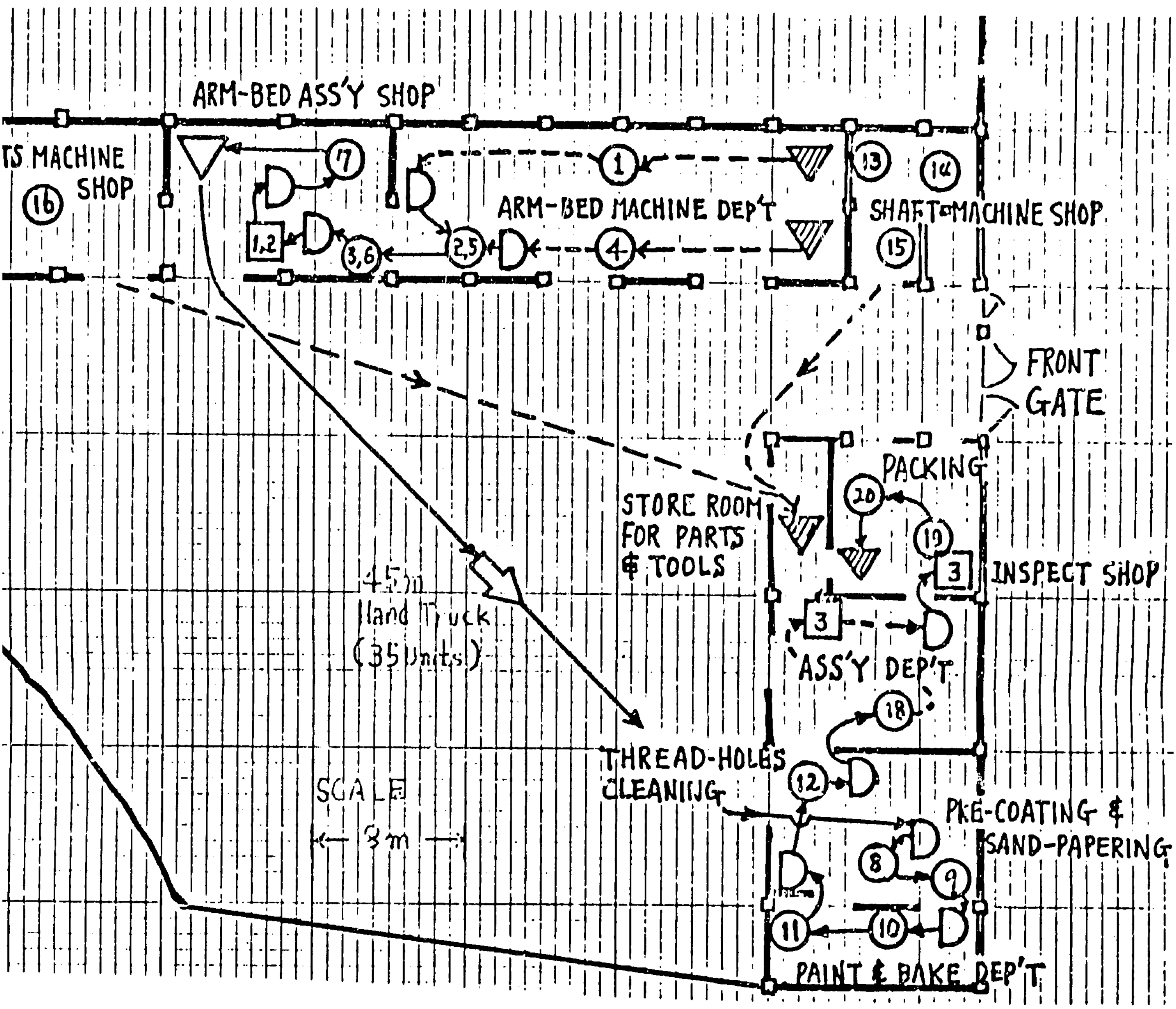
OPERATION PROCESS CHART



The above Operation Process Chart is rearranged below in a flow diagram in order to present a better picture of the manufacturing processes in the whole factory. The flow diagram is self-explanatory and the operation numbers and inspection numbers are the same as those in the operation process chart (Figure 3).

Figure 4

FLOW DIAGRAM

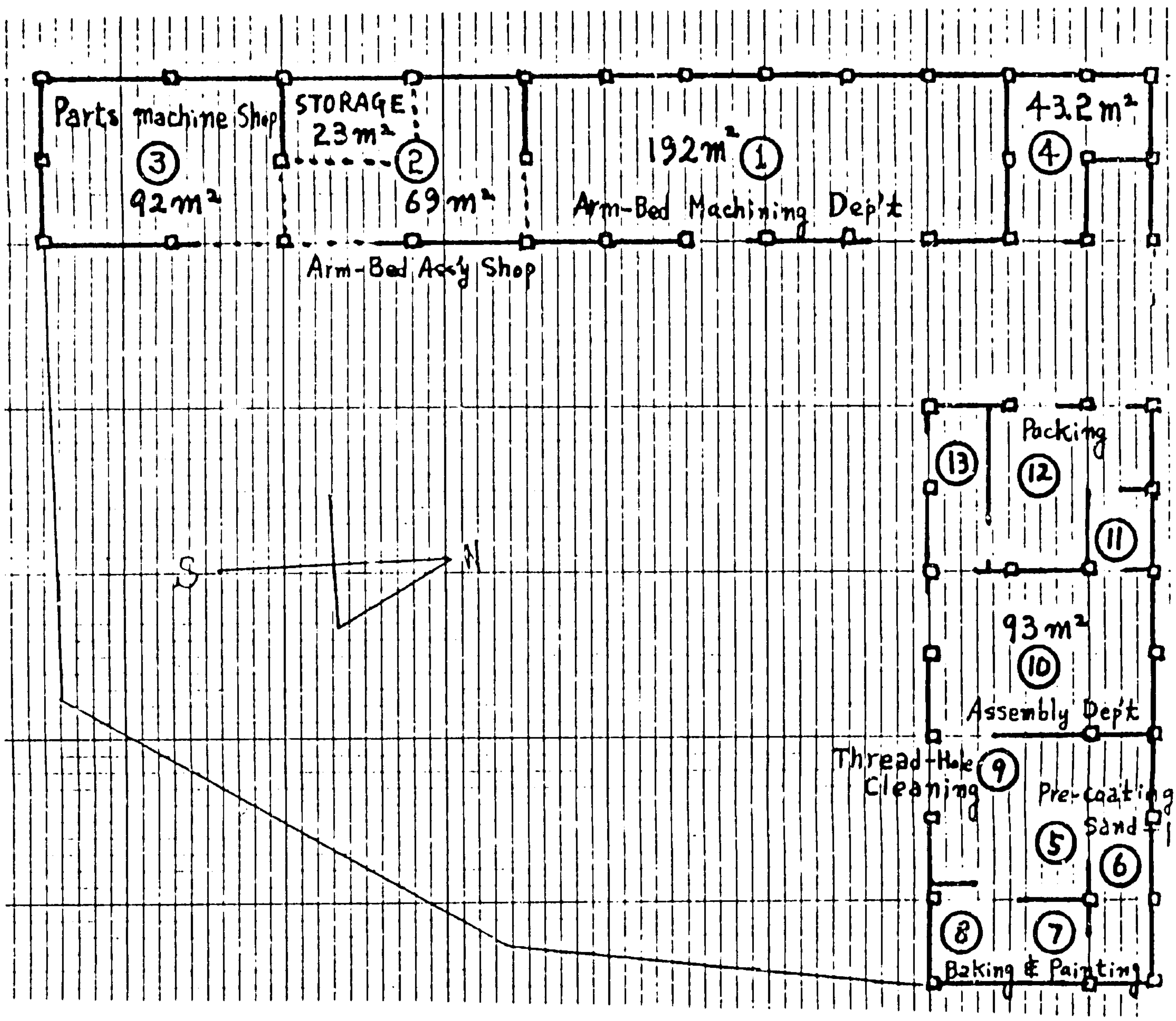


7-3 Manufacturing Facilities.

Total space available for manufacturing is about 745m^2. The overall arrangement of each department is shown in Figure 5.

Figure 5

BUILDING LAYOUT



Key to Figure 5*

1) Arm-Bed Machining Department

Area : $192m^2$
Equipment : Milling Machine - 20
Drilling Machine - 22
Boring Machine - 1
Reaming Machine - 4
Tapping Machine - 3

2) Arm-Bed Assembly Shop

Area : $92m^2$ ($23m^2$ is reserved and used for storage)
Equipment : Buffing Machine - 2
Grinding Machine - 2
Milling Machine - 1
Drilling Machine - 2
Dial Gauge - 2
Assembly Table and Tools

3) Parts Machine Shop

Area : $92m^2$
Equipment : Lathe - 8
Drilling Machine - 3
Milling Machine - 2
Small Press - 2

4) Shaft Machine Shop (leased to an independent vendor)

Area : $43.2m^2$
Equipment : Lathe - 8
Forging Facility - 1
Sawing Machine - 2
Swing-type Lathe - 2

5), 6) Precoating and Sandpapering Shop

Area : $64m^2$
Equipment : Precoating Facility - 1 set
Sandpapering Die (wet process)

7), 8) Painting and Baking Shop

Area : $35m^2$
Equipment : Spray Painting Facility - 1 set
Burner (oil) - 2 sets
Baking Facility - 2 sets

9) Thread-holes Cleaning Shop

Area : $40m^2$ (half of the area is used for storage)
Equipment : Large Working Table - 1
Hand Reamer - 3
Hole Cleaner (manual) - 5

(Continued)

Key to Figure 5* (Continued)

10) Assembly Department

    Area : $93m^2$
    Equipment : Assembly Facilities
    Work Benches
    Running Tester - 1 set

11) Inspection Shop

    Area : $14m^2$

12) Packing and Storage Area : $52m^2$

13) Parts and Tools Storeroom : $27m^2$

* Most of the machines are a bit specialized and machines are arranged following the manufacturing flow.

Appendix 7

STUDY OF THE UTILIZATION OF SOLAR ENERGY FOR WATER HEATING

STUDY OF THE UTILIZATION OF SOLAR ENERGY FOR WATER HEATING

Introduction

Solar energy is available any place on the earth. Although its energy density is very low, its energy quantity is very large. The major applications of solar energy are in water heating, space heating, refrigeration, and in the generation of electric power.

The purpose of this study is to determine the feasibility of utilizing solar energy for heating water. As a part of Georgia Institute of Technology (GIT) participation in the Small-Scale Industry Grant activities in Korea, Mr. Ed Lewis of the Economic Development Laboratory (EDL) visited Soong Jun University (SJU) during June 1976. During his three-week stay, he designed and supervised the construction of an experimental flat-plate solar collector.

Professor Byong Kyu Choi of the SJU Department of Industrial Engineering was on the GIT campus in Atlanta, Georgia, for three weeks in July 1976 observing and studying the solar energy research being conducted there.

An Experimental Solar Water System

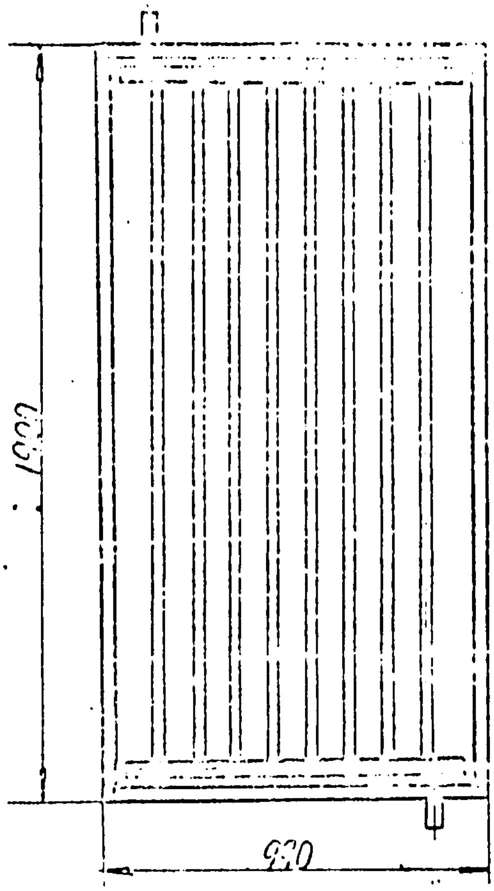
A solar heating system usually consists of a collector, a storage tank, and a load. The system built at SJU consists of a collector and a storage tank, but it has no load. The collector is the most important part of the system. The storage tank stores the solar energy, which can only be collected during daylight hours, thus making the heat available at all hours of the day.

Mr. Lewis designed a flat-plate water heating collector as shown in Figure 1. To improve collector efficiency, he wanted to use square steel tubing with thermal cement to hold the tube to the collector plate. However circular steel tube had to be used, welded to the plate rather than cemented to it, due to the lack of either square steel tubing or thermal cement in the Seoul area. Table 1 gives the specifications of the collector as it was built.

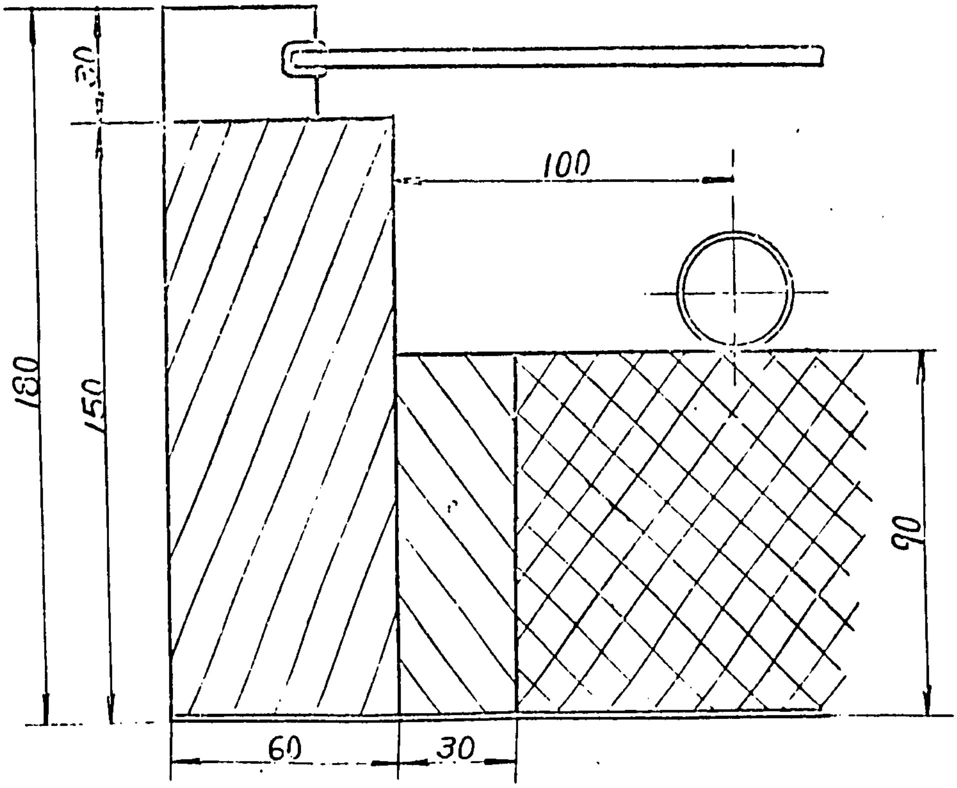
Water was used as the working substance for the energy transfer. Although natural convection is sometimes used for circulating the water, a forced convection system using an electrically powered 1/10 horsepower circulating water pump was installed in this unit. A 50-gallon drum was used as the storage tank. The collector was designed to be adjustable in order to determine the optimum

Figure 1

COLLECTOR



(a) Plane View of Collector



(b) Cross-Section View of Collector

Table 1

SPECIFICATIONS OF THE SOLAR COLLECTOR

Solar incidence area	1.62 m
Coating of panel surface	Black paint
Diameter of tube	1 inch
Number of tubes	8
Distance between tubes	10 cm
Thickness of panel	3.2 mm
Thickness of glass plate	5 mm
Height between panel and glass plate	7 cm
Material of frame	Wood
Material of insulation	Styrofoam and glass wool
Material of panel	Steel plate
Thickness of steel plate	2 mm

inclination of the collector. The initial inclination of the collector was set at 48° from horizontal and the unit was faced due south.

The piping and storage tank were insulated with styrofoam and glass wool. Piping is PVC hose of 1½-inch diameter. The entire unit was installed on a wheeled cart to allow it to be easily moved from place to place. Twenty-two gauge Cu-Co thermocouples are used for measuring the temperatures. These are installed in three places on the steel plate collector, on the entrance and exit tubes of the collector, at three points on the storage tank, and a ninth is utilized for the measurement of the ambient temperature. The storage tank contains 180 liters of water. During the colder months, the unit is filled with a 5% solution of antifreeze to prevent damage from freezing. Figure 2 presents a schematic diagram of the unit.

Experimental Results

Figure 3 presents the observed results from a typical day in September of 1976, with a reading taken every hour from 10:00 hours to 16:00 hours each day. Figure 4 gives comparable data for a typical day in October 1976.

To date the incidence and orientation have remained as originally set: 48° from horizontal and headed due south. Future plans call for experiments varying either or both the inclination and heading.

Table 2 presents data on collected solar energy, the maximum temperature of the water in the storage tank, and the average ambient temperature for the period between 10:00 and 16:00 hours.

Expenses

The cost of the materials which went into this solar unit totaled 200,000 ₩, including the cost of the cart. Exclusive of the cart, the unit cost 150,000 ₩; or 92,600 ₩/m^2. At an exchange rate of 448 ₩/$, the cost of the unit less cart would be US$206.70/$m^2$.

Figure 2

SCHEMATIC DIAGRAM OF SOLAR COLLECTOR

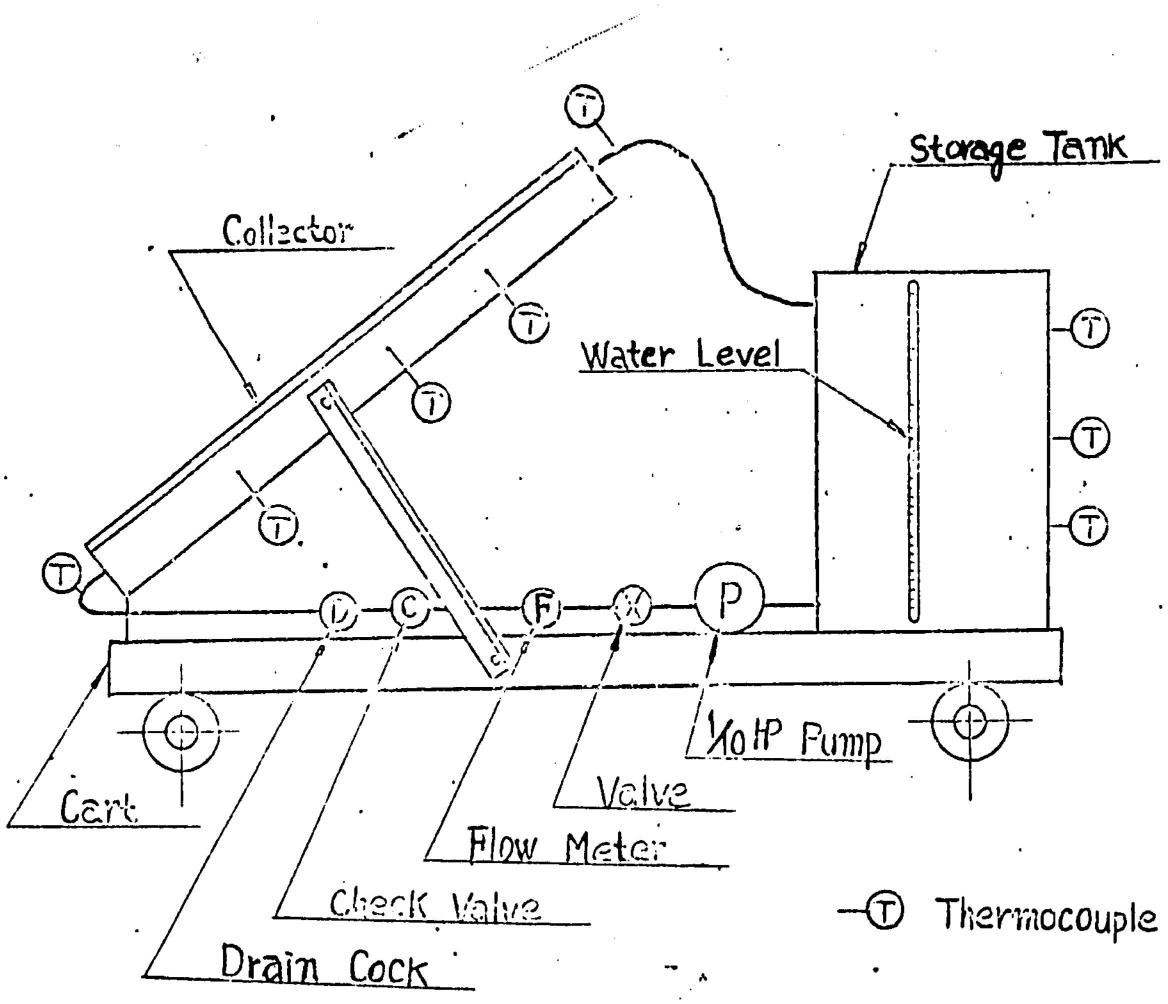


Figure 3

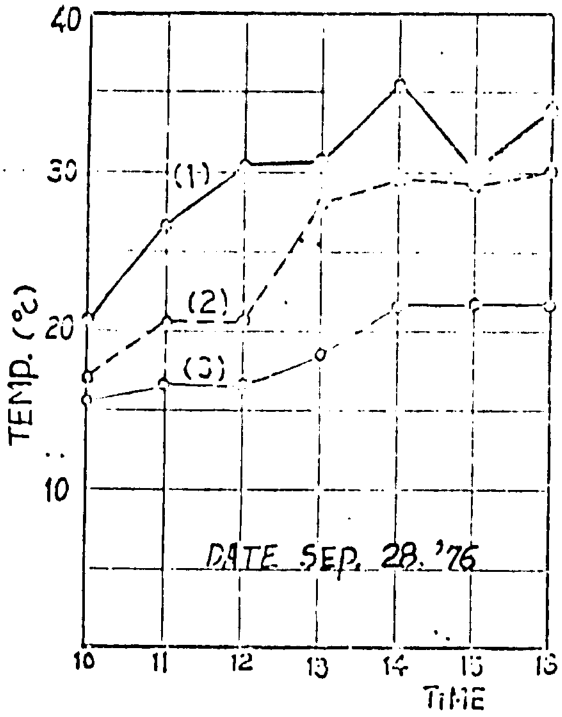
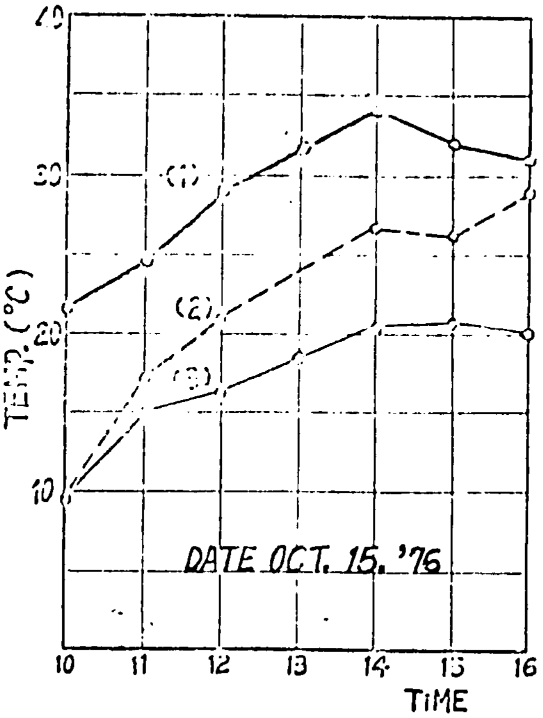


Figure 4



(1) Collector Surface Temp.

(2) Storage Tank Temp.

(3) Ambient Temp.

Table 2

	SEP. 28	OCT. 15
Collected Solar Energy	1400 kcal/day·m²	2133 Kcal/day·m²
Max. Temp. of water	30°C	29°C
Ave. Ambient Temp.	19°C	17°C