

**INDUSTRIAL DEVELOPMENT ADVISORY SERVICES
TO PAKISTAN**



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FINAL REPORT

A.R.F. Project No. I-021

ARMOUR RESEARCH FOUNDATION
OF ILLINOIS INSTITUTE OF TECHNOLOGY



ARMOUR RESEARCH FOUNDATION OF ILLINOIS INSTITUTE OF TECHNOLOGY

TECHNOLOGY CENTER • 10 WEST 35TH STREET • CHICAGO 18, ILLINOIS • U.S.A.

INTERNATIONAL DEPARTMENT

October 22, 1956

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Office of the Deputy Director
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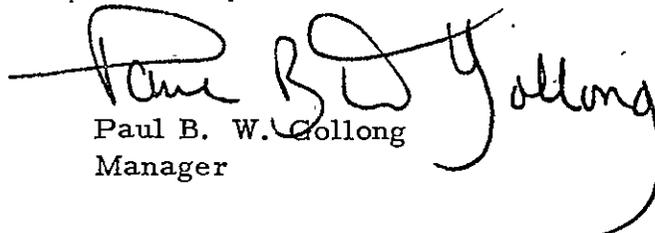
The Armour Research Foundation takes pleasure in transmitting the report on the program for Industrial Development Advisory Services to Pakistan, carried out in the field by our Mr. George D. Thomas, Machine Tool Technologist.

The two-year program of advisory services was conducted by the Foundation under contract with the International Cooperation Administration. The field work, supplemented and complemented by the staff and facilities of the base organization in Chicago, covered the broad areas of technological activities of importance both to the host country and to the U. S. Operations Mission in Karachi. Because of the nature of the program, the Foundation feels certain that the report will be a valuable guide in the subsequent technical development activities in Pakistan.

It is our understanding that Mr. Thomas may work directly with the Government of Pakistan, under contract with the International Cooperation Administration. We believe that such continuation of Mr. Thomas' services will do much to assure that the recommendations in the report will be carried out.

The Armour Research Foundation wishes to express its deep appreciation and pleasure for the co-operation given to Mr. Thomas and the many courtesies extended to him during his stay in Pakistan.

Sincerely,


Paul B. W. Collong
Manager

20

YEARS OF SERVICE THROUGH RESEARCH

1936-1956

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The Foundation wishes to express its appreciation to the many industrialists in Pakistan for their cooperation. The exchange of information and advice greatly contributed to the success of this project. In addition, the friendly assistance and constructive comments of the officials of the Government of Pakistan was deeply appreciated. These included Mr. Said Hasan, Secretary, Ministry of Economic Affairs; Mr. A. Khaleeli, Secretary, Ministry of Industries, and Mr. M. M. Qurereshi, Director-General, Department of Supply and Development.

ABSTRACT

Armour Research Foundation of Illinois Institute of Technology through the services of Mr. George D. Thomas, Machine Tool Technologist, provided technical assistance to the machine tool industries in Pakistan under a contract with the International Cooperation Administration.

Under this program, improved technological and production methods related to the machine tool industries were made available to the Pakistan Government and the United States Operations Mission to Pakistan.

In addition to formulating plans for the initiation of a program to encourage the establishment of small and medium size industries, the Technologist also served as Acting Industrial Advisor.

Technical assistance as afforded by the Foundation's Technologist has resulted in the counseling of Pakistani industrialists on machinery, equipment, and production methods. Particular emphasis was placed on the design and manufacture of production tools.

Frequently, recommendations were made to the Ministry of Economic Affairs and officials of the Planning Board of the Government of Pakistan, on the country's industrialization plans.

This report presents the findings of the Armour Research Foundation with regard to the level of mechanization of Pakistani industries; specific improvement programs initiated and carried out; plant and factory visits; recommendations made by the Technologist as Acting Industrial Advisor; additional technical assistance provided; the conclusions reached, and subsequent recommendations.

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Mr. Thomas concluded that continued technical and economic aid to the existing industries of Pakistan will bring about increased productivity, as well as a firm basis for sound future planning of the industrial development program.

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INDUSTRIAL DEVELOPMENT ADVISORY SERVICES

I. INTRODUCTION

In 1953, technical assistance to the mechanical industries of Pakistan was initiated under a contract between the Armour Research Foundation of Illinois Institute of Technology (ARF) and the International Cooperation Administration (ICA). Under this contract, Mr. George D. Thomas, ARF Machine Tool Technologist was assigned to the field for a one year period beginning in May, 1953.

As a result of his highly successful performance, the work was continued under a two year contract extension. This second tour of duty commenced on October 8, 1954 and terminated on September 19, 1956. The report summarizes the work conducted during this period. The contract provided for assistance to the Pakistan Government and the U. S. Operations Mission to Pakistan in improving technological and production methods related to the machine tool industries in Pakistan.

The Armour Research Foundation's Machine Tool Technologist's original duties consisted of training local technical personnel and mechanics in improved production techniques. However, during the Technologist's field assignment, the USOM Industrial Advisor returned to the U. S. A. leaving that position vacant until a replacement could be put in the field. The USOM/Pakistan conferred with Mr. Thomas and determined that in view of his past experience, he would be capable of extending his sphere of responsibility to include this additional temporary duty.

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Therefore, at the request of USOM/Pakistan, in January, 1955 the Technologist temporarily assumed the duties of the Industrial Advisor to the Mission, pending the arrival in Pakistan of a newly-appointed permanent Advisor. It was not until August of 1956 that the Advisor actually arrived in Karachi. In this interim period, Mr. Thomas carried out the duties of the Industrial Advisor to the Mission in addition to those as ARF Machine Tool Technologist.

Mr. Thomas' over-all assignment therefore centered on the following points:

1. Preliminary study of the manufacturing operations of small-scale and cottage industries, particularly from the viewpoint of correct use and application of machine tools and other production machinery.
2. Advice to those industries on the improvement in the use and application of such machinery, and, also, the use of machinery in place of hand labor whenever economically feasible.
3. Assistance to Pakistani industries in proper planning, designing, organization, and other aspects affecting quality and quantity of production.
4. Training of skilled and semi-skilled personnel in progressive production techniques, with particular emphasis on making the best use of the equipment and skills at hand.
5. Advice to the Government of Pakistan, particularly its Ministry of Industries, on the balanced expansion of small-scale and cottage industries, with minimum expenditure of foreign exchange.

6. Assistance to the industrial branch of USOM/Pakistan on all matters pertaining to the improvement of industrial production.
7. Industrial development advisory services to the Mission as Acting Industrial Advisor.

In addition to supplying the field services of a Machine Tool Technologist, the Foundation made available the supporting services of its home office staff of over 1,200 engineers, scientists and their assistants. The experience and facilities made available to the Technologist through this medium was of great aid in enabling him to fulfill the objectives of the program.

Backstopping services were afforded by Armour Research Foundation's staff in Chicago as an integral part of the services rendered. The staff support covered the three general areas of (1) engineering analysis, evaluation, and recommendation; (2) provision of technical data, statistics, drawings; and (3) furnishing of technical books and pamphlets as well as comprehensive technical literature surveys.

The technical information provided to the Technologist was coordinated through the International Department, which called on the other departments of the Foundation for specialized assistance as required. The major supporting departments were the Metals and Chemical Engineering Departments.

II. PRELIMINARY SURVEY

Upon arrival in Karachi, the ARF Technologist started an extensive survey of industries in the Karachi and Punjab areas in order to determine in what endeavors his services might best be utilized during his assignment.

As a result of this survey, it was decided that the framework of operation during the assignment should be centered on the following points:

1. Improvement of available machinery and mechanization of hand operations whenever economically possible.
2. Selection of certain skilled men from various industries for subsequent training in modern shop techniques through demonstrations and instructions.
3. Analysis of manufacturing requirements of products being manufactured with suggestions for improvements.
4. Initiation of production control, and other aspects of industrial engineering.
5. Evaluation of existing plant design and plant layout with suitable recommendations.
6. A review of raw materials with the viewpoint of reducing costs and improving products.
7. Application of new manufacturing methods aimed at eliminating useless motions, aiding work, increasing output, and reducing fatigue.

This was, in effect, a continuation of the highly successful work which was carried out by Mr. Thomas during his initial tour of duty in the area.

III. IMPROVEMENT PROGRAM

As a result of the survey, the Foundation believed that its attention would best be devoted to the detailed technological problems of representative industries rather than outlining broad technological problems in Pakistan and their solutions. Therefore, this report emphasizes and presents the technical aid given to specific industries.

Plant visits made by the Technologist are listed in the sections which follow. They are divided into those made to the Punjab and those plant visits made outside of that area. Since a number of companies were visited several times during this second phase of the technical aid program, the industries are listed in alphabetical sequence, by company name, and not in the order visited.

In January, 1955, the improvement program was expanded to include advisory services to the Mission by Mr. Thomas in his capacity as Acting Industrial Advisor. Mr. Thomas held this Advisory position until August, 1956, one month prior to the Technologist's departure from the field.

In view of Mr. Thomas' dual role, namely, that of Machine Tool Technologist and Acting Industrial Advisor, no attempt has been made to report on the two assignments separately. The two areas of responsibility overlapped so closely that it would be difficult to determine the dividing line between them.

IV. TECHNICAL EVALUATION OF PLANTS

General

In order to assist specific industries and make recommendations on their unique problems, the Technologist visited the factories listed below.

A. Afaco Surgical Works

Mr. Thomas visited the Afaco Surgical Works to guide and supervise the construction of desks and chairs for the Karachi-American School. The fabrication of these items was introduced to this company by the Technologist.

B. Allwin Engineering Company

Visits were made to inspect three new turret lathes the plant had purchased. The Technologist gave instructions on the proper location and wiring of these machines, and described how these machines should be tooled for manufacturing piston pins, pistons, and rings. Suggestions were also made on proper tolerances to be maintained on different sizes of pistons.

C. Amson Dairy

The Technologist inspected the dairy's facilities and investigated their ability to handle the reconstitution of powdered milk. This product was brought into Pakistan under the Commodity Aid Program by ICA. After careful study, it was decided that the plant's facilities were inadequate to perform this operation. As a result, new facilities were recommended.

D. Bureau of Industrial Design and Research and Export, Ltd.

Mr. S. A. Hosain, Managing Director of this newly-organized engineering consulting firm, requested advice in setting up a modern engineering office. At a meeting between Mr. Hosain and the Technologist plans were discussed and recommendations made for initiating a modern engineering consulting firm. Later, detailed information was presented to him which included a complete list of consultants needed and their qualifications. Also, detailed plans were provided for the organization and supplies required for a ten-man designing office. This included an estimated cost on office equipment and supplies.

E. Central Mechanical Engineering Company.

The Technologist provided advice and recommendations on machine operations, pattern making and some of the techniques of sand casting for the Singer Sewing Machine parts produced by this company. This plant will assume the responsibility of manufacturing the needed sample parts subject to approval of Singer's management for future manufacture in Pakistan.

After completion of the sewing machine sample parts, Mr. Patel, the managing director, indicated that up to this time he had not realized the capabilities of his workers and the capacity of his production. He felt that this had been brought about through the supervision and guidance of the Technologist. Mr. Patel was very pleased and proud of the quality of work produced on these sample parts. Realizing that

his men can perform intricate quality work, he now plans to orient his workers in the manufacture and production of locks and other hardware items. The Technologist was asked to process operation sequences for various parts required for the mass production of locks. He was also asked to make sketches for the dies, jigs and fixtures required. Please see photographs on pages 9 and 10.

F. Kruddson, Ltd.

This shop is a metal products manufacturing concern producing fifty pound steel drums, and porcelain utensils mostly used by the military. The plant is equipped with expensive, modern heavy equipment. It was discouraging to find this plant operating at about one-third capacity due to lack of raw material.

G. Malik Industries Plant

This plant had suffered severe flood damage. Mr. Thomas provided advice on measures for restoration of the plant and for its future development and expansion. He also suggested that use be made of the facilities of the new Industrial Productivity Center in Pakistan. Job descriptions for the type of foreign technicians which might be required by this company were provided.

H. Muhammadi Engineering Works, Ltd.

Through Mr. Said Hasan, Secretary, Ministry of Economic Affairs, Mr. Thomas met the manager of the Muhammadi Engineering Works, Ltd., a ship building, operating and repairing firm. Muhammadi



Photo 1 a

Mr. George Thomas of Armour Research Foundation and Mr. Raymond Simard, General Manager of Singer Sewing Machine Company in Karachi, inspecting the first sample model of the cope and the drag for the leg of the sewing machine base manufactured at Central Mechanical Engineering Company of Karachi.



Photo 2 a

The first sample model of the sewing machine base manufactured at Central Mechanical Engineering Company of Karachi is inspected by Mr. George D. Thomas, Machine Tool Technologist of Armour Research Foundation and Mr. Raymond Simard.



Photo 1 b

The first samples of screw machine and punch press parts for sewing machine manufactured at Central Mechanical Engineering are inspected by Mr. Raymond Simard, General Manager of Singer Sewing Machine Company and Mr. G. D. Thomas, Armour Research Foundation's Machine Tool Technologist.



Photo 2 b

Mr. George Thomas of Armour Research Foundation accompanied by Mr. Raymond Simard, General Manager of Singer Sewing Machine Company in Karachi, instructing local mold makers in the molding of the first sample model of the sewing machine base manufactured at Central Mechanical Engineering Company of Karachi.

owns several textile mills and considerable real estate holdings. This organization was interested in making oil firing equipment, vertical boilers, gas stoves, umbrella ribs, and textile finishing machinery. During the course of subsequent meetings, preliminary plans were formulated for manufacturing this equipment.

I. Pakistan Industries, Ltd.

An inspection of the plant revealed that there were approximately 30 wood screw making machines which were foreign purchased. About 25% of the production was "waste" since the equipment was very old. The plant itself was operating inefficiently. After inspecting the machinery, the Technologist discovered most of the bearings and shafts were badly worn. This created a great deal of waste and poor quality of product. By adjusting one of these machines, it gave a better performance. The shop foreman was given detailed instructions on how each machine was to be completely overhauled.

Three years ago, Pakistan Industries, Ltd. purchased some American-made electric generators. These generators were in need of spare parts and such parts were not obtainable. Plans had been made originally to have spare parts made in Europe. The Technologist suggested that the needed parts be made locally and recommended several local companies equipped to make these spare parts. It is interesting to note that the owners of the company were not aware of the existence of these facilities in the Karachi area.

J. Pervez Boot Polish Company

The above company had diversified into the manufacture of kerosene furnaces and ash trays. Mr. Thomas found that due to improper design the dies used were not producing satisfactory parts. The Technologist prepared sketches for reworking some of the dies and for making several new ones.

K. Pervez Industrial Corporation

Pervez Industrial Corporation requested detailed information on die design, particularly for die casting of brass. A complete report was submitted which described the steels to be used for brass die casting dies; the recommended heat-treatment for the specified steel; die venting, lubrication, shrinkage and temperatures; temperature measuring devices; procedures and furnaces for the melting of copper, brass and bronze. The recommendation that simple forging dies be used instead of die casting was accepted by the management. Additional advice was also given to correct some of the dies not producing satisfactory parts because of poor designs and workmanship. The present manual filling of shoe polish cans by this company has resulted in incorrect dispensing of material. To correct this condition, the Technologist supplied the company with a sketch of an automatic dispensing device.

L. Singer Sewing Machine Company

The Technologist was asked by Mr. Raymond Simard, General Manager of the Singer Sewing Machine Company in Pakistan, to

accompany him to inspect Singer's newly-organized assembly plant and facilities. This company has recently acquired an import license to import parts to be assembled in Pakistan. Mr. Thomas was directly responsible for the recommendations made to the Singer Company that will result in continued operation of the plant beyond a six-month plan, and for the setting up of a shop for the manufacture of machine parts. The making of these sewing machine parts locally will enable the company to import only those parts that cannot be manufactured in Pakistan and will solve a major import problem.

The Technologist reviewed the quality and cost of the sample parts manufactured by this firm. In comparing figures, it was discovered that it would be far less costly to import finished parts, in spite of a 30% import duty and 10% tax. This is mostly due to high cost of production and high cost of materials.

M. Sorson Electric Manufacturing Company

The above company is engaged in the production of electrical equipment such as electric irons, electric heaters, etc. Suggestions were made on improving the machining of the electric iron base and other parts changing from a lathe to a milling operation to give a better finish and improved quality. It was also suggested that the electric iron cover plate be made from a stamping instead of a casting. All of these suggestions were incorporated as recommended.

N. Steel General Mills Shop

The Technologist pointed out to the General Manager that the machines were definitely overloaded. Steel rollers were being machined beyond the capacity of the equipment employed. Defects were detected in the spindle and bearings of the machine. The Technologist was told that no heavier lathes were available. Improvements were suggested by Mr. Thomas. The heavy casting operations were considered satisfactory.

O. Sterling Plywood Industries

The above plant is equipped with modern machinery. The Technologist volunteered a few suggestions on a rotary sanding machine. Attention was called to the excessive stock being removed by this operation. The machine is not designed to remove this amount of stock. It was recommended that all steam fittings on the laminating press be replaced to eliminate unaccountable leakages.

P. WAH Ordnance Plant at Rawalpindi

This visit was made at the request of the IGA Director in December, 1955. An extensive eight-day survey was carried out and a report prepared. The report was "secret" and cannot be further elaborated upon in this report. However, the Mission has submitted a copy of the report to Washington.

Q. Water Power Engineering Company

This shop is engaged in water pump and refractory work. The water pump assembly and castings were inspected and found to be satisfactory.

V. ADVISORY SERVICES IN THE PUNJAB

General

To afford the major industries in the cities of Punjab with technical advice and assistance, the Technologist accompanied by Mr. I. T. Mulla, undertook an inspection trip in May of 1956. The industries visited were in areas such as Sailkot, Mazimabad, Gujranwala, and Lahore.

A. Anwor Industries, Gujranwala (West Pakistan)

Management: Mr. M. R. Anwor (Owner), Mr. Abdul Azisnias
(Plant Manager)

Estimated Capital Worth: Rs. 400,000

Manufacturers of: Pipe fittings such as valves, cock and fittings
for steam, oil, fire, water and gas use.

Personnel Employed: 69

Production Output: Rs. 400,000 per year.

This factory was established in April of 1955, and in a short time, has shown tremendous progress. The work, although of good quality, does not fully utilize standardization. With some technical assistance, this company can improve its quality and production to a great extent.

B. Bombay Brass Works, Gujranwala (WP)

Management: Mohamad Latif Blatti (Owner), Khwaja Bashir Ahmad
(General Manager)

Estimated Capital Worth: Rs. 1,000,000

Manufacturers of: Utensils

Personnel Employed: 175

Production Output: Rs. 1,800,000

This firm is the largest producer of utensils made of brass and aluminum. Better planning and organization was suggested at this plant. Several recommendations were made on the draw dies and spinning operations.

C. Ch. Fazal Din and Sons, Sialkot (W. P.)

Management: Mr. Mohd. Amin, Managing Partner
Manufacturers of: Small tools such as hammers, chisels,
drills, planers, dividers, etc.
Estimated Capital Worth: Rs. 500,000
Personnel Employed: 125
Production Output: Rs. 400,000

This is the largest company manufacturing small tools in Pakistan. The Technologist pointed out certain defects in the manufacturing operations to the manager.

D. Climax Engineering Works, Gujranwala (W. P.)

Management: Mr. Abdul Aziz (General Manager and Owner)
Estimated Capital Worth: Rs. 1,200,000
Manufacturers of: Ceiling, table and exhaust fans and
electric motors.
Personnel Employed: 230
Production Output: 50 to 60 per day (Ceiling, table and exhaust
fans - 15 per month 1/2 to 2 HP motors).

This is one of the largest fan manufacturing plants in Pakistan. Mr. Aziz expressed some concern to the Technologist on the subject of Government regulations and restrictions.

E. Ghulam Muhammad and Sons, Lahore (W. P.)

Management: Mr. Muhammed Nazir (Managing Director)
Estimated Capital Worth: Rs. 700,000
Manufacturers of: Machine tools and diesel engines.
Personnel Employed: 53

Production Output: Three lathes a month from 5-1/2 to 10 foot bed. Two diesel engines per month from 16 HP to 50-HP.

This company is well known in Lahore as a machine tool and diesel engine manufacturer. The Technologist, during inspection, suggested many changes. The Technologist also furnished material specifications for the manufacture of pistons, rings, cylinder liners for the diesel engines as requested by Mr. Nazir.

F. Hakam Dim and Sons, Sialkot (W. P.)

Management: Mr. Muhmad Ashraf
Estimated Capital Worth: Rs. 100,000
Manufacturers of: Military brass bands, pipe, band and orchestral musical instruments.
Personnel employed: 22
Production Output: Rs. 72,000 per year.

Manufacture of most items is handicapped by unavailability of machines and proper raw materials. Mr. Ashraf stated that easing of import license grants would help alleviate the problem.

G. Immuddin and Sons, Sialkot (W. P.)

Management: Mr. Muhd. Iqbal
Estimated Capital Worth: Rs. 400,000
Manufacturers of: 12 G. shot guns
Personnel Employed: 52
Production Output: Twelve guns per day.

The Technologist suggested an alternate method of drilling operation that increased the rate of production.

H. Joseph Brothers and Sons, Nazimabad (W. P.)

Management: Mr. Mohammad Joseph, Owner
Estimated Capital Worth: Rs. 25,000
Manufacturers of: Cutlery and small tools
Personnel Employed: 10
Production Output: Rs. 50,000 per year.

This shop is strictly a cottage industry. The quality of work seemed satisfactory considering the hand operations employed.

I. Khawri and Company, Nazimabad (W. P.)

Management: Mr. K. A. Khawri
Estimated Capital Worth: Rs. 250,000
Manufacturers of: Small tools and cutlery
Personnel Employed: 130
Production Output: Rs. 400,000 per year.

This company is making the same type of small tools as Ch. Fazal Din and Sons in Sialkot. Recommendations made by the Technologist concerning machine location and scrap material were accepted by Mr. Khawri.

J. M. F. Elahi and Company, Sialkot (W. P.)

Management: Mr. Abdul Qayum Khan, Owner
Estimated Capital Worth: Rs. 500,000
Manufacturers of: Surgical Instruments
Personnel Employed: 103
Production Output: Rs. 700,000 to 800,000 per year.

The quality of instruments produced at this shop is good. All instruments are made from stainless steel. Mr. Khan indicated that 90% of his products are exported and about 10% are locally sold. He stated that their greatest difficulty is getting an import license for materials.

K. Pak Alam Industries, Sialkot (W.P.)

Management: Mr. Manboob Alam, Managing Director
Estimated Capital Worth: Rs. 25,000
Manufacturers of: Cutlery
Personnel Employed: 26
Production Output: Rs. 90,000 per year.

Production mainly on a cottage industry basis. The appearance of the work was considered satisfactory.

L. Rajpul Metal Works, Gujranwala (W.P.)

Management: Mr. Mohammed Jamil (Partner)
Estimated Capital Worth: Rs. 1,000,000
Manufacturers of: Non-ferrous alloys, pipe fittings and valves.
Personnel Employed: 100
Production Output: Rs. 1,500,000 per year.

Production at this plant could be greatly increased if raw materials were available.

M. Taqi Butt and Company, Lahore (W.P.)

Management: Mr. Taqui Butt (Owner)
Estimated Capital Worth: Rs. 1,000,000
Manufacturers of: Hospital equipment such as beds, operating tables, sterilizing units, hospital enamelware, etc.
Personnel Employed: 60
Production Output: Rs. 300,000 per year.

The products manufactured are essential to the country and this company is capable of producing quality products at reasonable prices. Lack of import licenses for proper raw materials has severely hampered the company's progress and caused a reduction in quality of its hospital equipment.

N. Uberoi Corporated Sports, Ltd., Sialkot (W. P.)

Management: Mr. Khawja Hakam Din
Estimated Capital Worth: Rs. 500,000
Manufacturers of: Sporting Goods
Personnel Employed: 250
Production Output: Rs. 600,000 per year.

This is the largest sporting goods manufacturing plant in Pakistan. The quality of work produced here is very satisfactory.

O. Union Surgical Company, Sialkot (W. P.)

Management: Mr. M. A. Ghani, Owner
Estimated Capital Worth: Rs. 150,000
Manufacturers of: Surgical instruments
Personnel Employed: 66
Production Output: Rs. 250,000 per year.

The quality of the surgical instruments produced at this shop is good. Mr. Ghani showed the Technologist orders received from European countries to which he is exporting his products. To improve the quality of the instruments further, the Technologist suggested that the first forging operation be done with a forging die rather than by hand. This would provide a better and more uniform flow of the metal.

VI. ADDITIONAL TECHNICAL ASSISTANCE PROVIDED

During the course of the project, the Foundation and its field technologist in Pakistan were asked to provide spot assistance and advice on general technological problems confronting industries, individuals, government organizations, and other interested parties. Although not of an extensive technical effort, this type of assistance was of decided benefit since it aided in the most obvious technological problems. On a number of occasions, the Technologist was called upon to inspect industrial operations in order to provide technical consultation services. Typical examples of these services are detailed below.

A. Central Division, PWD, Lahore

In a trip to Lahore to inspect and check the progress on the -Center building, the Technologist discussed with Mr. Ali Mozaffer, Executive Engineer, Central Division, PWD, Lahore, certain changes on the driveways and roads surrounding the buildings and modifications on some of the electrical wiring. The revisions resulted in the savings of approximately Rs. 33,000 and caused the cancellation of a request to the Central Government for additional funds.

B. Central Engineering Company

The Technologist recommended the design of an American-type of pulley which resulted in a 250% increase in production. The new design reduced the weight of the pulley by one-half. The new item found immediate acceptance by Pakistan's industry.

C. Daco Machine and Tool Company

Mr. Alois A. Stauber, President of the Daco Machine and Tool Company, arrived in Karachi and spent two weeks as an ICA consultant. This was a reconnaissance visit to Karachi and Lahore, in connection with the proposed Industrial Research and Development Center. The Technologist met Mr. Stauber and devoted the scheduled two weeks to briefing him on the Center's progress and activities.

D. Department of Supply and Development

The status of the non-ferrous metal industries in Pakistan was made known to Mr. I. I. Khatri, Director of Engineering, Department of Supply and Development and Mr. Folke Petron, UN Technical Assistance Board Advisor.

E. Electronics Industries, Ltd.

Mr. R. A. McEwen, Production Manager of Electronic Industries, Ltd., was advised by Mr. Thomas on sources to contact in Pakistan for the manufacture of essential radio parts.

F. International Cooperation Administration

During the month of November, 1955 the Technologist spent ten days with Mr. Victor A. Gauthier (Area Operations Chief, Near East, South Asia and Africa, ICA/Washington) during his visit to Pakistan for the purpose of reviewing the industry program. During this time, Mr. Gauthier accompanied Mr. Thomas on his plant visits to Allwin

Engineering Company, Metalex Corporation, Central Mechanical Engineering Company and several others. The various improvements in methods at these companies were explained to Mr. Gauthier in detail.

G. Investment Guaranties Branch

Mr. Charles B. Warden and Mr. G. Anton Burgers of Investment Guaranties Branch Investment Development Branch, respectively, arrived in Karachi to discuss the matter of investment guaranties as well as expected problems in industry in this respect.

H. Training Center at Lahore

At the request of USOM/Pakistan, and the GOP officials with whom the technologist was working, Mr. Thomas followed the progress of the construction of the Training Center building in Lahore, and made himself available for consultation and assistance as requested.

I. Training School at Dacca

Assistance was given to the diesel locomotive specialist in completing formal project forms for setting up a training school in this field at Dacca.

J. United Nations Meeting

The Technologist participated in meetings with certain officials of the United Nations to discuss the latter's program for technical assistance to Pakistan. This was done primarily to avoid any duplication of effort with the USOM program.

K. U. S. House of Representatives

A group from the U. S. House of Representatives arrived in Pakistan, and at the request of USOM, the Technologist conducted the congressmen on a tour of several of the industries. The visitors appeared to be very favorably impressed by the many improvements which had been initiated by the ARF Technologist.

L. Visit of Dr. William Russell, ICA/Washington

Dr. William Russell, Deputy Director for Technical Services, ICA, Washington, visited Karachi. Mr. Thomas arranged for several industry visits to illustrate the accomplishments of his work with these industries.

M. Miscellaneous

1. A special report to provide a basic inventory of the USOM/- Pakistan programs in industry was requested by the Deputy Director of Programing. This report included a description of the Mission's activities, progress and problems, and the role of the GOP and other agencies in terms of technicians and investment in capital and equipment.

2. In his capacity as Advisor, the Technologist conducted the orientation of newly arrived Specialists and made arrangements for their meeting with the Embassy and USOM personnel, and GOP officials and Pakistani industrialists. Meetings were also arranged with members of The Ford Foundation and the Planning Board to discuss various pending projects of interest to the Specialists.

3. Mr. Jamil A. Khan, ICA Audio-Visual and Information Department employee, was assisted in the preparation of an "industry" safety program to be used by the newly organized school in Karachi.

4. Mr. Mohammed Amir, Managing Partner of Mohammad Khalil and Sons, was aided in the procurement of a manufacturing license for sewing machine parts. Inspection of the parts revealed that they are far superior to the present commercially available pieces.

5. The Technologist advised the General Iron and Steel Works on the importation of electrical equipment.

6. The Technologist met Mr. Harold Stassen, and discussed the prevailing conditions and problems of Pakistani industries. Needed improvements in present and new industries by means of technical and commodity aid was strongly urged. As a result a special cable bearing Mr. Stassen's name was directed to Washington to expedite delivery of the iron and steel commodities to Pakistan.

7. Mr. Thomas was appointed in May, 1955 to serve as a member of the Steering Committee of the Standing Training Conference to be conducted monthly at the Institute of Personnel Training. The purpose of such a conference was to provide opportunity for exchange of information and encourage coordination among organizations and individuals active in various fields of training.

8. Prior to his departure from Pakistan, Mr. Thomas held several orientation meetings with the Program office and the new Chief Industry Officer, Mr. Harrison H. Echols.

VII. NEW PROJECTS

The Foundation's Technologist during his assignment in Pakistan devoted considerable time to developing new projects for the industry program of the Mission. The areas explored by Mr. Thomas are listed below.

A. Establishment of the Small Industries

Mr. Thomas repeatedly offered advice on the establishment of the small industries. The over-all plan provided for such industries, when established, to be sold to private industry. The industries, in turn, would have technical support available to them from the projected Industrial Research and Training Center.

B. - Expansion of Allwin Engineering Company, Landhi

The Technologist's recommendation for the new plant site and building erection for the Allwin Engineering Company in Landhi was unanimously accepted by the Board of Directors of that company.

C. Glass Factory in the Karachi Area

The Technologist consulted with two local industrialists who plan to set up a much needed glass factory in the Karachi area. The site was visited and consultations held with the representative of the company which is to supply the equipment and machinery. Although the factory has government approval, difficulty is being encountered in securing import licenses. In view of the importance of the industry, the Technologist undertook to expedite the issuance of the licenses.

D. Industrial Research and Development Center

The Foundation's Technologist was asked in April, 1956 by Dr. H. K. Ghori, Project Director of the Industrial Research and Development Center, to review the Center's administration and organizational setup. He was also asked to prepare a complete list of salary scales for all personnel to be employed directly by the Center. The findings were submitted to the Ministries of Industries, Finance, and Economic Affairs for approval and sanction. The Foundation stated that it was able to undertake the staffing and implementation of the Center to both ICA/Washington and the Mission.

E. Kashmir Development Corporation

Information useful for the operation of a plywood factory was made available to Mr. M. R. Akhtar of Kashmir Development Corporation.

F. Utilization of Sui Gas

Mr. Thomas worked on projects related to the utilization of Sui (natural) gas for chemical and agricultural use. Several meetings were conducted with PIDC officials and Ministry of Industries to assemble the information. On July 26, 1955 the Foundation presented to the Ministry of Economic Affairs, Government of Pakistan, a proposal which described an approach to the development of the industrial potential of Sui gas in Pakistan.

VIII. SUMMARY AND CONCLUSIONS

The Foundation's Technologist, under this program, made available to the Pakistan Government and the United States Operations Mission to Pakistan improved technological and production methods related to the machine tool industries.

The technical evaluation of plants, advisory services in the Punjab, additional technical assistance to industrialists, and the investigations of new projects in Pakistan were undertaken by Mr. Thomas.

Field trips by the Technologist have enabled Mr. Thomas to make many recommendations on current problems and new developments in the industries. However, the industries are still handicapped by the lack of materials, spare parts, machinery and equipment, and qualified technicians. With proper supervision and guidance and technical know-how, the use of Pakistani materials and skills can be applied to the betterment of most of the industries of Pakistan. Most of the industrialists and Government officials are not aware of the industry facilities that are available in Pakistan.

Correction of the production difficulties that have resulted from the lack of raw materials and spare parts should encourage and lessen the risks involved to foreign investors.

As a result of the technologist's observations and discussions the Foundation feels that increased technical and economic aid should be extended to those industries operating at low capacity. In many cases, the difficulties caused by the shortage of imported raw materials, machinery

and replacement parts poses a real threat that operations may cease completely in the near future. However, the Foundation is confident that technical and economic aid to the existing industries will bring about increased productivity as well as a firm basis for sound future planning of the industrial development program.

The enthusiastic and appreciative reception of the Technologist's services, demonstrates the need for continued technical aid.