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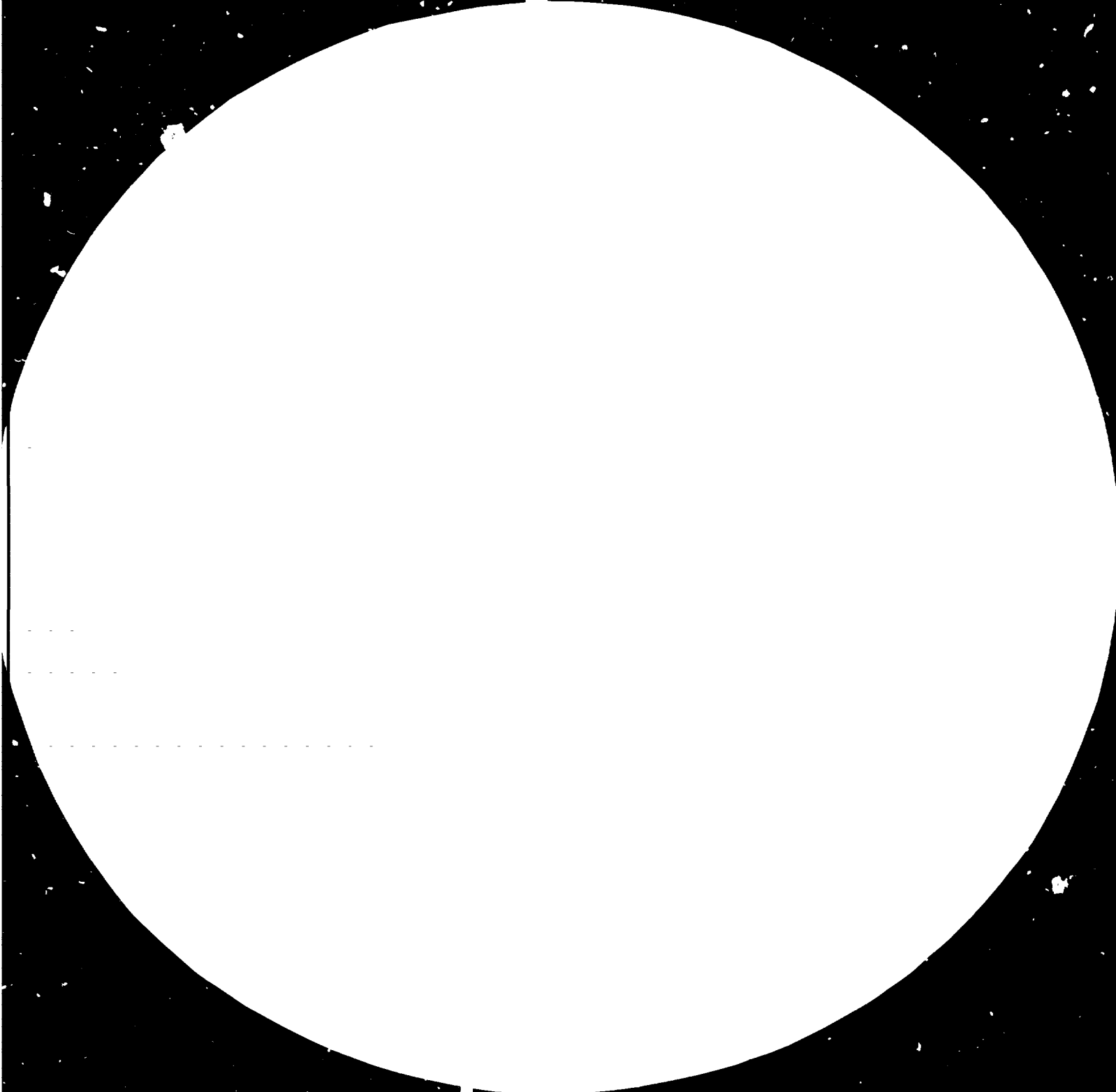
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DEVELOPMENT PROGRAMME IN TURKEY

11827

21 July 1982

Capital Goods Development Project
in Turkey,

DP/TUR/76/034

REPORT

ON THE WORK OF Mr. JAN MALKUS, INDUSTRIAL ENGINEER,
EXPERT ON CAPITAL GOODS MANUFACTURING INDUSTRY

Post, DP/TUR/76/034/11-04/31.2.A.

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1. INTRODUCTION

1.1. The State Planning Organisation(SPO) of Turkey, in close collaboration with the United Nations Industrial Development Organization (UNIDO) has undertaken a detailed study to develop and expand the capital goods manufacturing industries in Turkey.

The priority sectors selected by the Government for this study were as under:

- Power
- Mining
- Pulp and Paper
- Cement
- Food and Beverages
- Chemicals and Petrochemicals
- Fertilizers and Pesticides
- Machine Tools
- Diesel and Petrol Engines
- Electric Motors and Industrial Machinery
- Pumps and Compressors
- Steel Fabrication
- Castings and Forgings

1.2. The whole project involving various industry sectors has been conducted under the direction of Mr. M.M.Luther, Chief Technical Adviser, since November 1979.

1.3. Mr. Jan Malkus, Industrial/Mechanical Engineer, joined the project as an expert in March 1981 and was assigned to work with national experts for the following sectors:

- POWER

Power generation
Power transmission and distribution
Collaboration with Turkish Electricity Authority (TEK)
and State Hydraulic Works (DSİ),

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- MINING

Coal mining
Collaboration with Turkish Coal Mining (TKİ)
Iron ore mining and beneficiating
Collaboration with Turkish Iron ore and Steel Company (TDÇİ)
Non-ferrous ore mining and beneficiating
Collaboration with ETİBANK
Chemical and fertilizer mining and beneficiating
Collaboration with ETİBANK

- INDUSTRIAL CHEMICALS

Boric acid and boron compounds
Collaboration with ETİBANK

- MACHINE TOOLS

Metal cutting
Metal forming
Collaboration with Turkish Machine Tools Company (TAKSAN)

2. OBJECTIVES AND METHODOLOGY

2.1. OBJECTIVES OF THE PROJECT

- 2.1.1. The main objective of the Capital Goods Development Project is to plan long-range development of capital goods industry in Turkey through identification of machinery and equipment requirements of industrial plants planned to be constructed upto 2000 year and prepare plans for manufacture of as many of these capital goods as possible to reduce the level of their imports.
- 2.1.2. The demand for capital goods for process industries has been determined by following the methodology presented in Technical Report No. I- Methodology for Planning of Capital Goods Industries by CTA UNIDO. It deals with details of equipment and machinery in terms of their specifications as well as manufacturing characteristics.

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- 2.1.3. By means of computer programmes, the expected requirement for groups of equipment for the plants is determined and sorted in ascending numerical order according to their codes and classified into group of equipment.

The computer programme also lists for each equipment the quantity required, unit weight and unit value in US \$ (1980 base) and furthermore, gives weight and value distribution, yearwise, on the basis of anticipated year of commissioning. Those lists have been compiled as a result of examination of the modular production diagrams, modular flow diagrams and plant survey forms which are explained in the following sections.

- 2.1.4. The project, as visualised in the Technical Report No.I provide a tool for industrial policy-making and preparation of industrial feasibility studies for capital goods manufacture, including basic data for :

- Identification of magnitude of capital goods demand directly related to the investment programme for industrialisation of the country.
- Identification of products to be manufactured in the country.
- Identification of technical specifications of products to be analyzed by feasibility studies for their manufacture.
- Analysis of capacity and capability of existing plants for manufacture of capital goods.

2.2. METHODOLOGY FOR PROCESS INDUSTRIES

- 2.2.1. Different concepts have been used by Capital Goods Development Project teams for working out future demands of capital goods in different types of industries. This section briefly outlines the methodology as developed in the UNIDO team in Turkey for process industries. The technology and plant size for each plant have been considered and a mathematical model developed. The technical data, which is the



minimum required for a reasonable evaluation of demand/capacity, has been codified under 15 digit codes and information transferred on-to a computer programme. Using a computer system, it will be possible to identify common items and to readily establish requirements first for each plant, then for the particular industry and finally for all industries in Turkey. The basic guidelines are presented in Technical Report No.1 -Methodology for Planning of Capital Goods Industries by CTA, UNIDO.

2.2.2. COMMODITY CLASSIFICATION

The 4 digit International Standard Industrial Classification of United Nations (ISIC) has been used as the basis for classification of different parameters of industry to suit the Turkish conditions.

A fifth digit has been added to identify the specific commodity under consideration.

2.2.3. MODULAR PRODUCTION DIAGRAM

This diagram shows the use of raw material, technology, the resultant intermediate products, by-products, waste products, final products and material balance for a unit of raw material or final product.

2.2.4. INDUSTRY ACTIVITIES CHART

To classify and codify the process industries and production activities industry activities charts showing the stages of production have been prepared for each main product. A cumulative 9 digit coding system consisting of industry sector(4) main product (1), intermediate product or production stage (2), technology (1), capacity(1) has been used.

2.2.5. MODULAR PROCESS FLOW DIAGRAM AND PLANT SURVEY FORM

To identify each production module, one modular process flow diagram showing the process flow and machines required with their 15 digit codes, quantity and machine function codes have been prepared. For each production module, one plant survey form has been prepared for recording the required information for machines identification according to 15 digit codes and their estimated value in 1980 US \$.

2.3. METHODOLOGY FOR MACHINE TOOLS INDUSTRY

- 2.3.1. The forecasting model for machine tools demand depends principally on its relation with economic development of the country. Considering the present state of development of this industry in Turkey, the most important indicators that were considered for making the machine tools' demand forecast were, the past years' total demand and GNP.
- 2.3.2. In order to understand the relationship between GNP and machine tools consumption and to use this relation to make demand forecasts for future as a first step, the machine tools consumption per capita during the years 1967-1979 was studied.
- 2.3.3. During 1967-1980 values of GNP per capita were calculated on the basis of data taken from State Statistics Institute.
- 2.3.4. In order to find the correlation coefficient and the linear relation between these two variables, regression method was used.
- 2.3.5. In order to project the machine tools consumption figures to years 1982-2000 by means of the derived equations, GNP values and population in these years were estimated.

2.4 CLASSIFICATION AND CODIFICATION OF CAPITAL GOODS

- 2.4.1. A 15-digit system based on the 5 digit SITC code has been evolved to cover all capital goods expected to be used in sectors considered by the Capital Goods Development Project in Turkey. The first 5 digits are the SITC codes and classify machines and equipment according to their functions. The next 6th and 7th digits give the basic machine name, from 8th to 11th are allocated for definition of machine technological specification, from 12th to 14th digits for manufacturing characteristics and 15th for origin.

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The parameters indicated have been carefully chosen after detailed analysis, industry by industry, to provide the data, essential for developing plans for the capital goods industry in Turkey.

2.4.2. Classification and codification of capital goods used in sectors considered by the Capital Goods Development Project in Turkey was undertaken and completed by a large team of international and national experts .

3. TASK ACCOMPLISHED

Following the methodology described in Para 2 the tasks assigned to the experts were accomplished as under:

3.1. POWER

3.1.1. POWER GENERATION

Availability of electric energy is a basis for future industrialisation of the country. For this reason, the Turkish Electricity Authority has drawn up a very ambitious programme to expand the existing installed capacity by ten times by year 2000.

Three basic technologies have been considered by the Authority:-

- Thermal power plant using lignite.
- Hydraulic power plant using potential water energy.
- Nuclear Power Plant.

For the purpose of Capital Goods Project, only the thermal and hydraulic power plants have been taken into account because the nuclear power plants are expected to be imported on a turnkey basis.

The capacity of power plants has been classified and codified in nine groups according to the unit capacity of generators. The equipment requirements have been calculated using this coding system.

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3.1.2. POWER TRANSMISSION AND DISTRIBUTION

The capacity of power main substations and transformer stations for rural electrification has been classified and codified in nine groups according to the unit capacity of main power transformer. The equipment requirement for them have been calculated by using this coding system.

The final edition of forms used for power sector is expected to be finished by TEK in two weeks' time. The yearwise equipment by weight and value for each representative plant and for the sector as a whole is being computerised by TEK both for TEK and DSİ.

3.2. MINING

3.2.1. COAL MINING

It outlines the requirement of capital goods for the 17 new mines currently visualised for this sector. Only for one mine (Elbistan B), the equipment requirement has not yet been finished, because the data presented by TKİ experts needs to be revised at site. The equipment requirements for replacement have also been considered. By means of a computer programme, the expected year-wise and group requirement for each plant and for the sector as a whole have yet to be computed. For the time being, there are no computer facilities available to undertake this task.

3.2.2. IRON ORE MINING AND BENEFICIATION

It outlines the requirements of capital goods for the two new mines and beneficiating plants and for expansion and modernisation of the 15 mines currently visualised for this sector. The equipment requirements for replacement too have been considered for the 15 mines. By means of a computer programme the expected year-wise and group requirement by weight and value for each plant and for the sector as a whole have yet to be computed. For the time being, there are no computer facilities available to undertake this task.

3.2.3. Non-ferrous ore mining and beneficiation

For this project, the following basic minerals have been considered:

1. Copper
2. Aluminium
3. Silver
4. Chromium
5. Tungsten
6. Uranium
7. Mercury
8. Lead and Zinc
9. Antimony

3.2.4. Chemical and fertilizer mineral mining and beneficiation

For this project, the following basic minerals have been considered:

1. Phosphate
2. Baryte
3. Sulphur
4. Borate
5. Iron Pyrite

According to ETİBANK investment programme for both sectors, the non-ferrous ore mining and beneficiating and the chemical and fertiliser mineral mining and beneficiating this project outlines the requirement of capital goods for the 8 new mines and for expansion and modernisation of the 3 mines and beneficiating plants.

The equipment requirement for replacement for the 17 existing mines and beneficiating plants has also been considered. The expected year-wise and group requirement by weight and value for each plant and for the sectors as a whole are being computerised by ETİBANK.



3.2.5. Industrial Chemicals

Boric acid and boron compounds have been considered for this project.

It outlines the requirement of capital goods for one new boron compound and expansion of one existing boric acid plant, currently visualised for this sector. The expected year-wise and group requirement by weight and value for each plant and for the sector as a whole are being computerised by ETİBANK.

- 3.3. An analysis of capacity for capital goods required for process industries will require aggregation of the demands for same and similar equipment for all the industries. This work can be taken up when details of demands year-wise by weight and value, as coded are available for all industries under consideration.
- 3.4. The analysis of capital goods for process industries is based on the data available for this sector. It is however necessary to note that as detailed market research and feasibility studies are finalised, the actual capacity and hence the capital goods requirements may change. The methodology adapted for this project however has the flexibility to admit into computer files changes for a plant as a whole, or for a part of the plant.
- 3.5. A survey at present and anticipated capacity for manufacture of capital goods related to the process industries in public and private sector needs to be carried out.
- 3.6. Based on this survey, a demand-capacity balance of different types of equipment aggregated from the point of view of manufacturing facilities will be necessary.
- 3.7. Machine Tool Industry

The demand study for machine tools requirement has been carried out on the basis of macro-level indicators. In the first stage, TAKSAM licensed products were considered.

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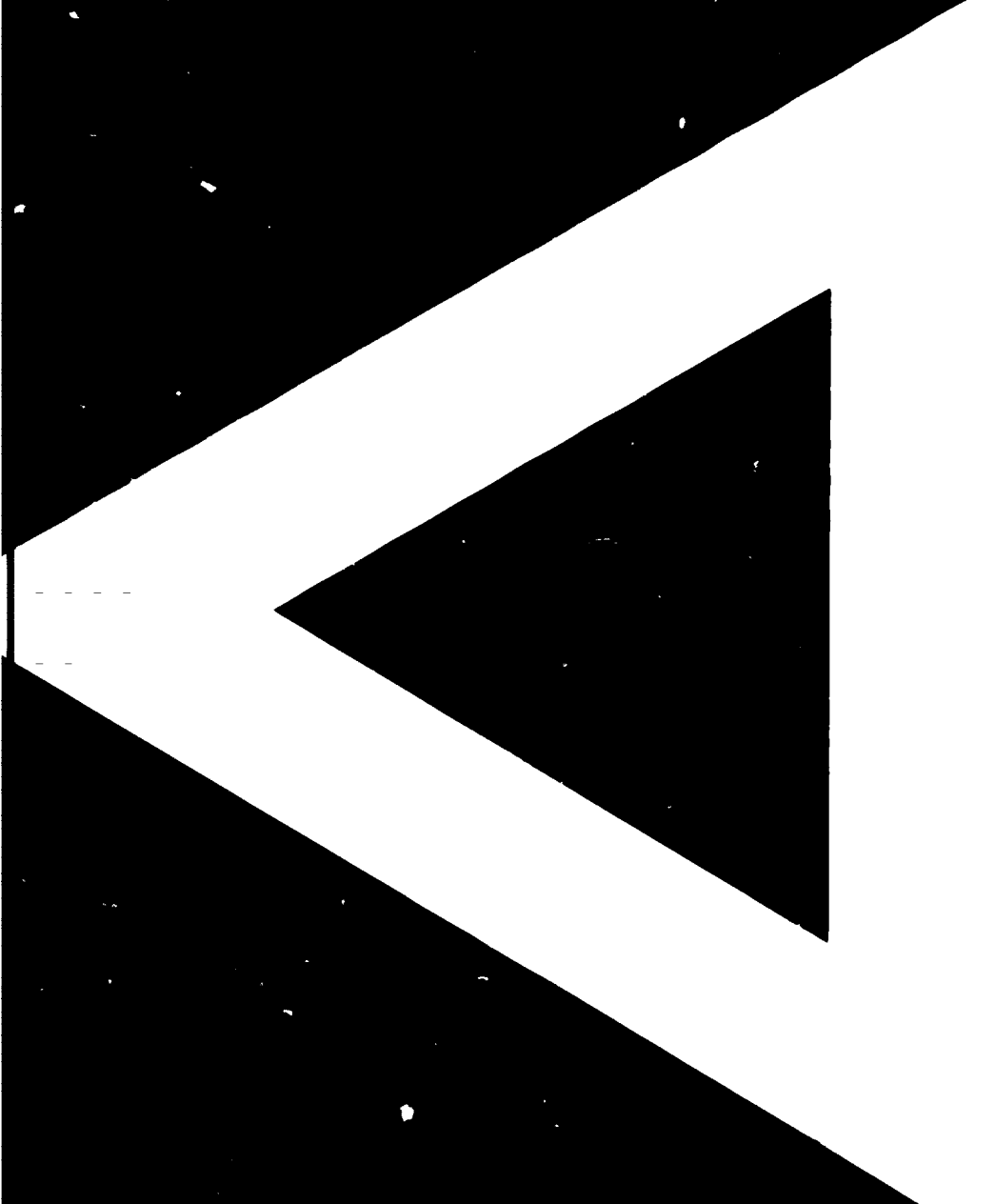
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Based on this study, a demand-capacity balance for TAKSAN licensed products was carried out. As a result of this balance, the spare capacity in TAKSAN new manufacturing plant has been found. For optimum utilisation of installed capacity in TAKSAN additional products have to be considered.

- 3.8. Draft reports for sectors considered in this report have been submitted to Mr. M.M.Luther, Chief Technical Adviser, UNIDO, for this approval as a project coordinator and further final edition as and when computer calculations are available.


Jan Malkus
Industrial Engineer
Expert



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