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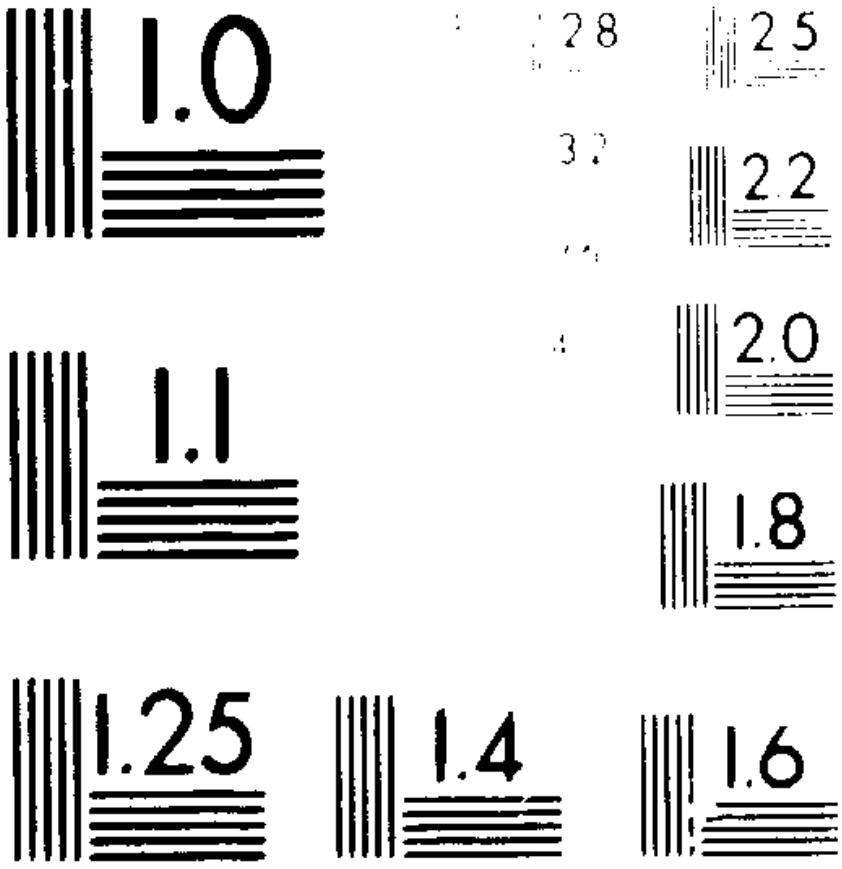

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DEVELOPMENT OF CAPITAL GOODS INDUSTRIES

DP/TUR/76/034

Turkey.

Technical Report No. XIII : Machine Tools With Special Referance to TAKSAN .

Birleşmiş Milletler Kalkınma Programı

UNITED NATIONS NATIONS UNIES

DEVELOPMENT PROGRAMME IN TURKEY

RESTRICTED

September 1982
English

DEVELOPMENT OF CAPITAL GOODS INDUSTRIES

DP/TUR/76/034

Technical report No. XIII

on Machine Tools with special referance to TAKSAN

Prepared for the Government of Turkey

by the United Nations Industrial Development Organization

acting as executing agency for the United Nations Development Programme

Based on the work of

Capital Goods Development Project Team in Turkey

United Nations Industrial Development Organization

Vienna

This report has not been cleared with the United Nations Industrial Development Organization which does not, therefore, necessarily share the views presented.

Birleşmiş Milletler Kalkınma Programı

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DEVELOPMENT PROGRAMME IN TURKEY

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CHAPTER I

INTRODUCTION

1.1. Capital Goods Development Project in Turkey was visualised for planning long-term perspectives and short-term strategies for this critical sector of economy and metal working machine tools were selected as one of the priority sub-sectors for an in-depth study.

1.2. The State Planning Organisation had, right in the initial stages placed heavy emphasis on an analysis by the Project of State Enterprises conceived for manufacture of different categories of capital goods. One of these was TAKSAN- the state enterprise charged with the task of manufacturing a wide range of metal cutting machine tools.

1.3. This report deals with the demand of metal cutting machine tools in general with special reference to TAKSAN.

1.4. General approach

1.4.1. Since SPO was keen on a clear analysis of TAKSAN's investment plan as a matter of highest priority, the first exercise was demand projections of those categories and types of machine tools which are already licensed by TAKSAN. The objective was to define how much of the capacity would be needed for these types according to fresh demand forecasts.

1.4.2. This initial study revealed that manufacture of 5 out of 16 machine tools need not be taken up for manufacture in the immediate future and the annual production of most of the remaining 11 should be considerably less than originally conceived. In order to find alternative use for the spare capacity, demand forecasts were made for a wide range of other metal cutting machine tools preferencebeing given to thode which need manufacturing technologies similar to the ones already available or provided for. However it is assumed that if basic assumptions made in this report change,fresh demand estimades will be made

1.4.3. With installed capacity expected to be surplus even after providing for other metal cutting machine tools, the possibility of TAKSAN taking up metal forming machine tools was investigated.

1.5. The studies for this sector were conducted under the direction of Mr. M.M.Luther, Chief Technical Adviser. They were commenced in Jan. 1980 when classification and codification of machine tools was taken up. Mr. Jan Malkus, Industrial and Mechanical Engineer, joined the project in March 1981 and was assigned to take up the detailed work of demand projections and its analysis with the help of national experts.

1.6. The project management is grateful to Mr. İsmail Özdağlar, who was General Manager of TAKSAN upto Feb. 1981 and Mr. Suat Bayraktar, who has been the General Manager of TAKSAN since then for continued assistance by way of experts and open and frank discussions with themselves. Mr. Adnan İğnebekçili was the focal point in TAKSAN for the project and he along with Mr. Fatih Öcal, Mr. Ali Yurdakul, Mr. Hasan Yılmaz, and Mr. Necati Türker, provided the necessary data and other help in all stages of this study.

1.7. Mrs. Güler İzmirlioğlu and Mr. Ziya Sıddıki, National Project Coordinators and Mr. Engin Oruç, Expert, all from SPO were continuously associated with the discussions.

M.M.Luther

Chief Technical Adviser

Capital Goods Development Project

CHAPTER II

SUMMARY

2.1 Machine Tools is one of the key sectors selected by State Planning Organization (SPO) for a study by the Capital Goods Development Project. SPO had desired that this may be done with special reference to TAKSAN, the State Enterprise charge with developing manufacture of a wide range of machine tools.

2.2 Within metal industries, the machine tool sector performs a basic function in the expansion of industrial production. It is not possible to accelerate the industrialization process without an increase in availability of efficient machine tools.

2.3 On account of adverse economic conditions both in National and International Markets, the continous rise in national demand for machine tools experienced up to 1977, gave way to a steep fall after 1978.

2.4 The previous Market Survey conducted for TAKSAN Machine Tools Project which was prepared on the basis of data for years 1970-76 was outdated, and a new study has been carried out by this project. This includes demand forecasts up to year 2000.

2.5 While the initial Product Mix of TAKSAN was justified on the basis of the assumptions made in 1977, its revision is considered necessary for optimum utilization of the capacity being installed.

2.6 As a result of the Economic Stability Programme launched on 25.1.1980, the economy is fast improving and with successful implementation of the programme, capital goods projects like TAKSAN will again assume the vital role originally intended for them.

2.7 Market Surveys based on relationship, between GNP and Consumption of Machine Tools have been considered to be the most dependable out of many alternative methodologies.

2.8 Two sets of projections have been made. The first one is with normally expected rate of GNP, rising from 4.4% in 1981 to 6% in 1986 and continuing at this rate up to year 2000. The second projection has been made at a constant GNP growth rate of 3.5% with the objective of arriving at the ABSOLUTE MINIMUM DEMAND to conceptualize the capacity to be created

with an eye on full utilization.

2.9 TAKSAN's original product mix is accordingly proposed to be revised. It has been recommended that for a Programme of manufacture up to 1990, out of 16 products previously planned, two machines,A16 A bar automatic lathe and BRV30 Vertical Surface Grinder, may be dropped and three machines,A20 A bar automatic lathe,BFT 80 Horizontal Boring Machine and SP12 P Semi automatic lathe, may be considered for manufacture in mid-ninetees in Phase II.

2.10 On the other hand two new products, a tool room milling machine and a Radial Drilling machine 75 mm capacity have been recommended for inclusion in TAKSAN's immediate plans of production.

2.11 The capacity available and Production proposed is summarized below.

Machine	Present Planned Capacity	Recomm. Phase I	Add. Phase II
BR 40 Radial Drill	200	60	-
FU 315 Universal Miller	250	250	-
FU 400 Universal Miller	150	100	-
FSS 400 Vertical Miller	100	60	-
BFT 80 Horizontal Boring Mach.	100	-	30
R5 Turret Lathe	150	60	-
SP12 P Copying Lathe	30	-	15
AB 80 A Chucker	60	40	-
A40 B Bar Automatic	40	25	-
A20 A " "	20	-	10
A16 A " "	20	-	-
BU 28 Universal Cyl. Grinder	150	60	-
BN 102 B Tool Grinder	150	40	-
BRH 20 A Hor. Surface Grinder	120	70	-
BPH 320 A " " "	100		-
BRV 30 Vertical Surface Grinder	80	-	-
Radial Drill 75 mm	-	40	-
Tool Room Milling Machine	-	60	-

2.12 Spare capacity in various departments has been calculated.

2.13 In order to utilize the excess capacity available, TAKSAN will also need other surveys to explore the possibility of manufacturing some other high precision products. It is recommended that a task force of production/ industrial engineers from Ministry of Defence,Ministry of Industry and Taksan may be set up for this pupose.

2.14 It is highly recommended that the export markets should be explored from now on.A separate study must be taken up for this. It is recommended that Covernment may consider setting up of a separate corporation to export engineering goods including machine tools since it is not possible for many potential exporters to take up the costly activity of export marketting.

2.15While at present Machine Tools Manufacturing Industry in Turkey is gaining experiance in design and manufacture, on a long term basis, Turkey should plan manufacture of more sophisticated machine tools including those with Numerical Control.

2.16 It will be crucial for TAKSAN to set up capacity for castings, gears and gear boxes, tools.dies,jigs,and fixtures. Capacity for these items to the quality desired for machine tools, is not likely to be available from other Turkish manufacturers.

2.17 PERSONNEL

2.17.1 Machine tool industry,because of the relatively hgih level of its complexity needs highly qualified personnel.

2.17.2 Within the framework of the existing wage and salary system in State Enterprises, employment and motivation of highly qualified personnel needs to be considered in the context of Long-Term State Policy.

2.17.3 Being the oldest machine tool manufacturer in Turkey,and also one of the largest shareholders of TAKSAN,M.K.E.K may make available some experienced engineers and skilled workers to TAKSAN, on mutually agreed terms. M.K.E.K and TAKSAN should also work out programmes for training of TAKSAN personnel and technical assistance in erection and putting into operation of TAKSAN workshops.

2.18 In view of the limited domestic demand, specialization in production of different machine tools,should be coordinated by the Government. In this

respect, the existing production programmes of manufacturers have to be ca fully studied, and changes made under the guidance of Ministry of Industry and Technology. This has particular relevance to need for rationalization of production of machine tools in the State Sector. (MKEK and TAKSAN)

2.19 It is desirable to found a Turkish Machine Tool Institute to serve as data bank, to organize testing of machine tools, to be a focal point for introduction of standards on a National basis, and to assist the small and medium scale manufacturers in designing products. This institute may be set up by Ministry of Industry and Technology with cooperation from all manufacturers of metal cutting, metal forming,and woodworking machinery.

M.M. Luther
Chief Technical Adviser
Capital Goods Development Proj

CHAPTER III

METHODOLOGY FOR DEMAND FORECASTS

3.1. BACKGROUND FOR A FRESH STUDY

3.1.1. Rise of petroleum prices due to the petroleum crisis which began in 1975 affected Turkey's foreign trade balance adversely, and between the years 1975-1980, Turkish economy is declined, rate of inflation rising to over 100% and devaluation of TL particularly from 1977 onwards from 14.44 TL to 71.40 per US $ (25.1.1980) and nearly 160 per US $ in July 1982. To meet the diffucult situation, following decisions were taken by the Government of Turkey.

(i) Postponing foreign currency transfers beginning from the second half of 1976 and finally stopping them in February 1977,

(ii) Imposition of somerestrictions in energy composition, due to problems in energy

production which appeared following the petroleum crisis.

(iii) Introduction of an economic stability programme on 24.1.1980.

3.1.2. Because of the stoppage of foreign currency transfers in February 1977, most of the Turkish industry could not obtain their imported inputs. Simultaneously non-availability of foreign credits prevented planned investments from starting, while those which were already under way, lagged behind the planned schedules due to continuously increasing investment costs. In particular, the automotive industry and its ancillaries which form the most important market for machine tools suffered because of the steep rise in petroleum prices.

3.1.3. As a result of the economic crisis during the period 1976-1980, industrialization slowed down considerably and most industrial establishments had steep falls in their capacity utilisation.

3.1.4. With this background as far as Taksan was concerned, the Capital Goods Project team felt that the study "Market Research for Machine Tools" prepared in September 1977 on the basis of data for years 1970-1976 during which the Turkish economy was very active, was out-dated and a new study was necessary so that suitable steps can be taken in time to ensure the reframing of the TAKSAN project where necessary, to suit the changed conditions. Accordingly a market research for machine tools including demand forecasts upto year 2000 was undertaken as the first step towards planning of the machine tool sector in Turkey.

3.2. TECHNIQUES FOR MACHINE TOOLS DEMAND FORECASTING

3.2.1. The forecasting models for machine tools demand mostly depend on the latter's relation with economic development of the country.A high demand is usually one of most important indicators of economic growth. In most developing countries where the economy depends on agriculture, the level of demand stays low.

3.2.2. The reliability of the techniques used for demand forecasting is closely related to the country's economic structure. Because of this, selection of forecasting methods becomes as important as selection of the most suitable indicators. The method to be used must recognize the current situation in a realistic way and also be able to reflect the effect of sudden changes that may take place in the economy.

3.2.3. Considering the present state of development of this industry in Turkey, the most important indicators that could be used for making the machine tool demand forecast are, the past years' total demand and GNP. These two factors are closely related to each other and both of them have shown similar trends in recent years.

3.3. INVESTIGATION OF IMPORT FIGURES AND CONSUMPTION TREND

3.3.1. One indicator of machine tools' demand in Turkey previ previously used was the quantity and type of the machi imported. These were used for projection of future demands. This was not considered relevant because a high import may in fact tend to saturate the market

and lead to a reduced demand rather than an increased demand which would result from a straight projection of import figures to determine future demands. Similarly if a projection is made on the basis of very low imports in recent years, the machine tool demand will gradually decrease in the years to come. Either way, projections make only on the basis of imports, will not realistically represent the future pattern of demand which must follow the anticipated pattern of economic development. Accordingly, import figures have been analysed in this study ONLY to determine the TOTAL PAST CONSUMPTION of machine tools by individual types according to specification. Turkey's import of machine tools in the years 1967-1980, has been investigated according to machine groups, both by quantity and value.

3.3.2. Machine tool demand is domestic production plus import. The study of demand pattern quite clearly shows that the trend of rapid increase in the total demand in early seventees was reversed in recent years.

3.3.3. RELATION BETWEEN GNP AND CONSUMPTION OF MACHINE TOOLS

3.3.3.1. In the "Machine Tool Industry" Publication of United Nations, economic structure and machine tool consumption of more than 80 countries has been studied and the results are shown in Table I by means of several economic indicators. Even though the correlation coefficient is higher for capital accumulation per capita, it was decided not to use this because of difficulties in obtaining relevant data. With high correlation coefficient between GNP/capita and Machine toolcapita, GNP was accepted as a logical indicator.

3.3.3.2. GNP per capita and Machine Tool consumption per capita have been plotted against time during the years 1967-1980 (Chart 1). It will be observed that both of them follow similar trends.

RELATION BETWEEN ECONOMIC INDICATORS AND MACHINE TOOL CONSUMPTION

INDICATORS	Level of Development	Simple corr. Coefficient	
		MIC tool cons. per capita	Industrial MIC tool cons./cp.
GNP per capita	◪+□	0.837(80)	0.947 (84)
	□	0.751(55)	0.866 (57)
CAPITAL FORMATION PER CAPITA	◪+□	0,886 (55)	0,936 (56)
BALANCE OF PAYMENT	◪+□	0,396 (64)	0,294 (67)
VEHICLE INUSE / CAPITA	◪	0,648 (23)	0,803 (24)
	□	0,622 (54)	0,765 (56)
PRODUCTION OF VEHIC./CAP.	◪+□	0,648 (40)	0,640 (42)
POWER CONSUMP. /CAPITA	◪+□	0,659 (80)	0,823 (84)
% OF ACTIVE POPULATION	◪+□	0,431 (75)	0,396 (76)
% OF PAPULATION WORKING IN MANUFACTURING INDUSTRY	◪+□	0,756 (73)	0,682 (73)
% OF ILLETERATE POPULATION	◪+□	-0,474 (52)	-0,358 (52)
TOTAL POPULATION	◪+□	0,111 (80)	0,066 (84)

Table: 1

◪ DEVELOPED COUNTRIES

□ DEVELOPING. COUUNTRIES

Value in paranthesis are the number of countrien studied.

RELATIONSHIP BETWEEN GNP AND CONSUMPTION OF MACHINE TOOLS (1967-1980)

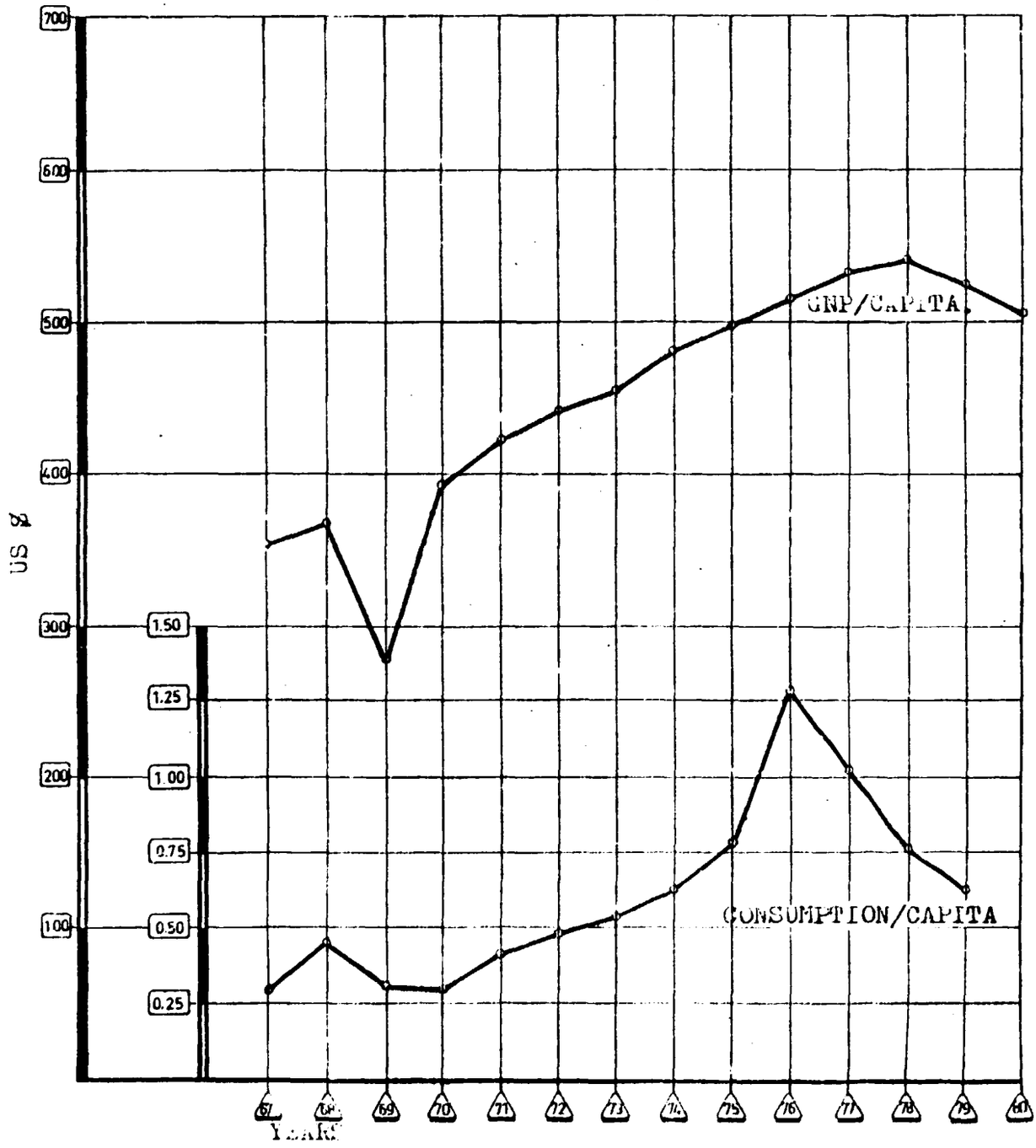

CHART-1

3.4. DEMAND FORECASTING TECHNIQUE AND RESULTS

3.4.1. Turkey currently is trying to solve its special economic problems with measures suited to its socio-economic environment and it was decided that it would be more realistic to calculate correlation coefficient and trend equations by using actual data valid for Turkey. A comparison however has been made with figures for "Developed-Developing Countries" the category in U.N. statistics that is applicable to Turkey.

3.4.2. In order to understand the relationship between GNP and machine tools' consumption and to use this relation to make demand forecasts for future, first of all the machine tool consumption per capita during the years 1967-1979 was studied. On the assumption that the total machine tool consumption is imports plus domestic production, the country's leading machine tool producers' actual production figures were found and their value calculated on the basis of 1968 dollar prices. The machine

tool consumption between the years 1967-1979 was calculated by adding values for machine tools' imports on the same basis. The machine tool consumption per capita was then determined by dividing this value by population for each year. Results are shown in Table 2.

3.4.3. During 1967-1980, values of GNP per capita were calculated on the basis of data taken from State Statistics Institute. These are shown in Table 3. In order to find the correlation coefficient and the linear relation between these two variables, regression method was used. How GNP per capita and Machine Tool consumption per capita effects each other can be explained by this simple equation:

$$y_1 = b + mx_1$$

where ,

x_1 = GNP per capita on the i^{th} year ($i=i_1 \ldots i_{18}$)

y_1 = Machine Tool consumption per capita on the i^{th} year ($i = i_1 \ldots\ldots i_{18}$)

b = Intersection point

m = Slope coefficient

CONSUMPTION OF MACHINE TOOLS (1967-1980)

Year	Populati-on (1000)	Machine tool consunption (1000 1968 $)			Consumption Percapita (1968 $)
		Domestic Prod.	Importa	Total	
1967	32.750	568	9.457	10.025	0,3061069
1968	33.585	1.778	13.068	14.846	0,4420426
1969	34.442	1.010	9.891	10.901	0,3165031
1970	35.321	1.595	9.156	10.751	0,3043798
1971	36.215	3.197	11.971	15.168	0,4188320
1972	37.132	5.187	12.836	18.023	0,4853765
1973	38.072	6.554	14.095	20.549	0,5397405
1974	39.036	8.104	16.189	24.293	0,6223230
1975	40.025	9.709	22.223	31.932	0,7978014
1976	40.938	11.490	41.158	52.648	1,2860423
1977	41.871	13.957	29.920	43.877	1,0479091
1978	42.825	13.464	19.192	32.656	0,7625452
1979	43.801	12.384	15.554	47.938	0,6378393
1980	44.799	5.399	N.A	N.A	N.A

Table : 2

GROSS NATIONAL PRODUCT IN TURKEY

(1967 - 1980)

Year	Population	GNP (1968 Value)		Per capita GNP (US $)
		Million TL.	1000 US $	
1967	32.750	105.461	11,614,648	354,6
1968	33.585	102.493	12,389,090	368,9
1969	34.442	118,594	13,061,006	279,2
1970	35.321	125.425	13,813,318	391,1
1971	36.215	138.185	15,218,604	420,2
1972	37.132	148.477	16,352,083	440,4
1973	38.072	156.458	17,231,048	452,6
1974	39.036	168.013	18,503,624	474,0
1975	40.025	181.383	19,976,090	499,0
1976	40.938	191.751	21,117,940	515,9
1977	41.871	203.358	22,396,243	534,9
1978	42.825	209.183	23,037,763	537,9
1979	43.801	208.343	22,945,252	523,8
1980	44.799	206.061	22,693,930	506,6

Table : 3

As a result of the regression made with the data of the years 1967-1979,

$$y = 0.689763022 + 0.00292359\ x$$

The correlation coefficient was found to be 0.7845993.

3.4.4. In order to project the machine tool consumption figures to years 1982-2000, GNP values and population in these years were estimated. A 2.27% growth rate of population has been assumed.

3.4.5. With the background of planning for full utilisation of installed capacity, two sets of projections were made for the 'Turkish Model' used in this study - one with normally expected growth rate of GNP and the second with lower figures for calculating the absolute minimum demand. It was felt that where high levels of investment are involved, it would be better to have the initial capacity installed on the basis of the minimum demand and expand it as market conditions warrant.

3.4.6. Tables 4,5 and 6 shows the following forecast figures:

(i) Turkish model with normal growth rates.

(ii) Turkish model for minimum demand.

(iii) UNIDO "Developed and Developing Countries" model with normal growth rate.

3.4.7. The values calculated for Turkish conditions were very interestingly, similar to the value for "Developing-Developed Countries" as shown in UNIDO's publication "Machine Tool Industry". A comparison of forecasts made by using UNIDO's equation for developing - developed countries, with results of the "Turkish Model" as used in this study is shown in Table. 7.

3.4.8. In order to make a clear representation of the results and also to evaluate them on the basis of current values all figures converted to 1980 base (US Dollar) are also shown in Table 7.

MACHINE TOOLS DEMAND FORECAST(1982-2000)
TURKISH MODEL WITH NORMAL GROWTHRATE

(1968 $ VALUE)

Year	Population (1000)	GNP			MACHINE TOOLS	
		Growth Rate(%)	Value (1000 US $)	Percapita US $	Percapita US $	Value (1000US$)
1982	46.864	4.5	24.758.634	528,3	0,8547741	40,058
1983	47.932	4.5	25.872.762	539,8	0,8883955	42,580
1984	49.025	4.5	27.037.036	551,5	0,92260168	45,230
1985	50.142	5.0	28.388.888	566,2	0,9655785	48,416
1986	51.280	6.0	30.092.221	586,8	1,0258047	52,603
1987	52.444	6.0	31.897.754	608,2	1,0883697	57.078
1988	53.635	6.0	33.811.619	630,4	1,1532736	61.855
1989	54.852	6.0	35.840.316	653,4	1,2205163	66.947
1990	56.097	6.0	37.990.735	677,4	1,2906827	72.403
1991	57.371	6.0	40.270.179	701,9	1,3623109	78.157
1992	58.673	6.0	42.686.390	727,5	1,4371550	84.322
1993	60.005	6.0	45.247.574	754,1	1,5149227	90.903
1994	61.367	6.0	47.962.428	781,6	1,5953217	97.900
1995	62.760	6.0	50.840.174	810,1	1,6786443	105.351
1996	64.185	6.0	53.890.584	839,6	1,7648904	113.279
1997	65.642	6.0	57.124.019	870,2	1,8543526	121.723
1998	67.132	6.0	60.551.460	902,0	1,9473230	130.727
1999	68.656	6.0	64.184.548	934,9	2,0435094	140.299
2000	70.214	6.0	68.035.621	970,4	2.1472971	150.770

Table:4

MACHINE TOOLS DEMAND FORECAST (1982-2000)
TURKISH MODEL FOR MINIMUM DEMAND
(1968 $ VALUE)

Year	Population (1000)	GNP			MACHINE TOOLS	
		Growth Rate(%)	Value (1000 US $)	Percapita US $	Percapita US $	Value (1000US$)
1982	46.864	3,5	24.521.690	[illegible]3,3	0,8401561	39,343
1983	47.932	3,5	25.379.959	529,5	0,8582825	41.139
1984	49.025	3,5	26.268.257	535,8	0,8767011	42.980
1985	50.142	3,5	27.187.646	542,2	0,8954122	44.898
1986	51.280	3,5	28.139.214	548,7	0,9144156	46.891
1987	52.444	3,5	29.124.086	555,3	0,9337113	48.967
1988	53.635	3,5	30.143.429	562,0	0,9532994	51.130
1989	54.852	3,5	31.198.449	568,8	0,9731799	53.381
1990	56.097	3,5	32.290.395	575,6	0,9930604	55.708
1991	57.371	3,5	33.420.559	582,5	1.0132332	58,130
1992	58.673	3,5	34.590.278	589,5	1,0336984	60.650
1993	60.005	3,5	35.800.938	596,6	1,0544559	63.273
1994	61.367	3,5	37.053.971	603,8	1,0755058	66.001
1995	62.760	3,5	38.350.860	611,1	1,0968481	68.838
1996	64.185	3,5	39.693.140	618,4	1.1181904	71.771
1997	65.642	3,5	41.082.400	625,9	1.1401174	74.840
1998	67.132	3,5	42.520.284	633,4	1,1620444	78.010
1999	68.656	3,5	44.008.484	641,0	1.1842637	81.307
2000	70.214	3,5	45.548.791	648,7	1.2067754	84.732

Table:5

MACHINE TOOLS DEMAND FORECAST (1982-2000)

UNIDO MODEL FOR DEVELOPING+DEVELOPED COUNTRIES

$y = -0.25+0.0020x$

(1968 $ VALUE)

Year	Popula-tion (1000)	GNP			MACHINE TOOLS	
		Growth Rate(%)	Value (1000 US $)	Percapita US $	Percapita US $	Value (1000US$)
1982	46.864	4,5	24.758.624	528,3	0,8066	47.801
1983	47.932	4,5	25.872.762	539,8	0,8096	49.764
1984	49.025	4,5	27.037,036	555,5	0,8530	41.818
1985	50.142	5,0	28.388.888	566,2	0,8824	44.245
1986	51.280	6,0	30.092.221	586,8	0,9236	47.362
1987	52.444	6,0	31.897.754	608,2	0,9664	50.682
1988	53.635	6,0	33.811.619	630,4	1,0108	54.214
1989	54.852	6,0	35.840.316	653,4	1,0568	57.968
1990	56.097	6,0	37.990.735	677,4	1,1048	61.976
1991	57.371	6,0	40.270.179	701,9	1,1548	66.195
1992	58.673	6,0	42.686.390	727,5	1,2050	70.701
1993	60.005	6,0	45.247.574	754,1	1.2582	75.498
1994	61.367	6,0	47.962.428	781,6	1,3132	80.857
1995	62.760	6,0	50.840.174	810,1	1.3702	85.980
1996	64.185	6,0	53.890.584	839,6	1,4292	91.733
1997	65.642	6,0	57.124.019	870,2	1,4904	97.833
1998	67.132	6,0	60.551.460	902,0	1,5540	104.323
1999	68.656	6,0	64.184.548	934,9	1,6198	1111209
2000	70.214	6,0	68.035.621	970,4	1,6908	118.718

Table:6

MACHINE TOOLS DEMAND FORECAST
1982-2000
COMPARISON OF ALTERNATIVES

Year	1968 Dollar Value (1000)			1980 Dollar Value (1000)		
	Turkish Model Minimum growth	Turkish Model Normal growth	UNIDO Model Normal Growth	Turkish Model Minimum growth	Turkish Model Normal growth	UNIDO Model Normal Growth
1982	39.373	40.058	37.801	104.023	105.833	99.870
1983	41.139	42.582	39.764	108.689	112.502	105.056
1984	42.980	45.230	41.818	113.553	119.498	110.483
1985	44.898	48.416	44.245	118.620	127.915	116.895
1986	46.891	52.603	47.362	123.886	139.028	125.130
1987	48.967	57.078	50.682	129.371	150.800	133.902
1988	51.130	61.855	54.214	135.085	163.421	143.233
1989	53.381	66.947	57.968	141.032	176.874	153 151
1990	55.708	72.403	61.976	147.181	191.289	163.741
1991	58.130	78.157	66.195	153.579	206.491	174.887
1992	60.650	84.322	70.701	160.237	222.779	186.792
1993	63.273	90.903	75.498	167.167	240.166	199.466
1994	66.001	97.900	80.587	174.375	258.652	212.910
1995	68.838	105.351	85.980	181.870	278.337	227.159
1996	71.771	113.279	91.733	189.619	299.283	242.359
1997	74.840	121.723	97.833	197.727	321.592	258.475
1998	78.010	130.727	104.323	206.102	345.381	275.621
1999	81.307	140.299	111.209	214.813	370.670	296.142
2000	84.732	150.770	118.718	223.862	398.334	313.653

Table : 7

CHAPTER IV

CLASSIFICATION AND CODIFICATION OF MACHINE TOOLS

4.1. 15 digit code developed by Capital Goods Development Project in Turkey for all machine tools based on the 5 digit SITC codes have been evolved as follows:

1 2 3 4 5	SITC Code
6 7	Basic machine nomenclature
8	Major specification(capacity
9	Major specification (Optional)
10	Major specification (Optional)
11	Type
12	Manufacturing characteristic (weight)
13	Manufacturing characteristic (main body material)
14	Manufacturing characteristic (Maximum component weight)
15	Origin

The first five digits indicate the basic machine group, 6th and 7th give the machine nomenclature. 8th, 9th and 10th indicate the major specifications. 11th gives the type, 12th, 13th and 14th manufacturing characteristics and the 15th shows if the machine is imported or manufactured in Turkey. For example, if we examine Table 13, it can be easily understood that WMW licensed FU400 universal milling machine can be coded as 73614.03.422.1121.2.

4.2. The 15 digit SITC codes as developed by UNIDO/SPO/TAKSAN for machine tools in Turkey are shown in Appendix I .

4.3. All the previous studies had been carried out on the basis of projections for broad groups of machines, each group containing not only different specifications of each category of machine tools but also machines of different types and categories. It was felt that it would be desirable to conduct this present study on the basis of SITC code suitably expanded to cover not only the individual categories of machine tools but also their specifications and broad manufacturing characteristics in line with formats evolved for machines for all other industries covered by the Project.

4.4. For the purpose of this study however, only the first 9 digits have been used - i.e. SITC code, basic machine, major specification (capacity) and one more specification. These adequately represent the depth to which it is necessary to pursue this research at this point. The balance will be used at the time of feasibility studies when more details are necessary to be recorded and analysed.

4.5. All the machines imported during 1976-1980 were detailed and coded upto 9 digits and this required time consuming deep research, in catalogues and files. After a detailed examination of output values, it was decided that the best way of expressing the results statistically would be in terms of averages for each year and each machine tool as coded.

CHAPTER V

PROJECTIONS AND PROPOSALS FOR TAKSAN'S LICENSED PRODUCTS

5.1. BASIC APPROACH

5.1.1. In the earlier studies on machine tool demand, machines were considered in general groups and could not be detailed because of insufficient data with State Institute of Statistics and other sources.

5.1.2. The basic approach of the Capital Goods Development Project as far as machine tools are concerned was put down in the first instance, as

(i) estimating the demand for each of TAKSAN'S licensed machines and

(ii) finding the additonal demand for machine tools which could be manufactured in TAKSAN'S Kayseri Plant.

For this reason, total imports of machine tools during 1977-1980 were examined, and machines similar to TAKSAN products in type of work and specifications were isolated.

They also had to be detailed and coded according to codes developed by UNIDO experts in collaboration with TAKSAN's engineers. A brief outline of these codes has been given in Chapter IV.

5.1.3. A list of the products presently licensed for manufacture in TAKSAN is at Page

5.2. IMPORT DATA (1976-1980)

5.2.1. Data of imports during 1976-1980 taken from Price Registration and Investigation Office, Istanbul, is shown in Table 8 from which it can be seen that the value of imports declined through these five years and came to its lowest level in 1980. As examined, this period was chosen since reliable figures could be collated only for these years.

IMPORT OF MACHINE TOOLS (1976-1980)

MACHINE GROUP	YEARS 1976 (1.3874)		1977 (1.2851)		1978 (1.1756)		1979 (1.0728)		1980 (1.0000)		TOTAL 1980 $		UNIT PRICE 1980 $	AVERAGE 1980 $		GROUP COEFF.
	Value $	Amount	Value $	Amount	Value $	Amount	Value $	Amount	Value $	Amount	Value	Amount		Value	Amount	
Milling Machines	8.576.503	516	10.713.479	736	8.084.121	240	7.206.147	177	2.159.836	99	45.636.913	1.768	25.813	9.127.382	354	0.120793
Horizontal Bore.Mill	1.534.699	35	2.088.619	33	1.237.041	20	2.391.589	30	561.440	4	8.819.027	122	72.287	1.763.805	24	0.023342
Jig Borers	3.094.169	43	601.793	7	1.721.864	19	948.162	10	399.539	9	9.003.162	88	102.308	1.800.632	18	0.023829
Cylindrical Grinding	7.943.676	173	1.054.344	60	1.676.081	44	2.788.781	79	1.109.726	10	18.445.924	366	50.398	3.689.184	73	0.048823
Surface Grinding	3.639.913	77	1.654.641	111	1.261.705	69	3.484.077	167	591.319	17	13.057.804	441	29.609	2.611.560	92	0.034561
Tool Grind.and Sharp	433.879	68	927.517	67	1.246.122	45	527.175	49	446.921	33	4.271.331	262	16.302	854.266	52	0.011305
Other Grinding	1.804.391	150	1.818.540	89	3.179.282	70	2.418.442	47	2.793.083	54	13.966.361	410	34.064	2.793.272	82	0.036966
Lathes	11.978.565	522	11.607.449	306	10.238.096	177	4.894.406	109	1.791.277	17	50.613.695	1.429	35.418	10.122.739	286	0.133966
Drilling Machines	4.611.410	206	6.268.716	146	2.052.406	103	1.279.279	93	1.117.926	16	19.352.650	564	34.313	3.870.530	113	0.051229
Radial Drills	5.392.610	55	1.329.069	64	941.904	75	440.456	29	468.098	21	11.237.497	244	46.055	2.247.499	49	0.029749
Planer and Shaper	1.053.195	382	2.416.163	407	981.241	217	4.253.975	33	1.178.111	49	11.461.536	1.088	10.534	2.292.307	218	0.030336
Presses	11.035.697	615	14.313.899	658	9.739.972	704	6.261.823	298	2.944.224	89	54.817.936	2.360	23.227	10.963.587	472	0.145094
Sawing Machines	1.286.210	931	768.997	278	217.704	63	214.488	218	273.457	16	3.532.218	1.506	2.345	706.443	301	0.009349
Shelletises	1.383.297	79	1.601.040	93	436.534	42	667.061	81	171.394	13	5.376.889	308	17.457	1.075.377	62	0.014231
Rectifying	1.594.949	132	1.200.578	131	534.367	30	45.489	19	440.523	51	4.873.220	351	13.883	974.644	72	0.012898
Threading	1.249.776	109	3.901.028	228	1.678.891	109	14.424	51	18.999	8	8.755.327	503	17.406	1.751.065	101	0.023173
Gear Cutting	1.811.279	46	2.841.220	120	2.031.015	47	1.971.429	22	161.475	7	10.828.301	242	44.745	2.165.660	48	0.028660
Hammering	213.850	39	5.399.534	41	204.090	5	349.314	13	124.319	12	7.974.627	110	72.496	1.594.925	22	0.021107
Boring	673.221	20	279.148	35	719.257	62	141.022	19	134.379	19	2.421.485	155	15.622	484.297	31	0.006409
Broaching	342.984	5	317.095	15	1.368.735	12	28.749	2	-	-	2.523.281	34	74.214	504.656	7	0.006678
Lapping	6.481	16	-	-	99.875	3	-	-	47.286	1	175.690	20	8.684	34.738	4	0.000459
Electroerosion	335.936	6	334.520	13	252.617	4	88.463	3	140.153	1	1.428.001	27	52.888	285.600	5	0.003779
Others	16,116.109	9329	18.803.106	606	9.083.470	167	5.213.647	370	1.543.427	435	64.338.515	9.909	6.495	12.867.703	1981	0.170293
Bending,Flattening	1.573.837	272	1.405.448	138	656.770	132	201.741	292	33.554	50	4.899.495	934	5.296	979.899	188	0.012968
TOTAL	87.247.452	13.122	91.557.594	4.440	59.643.067	2.459	45.826.136	2.205	19.128.362	1.027	377.808.350	23.243		75.561.770	4643	0.999985

TABLE 2

(20)

5.2.2. From the Price Investigation and registration Office (PIRO) data, import value can be summarized as follows:

YEAR	CURRENT PRICES (US $)	VALUE-1980 BASIS (US $)
1976	87.747.452	121.740.841
1977	91.557.394	117.660.407
1978	59.643.067	70.116.389
1979	45.826.136	49.162.278
1980	19.128.962	19.128.962
	TOTAL	377.808.850

Average: 75.561.770 1980 $/year

5.3. DEMAND FORECASTS FOR TAKSAN's LICENSED MACHINE TOOLS

5.3.1. All machine tools which could substitute TAKSAN' licensed machines were taken into account for calculating the share of TAKSAN machine tools in consumption figures. For each individual group unit prices and average values were calculated and used in detailing the total machine tool demand forecast figures given

in Para 2.5. Results are shown in "machine identification tables', Table No. 9 to 24. These indicate the broad specification, code number, past consumption current and 1980 base values, group coefficients and estimated demand according to the alternatives projections of GNP growth rates.

5.3.2. After detailed considerations, it was felt that for the present in Phase I, the capacity to be created should correspond to the demand anticipated in 1990.

5.3.3. On these tables, which are prepated for each machine separately, major specifications which best identify the machine and the relevant 15 digit code are given. By using the import values of 1976-1980 unit price average value and group coefficients were calculated and are shown on each table. The ratio of the average value of a group to the total average of imports for a year gives the group coefficient. The total machine tool demand forecast 1980 base (Table 7) was multiplied by the group coefficient to get the forecast value for that specific group and then divided by the unit price to get the expected quantities.

RADIAL DRILLING MACHINE

BR 40

7 3 6 | 1 5 | 0 3 4 3 2 0 1 2 1 2

- ☐ Max.diameter drilled: 4,5 mm
- ☐ Projection of drilling spindle: 1 2 5 0 mm
- ☐

Years	Value (Current $)	Value (1980 $)	Quanti
1976	226.236	313.880	21
1977	206.666	265.856	26
1978	351.424	413.134	28
1979	196.500	210.805	16
1980	78.147	78.147	15
	TOTAL	1.281.822	106

- ☐ Average Quantity: 2 1
- ☐ Average Value: 2 5 6 3 6 4
- ☐ Unit Price: 1 2 0 9 2
- ☐ Group Coefficient: 0 0 0 3 3 9

Years	1 % 6 TURKISH MODEL		2 % 3,5 TURKISH MODEL		3 % 6 UNIDO MODEL	
	Value	Quantity	Value	Quantity	Value	Quantity
1982	358.943	30	352.638	29	338.559	28
1983	381.381	32	368.455	30	356.139	29
1984	405.098	34	384.944	32	374.537	31
1985	433.631	36	402.121	33	396.274	33
1986	471.304	39	419.973	35	424.190	35
1987	511.212	42	438.567	36	453.927	37
1988	553.997	46	457.938	38	485.559	40
1989	599.602	50	478.098	39	519.181	43
1990	648.469	54	498.943	41	555.081	46
1991	700.004	58	520.632	43	592.866	49
1992	755.220	62	543.203	45	633.224	52
1993	814.162	67	566.696	47	676.189	56
1994	876.830	72	591.131	49	721.764	60
1995	943.562	78	616.539	51	770.069	64
1996	1.014.569	84	642.808	53	821.597	68
1997	1.090.196	90	670.294	55	876.230	72
1998	1.170.841	97	698.685	58	934.355	77
1999	1.256.521	104	728.216	60	1.003.921	83
2000	1.350.352	112	758.892	63	1.063.283	88

1980 $

UNIVERSAL MILLING MACHINE

FU315

7 3 6 | 1 4 | 0 3 4 2 2 2 1 2 1 2

☐ Length of table 1250 mm

☐ Width of table 315 mm

☐ Max table load 1000 Kg.

Years	Value (Current ₺)	Value (1980 ₺)	Quanti
1976	1.186.607	1.646.298	151
1977	2.310.327	2.966.691	269
1978	535.614	629.668	66
1979	388.840	417.148	28
1980	349,190	349.190	49
	TOTAL	6.008.995	563

☐ Average Quantity 113

☐ Average Value 120179.9

☐ Unit Price 1067 3

☐ Group Coefficient 0,01590

Years	1 % 6 TURKISH MODEL		2 % 3,5 TURKISH MODEL		3 % 6 UNIDO MODEL	
	Value	Quantity	Value	Quantity	Value	Quantity
1982	1.682.744	158	1.653.965	155	1.587.933	149
1983	1.788.781	167	1.728.155	162	1.670.390	156
1984	1.900.018	178	1.805.492	169	1.756.679	164
1985	2.033	190	1.886.058	177	1.858.630	174
1986	2.210.545	207	1.969.787	184	1.989.567	186
1987	2.397.720	225	2.056.998	193	2.129.041	199
1988	2.598.393	243	2.147.851	201	2.277.404	213
1989	2.812.296	263	2.242.408	210	2.435.100	228
1990	3.041.495	285	2.340.177	219.	2.603.481	244
1991	2.283.206	308	2.441.906	229	2.780.703	260
1992	3.542.186	332	2.547.768	239	2.969.992	278
1993	3.818.639	358	2.657.955	249	3.171.509	297
1994	4.112.566	385	2.772.562	260	3.385.269	317
1995	4.425.558	415	2.891.733	271	3.611.828	338
1996	4.758.599	446	3.014.942	282	3.853.508	361
1997	5.113.312	479	3.143.859	294	4.109.752	385
1998	5.491.557	514	3.277.021	307	4.382.373	411
1999	5.893.653	552	3.415.526	320	4.708.657	441
2000	6.333.51[illegible]	593	3.559.405	333	4.987.082	467

1980 ₺

UNIVERSAL MILLING MACHINE

FU 400

7 3 6 | 1 4 | 0 3 5 2 2 2 1 2 1 2

☐ Length of table 1 6 0 0 mm

☐ Width of table 4 0 0 mm

☐ Max table load 1 5 0 0 kg

Years	Value (Current $)	Value (1980 $)	Quanti
1976	797.876	1.107.052	47
1977	1.240.937	1.594.728	89
1978	687.377	808.080	44
1979	722.964	829.203	34
1980	142.726	142.726	9
	TOTAL	4.481.789	223

☐ Average Quantity 4 5

☐ Average Value 8 9 6 3 5 7

☐ Unit Price 2 0 0 9 7

☐ Group Coefficient 0 0 1 1 8 6

Years	1 % 6 TURKISH MODEL		2 % 3,5 TURKISH MODEL		3 % 6 UNIDO MODEL	
	Value	Quantity	Value	Quantity	Value	Quantity
1982	1.255.129	62	1.253.712	61	1.184.458	59
1983	1.334.223	66	1.289.091	64	1.245.964	62
1984	1.417.246	70	1.346.748	67	1.310.352	65
1985	1.517.071	75	1.406.833	70	1.386.574	69
1986	1.648.872	82	1.469.287	73	1.484.041	74
1987	1.788.488	89	1.534.340	76	1.588.077	79
1988	1.938.173	96	1.602.108	80	1.698.743	84
1989	2.097.725	104	1.672.639	83	1.816.370	90
1990	2.268.787	113	1.745.506	87	1.941.968	97
1991	2.448.985	122	1.821.446	91	2.074.159	103
1992	2.642.158	131	1.900.416	94	2.215.353	110
1993	2.848.368	142	1.982.600	99	2.365.666	118
1994	3.069.612	153	2.068.087	104	2.525.112	126
1995	3.301.076	164	2.156.978	107	2.694.105	134
1996	3.549.496	177	2.248.881	112	2.874.377	143
1997	3.814.081	190	2.345.042	117	3.065.513	152
1998	4.096.218	204	2.444.569	122	3.268.865	163
1999	4.396.146	219	2.547.682	127	3.512.244	175
2000	4.724.241	235	2.655.003	132	3.719.924	185

1980 $

VERTICAL MILLING MACHINE

FSS 400

7 3 6 | 1 4 | 0 2 5 2 2 2 1 2 1 2

- ☐ Length of table: 1,6,00 mm
- ☐ Width of table: 4,0,0 mm
- ☐ Max table load: 1,5,0,0 mm

Years	Value (Current $)	Value (1980 $)	Quanti
1976	318.445	441.811	41
1977	163.413	210.003	11
1978	500.214	588.051	21
1979	702.370	850.054	39
1980	142.669	142.669	11
	TOTAL	2.232.588	123

- ☐ Average Quantity: 2,5
- ☐ Average Value: 4,4,6,5,1,7
- ☐ Unit Price: 1,8,1,5,1
- ☐ Group Coefficient: 0,0,0,5,9,1

Years	1 % 6 TURKISH MODEL		2 % 3,5 TURKISH MODEL		3 % 6 UNIDO MODEL	
	Value	Quantity	Value	Quantity	Value	Quantity
1982	625.473	34	614.725	34	590.231	32
1983	664.886	37	642.351	35	620.830	34
1984	706.233	39	671.098	37	652.954	36
1985	755.977	42	701.044	39	690.849	38
1986	821.655	45	732.166	40	739.518	41
1987	891.228	49	764.582	42	791.360	43
1988	965.818	53	798.352	44	846.507	47
1989	1.045.325	57	833.499	46	905.122	50
1990	1.130.517	62	869.849	48	967.709	53
1991	1.220.361	67	907.651	50	1.033.582	57
1992	1.316.623	72	947.000	52	1.103.940	61
1993	1.419.381	78	987.956	54	1.178.844	65
1994	1.528.633	84	1.030.556	57	1.258.298	69
1995	1.644.071	91	1.074.851	59	1.342.509	74
1996	1.768.762	97	1.120.648	62	1.432.341	79
1997	1.900.608	105	1.168.566	64	1.527.587	84
1998	2.041.201	112	1.218.062	67	1.628.920	90
1999	2.190.659	120	1.269.544	70	1.750.199	96
2000	2.354.153	129	1.323.029	73	1.855.689	102

1980 $

HORIZONTAL BORING, DRILLING AND MILLING MACHINE

Table 13

BFT 80

7 3 6 | 1 5 | 1 2 3 32 1 2 2 2

☐ Long tudinal traverse of table with boring stay — 1 2 5 0 mm

☐ Cross traverse of table — 1 0 0 0 mm

☐ Dia.of boring spindle — 8 0 mm

Years	Value (Current $)	Value (1980 $)	Quanti
1976	741.930	1.029.353	21
1977	441.215	567.005	14
1978	407.345	478.874	10
1979	552.727	560.781	13
1980	-	-	-
	TOTAL	2.636.013	58

☐ Average Quantity — 1 2

☐ Average Value — 5 2 7 2 0 2

☐ Unit Price — 4 5 4 4 8

☐ Group Coefficient — 0 0 0 6 9 7

Years	1 % 6 TURKISH MODEL		2 % 3,5 TURKISH MODEL		3 % 6 UNIDO MODEL	
	Value	Quantity	Value	Quantity	Value	Quantity
1982	737.656	16	735.040	16	696.093	15
1983	784.138	17	757.562	17	732.240	16
1984	832.901	18	791.464	17	770.066	17
1985	891.567	20	826.781	18	814.758	18
1986	969.025	21	863.485	19	872.156	19
1987	1.051.026	23	901.715	20	933.296	20
1988	1.139.044	25	941.542	21	998.334	22
1989	1.242.811	27	982.993	22	1.067.462	23
1990	1.333.284	29	1.025.851	22	1.141.127	25
1991	1.439.242	32	1.070.445	23	1.218.962	27
1992	1.552.769	34	1.116.851	24	1.301.940	29
1993	1.673.957	37	1.165.153	26	1.390.278	30
1994	1.802.804	40	1.215.393	27	1.483.982	33
1995	1.940.008	43	1.267.633	28	1.583.238	35
1996	2.086.002	46	1.321.644	29	1.689.242	37
1997	2.241.496	49	1.378.157	30	1.801.570	40
1998	2.407.304	53	1.436.530	32	1.921.078	42
1999	2.583.569	57	1.497.246	33	2.064.109	45
2000	2.771.497	61	1.560.313	34	2.186.161	48

1980 $

CAPSTAN AND TURRET LATHE

R5

7 3 6 | 1 3 | 0 5 3 2 2 1 1 2 1 2

☐ Swing over longitudinal slide 450 mm

☐ Max.distance collet chuck to turret 590 mm

☐ Bar capacity 53

Years	Value (Current $)	Value (1980 $)	Quanti
1976	378.311	524.868	37
1977	260.360	334.588	20
1978	842.290	994.898	22
1979	912.787	979.237	33
1980	67.558	67.558	2
	TOTAL	2.901.149	114

☐ Average Quantity 23

☐ Average Value 5 8 0 2 2 9

☐ Unit Price 2 5 4 4 8

☐ Group Coefficient 0,0 0 7 6 7

Years	1 % 6 TURKISH MODEL		2 % 3,5 TURKISH MODEL		3 % 6 UNIDO MODEL	
	Value	Quantity	Value	Quantity	Value	Quantity
1982	811.739	32	797.856	31	766.002	30
1983	862.890	34	833.644	33	805.779	32
1984	916.549	36	870.951	34	847.404	33
1985	971.418	38	909.815	36	896.584	35
1986	1.066.344	42	950.205	37	959.747	38
1987	1.156.636	45	992.275	39	1.027.028	40
1988	1.253.439	49	1.036.101	41	1.098.597	43
1989	1.356.623	53	1.081.715	43	1.174.668	46
1990	1.452.693	57	1.128.878	44	1.255.833	49
1991	1.583.785	62	1.177.950	46	1.341.333	53
1992	1.708.715	67	1.229.017	48	1.432.694	56
1993	1.842.073	72	1.282.170	50	1.529.904	60
1994	1.988.860	78	1.337.456	52	1.633.019	64
1995	2.134.844	84	1.394.942	55	1.742.309	68
1996	2.295.500	90	1.454.377	57	1.858.893	73
1997	2.466.610	97	1.516.566	59	1.982.503	78
1998	2.649.072	104	1.580.802	62	2.114.013	83
1999	2.844.038	112	1.647.615	65	2.271.409	89
2000	3.053.021	120	1.717.021	67	2.405.718	94

1980 $

SEMI-AUTOMATIC COPYING LATHE

SP 12 P

7 3 6 | 1 3 | 1 0 2 2 2 0 1 2 1 2

- ☐ Swing over bed: 280 mm
- ☐ Max distance between centres: 550 mm
- ☐ Max turning length: 500 mm

Years	Value (Current $)	Value (1980 $)	Quantity
1976	381.728	529.609	8
1977	524.216	673.669	13
1978	38.905	45.736	2
1979	60.452	64.852	2
1980	-	-	-
	TOTAL	1.313.866	25

- ☐ Average quantity: 5
- ☐ Average Value: 262710
- ☐ Unit Price: 52554
- ☐ Group coefficient: 0,00347

Years	1 % 6 TURKISH MODEL		2 % 3,5 TURKISH MODEL		3 % 6 UNIDO MODEL	
	Value	Quantity	Value	Quantity	Value	Quantity
1982	367.240	7	360.959	7	346.548	7
1983	390.381	7	377.150	7	364.454	7
1984	414.658	8	394.028	7	383.376	7
1985	443.865	8	411.611	8	405.625	8
1986	482.427	9	429.884	8	434.201	8
1987	523.276	10	448.917	8	464.639	9
1988	567.070	11	468.744	9	497.018	9
1989	613.752	12	489.381	9	531.433	10
1990	663.772	13	510.718	10	568.181	11
1991	716.523	14	532.919	10	606.857	11
1992	773.043	15	556.022	11	648.168	12
1993	833.376	16	580.069	11	692.147	13
1994	897.522	17	605.081	12	738.797	14
1995	965.829	18	631.088	12	788.241	15
1996	1038.512	20	657.977	13	840.985	16
1997	1115.924	21	686.112	13	896.908	17
1998	1198.472	23	715.173	14	956.404	18
1999	1286.224	24	745.401	14	1.027.612	19
2000	1382.218	26	776.801	15	1.088.475	21

1980 $

CAMLESS AUTOMATIC LATHE

AB 80 A

7 3 6 | 1 3 | 0 7 2 0 2 1 1 2 1 2

- ☐ Swing over bed: 2.4.0
- ☐ Bar capacity: 8.0
- ☐

Years	Value (Current ₺)	Value (1980 ₺)	Quanti
1976	749.428	1.039.756	14
1977	1.078.888	1.386.478	24
1978	965.920	1.135.535	36
1979	156.430	167.818	2
1980	28.000	28.000	2
	TOTAL	3.757.587	78

- ☐ Average Quantity: 1.6
- ☐ Average Value: 7.5.1.5.1.7
- ☐ Unit Price: 4.8.1.7.4
- ☐ Group Coefficient: 0.0.0.9.9.4

Years	1 % 6 TURKISH MODEL		2 % 3,5 TURKISH MODEL		3 % 6 UNIDO MODEL	
	Value	Quantity	Value	Quantity	Value	Quantity
1982	1.051.980	22	1.033.988	21	992.770	20
1983	1.118.369	23	1.080.368	22	1.044.256	21
1984	1.187.810	25	1.128.716	23	1.098.201	23
1985	1.271.445	26	1.179.082	24	1.161.936	24
1986	1.381.938	29	1.231.426	25	1.243.792	26
1987	1.498.952	31	1.285.947	27	1.330.985	28
1988	1.624.404	34	1.342.745	28	1.423.736	30
1989	1.758.127	36	1.401.858	29	1.522.320	32
1990	1.901.412	39	1.462.979	30	1.627.585	34
1991	2.052.520	42	1.526.575	32	1.738.376	36
1992	2.214.423	46	1.592.755	33	1.856.712	38
1993	2.387.250	49	1.661.639	34	1.982.692	41
1994	2.571.000	53	1.733.287	36	2.116.326	44
1995	2.766.669	57	1.807.782	37	2.257.960	47
1996	2.974.873	62	1.884.812	39	2.409.048	50
1997	3.196.624	66	1.965.406	41	2.569.241	53
1998	3.433.082	71	2.048.653	42	2.739.672	57
1999	3.684.459	76	2.135.241	44	2.943.651	61
2000	3.950.443	82	2.225.188	46	3.117.710	65

1980 ₺

AUTOMATIC SINGLE-SPINDLE TURRET LATHE

A 40 B | 7 3 6 | 1 3 | 0 7 2 1 2 1 1 2 1 2

☐ Max.round stock capacity with internal feeding 4,2 mm

☐ Max.length of stock advance 9,5 mm

☐

Years	Value (Current $)	Value (1960 $)	Quanti
1976	592.226	821.654	40
1977	652.175	838.110	13
1978	10.470	12.308	1
1979	-	-	-
1980	-	-	-
	TOTAL	1.672.072	54

☐ Average Quantity 11

☐ Average Value 3 3 4 4 1 4

☐ Unit Price 3 0 9 6 4

☐ Group Coefficient 0 0 0 4 4 2

Years	1 % 6 TURKISH MODEL		2 % 3,5 TURKISH MODEL		3 % 6 UNIDO MODEL	
	Value	Quantity	Value	Quantity	Value	Quantity
1982	467.781	15	459.781	15	441.425	14
1983	497.258	16	480.405	10	464.347	15
1984	528.181	17	501.904	16	488.334	16
1985	565.384	18	524.500	17	516.676	17
1986	614.503	20	547.576	18	553.074	18
1987	666.536	21	571.819	18	591.846	19
1988	722.320	23	597.075	19	633.089	20
1989	781.783	25	623.361	20	676.922	22
1990	845.497	27	650.540	21	723.735	23
1991	913.690	29	678.819	22	773.000	25
1992	984.683	32	708.247	23	825.620	27
1993	1.061.533	34	738.878	24	881.639	28
1994	1.143.241	37	770.737	25	941.062	30
1995	1.230.249	40	803.865	26	1.004.042	32
1996	1.322.830	43	838.119	27	1.071.226	34
1997	1.421.436	46	873.953	28	1.142.459	37
1998	1.526.584	49	910.970	29	1.218.244	39
1999	1.[illegible].361	53	949.423	31	1.308.947	42
2000	1.[illegible].666	57	989.470	32	1.386.348	45

1980 $

AUTOMATIC SINGLE-SPINDLE TURRET LATHE

A20A

7 35 | 1 3 | 0 7 1 1 2 1 1 2 1 2

- ☐ Max.round stock capacity with internal feeding: 22 mm
- ☐ Max.length of stock advance: 64 mm
- ☐ Max.length of bar stock fed: 3000 mm

Years	Value (Current $)	Value (1980 $)	Quantity
1976	185.400	257.224	10
1977	58.499	75.177	4
1978	-	-	-
1979	-	-	-
1980	-	-	-
	TOTAL	332.401	14

- ☐ Average Quantity: 3
- ☐ Average Value: 66480
- ☐ Unit Price: 23742
- ☐ Group Coefficient: 0,00888

Years	1 % 6 TURKISH MODEL		2 % 3,5 TURKISH MODEL		3 % 8 UNIDO MODEL	
	Value	Quantity	Value	Quantity	Value	Quantity
1982	93.133	4	91.960	4	82.885	4
1983						
1984						
1985	112.965	5	101.885	4	102.867	4
1986						
1987						
1988						
1989						
1990	168.334	7	121.112	5	144.092	6
1991						
1992						
1993						
1994						
1995	244.936	10	160.045	7	199.899	8
1996						
1997						
1998						
1999						
2000	350.943	15	230.		292.414	12

1980 ✓

AUTOMATIC SINGLE-SPINDLE TURRET LATHE

A16A

2	3	6	1	3	0	7	1	1	2	1	1	2	1	2

☐ Max.round stock capacity with internal feeding 1,8 mm

☐ Max.length of stock advance 6,4 mm

☐ Max.length of bar stock fed 3,0,0,0 mm

Years	Value (Current $)	Value (1980 $)	Quanti
1976	33.588	46.590	6
1977	15.234	18.576	1
1978	-	-	-
1979	-	-	-
1980	-	-	-
	TOTAL	65.166	7

☐ Average Quantity 1

☐ Average Value 13033

☐ Unit Price 9309

☐ Group Coefficient 0,0 0 1 7

Years	1 % 6 TURKISH MODEL		2 % 3,5 TURKISH MODEL		3 % 6 UNIDO MODEL	
	Value	Quantity	Value	Quantity	Value	Quantity
1982	17.991	2	17.683	2	16.977	2
1983						
1984						
1985	21.745	2	20.165	2	19.872	2
1986						
1987						
1988						
1989						
1990	32.519	3	25.020	3	27.835	3
1991						
1992						
1993						
1994						
1995	47.317	5	30.917	3	38.617	4
1996						
1997						
1998						
1999						
2000	67.716	7	38.056	4	53.321	6

1980 $

UNIVERSAL CYLINDRICAL GRINDING MACHINE

BU 28

7 3 6 | 1 9 | 0 2 4 2 2 0 1 2 1 2

- ☐ Max. Diameter of Workpiece: 2 9 5 mm
- ☐ Distance between centres: 1 0 0 0 mm
- ☐ Max. admissible weight of workpiece loaded between centres: 6 5 kg

Years	Value (Current $)	Value (1980 $)	Quanti
1976	603.390	837.143	55
1977	190.596	244.934	14
1978	470.228	552.800	22
1979	379.383	407.002	29
1980	20.500	20.500	1
	TOTAL	2.062.379	121

- ☐ Average Quantity: 2 4
- ☐ Average Value: 4 1 2 4 7 5
- ☐ Unit Price: 1 7 0 4 4
- ☐ Group Coefficient: 0 0 0 5 4 5

Years	1 % 6 TURKISH MODEL		2 % 3,5 TURKISH MODEL		3 % 6 UNIDO MODEL	
	Value	Quantity	Value	Quantity	Value	Quantity
1982	576.789	34	566.925	33	544.291	32
1983	613.135	36	592.355	35	572.555	33
1984	651.264	38	618.863	36	602.132	35
1985	697.136	41	646.479	38	637.077	37
1986	757.702	44	675.178	40	681.958	40
1987	821.860	48	705.071	41	729.765	43
1988	890.644	52	736.213	43	780.619	46
1989	963.963	56	768.624	45	834.672	49
1990	1.042.525	61	802.146	47	892.388	52
1991	1.125.375	66	837.005	49	953.134	56
1992	1.214.145	71	873.291	51	1.018.016	60
1993	1.308.904	77	911.060	53	1.087.089	64
1994	1.409.653	83	950.343	56	1.160.359	68
1995	1.516.936	89	991.191	58	1.238.016	73
1996	1.631.092	96	1.033.369	61	1.320.856	77
1997	1.752.676	103	1.077.612	63	1.408.688	83
1998	1.882.326	110	1.123.255	66	1.502.134	88
1999	2.020.151	118	1.170.730	69	1.613.973	95
2000	2.170.920	127	1.220.047	71	1.709.726	100

1980 $

UNIVERSAL TOOL AND CUTTER GRINDING MACHINE

BN 102 B

2 4 6 | 1 9 | 1 3 4 3 3 0 1 3 1 2

☐ Max.Diameter of workpiece 2 8 0 mm

☐ Distance between centres 7 0 0 mm

☐ Swivel of wheel head in horizontal plane 3 6 0°

Years	Value (Current $)	Value (1980 $)	Quantity
1976	133.659	185.438	22
1977	77.112	99.096	13
1978	137.680	161.856	15
1979	327.106	350.919	26
1980	52.988	52.988	6
	TOTAL	850.297	82

☐ Average quantity 1 0

☐ Average value 1 2 0 0 5 9

☐ Unit price 1 0 3 6 8

☐ Group coefficient 0,0 6 8 2 5

Years	1 % 6 TURRIS NOBEL		2 % 3,5 TURRIS NOBEL		3 % 6 BRIDO NOBEL	
	Value	Quantity	Value	Quantity	Value	Quantity
1982	236.124	23	234.051	22	224.207	22
1983	253.129	24	244.550	23	236.376	23
1984	268.870	26	255.494	25	248.586	24
1985	287.808	28	266.895	26	263.013	25
1986	312.813	30	278.743	27	281.542	27
1987	339.300	33	291.084	28	301.229	29
1988	367.697	35	303.941	29	322.274	31
1989	397.966	38	317.322	31	344.589	33
1990	430.400	41	331.157	32	368.417	35
1991	464.604	45	345.552	33	393.495	38
1992	501.252	48	360.533	35	420.282	40
1993	540.323	52	376.125	36	448.798	43
1994	581.967	56	392.343	38	479.047	46
1995	626.258	60	409.207	39	511.102	49
1996	673.386	65	426.642	41	545.307	52
1997	723.582	70	444.885	42	581.568	56
1998	777.102	75	463.729	45	620.142	60
1999	834.007	80	483.329	47	661.319	64
2000	896.251	86	503.689	49	705.219	68

1980 $

HORIZONTAL SURFACE GRINDING MACHINE

BRH 20 A

7 3 6 | 1 9 | 2 1 2 2 2 1 1 2 1 2

☐ Width of table: 2 0 0 mm

☐ Lenght of table: 6 3 0 mm

☐

Years	Value (Current $)	Value (1980 $)	Quantity
1976	43.140	59.852	8
1977	136.827	175.836	17
1978	144.932	170.382	15
1979	690.090	740.328	55
1980	45.800	45.800	6
	TOTAL	1.192.198	101

☐ Average quantity: 2 0

☐ Average Value: 1 2 3 8 4 3 9

☐ Unit Price: 1 1 8 0 3

☐ Group Coefficient: 0.0 0 3 1 5

Years	1 % 6 TURKISH MODEL		2 % 3,5 TURKISH MODEL		3 % 6 UNIDO MODEL	
	Value	Quantity	Value	Quantity	Value	Quantity
1982	333.373	28	327.672	28	314.590	27
1983	354.381	30	342.370	29	330.926	28
1984	376.418	32	357.691	30	348.021	29
1985	402.932	34	373.653	32	368.219	31
1986	437.938	37	390.240	33	394.159	33
1987	475.020	40	407.518	34	421.791	36
1988	514.776	44	425.517	36	451.183	38
1989	557.153	47	444.250	38	482.425	41
1990	602.560	51	463.620	39	515.784	44
1991	650.446	55	483.773	41	550.894	47
1992	701.753	59	504.746	43	588.394	50
1993	756.522	64	526.576	45	628.317	53
1994	814.753	69	549.281	46	670.666	57
1995	876.761	74	572.890	48	715.550	61
1996	942.741	80	597.209	51	763.430	65
1997	1.013.014	86	622.840	53	814.196	69
1998	1.087.950	92	649.221	55	868.206	23
1999	1.167.610	99	676.660	57	932.847	79
2000	1.252.752	106	705.165	60	988.006	84

1980 $

HORIZONTAL SURFACE GRINDING MACHINE

BPH 320 A

7 3 6 | 1 9 | 2 1 3 2 2 1 1 2 1 2

☐ Width of table 320 mm

☐ Lenght of table 1000 mm

☐

Years	Value (Current $)	Value (1980 $)	Quanti
1976	148.390	205.876	15
1977	23.954	30.783	3
1978	83.733	98.436	6
1979	102.153	109.589	9
1980	-	-	-
	TOTAL	444.684	33

☐ Average Quantity 7

☐ Average Value 88936

☐ Unit Price 13475

☐ Group Coefficient 0.0.0 1 1 7

Years	1 % 6 TURKISH MODEL		2 % 3,5 TURKISH MODEL		3 % 6 UNIDO MODEL	
	Value	Quantity	Value	Quantity	Value	Quantity
1982	123.824	9	121.706	9	116.847	9
1983	131.627	10	127.166	9	122.915	9
1984	139.812	10	132.857	10	129.265	9
1985	149.660	11	138.785	10	136.767	10
1986						
1987						
1988						
1989						
1990	223.808	17	172.201	13	191.576	14
1991						
1992						
1993						
1994						
1995	325.654	24	212.787	16	265.776	20
1996						
1997						
1998						
1999						
2000	466.050	34	261.918	19	366.974	27

1980 $

VERTICAL SURFACE GRINDING MACHINE

BRV 30 | 736 | 19 | 2133222212

- ☐ Width of table: 300 mm
- ☐ Lenght of table: 1500 mm
- ☐

Years	Value (Current $)	Value (1980 $)	Quanti
1976	48.665	67.517	3
1977	65.086	83.642	3
1978	-	-	-
1979	10.134	10.871	1
1980	-	-	-
	TOTAL	162.030	7

- ☐ Average Quantity: 1
- ☐ Average Value: 32406
- ☐ Unit Price: 23147
- ☐ Group Coefficient: 0,0042

Years	1 % 6 TURKISH MODEL		2 % 3,5 TURKISH MODEL		3 % 6 UNIDO MODEL	
	Value	Quantity	Value	Quantity	Value	Quantity
1982	44.449	2	43.689	2	41.945	2
1983						
1984						
1985	53.724	2	49.820	2	49.095	
1986						
1987						
1988						
1989						
1990	80.341	3	61.816	3	68.771	3
1991						
1992						
1993						
1994						
1995	116.901	5	76.385	3	95.406	4
1996						
1997						
1998						
1999						
2000	167.300	7	94.022	4	131.734	6

1980 $

5.4. EVALUATION OF THE RESULTS

5.4.1. As pointed out earlier, after the adverse economic situation in 1976-1980, an "Economic Stability Programme"was launched by the Government on 25.1.1980. As a result of these, it is expected that inflation will be around 25% in 1982. With this positive trend in the economy, it is felt that capital goods projects like TAKSAN will assume the vital role originally intended for them.

5.4.2. The net increase in GNP in 1981 is 4.4.% which is above the estimated value (3.5%) and between the years 1986-2000 a 6% increase in GNP/year is expected. It will be useful to consider the following points while analyzing the values of demand forecasts of machine tools up to the year 2000.

(i) In the foreasts, the domestic demand is considered as the sum of imports and the domestic production of machine tools. But the actual demand may be higher since imports

were conditioned by restrictions for different types of machine tools.

From this point of view, demand for radial drills, automatic and semi-automatic lathes, which did not figure in import lists until 1979 and grinding machines only some of which appeared in these lists, may be expected to be above the figures revealed by this study.

(ii) This study only determines the domestic demand.But while making the production plan for TAKSAN, it will be necessary to take into consideration the increasing importance given to exports in the Turkish economy.

5.4.3. EXPORTS

5.4.3.1. It is felt that the potential for exports of machine tools should be explored in different forms both in bilateral as well as multilatural basis. These are:

(I) RCD Countries
(II) Islamic Africa and Asia Countries
(III) Middle East and Gulf Countries
(IV) Other developing countries

Machine tools import potentials of these countries are given in Table 33.

5.4.3.2. It is obvious that in order to be successful, it is necessary to produce goods which meet international standards of quality and can be offered at competitive price. In this context, production of high quality goods in the ancillary industries for machine tool manufacture will

increase the demand for the automatic lathes and grinding machines in them.

5.4.3.3. At the same time it will be crucial to create and develop an aggressive marketting organisation which can continuously monitor the demands in other countries and besides feeding the Government with the requisite data for bilateral discussions and mount an offensive for selling Turkish machine tools in potential markets.

5.5. CONCLUSIONS

5.5.1. RADIAL DRILLS

5.5.1.1. Radial drills, as pointed out earlier, did not find a place in the import lists until 1979. After an application from TAKSAN, radial drills were included in the scope of "1979 Liberalized Import Lists - Customs Tariff No. 84.45 " and from then on, it was possible for the industrial establishments and importers to import these machines even without making use of incentive schemes introduced by the Government for

promotion of some industries. Imports of radial drills between 1979-1980 were however lower than expected because of scarcity of foreign exchange.

5.5.1.2. An analyses of imports of radial drills between 1976-1980 shows than an average of 47 radial drills were imported during that period. When the technical specifications were considered, it was seen that almost the entire demand is for two sizes of radial drills, 50 mm and 75 mm. Out of a total demand in value for these two, the 50 mm radial drills constitute 40 % of the demand and the 75 mm drills, balance 60%. The total demand for these two is expected to be 75 by 1985.

5.5.1.3. The planned capacity is 200 nos pa of 50 mm radial drilling. It is recommended that capacity in 1990 for both sizes should be 100 units per year.

5.5.2. MILLING MACHINES

5.5.2.1. It can be seen from import figures of these machines that there was no restriction on imports of milling machines except those that are indigenously produced. It is interesting that demand forecasts of these machines, showed up a particularly low unit price for model FU 315.

Discussions showed that one possible reason for this was that various organizations of small industrial groups freely imported milling machines at a relatively low price.

5.5.2.2. It is felt that Universal millers FU 315 and FU 400 and vertical miller FSS 400 should be taken up for manufacture. The capacity planned, 250 and 150 and 100 respectively is expected to be fully utilised by 1989, 1994 and 1997.

5.5.2.3. The demand in 1990 is expected to be 285, 113 and 62 respectively and it is recommended that TAKSAN's capacities in 1990 should be 250 and 100 and 60 units per year. It is recommended that universal boring and milling machine BFT 80 should not be taken up for the time being.

5.5.3. AUTOMATIC AND SEMI-AUTOMATIC LATHES

5.5.3.1. This group of machines also did not find a place in the import lists until 1979 so their actual demand is expected to be higher than the values calculated in this study.

5.5.3.2. When making demand forecasts of the camless automatic lathe AB80A, it has been assumed that problems which the automative industry is facing now, will continue in the next few years.

5.5.3.3. R-5 Lathe: This is the only turret lathe at present planned in Turkey, and should be taken up for manufacture immediately. The capacity planned is 150 pa, not expected to be reached upto year 2000, the demand in 1985 is forecast at 38 pa while the break even point (56) is expected to be reached in 1990. However it is recommended that TAKSAN should consider instead of this, a more modern tarret lathe. The capacity to be set up in the first instance is recommended as 60 nos/p.a.

5.5.3.4. SPL P: This is a semi-automatic copying lathe which is a complex machine. The capacity planned is 30 pa not expected to be reached upto year 2000.

The machine should not be taken up for the time being.

5.5.3.5. AB80A: This is a camless automatic lathe with a planned capacity of 60 p.a. expected to be reached by 1996. Its demand in 1985 is forecast at 26 p.a. while the breakeven point is 21 p.a. The manufacture of this machine should be taken up immediately for a capacity of 40 nos. p.a.

5.5.3.6. A40B: This is bar automatic has a planned capacity of 40 p.a. expected to be reached in 1995. Its demand in 1985 is expected to be 18 p.a. and its breakeven point is 14 p.a.

This machine should also be taken up immediately for manufacture for a capacity of 25 nos. p.a.

5.5.3.7. A20A and A16A : These bar automatics' planned capacity of 20 p.a. each is not expected to be reached even by 2000. Their demand in 1985 is palced at 5 and 2 respectively.

It is recommended that neither of these be taken up by TAKSAN for the time being. A part

of demand for these will be taken up by A40B automatic lathe.

5.5.4. GRINDING MACHINES

5.5.4.1. BU28 - Universal Grinding Machine

The capacity planned is 150 and expected be reached by 2000. It is a popular machine and the only one of its type planned in Turkey. Its demand in 1985 is expected to be 41 while the breakeven point 52 is expected be reached in 1988.

This should be taken up immediately for a capacity of 60 pa.

5.5.4.2. BN102B -Universal tool grinding and sharpening machine

The capacity planned is 150 not expected to be reached by 2000. Its demand in 1985 is expected to be 28 and the breakeven point is 52 expected to be reached in 1993. This demand however is artificially low because of primitive methods of tool grinding being used in small and medium scale industry which are bound to give way to more modern methods.

Demand for this machine will go up as demand for higher productivity and better qualtiy is faced by this industry.

This is critical machine for the entire engineering industry and should be taken up on high priority for a capacity of 40 nos. p.a.

5.5.4.3. BRH 20A and BPH 320A- Horizontal surface grinders

The planned capacity is 120 and 100 nos p.a. BRH20 is a small grinder and its demand is expected to be substantially met by a similar though smaller machine being marketed by BİMAK, a private sector manufacturer. As a result, the only higher capacity surface grinder in the market, BPH320A is showing a trend of demand higher than forecast.

It is recommended that while BRH20A need not be taken up just now, BPH320A should be considered for the first phase with a capacity of 70 nos. p.a.

5.5.4.4. BKV30- Vertical Surface Grinder

Its planned capacity is 80 p.a. and there is hardly any demand for it. This should be dropped. However, investigations may be made for an alternativ smaller vertical grinder.

5.5.5. Horizontal boring and milling machine

These are sophisticated machine tools and should be taken up in Phase II after manufacture of a large number of machine tools in Phase I(upto 1990) is mastered.

5.5.6. SUMMARY

5.5.6.1. Summary of conclusions and recommendations is given in table 25. The charts on page gives at a glance, the present planned capacity and recommended capacity in Phase I (to be achieved by 1990), and Phase II (to be achieved by 1995).

5.5.6.2. Determination of the demand pattern upto 2000 for machine tools that are in the current production programme of TAKSAN shows that after taking into account the numbers to be produced by 1990 in Phase I, sizable spare capacity will be available.

CAPITAL GOODS DEVELOPMENT PROJECT IN TURKEY

TABLE 25

DEMAND AND CAPACITY FOR TAKSAN'S LICENSED MACHINE TOOLS

Machine nomenclature type-name	Planned capacity		Breakeven point		Demand			Recommended Capacity 1990	Remorks
	Nos Pa	full utilization year	Nos Pa	Year	1985	1990	2000		
BR40-Radial Drill	200	2000	69	1994	36	54	112	60	
FU 315-Üniversal Miller	250	1989	86	1982	190	285	593	250	
FU 400-Üniversal Miller	150	1994	52	1982	75	113	235	100	
FSS-400Vertical Miller	100	1997	34	1982	42	62	129	60	
BFT80-Hor.Bor.and.Milling	100	2000	34	1992	20	29	61	-	Phase II 30 pa.
R5- Turret Lathe	150	2000	56	1990	38	57	120	60	
SP12P-Copy Lathe	30	2000	10	1987	8	13	26	-	Phase II 15 pa.
AB80A-Chucker	60	1996	21	1982	26	39	82	40	
A40B-Bar automat lathe	40	1995	14	1982	18	27	57	25	
A20A-Bar automat lathe	20	2000	7	1990	5	7	15		Phase II 10 pa.
A16A-Bar automat lathe	20	2000	7	2000	2	3	7	-	-
B[illegible]28-Unv.Cyl.Grinder	150	2000	52	1988	41	61	127	60	
[illegible] 102N-Tool Grinder	150	2000	52	1993	28	41	86	40	
SPH20A-H.Surf.Grinder	120	2000	41	1988	34	51	106	70	
[illegible] 320A H.Surf.Grinder	100	2000	34	2000	11	17	54		
[illegible]	[illegible]	2000	27	2000	[illegible]	[illegible]	[illegible]	-	

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CHAPTER VI

MARKET ANALYSIS FOR ADDITIONAL MACHINE TOOLS IN TAKSAN

6.1. In Chapter V, demand for those machine tools which are licensed to be produced in TAKSAN's Kayseri integrated plant have been examined and given on the basis of 1980 Dollars and in units in Tables 9-24. A comparison between 1985, 1990, 2000 demand and Taksan's planned capacity is shown in Table 25.

6.2. In order to increase the profitability of investment, the Government of Turkey has stressed that capacity utilisation must be optimized. One approach to utilise the spare capacity is to produce subject to demand, a larger range of licensed machines. Another approach is to examine the total demand and to produce completely different products which have higher demand than others.

6.3. In order, however, to decide which approach to follow, import figures of all machine tools between years 1976-1980 were examined and results are shown in Table 8. Import figures which are given in current US $ and units are summed up on

1980 $ basis and yearly averages are given. Relationship of import value of a machine group to total imports are shown in the last column under the heading "Group Coefficient". Machine tool groups which have high demand can be determined by examining these group coefficients.

6.4. The results of investigations, made to find out possible additional types of machines which TAKSAN may take up are given below:

6.4.1. MILLING MACHINES

6.4.1.1. Import values of universal milling machines FU 315 and FU 400 and vertical milling machine FSS 400 and ratios of these to total Milling machine imports are shown below:

TYPE OF MACHINE	AVERAGE		PERCENT	
	VALUE	UNIT	VALUE	UNIT
FU 315	1.201.799	113	13.1	31.9
FU 400	896.357	45	9.8	12.7
FSS400	446.517	25	4.8	7
Total	2.544.673	183	27.7	51.6

6.4.1.2. It will be seen that the ratio of TAKSAN's licensed milling machines to total milling machines is 27.7% on value basis and 51.6% on quantity basis. As our market demand is calculated on value basis, these results are valid also for the future. Examination of the balance 72.3% in this machine group showed that most of them are very expensive, special purpose milling machines. Results of the studies about two types of milling machines, tool room milling machine and Universal milling machine, however, which, prima facie, can be considered for TAKSAN, are given in "Machine Identification Card" Tables 26 and 27.

6.4.1.3. TOOL ROOM MILLING MACHINE

Value of total imports of tool room milling machines with a representative 300 x 1300 mm. table size were 619.652 $ for 115 units. Yearly average value works out to be 123.930 $ for 23 machines. On the basis of value this provided for 1.3% and on quantity basis, 6.5% of all milling machines.

TOOL ROOM MILLING MACHINE

7	3	6		1	4		0	5	4	2	2	2	1	2	1	2

☐ Length of table 1300 mm

☐ Width of table 300 mm

☐

Years	Value (Current ₺)	Value (1980 ₺)	Quantity
1976	222.967	309.344	55
1977	174.037	223.654	47
1978	16.942	19.917	5
1979	17.000	18.237	3
1980	48.500	48.500	5
	TOTAL	619.652	115

☐ Average Quantity 23

☐ Average Value 123930

☐ Unit Price 5388

☐ Group Coefficient 0.00164

Years	1 % 6 TURKISH MODEL		2 % 3,9 TURKISH MODEL		3 % 6 UNIDO MODEL	
	Value	Quantity	Value	Quantity	Value	Quantity
1982	173.566	32	170.597	32	163.786	30
1983	184.503	34	178.249	33	172.291	32
1984	195.976	36	186.226	34	181.192	34
1985	209.780	39	194.536	36	191.707	35
1986	228.005	42	203.173	38	205.213	38
1987	247.312	46	212.168	39	219.599	41
1988	268.010	50	221.539	41	234.902	43
1989	290.073	54	231.292	43	251.167	47
1990	313.713	58	241.376	45	268.535	50
1991	338.645	63	251.869	47	286.814	53
1992	365.357	68	262.788	49	306.338	57
1993	393.872	73	274.153	51	327.124	61
1994	424.189	79	285.975	53	349.172	65
1995	456.472	85	298.266	55	372.540	69
1996	490.824	91	310.975	58	397.468	74
1997	527.410	98	324.272	60	423.899	79
1998	566.424	105	338.007	63	452.018	84
1999	607.898	113	352.293	65	485.672	90
2000	653.267	121	367.133	68	514.390	95

1980 ₺

UNIVERSAL MILLING MACHINE

(BIG)

7 3 6	1 4	0 3 5 3 2 1 1 2 1 2

☐ Length of table 2 0 0 0 mm

☐ Width of table 5 0 0 mm

☐

Years	Value (Current £)	Value (1980 £)	Quantity
1976	57.000	79.081	1
1977	482.725	620.349	11
1978	192.647	226.475	5
1979	75.765	81.066	2
1980	92.967	92.967	2
	TOTAL	1.099.938	21

☐ Average Quantity 4

☐ Average Value 2 1 9 9 8 7

☐ Unit Price 5 2 3 7 8

☐ Group Coefficient 0.0 0 2 9 1

Years	1 % 6 TURKISH MODEL		2 % 3,5 TURKISH MODEL		3 % 6 UNIDO MODEL	
	Value	Quantity	Value	Quantity	Value	Quantity
1982	307.974	6	302.706	6	290.621	5
1983						
1984						
1985	372.232	7	345.184	6	340.164	6
1986						
1987						
1988						
1989						
1990	556.650	11	428.296	8	476.486	9
1991						
1992						
1993						
1994						
1995	809.960	15	529.241	10	661.032	13
1996						
1997						
1998						
	1.159.151	22	651.438	12	912.730	17

In Turkey, there is at present no company which could be expected to supply 39 machines for 209.780 $ in 1985. Only BİMAK is producing a tool room milling machine with 240 x 600 mm table size and max. 25 mm drill capacity and in 1981 they produced 25 units of this KF. 6025 model. Because the specifications of this model are different, it will not affect the calculated demand for 1300 x 300 mm table size tool room milling machine.

It is felt that this machine should be included in Taksan's production programme at the rate of 50 nos p.a.

6.4.1.4. UNIVERSAL MILLING MACHINE (500-600x2000-2500 mm Table size)

Demand for universal milling machines with 500-600x2000-2500 table size was taken up because similar machines are already in Taksan's programme. Because of its being expensive, the numbers are relatively low.

During 1976-1980, a total of 21 machines for 1.099.938 $ were imported. Yearly average was 4 machines valued at 219.987 $. When compared with total imported milling machines, they represented 2.4% on value and 1.1 % on unit basis.

M.K.E.K. which is the largest producer of milling machines in Turkey has the biggest model ÜF 2.5 with table size 1500 x 315 mm. Calculated demand for universal milling machine in this range in 1985 is 372.232 $ - 7 machines at 52.378 $ unit price.

TAKSAN's licensed milling machines FU400, FU315 and FSS 400 have the largest share in total demand. If the tool room and bigger universal milling machines are also produced, share of TAKSAN milling machines in Turkey's total milling machine demand will be as follows:

TYPE OF MACHINE	AVERAGE VALUE	AVERAGE UNIT	PERCENT VALUE	PERCENT UNIT
FU 315	1.201.799	113	13.1	31.3
FU 400	896.357	45	12.7	9.8
Tool Room m/m	123.930	23	6.5	1.3
Big Unv. Miller	219.987	4	2.4	1.1
FSS 400	446.517	25	4.8	7.
TOTAL	2.888.590	210	36.6	53.4

The demand however does not justify inclusion of these large universal milling machines in the present phase of production facilities.

All milling machines which are in the production plan of TAKSAN, are included in 736.14 code of knee-type milling machines in SITC coding system. When the data of 1976-1980 knee-type milling machines was examined, it was seen that yearly average of 1.347.879 $ and 39 units of machines

could not be specified. This makes an unknown rate of 14.7% on value basis and 11 % on unit nasis. When all the milling machines are considered, these 'unspecified' machines are worth 2.430.033 $ (58 units) yearly. This makes 26.6% on value and 16.3% on unit basis. It is logical to consider that a part of demand of these machine tools will be met by TAKSAN.

6.4.2. HORIZONTAL BORINC AND MILLING MACHINES

Import figures of TAKSAN's licensed BFT80 horizontal boring and milling machines during 1976-1980 are 527.202 $ for 12 machines (Table 13). During these years total import of horizontal boring and milling machine was 1.763.803 $ for 24 machines, yearly. This means that BFT 80 is a substitute for 29% on value basis and 50% on unit basis of all horizontal boring mills.

In order to find another group of Horizontal boring and milling machines which are in heavy demand, a study was carried out and the results are shown in "Machine Tool Identification Card" for Horizontal boring and milling machine with 100-110 mm spindle capacity.

The status of these two machines among the total horizontal boring mills is shown below:

TYPE OF MACHINE	AVERAGE		PERCENT	
	VALUE	UNIT	VALUE	UNIT
BFT 80	527.202	12	29	50
Ø 100-110	361.652	6	20	25
Total	888.854	18	49	75

If horizontal boring and milling machine with 100mm spindle capacity is included in TAKSAN's production programme, 75% on unit basis and 49% on value basis of all demand could be supplied. There is no other Turkish company manufacturing this type of machines.

In fact, by 1985 a demand of TAKSAN's BFT80 Horizontal Boring and Milling Machines alone will be 1.503.000 $ worth for 30 units.(Tables 13 and 28). These are however sophisticated machines and should be taken up in Phase II after nearly full production capacity is realised for all the machines recommended for Phase I - including 11 types already licensed.

HORIZONTAL BORING, DRILLING AND MILLING MACHINE

☐ Dia.of boring spindle 110

☐

☐

Years	Value (Current $)	Value (1980 $)	Quanti
1976	319.914	443.848	6
1977	99.237	127.529	2
1978	617.820	726.309	12
1979	399.643	428.737	8
1980	81.840	81.840	1
	TOTAL	1.808.263	29

☐ Average Quantity 6

☐ Average Value 361652

☐ Unit Price 62353

☐ Group Coefficient 000478

Years	1 % 6 TURKISH MODEL		2 % 3,5 TURKISH MODEL		3 % 6 UNIDO MODEL	
	Value	Quantity	Value	Quantity	Value	Quantity
1982	505.881	8	497.229	8	477.378	8
1983						
1984						
1985	611.433	10	567.003	9	558.758	9
1986						
1987						
1988						
1989						
1990	914.361	15	703.525	11	782.681	12
1991						
1992						
1993						
1994						
1995	1.330.450	21	869.338	14	1.085.820	17
1996						
1997						
1998						
1999						
2000	1.904.036	30	1.070.060	17	1.499.261	24

Since no new production facilities will be required for the bigger mill, it is felt that 10 nos. pa. of these may be added to 30 nos.pa. of BFT80 in the second phase.

6.4.3. JIG BORING MACHINES

These are highly sophisticated, ver expensive machines. The yearly average imports of jig bores were 1.800.632 $ for 18 units and when these machines were classified and coded according to their specifications, demand for each group was too small to be considered for local manufacture.

6.4.4. CYLINDRICAL GRINDING MACHINES

Cylindrical grinding machines are expressed by a very high group coefficient 0.048823. When these were coded, it was seen that most of them were special purpose machines. The future demand values under the heading "BU 28" in the study was for grinders with grinding length 500 to 1000 mm. It was also noted that a grinder with grinding length of 630 mm and grinding diameter of 295 mm has only 14% of the demand of BU 28 with 1000 mm grinding length.

Import figures and demand forecast for BU 630 x 295 mm is given in "Machine Tool Identification Card"(Table 29). Other machine with 1000 mm grinding length can be found in Table 20.

Status of these two machines among all cylindrical grinders is as follows:

TYPE OF	AVERAGE		PERCENT	
MACHINE	VALUE	UNIT	VALUE	UNIT
BU28(630)	70.963	3	1.9	4.1
BU28(1000)	412.475	24	11.1	32.8
TOTAL	483.438	27	13.0	36.9

Under these circumstances, it is felt that including BU28 x 1000 mm. in the production programme of TAKSAN will be logical.

UNIVERSAL CYLINDRICAL GRINDING MACHINE

7 3 6 | 1 9 | 0 2 4 2 2 0 1 2 1 2

☐ Distance between centres: 6 3 0 mm

☐ Max.Diameter of workpiece: 3 0 0 mm

☐

Years	Value (Current $)	Value (1980 $)	Quantity
1976	-	-	-
1977	-	-	-
1978	128.527	151.096	7
1979	189.495	203.290	10
1980	-	-	-
	TOTAL	354.817	17

☐ Average Quantity: 3

☐ Average Value: 7 0 9 6 3

☐ Unit Price: 2 0 8 7 1

☐ Group Coefficient: 0 0 0 0 9 4

Years	1 % 6 TURKISH MODEL		2 % 3,5 TURKISH MODEL		3 % 6 URIDO MODEL	
	Value	Quantity	Value	Quantity	Value	Quantity
1982	99.483	5	97.781	5	93.877	4
1983						
1984						
1985	120.240	6	111.502	5	109.881	5
1986						
1987						
1988						
1989						
1990	179.811	9	138.350	7	153.916	7
1991						
1992						
1993						
1994						
1995	261.636	12	170.957	8	213.529	10
1996						
1997						
1998						
1999						
[illegible]	374.433	16	210.430	10	294.833	14

Import figures and future demand for 1000-1500 mm cylindrical grinding machine are given in "Machine Identification Card 30". Yearly average worked out to 116.778 $ and 4 units and the share of these machines among all cylindrical grinders is 5.4% on unit basis and 3.1% on value basis. If these machines are included in TAKSAN's production programme, it will not have much affect onprofitability and TAKSAN machine tools among all cylindrical grinders will rise to 38.2% on unit basis and 14.2% on value basis.

Although most of the imported machine tools are expensive special purpose machines, BU28 x 1000 mm cylindrical grinders form the biggest group among all universal grinders.

About 64 cylindrical grinders which worth 2.955.375 $, necessary specifications could not be found. This represents an unspecified amount of 16% on value basis and 17.4 % on unit basis (which means 13 machines) per year. Knowing that 38.2% of all cylindrical grinders are BU28 x 1000 this may mean upto additional 5

UNIVERSAL CYLINDRICAL GRINDING MACHINE

7 3 6 | 1 9 | 0 2 5 3 2 0 1 2 0 2

☐ Distance between centres 1500 mm

☐ Max.Diameter of workpiece 400 mm

☐

Years	Value (Current $)	Value (1980 $)	Quantity
1976	102.022	141.545	10
1977	61.036	78.437	5
1978	69.230	81.386	2
1979	223.580	239.856	4
1980	42.666	42.666	1
	TOTAL	583.890	22

☐ Average Quantity 4

☐ Average Value 116778

☐ Unit Price 26540

☐ Group Coefficient 000154

Years	1 % 6 TURKISH MODEL		2 % 3,5 TURKISH MODEL		3 % 6 UNIDO MODEL	
	Value	Quantity	Value	Quantity	Value	Quantity
1982	162.982	6	160.195	6	153.799	6
1983						
1984						
1985	196.989	7	182.674	7	180.018	7
1986						
1987						
1988						
1989						
1990	294.585	11	226.650	8	252.161	9
1991						
1992						
1993						
1994						
1995	428.638	16	280.079	10	349.824	13
1996						
1997						
1998						
1999						
2000	613.434	23	344.747	13	483.025	18

machines per year.

6.4.5. SURFACE GRINDING MACHINES

3.4% of all imported machine tools are surface grinders. While TAKSAN's 3 different kinds of machines cover a large grinding range they do not representative high percentages of total demand.

TYPE OF	AVERAGE		PERCENT	
MACHINE	Value	Unit	Value	Unit
BRH 20A	238.439	20	9	24.3
BPH 320A	88.936	7	3.4	8.5
BRV 30	32.406	1	1.2	1.2
Total	359.781	28	13.6	34

In Machine Identification Card (Table 31), results of the study about a surface grinder with bigger table size is given. Yearly average of 116.086 $ for 3 units of this size of machine is expressed as 4.4% on value basis and 3.6% on unit basis of all imported surface grinders. If this machine is included in production programme, TAKSAN will cover 18% on value and 37.6% on

HORIZONTAL SURFACE GRINDING MACHINE

7 3 6 | 1 9 | 0 9 4 4 2 1 1 2 0 2

☐ Length of table: 1 6 0 0 mm

☐ Width of table: 5 5 0 mm

☐

Years	Value (Current $)	Value (1980 $)	Quanti
1976	26.899	37.319	1
1977	30.862	39.660	1
1978	59.117	69.497	2
1979	46.492	49.876	6
1980	384.081	384.081	7
	TOTAL	580.433	17

☐ Average Quantity: 3

☐ Average Value: 1 1 6 0 8 6

☐ Unit Price: 3 4 1 4 3

☐ Group Coefficient: 0 0 0 1 5 3

Years	1 % 6 TURKISH MODEL		2 % 3,5 TURKISH MODEL		3 % 6 UNIDO MODEL	
	Value	Quantity	Value	Quantity	Value	Quantity
1982	161.924	5	159.155	5	152.801	4
1983						
1984						
1985	195.709	6	181.488	5	178.849	5
1986						
1987						
1988						
1989						
1990	292.672	9	225.186	7	250.523	7
1991						
1992						
1993						
1994						
1995	425.855	12	278.261	8	347.553	10
1996						
1997						
1998						
1999						
2000	609.451	18	342.508	10	479.889	14

1980 $

unit basis of all surface grinders. But these results must be considered as minimum values. During 1976-1980 39 units of surface grinders which worth 1.740.305 $ could not be coded according to their specifications. Unit price of these machines is calculated as 44.623.$ which is relatviely expensive. The unspecified machines are 13.3% on value and 8.8% on unit basis and this must be taken into consideration, as a factor which will favourably affect the demand for TAKSAN machines.

It is felt that no machine of this type besides the 3 machine already included in the present programme need be taken up by TAKSAN.

6.4.6. TOOL GRINDING AND SHARPENING

Demand for TAKSAN's licensed tool grinding and sharpening machine BN102B is much lower than planned capacity. During 1976-1980, yearly 16 units of BN102B for 170.059 $ were imported and this amount covered 19.9% on value, 30.7% on unit basis of all tool grinding and sha ening machines. These figures will be higher if BNV80 drill sharpener, licensed by TAKSAN and planned as 80 nos. p.a. is taken into account. If it is assumed that BN102B could be a substitute for all tool grinders and sharpeners imported during

this period, demand for 1985 is calculated as 89 units which is still lower than 150 units/year capacity.

It is found that BN102B forms the largest group among all tool grinder and sharpeners. Others are mostly small drill head sharpeners or unspecified machine tools. No other machine under this heading need be included in TAKSAN's programme.

6.4.7. LATHES

As can be seen from Table 8, lathes form one of the largest groups with inputs of 10.122.739 $ per year. In the first phase of market research, lathes were studied in four groups, namely, universal, automatic, turret and others.

TAKSAN's licensed lathes cover 19.8 % on value and 20.6 % on unit basis of all lathes imported during 1976-1980. With lathes as a group having a demand which is high both in numbers and value, TAKSAN's own products in this group represent a very sizable capacity.

In Turkey, universal lathes have been manufactured for a long time. Production figures of most important manufacturers of universal lathes, MKEK, BİMAK, TEZSAN are given below in units.

FIRMS	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81
MKEK	30	75	40	54	82	116	90	91	118	127	100	151	108	122	194
TEZSAN					185	360	420	858	788	882	1248	1112	1180	431	841
BİMAK	19	74	61	104	145	188	230	331	275	414	381	404	249	99	175
TOTAL	49	149	101	158	412	664	746	1007	1181	1423	1749	1667	1537	652	1210
Average per year										1406					

Between 1976-1980 yearly average 1406 units of universal lathes were manufactured and 89 units imported. Although this shows the high demand for universal lathes, Turkey's present capacity is adequate for it. Most of the machine tool manufacturers hold high universal lathe stocks on their hands. In these circumstances, it is not advisable to begin universal lathes production in TAKSAN factory.

Although TAKSAN's automatic lathes A16A, A20A,A40B and AB80A cover a big range of capacity, they cannot be expressed in high percentages. Most of the automatic lathes other than TAKSAN's licensed machine tools which cover 59.6% on unit and 38.5% on value basis of total imports, are multispindle automatics or expensive numeric controlled machines. When these were examined it was seen that there is no individual group the demand of which is large enough for inclusion into TAKSAN's production programme. As mentioned in Chapter V. of this report, taking A16A out of the production plan will increase the demand for A40A.

It is obvious that selection of R5 turret lathe for manufacturing is a good choice, because during 1976-1980, 88.4% on unit and 63.4% on value basis of all turret lathes imported were substitutes of R5.

Above figures indicates that TAKSAN's licensed lathe are the most suitable ones for Turkey's demand, and no other lathes need be added to TAKSAN's licenses.

6.4.8. DRILLING MACHINES

When drilling machines other than radial drills were investigated, it was seen that most of them are sophisticated, numerically controlled and multisindle drills. If we consider the fact that simple column drilling machines are being manufactured by many companies in Turkey, low import values of these are understandable. During 1976-1980 most of the imported drilling machines could not be classified according to their specifications. During these years, 554 units for 19.352.650 $ were imported but specifications of 133 units worth 10,478.021 $ could not be found. This makes an unspecified total of 23.8% on unit and 54% on value basis. This is the main reason for not making any recommendations on drilling machines.

Most of the column drill manufacturers in Turkey produce machines in low range. It is certain that there is a demand for column drills having drilling capacity of 50 mm or more, but this demand cannot be quantified on the basis of available data.No pillar/column machines are recommended for TAKSAN for the time being. However, the manufacturers in the private sector may be encouraged to take up bigger sizes.

6.4.9. RADIAL DRILLING MACHINES

Demand forecast figures of 2R40 model Radial drill with 45 mm drilling capacity are given in Table 9. Among others, it is seen that the largest group is formed by radial drills which have 75-80 mm drilling capacity and 1500-2000 mm length of arm. Import values and forecast demand figures of such radial drilling machines are given in "Machine Tool Identification Card" 32.

During 1976-1980, yearly average 43 units of radial drills for 685.348 $ were imported. 21 of these for 256.364 $ had 45 mm drilling capacity and 22 of these for 428.984 $ had 75 mm drilling capacity in steel. The share of these machines in total radial drills imported can be summarized as follows:

RADIAL DRILLING MACHINE

7 3 6 | 1 5 | 0 3 5 4 2 0 1 2 0 2

☐ Max.diameter drilled 7 5 mm

☐ Projection of drilling spindle 2 0 0 0 mm

☐

Years	Value (Current $)	Value (1980 $)	Quantity
1976	56.055	77.784	3
1977	505.270	649.322	32
1978	839.927	987.418	53
1979	181.712	194.940	12
1980	235.457	235.457	8
	TOTAL	2.144.921	108

( ) Average quantity 2 2

☐ Average Value 4 2 8 9 8 4

☐ Unit Price 1 9 8 6 0

☐ Group Coefficient 0.0 0 5 6 7

Years	1 % 6 TURKISH MODEL		2 % 3,5 TURKISH MODEL		3 % 6 UNIDO MODEL	
	Value	Quantity	Value	Quantity	Value	Quantity
1982	600.073	30	589.810	30	566.262	28
1983	637.886	32	616.266	31	595.667	30
1984	677.553	34	643.845	32	626.438	31
1985	725.278	36	672.575	34	662.794	33
1986	788.288	40	702.433	35	709.487	36
1987	855.036	43	733.533	37	759.224	38
1988	926.597	47	765.931	38	812.131	41
1989	1.002.875	50	799.651	40	868.366	44
1990	1.084.608	55	834.516	42	928.411	47
1991	1.170.803	59	870.792	44	991.609	50
1992	1.263.156	64	908.543	46	1.059.110	53
1993	1.361.741	68	947.836	48	1.130.972	57
1994	1.466.556	74	988.706	50	1.207.199	61
1995	1.578.170	79	1.031.202	52	1.287.991	65
1996	1.696.934	85	1.075.139	54	1.374.175	69
1997	1.823.426	92	1.121.112	56	1.465.553	74
1998	1.958.310	99	1.168.598	59	1.562.771	79
1999	2.101.698	106	1.217.989	61	1.679.125	84
2000	2.258.553	114	1.269.297	64	1.778.412	90

1980 $

TYPE OF	AVERAGE		PERCENT	
MACHINE	Value	Unit	Value	Units
BR 40	256.364	21	11.4	42.8
Ø 75	428.984	22	19	44.8
Total	685.348	43	30.4	87.6

It is seen that 87.6% of total units represent 30.4% of total value. The reason for that is that 12.4% of units are very sophisticated and expensive machine tools. As recommended, if TAKSAN includes this radial drill with 75 mm drilling capacity, in 1990 there will be total demand for radial drills of 109 units and in 2000 demand will be greater than the planned capacity. It is therefore recommended that TAKSAN should take up manufacture of both 45 and 75 mm radial drills.

6.4.10. PLANERS AND SHAPERS

Planers and shapers are being manufactured by many small companies with simple technology. Because of low unit prices, it must be produced and sold in large quantities in order ot increase the rate of return. There are however, many problems of quality. Although it is a fact that

there is a demand for planers in Turkey, TAKSAN plans to introduce milling machines for use by sectors of industry desiring high quality. No planers or shapers are recommended for TAKSAN .

6.4.11. RECTIFYING MACHINES

During 1976-1980, an yearly average, 72 units of rectifying machines for 974.644 $ were imported.It is felt that these machines are basically for automotive repair shops. In order to understand the kind of rectifying machines which have the most demand in Turkey, a research was conducted in small industry of Ankara region.

The rectifying machines which were imported in big quantities, especially in 1976-1977 could not be sold due to the crisis in automotive industry. Also in 1978-1979 ERKAL Machine and Motor Industry manufactured 20 units of cylindrical rectifiers and sold them. There is another rectifier manufacturer in Konya. These domestically produced machines can also make motor block surface grinding of high quality.

Cylinder rectifying machines cannot be used alone. In order to make motor rectifying, this machine must be used in coordination with crankshaft grinding, cylinder honing and fine boring machines.

In most of the factories of automotive industry, highly sophisticated numerical controlled rectification machines are being used.

As a result, no rectifying machinery is recommended for TAKSAN.

6.4.12. GEAR CUTTING MACHINES

During 1976-1980, 2.8% of total imports were for gear cutting machines. When these machines were investigated in main groups, results were as follows:

	Gear Hobbing	Gear finishing	Bevel Gear Generating	Gear Grinding	Others	
76	720.796	186.122	77.350	144.431	682.580	Value
	15	6	2	3	20	Number
77	1.730.152	467.265	226.076	238.448	175.331	Value
	39	23	2	4	52	Number
78	1.125.016	488.403	-	-	417.596	Value
	31	8	-	-	8	Number
79	246.410	-	-	137.952	1.587.603	Value
	13	-	-	2	7	Number
80	157.575	-	-	-	3.900	Value
	6	-	-	-	1	Number

Gear hobbing machines form the largest group with yearly average of 21 machines for 795.989 $. These machines which have a group coefficient of 0.01053 could not be coded and future demand values could not be calculated because of the insufficient data. For the time being machines of these types are not recommended for TAKSAN.


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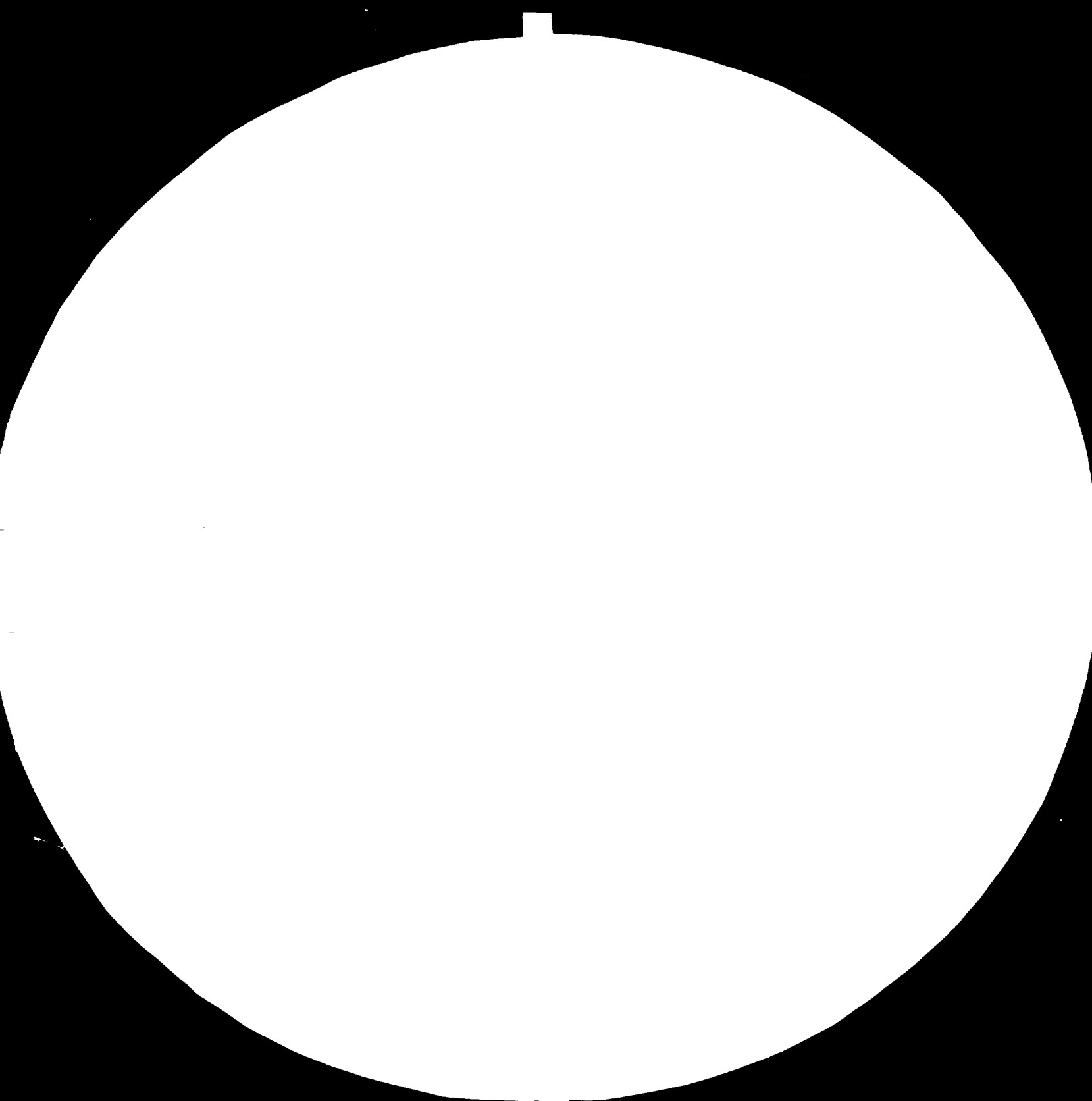

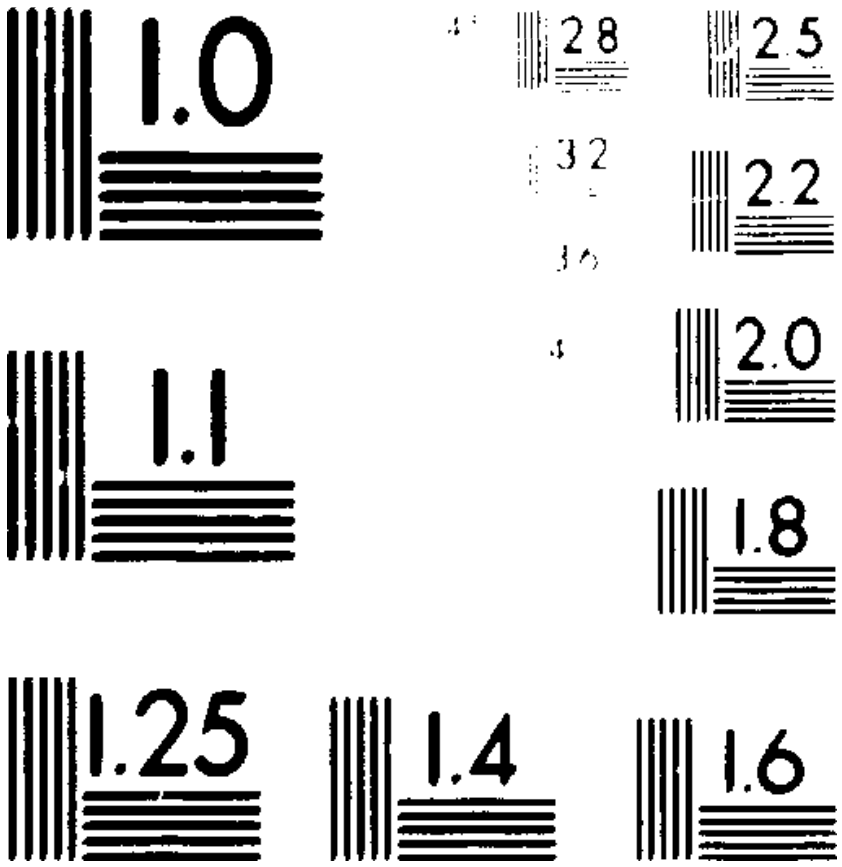

6.4.13. PRESSES

As shown in Table 8, presses and press brakes show a high group coefficient of 0.145094. There are several manufacturers of presses, press brakes and guillotines in Turkey but in order to understand their manufacturing capacities, quality levels and prices, teams visited the most important out of them.

A detailed report of this research is given in App.IL From the interviews made with factory managers as well as the catalogues collected, it was seen that, there is a high capacity of presses, press brakers and guillotines and in fact, due to the low demand in recent years, most of the factories are working at low capacity utilisation rates and some of them can reach high levels of quality.

It is felt that, at this stage there is no reason for TAKSAN to go in for press, press brakes or guillotines production.

6.5. EXPORTS

In the context of Turkey's developing range of machine tools a preliminary study was made of the potential for exports in different groups.

GrI.RCD countries

Gr II Middle East Countries

Gr III Islamic Group of Countries

The figures obtained are on Table 33. It is felt that special organisation to take up export of engineering goods including machine tools. This is necessary because it is often not possible for individual manufacturers to take up costly export marketting on their own. Such organisations have proved their worth in other developing countries.

6.6. CONCLUSIONS

As it is felt that in addition to the machines already licensed by TAKSAN, the production of which may be taken up for capacity indicated in Chapter V., the following additional machines may be included in their programme in upto 1990.

(i) Tool Room milling machine, table size
1300 x 300 mm - 50 number p.a

(ii) Radial drilling machine, drilling dies 75 mm -
40 numbers p.a.

MACHINE TOOLS IMPORT POTENTIAL
OF SOME SELECTED COUNTRIES
(MILLION US $)

COUNTRIES	1975	1976	1977	1978	1979	Average	PRIORITY
GROUP I:							
IRAN ▢	63,5	84.1	117.7	100.8	32.3	79.7	1
PAKISTAN ◪	3.5	4.3	5.0	6.7	8.2	5.5	2
GROUP II:							
BAHRAIN	1.1	3.8	5.6	1.6	0.8	2.6	Negl.
IRAQ ▢	34.4	27.6	34.2	35.5	29.1	32.2	1
KUWAIT ◪	3.8	7.3	8.4	9.0	4.5	6.6	2
LEBANON ◪	7.0	1.0	5.3	6.7	5.3	5.1	2
SAUDI ARABIA ▢	11.8	31.8	46.0	34.9	32.2	31.3	1
SYRIAN ARAB R ▢	7.2	19.0	18.8	14.9	6.8	13.3	1
GROUP III:							
ALGERIA ▢	41.9	45.6	53.7	49.1	41.2	50.3	1
BANGLADESH	1.4	2.5	4.5	4.0	4.5	3.4	Negl.
EGYPT ▢	27.5	40.8	34.6	41.5	29.1	34.7	1
ETHIOPYA	0.6	0.2	0.9	0.7	1.0	0.7	Negl.
GHANA	1.6	2.6	2.1	2.2	0.9	1.9	Negl.
INDONESIA ▢	12.8	17.5	14.1	30.3	19.4	18.8	1
LIBYAN ARAB R ◪	6.9	8.9	6.5	8.5	10.0	8.8	2
MALESIA ▢	11.4	12.6	11.1	15.9	15.7	13.3	1
MOROCCO ▢	8.5	10.8	15.6	13.2	6.0	10.8	1
NIGERIA ▢	15.8	17.6	27.2	33.3	13.5	21.9	1
SUDAN	1.4	2.2	3.4	5.9	2.8	3.1	Negl.
THAILAND ▢	12.6	9.5	13.5	23.3	26.1	17.0	1
TUNUSIA ◪	5.1	6.6	7.4	13.9	7.3	8.0	2
ZAIRE	2.3	0.8	3.4	1.5	0.8	1.8	Negl.

▢ Machine tools import potential greater than 10.000.000 $/ye

◪ Machine tools import potential greater than 5.000.000 $/ye

CHAPTER VII

UTILISATION OF INSTALLED CAPACITY OF TAKSAN

7.1 PRODUCTION PROGRAMME - PHASE I

7.1.1 TAKSAN Machine Tools Industry and Trade Co. was established under a Decree of Turkish Government on November 1975. The first investment program of the Company was determined as below.

PLANT	SITE
(i) Gear-and-Gear Boxes Manufacturing Factory, Gray Iron Foundry, and Hot and Cold Forging Shops	Yozgat-Yerkoy
(ii) Milling and Radial Drilling Machines Manufacturing Factory	Tokat
(iii) Grinding Machines Manufacturing Plant	Tokat
(iv) Automatic Lathes Manufacturing Plant	Kayseri-Incesu
(v) Heavy Duty Machine Tools Manufacturing Plant	Erzincan

7.1.2 Later on, a Special Commission appointed by S.P.O, investigated this program and recommended that the entire investment should be in the form of an Integrated Machine Tools Manufacturing Plant, at Kayseri-- Incesu area.

7.1.3 In accordance with this Report, the Ministry of State enterprises asked TAKSAN to prepare new feasibility study for an Integrated Machine Tools Manufacturing Plant.

7.1.3.1 The Foundry Project was first revised according to the new investment strategy,and given a separate investment Certificate.

7.1.3.2 The Gear-Gear Boxes,Grinding Machines,Automatic Lathes,and Milling and Drilling Machines Projects were combined in a separate feasibility study.

7.1.3.3.The remaining projects from the first program, namely Heavy Duty Machine Tools Investment Project and Cold-and-Hot Forging Project were deleted.

7.1.4 Consequently,the investment projects of TAKSAN were reduced in 1978 to five and these were incorporated in one Integrated Project. Among these three are Machine Tool Building Factories,the remainders two are anciliary factories to supply

(i) castings

(ii) gears and finished gear boxes. Obviously,anciliary projects are crucial for the final product.

7.1.5 The Gear-and-Gear Boxes Plant need to be urgently taken up for the following reasons-

(i) This project has the very important Jigs-Fixtures, Tools and Gauges Manufacturing Shop which is supposed to serve all factories in the Integrated Project.

(ii) This Project has also a Central Heat Treatment Shop,which serves all other projects and will

process only gears,but spindles,shafts,and a large number of components.

(iii) Gears and Gear Boxes for machine tools can only be manufactured by the other Machine Tool Builders namely Tezsan,Bımak due to high level of precision (all gears are ground). They would also need new investments for this purpose.

(iV) Price and delivery considerations and policy of other manufacturers may make it difficult for Taksan to buy these items from them.

7.1.6 Simultaneously with a new demand analysis,the production programme of TAKSAN KAYSERI PROJECT has been analysed in depth. As a first step,production programme assumed for feasibility study (1977) and the production levels recommended to be reached by 1990 (designated as Phase I) as a result of this study were compared. This comparison showed that considerable spare capacity will be available in the new Kayseri integrated plant. Accordingly,in order to ensure optimum utilisation of installed capacity,additional areas of production have been recommended.

7.2. RESULTS OF THE STUDY-MACHINERY AND ASSEMBLY SHOPS

The results of the study are presented below:

7.2.1. GEARS,GEAR BOXES AND SPINDLE PRODUCTION PLANT

	Production as per feasibility study	1990 Production recommended in this study
1. Gears,for TAKSAN's machine tools	49.000 pcs/y	44.000 pcs/y
2. Gears for other customers	80.000 pcs/y	not defined yet
3. Spline shafts and other types of shafts	56.250 "	52.000 pcs/y
4. Spindles	1.470 "	1.370 "
5. Gear Boxes in assembled form	3.350 "	2.900 "

7.2.2. MILLING AND DRILLING MACHINES PRODUCTION PLANT

7.2.2.1. Licensed machine tools

	Feasibility study	Recommended 1990 Programme
1. FU 315 Universal Milling Machine	250 pcs/y	250 pcs/y
2. FU 400 Universal Milling Machine	150 "	100 "

	Feasibility study	1990 Programme
3. FSS 400 Vertical Milling Machine	100 pcs/y	60 pcs/y
4. BR 40 Radial drilling Machine	200 "	60 "
5. BFT80 Horizontal boring and drilling machine	100 "	- "

7.2.2.2. Additional machine tools

1. Tool Room Milling Machine ,table size 1300 x 300 mm	-	60 "
2. Radial Drilling Machine, drilling dia 75 mm	-	40 "

7.2.3. AUTOMATIC LATHES PRODUCTION PLANT

7.2.3.1. Licensed machine tools

	Feasibility study	Recommended 1990 Programme
1. R5 Turret Lathe	150 pcs/y	60 pcs/y
2. SP12Pgemi automatic copy lathe	30 "	-

	Feasibility study	1990 Programme
3. A16A/A20A Bar Automat	40 pcs/y	-
4. A40B Bar Automat	40 "	25 pcs/y
5. AB80A Chucker	60 "	40 "

7.2.3.2. Additional machine tools accessories

(From TOKAT Project)

1. Collets	-	12.000 pcs/y
2. Drill chucks	-	27.000 "
3. Live Centres	-	3.750 "
4. Collet Chucks	-	750 "
5. Morse Tapered Shanks	-	3.000 "
6. Reducing Sleeves	-	6.000 "

7.2.4. GRINDING MACHINES PRODUCTION PLANT

7.4.2.1. Licensed Machine Tools

	Feasibility Study	1990 Programme
1. BU28 cylindrical grinder	150 pcs/y	60 pcs/y
2. BN102B Tool grinder	150 "	40 "
3. BRH 20A Surface grinder	120 "	}
4. BPH 320A Surface grinder	100 "	} 70 "
5. BNV 80 Drill Grinder	80 "	80 "
6. BM 350 Surface polisher	150 "	150 "
7. BRV 30 Vertical surface grinder	80 "	-

7.3.A comparison has also been made of the design capacity of the central foundry and requirements of TAKSAN. The results are tabulated below:

Departments		F.S.Design Capacity t/year	TAKSAN Requirement t/year	Spare Capacity for other customers t/year
1. Melting	(casts)	7400		
	(good prod.)	6000	3030	2970
2. Moulding	(sand)	18000	9000	9000
3. Casting				
a)Roller line casting		1200	600	600
b)Floor casting		5300	2430	2370
4. Cast		6000	3030	2970
5. Heat Treatment		4500	2250	2250
6. Crinding/polishing		6000	3000	3000
7. Pateern shop	(wooden)	500m^3/y	250m^3/y	250m^3/y

7.4. PRODUCTION PROGRAMME-PHASE II

By 1987-88 another market study with a greater emphasis on exports may be taken up to study the market behaviour for machine tools.From present indicators it can be assumed that the following items may be considered for Phase II.

	Production as per feasibility study 1977	Phase II recommended in this study
BFT 80 Horizontal Boring and Milling Machine	100	30
100mm Horizontal Boring and Milling Machine	-	15
SP12P Copying Lathe	30	

7.5. The following machines are now not considered justified for being taken up.

	Production capacity as per Feasibility study 1977
A20A Bar Automatic Lathe	20
A16A Bar Automatic Lathe	20
BRV30 Vertical Surface Grinder	80

7.6. CONCLUSIONS AND RECOMMENDATIONS REGARDING UTILISATION OF INSTALLED CAPACITY OF TAKSAN

7.6.1. After determining the production programme for 1990, an analysis of capacity available has been carried out and new proposals developed for optimum utilisation of installed capacity for each production plant.
Capacity calculations have been done on the basis of standard working time in hours obtained by TAKSAN from licensors. The results of this analysis are given in the following tables:

Table 34 - For A1 - Gears,gear boxes and spindle production plant.

Table 35 - For A2 - Milling and drilling machines production plant.

Table 36 - For A3 - Automatic lathes production plant.

Table 37 - For A4 - Grinding machines production plant.

Table 38 - For A5 - Central foundry.

7.6.2 It will be seen that even after providing for all machines for 1990 production programme including those at present not licensed, there will be excess capacity in some production plants or some machining operations.

7.6.3 It is strongly recommended that considering the type of machinery already available and the quality of work they are meant for, a task force consisting of production/industrial engineers from the Ministry of Defence, Ministry of Industry and TAKSAN may be urgently set up to draw up specific plans for utilisation of the Spare Capacity.

Table 34

GEARS, GEAR BOXES, SPINDLES PRODUCTION PLANT (A1)

CAPACITY UTILIZATION

NO	PROD.MACHINE GROUP	E Designed ESTABLISHED CAPACITY (hr)	A CAPACITY REQ'D FOR %100 PROD OF MILLING & DRILL.MC.(hr)	B CAP.REQ'D FOR %100 PROD.OF GEAR BOXES FOR LATHES & GRIND MC (hr)	A+B TOTAL CAP. REQ'D FOR %100 PROD (hr)	C CAP.REQ'D FOR 1990 PROD. OF MILLING DRILL MC. (hr)	D CAP.REQ'D FOR 1990 PROD.OF GEAR BOX. FOR LAT & GRMC.(hr)	C+D TOTAL CAP. REQ'L FOR 1990 PROD (hr)	(C+D)/E CAPACITY UTILIZATION RATIO (%)
1	Universal Lathes	64.000	39.350	9.675	49.025	26.562	9.212	35.774	56
2	Semi Aut.Lathes	44.000	33.335	6.590	39.925	22.502	6.275	28.777	66
3	NC Machine Tools	52.000	27.745	10.560	38.305	18.728	10.055	28.783	56
4	Drilling Machines	44.000	21.915	5.815	27.730	14.793	5.537	20.330	47
5	Horizontal Boring/ Milling Mc.	52.000	28.485	10.900	39.385	16.528	10.378	26.906	52
6	Milling Machines	36.000	22.370	6.475	27.485	15.100	6.165	21.265	59
7	Cylindrical Grinding Mc.	28.000	17.530	4.460	21.990	11.833	4.247	16.080	58
8	Internal Grinding Mc.	20.000	10.060	2.990	13.050	6.791	2.847	9.638	49
9	Surface Grinding Mc.	16.000	6.000	1.840	7.840	4.050	1.752	5.802	37
10	Millers/Plano Millers/Planers	24.000	10.120	4.410	14.530	6.831	4.199	11.030	46
11	Slideway Grinding Machine	4.000	2.845	360	3.205	1.921	343	2.264	57
12	Other/Special Machine Tools	40.000	12.790	4.475	17.265	8.634	4.261	12.895	33
13	Gear Prod.Machine Tools	160.000	71.555	23.370	94.925	48.300	22.252	70.552	45

Note: A and B refer to installed capacity

Table 35

MILLING & DRILLING MACHINES PRODUCTION PLANT (A2)

CAPACITY UTILIZATION

NO	PROD. MACHINE GROUP	K ESTABLISHED CAPACITY (hr)	T CAPACITY REQ'D FOR %100 MACH.T. PROD. –	A CAPACITY REQ'D FOR 1990 LICENCE PROD.	A/K CAPACITY UTILIZATION RATIO (%)
1	Universal Lathes	40.000	31.595	21.237	54
2	Semi Automatic Lathes	20.000	16.615	11.216	57
3	NC Machine Tools	12.000	4.155	2.805	24
4	Drilling Machines	36.000	15.865	10.709	30
5	Horiz.Boring Milling Mc.	40.000	28.165	19.012	48
6	Milling Machines	24.000	15.145	10.223	43
7	Cylindrical Grinding Mc.	16.000	7.085	4.783	30
8	Internal Grinding Mc.	8.000	2.170	1.465	19
9	Surface Grinding Mc.	4.000	1.150	777	20
10	Millers/Plano Millers/ Planers	44.000	34.310	23.160	53
11	Slidéway Grinding Mc.	12.000	6.120	4.131	35
12	Other/Special Mc.Tools	28.000	8.960	6.048	22

Note: T refers to installed capacity

Table 36

AUTOMATIC LATHES PRODUCTION PLANT (A3)

CAPACITY UTILIZATION

NO.	PROD.MACHINE GROUP	K ESTABLISHED CAPACITY (hr)	T CAPACITY RQD FOR %10C M.T PRODUCTION	A CAPACITY RQD FOR 1990 PROD.FIGURES	B CAPACITY RQD FOR 1990 ACCESSORIES PROD.	C TOTAL 1990 CAPACITY REQUIREMENT	B/A CAPACITY RATIO (%)	C/K CAPACITY UTILIZATION RATIO (%)
1	Universal Lathes	48.000	41.033	19.604	4.089	23.693	17	49
2	Semi Automatic Lathes	60.000	89.319	31.644	19.713	51.357	38	86
3	NC Lathes	32.000	41.671	18.578	3.192	21.770	15	68
4	Drilling Machines	68.000	55.754	27.258	6.273	33.531	19	49
5	Horizontal Mill. Drill Machines	52.000	53.896	28.115	-	28.115	-	54
6	Milling Machines	80.000	125.284	58.916	3.407	62.323	5	78
7	Cylindrical Grinders	32.000	31.878	14.993	3.996	18,989	21	59
8	Internal Grinders	12.000	19.334	9.342	3.494	12.836	27	107
9	Surface Grinders	32.000	35.078	17.967	3.062	21.029	15	66
10	Plano millers/Planers	20.000	5.238	2.974	-	2.974	-	15
11	Slideway Grinders	12.000	7.242	3.521	-	3.521	-	29
12	Other/Special Machines	100.000	44.013	22.733	5.124	27.857	18	28
13	Special machines for Accessories Production	(16.000)	-	-	4.563	4.563	100	-

Note: T refers to installed capacity

Table 37

GRINDING MACHINES PRODUCTION PLANT (A4)

CAPACITY UTILIZATION

NO	PROD.MACHINE GROUP	K ESTABLISHED CAPACITY (hr.)	T CAPACITY RQD FOR % 100 LIC PROD	A CAPACITY RQD FOR 1990 LICENSE PROD	B CAPACITY RQD FOR 1990 MES PROD	C TOTAL 1990 CAPACITY REQUIREMENT	B/A CAPACITY RATIO (%)	C/K CAPACITY UTILIZATION RATIO (%)
1	Universal Lathes	96.000	137.690	52.955	10.922	63.877	20.6	67
2	Semi Automatic Lathes	28.000	68.751	23.674	11.761	35.435	49,7	127
3	NC Lathes	24.000	37.485	15.735	16.748	32.483	106.4	135
4	Drilling Machines	76.000	78.695	28.151	14.215	42.366	50,6	56
5	Horizontal Mill Drill Machine	52.000	48,045	17.297	10,749	28.046	62,12	54
6	Milling Machines	68.000	108.201	41.842	25.506	67,348	60.9	99
7	Cylindrical Grinders	32.000	58.569	22.060	5,710	27.770	25.9	87
8	Internal Grinders	8.000	12.815	4.621	5.257	9.878	113.1	123
9	Surface Grinders	24.000	30.099	10.943	2.896	13.839	26.46	58
10	Planemillers/Planers	40.000	27.260	8.833	444	9.277	5.0	23
11	Slideway Grinders	16.000	9.410	3.047	3.023	6.070	99.2	38
12	Other/Special Mac.	60.000	42.130	14.966	9.302	24.268	62.2	40

Note: T refers to installed capacity

A5 - CENTRAL FOUNDRY CAPACITY UTILIZATION
(as of 1990)

DEPARTMENTS	(K) Established Capacity	A TAKSAN Requirement t/yil	B Other Customers t/year	C Total Prod. t/year	A/K %TAKSAN Cap. Util. Factor
1- MELTING	7400 t/year cast	3030	2970	6000	41
2- MOULDING	18000 t/year sand	9000	9000	18000	50
3- CASTING					
a-Roller Line Casting	1200 t/year	600	600	1200	50
b-Floor Casting	5300 t/year	2430	2370	4800	46
4- CAST CLEANING	6000 t/year	3030	2970	6000	51
5- HEAT TREATMENT	4500 t/year	2250	2250	4500	50
6- GRINDING/POLISHING	6000 t/year	3000	3000	6000	50
7- PATTERN SHOP	500 m^3/year wooden	250	250	500	50

CHAPTER VIII

MASTER PLAN FOR MACHINE TOOL INDUSTRY AND POLICY CONSIDERATIONS

8.1. ROLE OF MACHINE TOOL INDUSTY IN ENGINEERING SECTOR

Within metal industries, the machine tool sector performs a basic function in the expansion of industrial production. Since almost all products are manufactured by means of machine tools or by machinery produced by such tools. It is not possible to accelerate the industrialization process without an increase in availability of efficient machine tools. The increase in availability of machine tools may be acl ieved either by development of national capacity and capability in this sector or increased imports. With the current emphasis on reduction of imports and self sufficieny, it is of utmost importance to put particular emphasis on a clear strategy for development of the machine tool sector in Turkey. For easy reference a table showing the principal manufacturers of metal cutting machine tools is given in Table 39.

8.2. TECHNOLOGICAL PARAMETERS OF THE MACHINE TOOLS INDUSTRY

In the machine tool industry, there is a wide diversity of products and degrees of technological sophistication. In the

Table 39 (1/3)

MACHINE TOOLS LICENSED FOR MANUFACTURE IN TURKEY

No.	Machine	Machine Type	Licenser Firm	Manufacturer
1	Vertical Milling Mach.	FSS 400x1600 (400x1600 mm)	WMW-DDR	TAKSAN
	" "	BF-2.5 (355x1500 mm)	F.Werner-W.Germany	MKEK
	" "	FG 32-V (320x1250 mm)	Romania	Bimak
	" "	FV 36/160 (360x1600 mm)	Czechoslovakia	Bimak
2	Universal Milling Mach.	FU-1 (225x1000 mm)	F.Werner-W.Germany	MKEK
	" "	FU-2,5 (315x1500 mm)	" "	"
	" "	FU-315x1250 (315x1250 mm)	WMW-DDR	TAKSAN
	" "	FU-400x1600 (400x1600 mm)	"	"
	" "	FG-32-U (320x1250 mm)	Romania	Bimak
	" "	FU-36/160 (360x1600 mm)	Czechoslovakia	"
3	Horizontal Milling and Boring Machine	BFT 80/2 (Ø80 mm)	WMW-DDR	TAKSAN
4	Tool Room Milling Mach.	KF-6025 (240x600 mm)	-	Bimak
5	Automatic Bar Lathe	A-40B (Ø50 mm max.)	Strojimport	TAKSAN

No.	Machine	Machine Type
5	Automatic Bar Lathe	A-20B (Ø26 mm max.)
	" "	A-16A (Ø22 mm max.)
	" "	M-26 Ø26 mm max.)
6	Turret Lathe	R-5 (Ø 50 mm)
	"	RT20 (Ø 20 mm)
	"	RT30 (Ø 30 mm)
	"	RT42 (Ø 42 mm)
	"	RT60 (Ø 60 mm)
	"	R-77 (Ø 30 mm)
	"	— (Ø 30 mm)
7	Automatic Chucking Lathe	AB80A (Ø 80 mm)
8	Copying Lathe	SP12P (Ø 120 mm)
9	Cylindrical Grinder	BU 28/630 (Ø 290 mm)

Table 39 (2/3)

Licenser Firm	Manufacturer
Strojimport	Taksan
"	"
-	Metoat
Strojimport	Taksan
-	Metoat
-	"
-	"
-	"
-	Remak
-	Kamsan
Strojimport	Taksan
"	"
"	"

No.	Machine	Machine Type
10	Horizantal Surface Grinder	BFH20A-I (200x630 mm)
	" "	BPH 320 A (320x1000 mm)
	" "	DT-230/550 (230x550 mm)
11	Vertical Surface Grinder	BRV 30/1500 (300x1500 mm)
12	Pillar Drills	SM35 (Ø 35 mm)
	" "	BS 40 (Ø 40 mm)
	" "	36 (Ø 36 mm)
13	Radial Drills	BR 40 (Ø 45 mm)
14	Universal Tool and cutter grinder	BN 102 B (swing 280 mm 140x230 mm table)

Table 39 (3/3)

Licenser Firm	Manufacturer
Strojimport	Taksan
"	"
-	Bimak
Strojimport	Taksan
-	Tezsan
-	Sahinler
-	Ideal
WMW-DDR	Taksan
Strojimport	"

matter of producing machine tools, the industry should be developed in the following stages:

During the first stage, and on a short-term basis, the range of machine tools should be universal and include only flexible types, suitable for short and medium runs of production, care being taken however, to avoid fresh capital expenditure on developing machine tools which are already obsolete in the industrialized countries. This stage should enable the industry to gain experience in design and manufacturing techniques as well as creating a basic infrastructure, which has to respond to demanding requirements of quality.

During the second stage, and on a long-term basis, Turkey should begin the manufacture of more sophisticated machine tools including those with numerical control. Such machine tools, though expensive initially, are economical and flexible for manufacture of parts.

8.3. PERSONNEL IN MACHINE TOOLS INDUSTRY

The machine tool industry, because of the relatively high level of its complexity needs highly qualified personnel. This ircludes managers, engineers, and workers. It is crucial to draw up job specifications and training profiles for various categories of personnel who have to be motivated tc make their careers in manufacturing establishments on a long-term basis by suitable personnel policies.

It is recommended that for a continuous intake of skilled workers an apprenticeship scheme should be introduced in the industry a whole by law.

8.4. SPECIALIZATION IN MACHINE TOOLS INDUSTRY

Specialization by different units in different types of machine tools would result in the following benefits:

(i) Increase in technological level of machines manufactured.

(ii) Improvement of qualtiy of machines, manufactured.

(iii) Lower production costs.

(iv) Improvement in utilisation of installed capacities.

(v) Lower capital requirements.

(vi) Increase in labor productivity.

(vii) Improvement in export potential by making the machine tool industry competitive in the world market.

8.5. DESIGN AND DEVELOPMENT

While in initial stages it is necessary and even desirable to obtain complete designs from foreign collaborators, the stage has already reached for Turkish machine tool builders to develop a design organisation which will not only adapt the foreign designs to suit local conditions (such as availability of raw material and components) but also take up designs of new models and types. It will be necessary for the designers to get assistance from foreign collaborators which should include training in their design offices and later vetting and checking the designs and calculations made by local experts. The objective of local expertise being developed to the point of complete designing of

machine tools in a period of 5-8 years should be spelt out by the Government and facilities made available to the manufacturers to achieve it.

Incidentally design personnel are generally in short supply and their terms and conditions of service may need to be adjusted to ensure their continued availability to the enterprises.

8.6. PROTECTION OF LOCAL INDUSTRY

It is normal for indigenous manufacturers to seek Government protection by restriction of imports of products similar to their own for a certain period of time to allow them to achieve a level of healthy growth to a point that they can compete with foreign suppliers by way of cost and quality. While this is certainly desirable, the protection must not be a cover for inefficiency and hence denial to users of urgently-needed machinery in the name of protection. The manufacturers must be able to submit to users and publicise their plans of production which if accepted by the Government as reasonable, may be used as the basis of import restrictions.

8.7. TOOL, JIGS, DIES AND FIXTURES

The efficiency of utilisation of machine tools depends to a large extent on the design and quality of cutting tools, jigs, dies and fixtures. It is desirable for the machine tool manufacturerto set apart specific capacity for both design and manufacture of these items to suit their products. This is particularly needed by the small and medium scale users including ancillary industries who cannot afford to employ highly paid design engineers for this purpose. It should be a service offered by the manufacturers to all users.

8.8. ANCILLARY INDUSTRIES

Turkey has a well developed ancillary industry but it is extremely important for units like TAKSAN to build up a sound information system on performance of individual units and also to organise a dependable quality control programme for its bought-out items.

8.9. AFTER SALES SERVICE

After sales service covers a wide range of activities but perhaps the most important is immediate professional attention to complaints on quality and performance. A careful record needs to be kept of all complaints and action taken on them. This record could well be the basis of design changes.

8.10. ROLE OF STATE SECTOR

8.10.1. The machine tool manufacturing industry as a general rule, is characterized by heavy initial investment, long gestation periods, instability in demand that implies great risks, and low rates of profit. These conditions offer opportunities for investment which would interest the private sectors only for a limited range of general purpose machines. For developing this industry, a conseious and deliberate policy on the role of State Enterprises therefore becomes necessary.

8.10.2. Machine Tools Produced by MKEK

At present, MKEK's capacity for machine tools is as under:

Centre Lathe TA24 and TA21

(Fritz Werner License).....2500,2000,1500,1000mm between centres
240,210 mm height of centres

Centre Lathe TA 18

(Fritz Werner License).....1500,1000,500 mm between centres
180 mm height of centres

Vertical milling MachinesFDI

(Fritz Werner License).....Table size 1000 x 225 mm.

Vertical milling Machines FDO

(Fritz Werner License).....Table size 710 x 225 mm.

Horizontal milling Machines YI

(Fritz Werner License)..... ...Table size 1000 x 225 mm.

Horizontal milling Machine FYU
(Fritz Werner License).....Table size 710 x 225 mm.

Universal milling Machine FUI
(Fritz Werner License).....Table size 1000 x 225 mm.

Universal milling Machine FUO
(Fritz Werner License).....Table size 750 x 225 mm.

Shaper.....Table size 340 x 600 mm.

Pillar drilling machine ..... 23 mm

Bench drilling machine..... 16 mm.

In addition MKEK also produce eccentric presses of 20T, 40T, 80T and 160T capacity.

8.10.3. Coordination between Taksan and MKEK

It is felt that a very close coordination between Taksan and MKEK in the matter of plans of manufacture of machine tools in the state sector is essential so that the Government's objective of

maximum utilisation of installed capacity is achieved as far as this sub-sector in the state enterprises is concerned. Their product mix may also be rationalised so that in keeping with the Government's policy, similar machine tools are not produced by both the units. It is felt that this coordination should include MKEK's making available some experienced engineers and skilled artizans to TAKSAN, on mutually acceptable terms. They could be loaned for specific periods or transferred on a permanent basis, as agreed to by both.

8.11. COORDINATION BETWEEN STATE UNITS (TAKSAN,MKEK) AND PRIVATE SECTOR

With the total number of recognised machine tool manufacturers being limited,and considering the size of the domesticdemand, it is extremely desirable that all the different units should adopt a common policy of standardisation of parts, quality control standards, research and development and acqusition and storage of documentation. These could be done under the umbrella of a National Institute referred to in Para 8.12.

8.12. NEED FOR A MACHINE TOOL INSTITUTE

With a basic machine tool manufacturing industry already available, it is desirable to consider setting up a coordinating organisation which will serve as a data bank , organise testing of machine tools, be a focal point for introduction of standards on a national basis and assist the small and medium scale manufacturers in designing their products. By the very nature of its work, it should be an independent organisation under the Ministry of Industry, possibly called Turkish Machine Tool Institute. Specifically it could:

(i) serve as an information link among various firms in order to be able to make up, and to bring up-to-date, more precise market studies,

(ii) analyse the complexities of manufacture and give advise on measures to create capacity for its different levels and consequently on types of machine tool to be manufactured in Turkey,

(iii) assist individual companies in achieving the highest possible degree of specialization,

(iv) advise the ancillary industry in meeting technological requirements of machine tool producers.

(v) be an instrument for exchange of technical information among firms in this sector in regard to quality, technological development, etc.,

(vi) keep updated information on international prices for benefit of machine tool users and manufacturers,

(vii) create a system of national standards for raw materials as well as finished products,

(viii) prepare basic data and programmes for training of personnel,

(ix) offer services to the entire metal-working industry in which the processes of production by metal cutting machine tools and metal forming machine tools are applied,

(x) study the infrastructure of the country in the area of application of machine tools.

(xi) offer servicesto the investors in the sector in preparation of feasibilitv studies and project engineering,

(xii) offer assistance for the acquisition of technologv in the sector,

(xiii) offer advice in acquisition of machine tools from other countries and contribute to national technological progress through its own research and development programmes.

SITC Code 736.12 - Metal cutting machine-tools.
Gear-cutting machines

6-7		8	9	10	11	12	13	14	15
Basic Machine Nomenclature		Major Specification (Capacity)	Major Spec.-1 Optional	Major Spec.-2 Optional	Type	Manufacturing characteristic -1	Manufacturing characteristic -2	Manufacturing characteristic -3	Origin
Code	Name	Code Max.outside diameter (mm)	Code	Code Control system	Code Description	Code Weight(tons)	Code Main body material	Code Max. Component Weight(tons)	Code
01 Gear milling machines (worms, worm gear) 02 Gear milling machines (Spur, helical, worms) 03 Gear milling machines (bevel) 04 Gear milling machines (others)		1.Upto 150 2.150-200 3.200-300 4.300-500 5.500-700 6.Above 700		1.With numerical control 2.Without numerical control	1.External 2.Internal	1.Upto 5 2.5-10 3.10-25 4.25-50 5.50-100 6.100-200 7.200-300 8.300-500 9.Over 500	1.Chilled iron casting 2.Grey iron casting 3.Alloy iron casting 4.Malleable iron casting 5.Spheroidal iron casting 6.Carbon steel casting 7.Alloy steel casting 8.Non-ferrous casting 9.Steel fabrication	1.Upto 1 2.1-2 3.2-5 4.5-10 5.10-15 6.15-25 7.25-50 8.50-100 9.Over 100	1.Turkey 2.Imported
05 Gear hobbing machines (worms, worm gear) 06 Gear hobbing machines (spur, helical,worms) 07 Gear hobbing machines (bevel) 08 Gear hobbing machines (others)									
09 Gear shaping machines (spur, helical) 10 Gear shaping machines (herringbone) 11 Gear shaping machines (others)					1.External-pull 2.External-push 3.Internal-pull 4.Internal-push				
12 Gear broaching machines (spur, helical) 13 Gear broaching machines (others)									

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STTC Code 736.12 - Metal cutting machine-tools.
Gear-cutting machines

6-7		8		9		10		11		12		13		14		15	
Basic Machine Nomenclature		Major Specification (Capacity)		Major Spec.-1 Optional		Major Spec.-2 Optional		Type		Manufacturing characteristic -1		Manufacturing characteristic -2		Manufacturing characteristic -3		Origin	
Code	Name	Code	Max.outside diameter (mm)	Code		Code	Control system	Code	Description	Code	Weight(tons)	Code	Main body material	Code	Max. Component Weight(tons)	Code	
14	Gear shearing machines (spur)	1	Upto 150			1	With numerical control	1	External	1	Upto 5	1	Chilled iron casting	1	Upto 1	1	Turkey
15	Gear shearing machines (others)	2	150-200			2	Without numerical control	2	Incernal	2	5-10	2	Grey iron casting	2	1-2	2	Imported
16	Gear shaving machines (spur, helical)	3	200-300							3	10-25	3	Alloy iron casting	3	2-5		
17	Gear shaving machines (herringbone)	4	300-500					1	External-Rotary	4	25-50	4	Malleable iron casting	4	5-10		
18	Gear shaving machines (others)	5	500-700					2	External-Rack	5	50-100	5	Spheroidal iron casting	5	10-15		
19	Gear honing machines (spur, helical)	6	Above 700					3	Internal-Rotary	6	100-200	6	Carbon steel casting	6	15-25		
20	Gear honing machines (others)							4	Internal-Rack	7	200-300	7	Alloy steel casting	7	25-50		
21	Gear lapping machines (spur, helical)							1	External	8	300-500	8	Non-ferrous casting	8	50-100		
22	Gear lapping machines (bevel, spiral bevel)							2	Internal	9	Over 500	9	Steel fabrication	9	Over 100		
23	Gear lapping machines (hypoid)																
24	Gear grinding machines (spur, helical)							1	External								
25	Gear grinding machines (worms)							2	Internal								
26	Gear grinding machines (bevel)																

SITC Code 736.13 - Metal cutting machine-tools.
Lathes, metalworking

5-7		8	9	10	11		12	13	14	15
Basic Machine Nomenclature		Major Specification (Capacity)	Major Spec.-1 Optional	Major Spec.-2 Optional	Type		Manufacturing characteristic -1	Manufacturing characteristic -2	Manufacturing characteristic -3	Origin
Code	Name	Code / Swing over bed or turning dia. (mm)	Code / Max. working length (mm)	Code / Control system	Code	Description	Code / Weight (tons)	Code / Main body material	Code / Max. Component Weight (tons)	Code
01	Tool room lathes	1. Upto 100	1. Upto 300	1. With numerical control			1. Upto 5	1. Chilled iron casting	1. Upto 1	1. Turkey
02	Chucking lathes	2. 100-300	2. 300-1000	2. Without numerical control			2. 5-10	2. Grey i. casting	2. 1-2	2. Imported
03	Centre lathes	3. 300-500	3. 1000-3000				3. 10-25		3. 2-5	
04	Facing lathes	4. 500-700	4. 3000-8000				4. 25-50		4. 5-10	
05	Horizontal turret lathes	5. 700-1000	5. 8000-12,000		1. Single-station		5. 50-100	3. Alloy iron casting	5. 10-15	
		6. 1000-1500	6. Above 12,000		2. Multi-station		6. 100-200		6. 15-25	
		7. 1500-2500					7. 200-300	4. Malleable iron casting	7. 25-50	
06	Vertical turning and boring mills	8. Above 2500			1. Single-column		8. 300-500		8. 50-100	
					2. Double-column		9. Over 500	5. Spheroidal iron casting	9. Over 100	
07	Horizontal automatic lathes				1. Single-spindle			6. Carbon steel casting		
08	Vertical automatic lathes				2. Multi-spindle			7. Alloy steel casting		
09	Automatic screw cutting lathes				1. Single-spindle			8. Non-ferrous casting		
					2. Multi-spindle			9. Steel fabrication		
10	Special purpose lathes/ crank-shaft, duplicating, roll turning, and other special lathes									

SITC Code 736.14 - Metal cutting machine-tools.
Reaming and milling machines, metalworking.

6-7		8	9	10	11	12	13	14	15
Basic Machine Nomenclature		Major Specification (Capacity)	Major Spec.-1 Optional	Major Spec.-2 Optional	Type	Manufacturing characteristic -1	Manufacturing characteristic -2	Manufacturing characteristic -3	Origin
Code	Name	Code / Longitudinal travel (mm)	Code / Max.working width(transverse) (mm)	Code / Control system	Code / Description	Code / Weight(tons)	Code / Main body material	Code / Max. Component Weight(tons)	Code /
	Knee-type milling machines	1 Upto 250 2 250-700 3 700-1000 4 1000-1500 5 1500-5000 6 Above 5000	1 Upto 250 2 250-500 3 500-700 4 700-1000 5 1000-1500 6 Above 1500	1 With numerical control 2 Without numerical control	1 Horizontal 2 Vertical	1 Upto 5 2 5-10 3 10-25 4 25-50 5 50-100 6 100-200 7 200-300 8 300-500 9 Over 500	1 Chilled iron casting 2 Grey iron casting 3 Alloy iron casting 4 Malleable iron casting 5 Spheroidal iron casting 6 Carbon steel casting 7 Alloy steel casting 8 Non-ferrous casting 9 Steel fabrication	1 Upto 1 2 1-2 3 2-5 4 5-10 5 10-15 6 15-25 7 25-50 8 50-100 9 Over 100	1 Turkey 2 Imported
01	Hand feed millers								
02	Plain milling machines								
03	Universal milling machines								
04	Ram type universal milling machines								
05	Rotary head milling machines								
06									
	Bed-type milling machines				1 Horizontal 2 Vertical				
07	Simplex (1 spindle)								
08	Duplex (2 spindles)								
09	Triplex (3 spindles)								
10	Multi spindle milling machines								
11									
	Plano-milling machines								
12	Open-side milling machines								
13	Double-column milling machines								
	Special milling machines								
14	Rotary table milling machines								
15	Profiling machines								
16	Duplicating machines								
17	Pantograph milling machines								
18	Machining centers								
19	Thread milling machines								
20	Other special milling machines								

SITC Code 736.13 - Metal cutting machine-tools.
Drilling and boring machines, metalworking.

6-7		8		9		10		11		12		13		14		15	
Basic Machine Nomenclature		Major Specification (Capacity)		Major Spec.-1 Optional		Major Spec.-2 Optional		Type		Manufacturing characteristic -1		Manufacturing characteristic -2		Manufacturing characteristic -3		Origin	
Code	Name	Code	Max.drilling dia (mm)	Code	Max.drilling depth (mm)	Code	Control system	Code	Description	Code	Weight(tons)	Code	Main body material	Code	Max. Component Weight(tons)	Code	
	Drilling machines	1	Upto 10	1	Upto 100	1	With numerical control			1	Upto 5	1	Chilled iron casting	1	Upto 1	1	Turkey
		2	10-25	2	100-200	2	Without numerical control			2	5-10	2	Grey iron casting	2	1-2	2	Imports
01	Portable drills	3	25-35	3	200-400					3	10-25	3	Alloy iron casting	3	2-5		
02	Up-right drilling machines	4	35-50	4	400-500					4	25-50	4	Malleable iron casting	4	5-10		
03	Radial drilling machines	5	50-00	5	Above 500					5	50-100	5	Spheroidal iron casting	5	10-15		
04	Turret drilling machines	6	Above 00							6	100-200	6	Carbon steel casting	6	15-25		
05	Multi-spindle drilling machines									7	200-300	7	Alloy steel casting	7	25-50		
06	Automatic production drilling machines									8	300-500	8	Non-ferrous casting	8	50-100		
07	Deep-hole drilling machines									9	Over 500	9	Steel fabrication	9	Over 100		
08	Horizontal drilling machines																
09																	
			Spindle dia (mm)		Max.workable hight x width (mm)												
	Boring machines																
10	Precision boring machines	1	Upto 10	1	Upto 500 x 500	1	With numerical control	1	Table type								
11	Horizontal boring machines	2	10-50	2	500-1000 x 500 -1000	2	Without numerical control	2	Floor type								
12	Vertical jig borers	3	50-100	3	1000-1500 x 1000-1500												
13	Special boring machines	4	100-150	4	1500-2000 x 1500-2000												
		5	150-200	5	2000-2500 x 2000-2500												
		6	Above 200	6	Above 2500 x 2500												

SITC Code 736.16 - Metal cutting machine-tools, Sawing (including friction or abrasive cutting off) machines, metalworking.

6-7		8		9		10		11		12		13		14		15	
Basic Machine Nomenclature		Major Specification (Capacity)		Major Spec.-1 Optional		Major Spec.-2 Optional		Type		Manufacturing characteristic -1		Manufacturing characteristic -2		Manufacturing characteristic -3		Origin	
Code	Name	Code	Cutting diameter (cm)	Code		Code	Control system	Code	Description	Code	Weight(tons)	Code	Main body material	Code	Max. Component Weight(tons)	Code	
01	Reciprocating sawing machine (with arm saw blade)	1	Upto 150			1	With numerical control			1	Upto 5	1	Chilled iron casting	1	Upto 1	1	Turkey
	Circular sawing machines	2	150-250		Saw diameter (mm)	2	Without numerical control			2	5-10	2	Grey iron casting	2	1-2	2	Imported
02	Circular sawing machines with circular blade	3	250-350	1	Upto 500					3	10-25	3	Alloy iron casting	3	2-5		
03	Circular sawing machines with steel friction disc	4	Above 350	2	500-800					4	25-50	4	Malleable iron casting	4	5-10		
04	Circular sawing machines with abresive disc			3	800-1500					5	50-100	5	Spheroidal iron casting	5	10-15		
05	Circular sawing machines, others			4	Above 1500					6	100-200	6	Carbon steel casting	6	15-25		
	Band sawing machines							1	Horisontal	7	200-300	7	Alloy steel casting	7	25-50		
06	Band saws with sawing blade							2	Vertical	8	300-500	8	Non-ferrous casting	8	50-100		
07	Band saws with friction blade									9	Over 500	9	Steel fabrication	9	Over 100		
08	Band saws, others																
09	Contour sawing and filing machines																
10	Sawing machines, others																

SITC Code 736.17 - Metal cutting machine-tools,
Planing machines, metalworking

6-7		8		9		10		11		12		13		14		15	
Basic Machine Nomenclature		Major Specification (Capacity)		Major Spec.-1 Optional		Major Spec.-2 Optional		Type		Manufacturing characteristic -1		Manufacturing characteristic -2		Manufacturing characteristic -3		Origin	
Code	Name	Code	Maximum workable length (mm)	Code	Maximum workable width (mm)	Code	Control system	Code	Description	Code	Weight(tons)	Code	Main body material	Code	Max. Component Weight(tons)	Code	
	Planers	1	Upto 2000	1	Upto 1500	1	With numerical control			1	Upto 5	1	Chilled iron casting	1	Upto 1	1	Turkey
01	Double column planers	2	2000-4000	2	1500-1750	2	Without numerical control			2	5-10	2	Grey iron casting	2	1-2	2	Imported
02	Open-side planers	3	4000-6000	3	1750-2000					3	10-25	3	Alloy iron casting	3	2-5		
03	Pit-type planers	4	6000-8000	4	2000-2250					4	25-50	4	Malleable iron casting	4	5-10		
04	Edge or plate planers	5	8000-10000	5	2250-2500					5	50-100	5	Spheroidal iron casting	5	10-15		
05		6	10000-12000	6	2500-2750					6	100-200	6	Carbon steel casting	6	15-25		
06		7	Above 12000	7	Above 2750					7	200-300	7	Alloy steel casting	7	25-50		
	Shapers									8	300-500	8	Non-ferrous casting	8	50-100		
07	Horizontal-push cut shapers	1	Upto 150	1	Upto 500					9	Over 500	9	Steel fabrication	9	Over 100		
08	Horizontal-drow cut shapers	2	150-300	2	500-600												
09	Special purpose shapers	3	300-450	3	600-700												
10		4	450-600	4	700-800												
11		5	600-750	5	800-900												
		6	750-1000	6	900-1000												
	Slotters	7	Above 1000	7	Above 1000												
12	Key slotters																
13																	
14																	
15			Broaching force (tons)		Broaching length (mm)												
16																	
	Broaching machines	1	Upto 2	1	Upto 900			1	External								
17	Pull broaching machines (Vertical-mechanical)	2	2-10	2	900-1000			2	Internal								
		3	10-20	3	1000-1200			3	External-Internal								
18	Pull broaching machines (Vertical-hydraulic)	4	20-40	4	1200-1600												
		5	40-50	5	1600-2000												
		6	Above 50	6	Above 2000												

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SITC Code 736.17 - Metal cutting machine-tools.
Planning machines, metalworking

6-7		8	9	10	11	12	13	14	15
Basic Machine Nomenclature		Major Specification (Capacity)	Major Spec.-1 Optional	Major Spec.-2 Optional	Type	Manufacturing characteristic -1	Manufacturing characteristic -2	Manufacturing characteristic -3	Origin
Code	Name	Code / Broaching force (tons)	Code / Broaching length (cm)	Code / Control system	Code / Description	Code / Weight(tons)	Code / Main body material	Code / Max. Component Weight(tons)	Code
19	Pull broaching machines (Horizontal-mechanical)	1 Upto 2	1 Upto 900	1 With numerical control	1 External	1 Upto 5	1 Chilled iron casting	1 Upto 1	1 Turkey
20	Pull broaching machines (Horizontal-hydraulic)	2 2-10	2 900-1000	2 Without numerical control	2 Internal	2 5-10	2 Grey iron casting	2 1-2	2 Imported
21	Push broaching machines (Mechanical)	3 10-20	3 1000-1200		3 External-Internal	3 10-25	3 Alloy iron casting	3 2-5	
22	Push broaching machines (Hydraulic)	4 20-40	4 1200-1600			4 25-50	4 Malleable iron casting	4 5-10	
23		5 40-50	5 1600-2000			5 50-100	5 Spheroidal iron casting	5 10-15	
24	Continuous broaching machines (Surface broach-mechanical)	6 Above 50	6 Above 2000			6 100-200	6 Carbon steel casting	6 15-25	
25	Continuous broaching machines (Surface broach-hydraulic)					7 200-300	7 Alloy steel casting	7 25-50	
26	Rotary broaching machines					8 300-500	8 Non-ferrous casting	8 50-100	
27						9 Over 500	9 Steel fabrication	9 Over 100	

SITC Code 736.18 - Metal cutting machine-tools. Tapping or screw-cutting machines.

6-7		8	9	10	11	12	13	14	15
Basic Machine Nomenclature		Major Specification (Capacity)	Major Spec.-1 Optional	Major Spec.-2 Optional	Type	Manufacturing characteristic -1	Manufacturing characteristic -2	Manufacturing characteristic -3	Origin
Code	Name	Code / Max.working diameter (cm)	Code / Max.workable length (cm)	Code / Control system	Code / Description	Code / Weight(tons)	Code / Main body material	Code / Max. Component Weight(tons)	Code
01	High speed threading machines (single tip-tool)	1 Upto 10 2 10-30	1 Upto 250 2 250-500	1 With numerical control 2 Without numerical control		1 Upto 5 2 5-10	1 Chilled iron casting 2 Grey iron casting	1 Upto 1 2 1-2	1 Turkey 2 Imported
02	Automatic die head (turret lathes)	3 30-60 4 60-100	3 500-1000 4 1000-1500			3 10-25 4 25-50	3 Alloy iron casting	3 2-5 4 5-10	
03	Thread milling machines	5 100-150	5 1500-2000			5 50-100	4 Malleable iron casting	5 10-15	
04	Thread chasing machines	6 150-250	6 2000-3000			6 100-200	5 Spheroidal iron casting	6 15-25	
05	Flat die thread rolling machines	7 Above 250	7 Above 3000			7 200-300 8 300-500	6 Carbon steel casting	7 25-50 8 50-100	
06	Round die thread rolling machines					9 Over 500	7 Alloy steel casting	9 Over 100	
07	Tapping machines						8 Non-ferrous casting		
08							9 Steel fabrication		
09	Thread grinders								
10									

SITC Code 736.19 - Metal cutting machine-tools
Sharpening, trimming, truing, grinding, polishing, lapping, dressing or surfacing machines and similar machines for working metal or metal carbides, operating by means of grinding wheels, abrasives or polishing products.

6-7		8	9	10	11	12	13	14	15
Basic Machine Nomenclature		Major Specification (Capacity)	Major Spec.-1 Optional	Major Spec.-2 Optional	Type	Manufacturing characteristic -1	Manufacturing characteristic -2	Manufacturing characteristic -3	Origin
Code	Name	Code Max.workable diameter (mm)	Code Max. workable length(mm)	Code Control system	Code Description	Code Weight(tons)	Code Main body material	Code Max. Component Weight(tons)	Code
	External cylindrical grinders	1. Upto 100 2. 100-150 3. 150-250	1. Upto 500 2. 500-1000 3. 1000-1500	1. With numerical control 2. Without numerical control		1. Upto 5 2. 5-10 3. 10-25	1. Chilled iron casting 2. Grey iron casting 3. Alloy iron casting	1. Upto 1 2. 1-2 3. 2-5	1. Turkey 2. Imported
01	External cylindrical grinders (Plain)	4. 250-350	4. 1500-2500			4. 25-50		4. 5-10	
02	External cylindrical grinders (Universal)	5. 350-450 6. 450-600	5. 2500-3000 6. 3000-4000			5. 50-100 6. 100-200		5. 10-15 6. 15-25	
03	External cylindrical grinders (roll and centerless)	7. Above 600	7. Above 4000			7. 200-300 8. 300-500	4. Malleable iron casting	7. 25-50 8. 50-100	
04	External cylindrical grinders (Others)					9. Over 500	5. Spheroidal iron casting	9. Over 100	
	Internal cylindrical grinders						6. Carbon steel casting		
05	Internal cylindrical grinders (plain)						7. Alloy steel casting		
06	Internal cylindrical grinders (centerless)						8. Non-ferrous casting		
07	Internal cylindrical grinders (others)						9. Steel fabrication		
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SITC Code 736.19 - Metal cutting machine-tools
Sharpening, trimming, truing, grinding, polishing, lapping, dressing or surfacing machines and similar machines for working metal or metal carbides, operating by means of grinding wheels, abrasives or polishing products.

6-7		8		9		10		11		12		13		14		15	
Basic Machine Nomenclature		Major Specification (Capacity)		Major Spec.-1 Optional		Major Spec.-2 Optional		Type		Manufacturing characteristic -1		Manufacturing characteristic -2		Manufacturing characteristic -3		Origin	
Code	Name	Code	Max.workable width (mm)	Code	Max. workable length(mm)	Code	Control system	Code	Description	Code	Weight(tons)	Code	Main body material	Code	Max. Component Weight(tons)	Code	
64	Surface grinders	1	Upto 150	1	Upto 500	1	With numerical control	1	Horizontal spindle	1	Upto 5	1	Chilled iron casting	1	Upto 1	1	Turkey
09	Surface grinders (reciprocating table)	2	150-250	2	500-1000	2	Without numerical control	2	Vertical spindle	2	5-10	2	Grey iron casting	2	1-2	2	Imported
10	Surface grinders (rotary table)	3	250-500	3	1000-1500					3	10-25	3	Alloy iron casting	3	2-5		
11	Surface grinders (others)	4	500-750	4	1500-2500					4	25-50	4	Malleable iron casting	4	5-10		
12		5	750-1000	5	2500-3000					5	50-100	5	Spheroidal iron casting	5	10-15		
13	Tool and cutter grinding machines (universal)	6	1000-1500	6	3000-4000					6	100-200	6	Carbon steel casting	6	15-25		
14	Tool and cutter grinding machines (special purpose--drill, tool bit)	7	Above 1500	7	Above 4000					7	200-300	7	Alloy steel casting	7	25-50		
15	Tool and cutter grinding machines (jig grinding machines)		Max.workable diameter (mm)							8	300-500	8	Non-ferrous casting	8	50-100		
16		1	Upto 100							9	Over 500	9	Steel fabrication	9	Over 100		
		2	100-150														
		3	150-250														
		4	250-350														
		5	350-450														
		6	450-600														
		7	Above 600														

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SITC Code 736.19 - Metal cutting machine-tools
Sharpening,trimming,trueing,grinding,polishing,lapping,dressing or surfacing machines and similar machines for working metal or metal carbides operating by means of grinding wheels,abrasives or polishing products.

Basic Machine Nomenclature	Major Specification (Capacity)	Major Spec.1 Optional	Major Spec.2 Optional	Type	Manufacturing Characteristic 1	Manufacturing Characteristic 2	Manufacturing Characteristic 3	Origin
Code Name	Code Max. workable width (mm)	Code Max. workable length (mm)	Code Control system	Code Description	Code Weight (tons)	Code Main body material	Code Max. component weight(tons)	Code
17 Special purpose grinding machines/ slide-way, cam,piston crank-shaft	1.Upto 100 2.100-150 3.150-250 4.250-350 5.350-450 6.450-600 7.Above 600	1.Upto 50 2.500-1000 3.1000-1500 4.1500-2500 5.2500-3000 6.3000-4000 7.Above 4000	1.With numerical control 2.Without numerical control	-	1.Upto 5 2.5-10 3.10-25 4.25-50 5.50-100 6.100-200 7.200-300 8.300-500 9.Over 500	1.Chilled iron casting 2.Grey iron casting 3.Alloy iron casting 4.Malleable iron casting 5.Spheroidal iron casting 6.Carbon steel casting 7.Alloy steel casting 8.Non-ferrous casting 9.Steel fabrication	1.Upto 1 2.1-2 3.2-5 4.5-10 5.10-15 6.15-25 7.25-50 8.50-100 9.Over 100	1.Turkey 2.Imported
18 Disk,surface finishing machines machines								
19 Flexible band, surface finishing								
20 Two-wheel polishing or buffing machines								

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Machines

SITC Code 736.19 - Metal cutting machine-tools
Sharpening, trimming, truing, grinding, polishing, lapping, dressing or surfacing machines and similar machines for working metal or metal carbides, operating by means of grinding wheels, abrasives or polishing products.

6-7		8		9		10		11		12		13		14		15	
Basic Machine Nomenclature		Major Specification (Capacity)		Major Spec.-1 Optional		Major Spec.-2 Optional		Type		Manufacturing characteristic -1		Manufacturing characteristic -2		Manufacturing characteristic -3		Origin	
Code	Name	Code	Max. workable Diameter(mm)	Code	Max. workable Length(mm)	Code	Control system	Code	Description	Code	Weight(tons)	Code	Main body material	Code	Max. Component Weight(tons)	Code	
21	Honing machines	1	Upto 100	1	Upto 500	1	With numerical control	-		1	Upto 5	1	Chilled iron casting	1	Upto 1	1	Turkey
22	Lapping machines	2	100-150	2	500-1000	2	Without numerical control			2	5-10	2	Grey iron casting	2	1-2	2	Imported
23	Sharpening machines	3	150-250	3	1000-1500					3	10-25			3	2-5		
24	Superfinishing and other abrasing machines	4	250-350	4	1500-2500					4	25-50	3	Alloy iron casting	4	5-10		
		5	350-450	5	2500-3000					5	50-100			5	10-15		
		6	450-600	6	3000-4000					6	100-200	4	Malleable iron castings	6	15-25		
		7	Above 600	7	Above 4000					7	200-300			7	25-50		
										8	300-500	5	Spheroidal iron castings	8	50-100		
										9	Over 500	6	Carbon steel castings	9	Over 100		
												7	Alloy steel castings				
												8	Non-ferrous castings				
												9	Steel fabrication				

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SITC Code 736.21 - Metal forming machine-tools. Forging machines and stamping machines, metalworking

6-7 Basic Machine Nomenclature		8 Major Specification (Capacity)		9 Major Spec.-1 Optional		10 Major Spec.-2 Optional		11 Type		12 Manufacturing characteristic -1		13 Manufacturing characteristic -2		14 Manufacturing characteristic -3		15 Origin	
Code	Name	Code	Force (tons)	Code		Code	Control system	Code	Description	Code	Weight (tons)	Code	Main body material	Code	Max. Component Weight (tons)	Code	
01	Drop hammers	1	Upto 10			1	With numerical control		—	1	Upto 5	1	Chilled iron casting	1	Upto 1	1	Turkey
02	Steam and compressed air hammer	2	10-20			2	Without numerical control			2	5-10	2	Grey iron casting	2	1-2	2	Imported
		3	20-40							3	10-25	3	Alloy iron casting	3	2-5		
		4	40-75							4	25-50	4	Malleable iron casting	4	5-10		
03	Spring hammers	5	75-150							5	50-100	5	Spheroidal iron castings	5	10-15		
04	Electromagnetic hammers	6	150-300							6	100-200	6	Carbon steel castings	6	15-25		
		7	300-1000							7	200-300	7	Alloy steel castings	7	25-50		
05		8	1000-5000							8	300-500	8	Non-ferrous castings	8	50-100		
06		9	Above 5000							9	Over 500	9	Steel fabrications	9	Over 100		
07	Forging machines							1	Mechanical								
08	Forging presses							2	Hydraulic								
09	Swaging machines																
10	Forging rolls																
11																	
12																	
13	Stamping presses																

Machines

SITC Code 736.22 - Metal forming machine-tools, Bending, forming, folding or flattening machines, metalworking

6-7		8		9		10		11		12		13		14		15	
Basic Machine Nomenclature		Major Specification (Capacity)		Major Spec.-1 Optional		Major Spec.-2 Optional		Type		Manufacturing characteristic -1		Manufacturing characteristic -2		Manufacturing characteristic -3		Origin	
Code	Name	Code	Force (tons)	Code		Code	Control system	Code	Description	Code	Weight (tons)	Code	Main body material	Code	Max. Component Weight (tons)	Code	
01	Bench press (forming, bending, folding)	1	Upto 10			1	With numerical control	1	Single column (mechanical)	1	Upto 5	1	Chilled iron casting	1	Upto 1	1	Turkey
		2	10-20			2	Without numerical control	2	Single column (hydraulic)	2	5-10	2	Grey iron casting	2	1-2	2	Imported
02	Bench press (drawing)	3	20-40					3	Double column (mechanical)	3	10-25	3	Alloy iron casting	3	2-5		
		4	40-75					4	Double column (hydraulic)	4	25-50	4	Malleable iron casting	4	5-10		
03	Bench press (others)	5	75-150					5	Multi column (mechanical)	5	50-100	5	Spheroidal iron casting	5	10-15		
		6	150-500					6	Multi column (hydraulic)	6	100-200	6	Carbon steel casting	6	15-25		
04	Inclinable press-open back (forming, bending, folding)	7	500-1000					7	Horizontal (mechanical)	7	200-300	7	Alloy steel casting	7	25-50		
		8	1000-5000					8	Horizontal (hydraulic)	8	300-500	8	Non-ferrous casting	8	50-100		
		9	Above 5000					9	Others	9	Over 500	9	Steel fabrication	9	Over 100		
05	Inclinable press-open back (drawing)																
06	Inclinable press-open back (extruding, coining, flattening)																

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SITC Code 736.22 - Metal forming machine-tools, Bending, forming, folding or flattening machines, metalworking

6-7		8		9		10		11		12		13		14		15	
Basic Machine Nomenclature		Major Specification (Capacity)		Major Spec.-1 Optional		Major Spec.-2 Optional		Type		Manufacturing characteristic -1		Manufacturing characteristic -2		Manufacturing characteristic -3		Origin	
Code	Name	Code	Force (tons)	Code		Code	Control system	Code	Description	Code	Weight(tons)	Code	Main body material	Code	Max. Component Weight(tons)	Code	
07	Non-inclinable press (forming, bending, folding)	1	Upto 10			1	With numerical control	1	Simple column (mechanical)	1	Upto 5	1	Chilled iron casting	1	Upto 1	1	Turkey
		2	10-20			2	Without numerical control	2	Simple column (hydraulic)	2	5-10	2	Grey iron casting	2	1-2	2	Imported
08	Non-inclinable press (drawing)	3	20-40					3	Double column (mechanical)	3	10-25	3	Alloy iron casting	3	2-5		
09	Non-inclinable press (extruding, coining, flattening)	4	40-75					4	Double column (hydraulic)	4	25-50	4	Malleable iron casting	4	5-10		
		5	75-150					5	Multi column (mechanical)	5	50-100	5	Spheroidal iron casting	5	10-15		
		6	150-500					6	Multi column (hydraulic)	6	100-200	6	Carbon steel casting	6	15-25		
		7	500-1000					7	Horizontal (mechanical)	7	200-300	7	Alloy steel casting	7	25-50		
		8	1000-5000					8	Horizontal (hydraulic)	8	300-500	8	Non-ferrous casting	8	50-100		
		9	Above 5000					9	Others	9	Over 500	9	Steel fabrication	9	Over 100		
10	End-wheel press, closed back (Deepthroat press), (forming, folding)																
11	End-wheel press, closed back (Deepthroat press), (blanking)																
12	Horn press-adjustable bed (forming, bending)																

SITC Code 736.22 - Metal forming machine-tools.
Bending, forming, folding or flattening machines, metalworking

6-7		8		9		10		11		12		13		14		15	
Basic Machine Nomenclature		Major Specification (Capacity)		Major Spec.-1 Optional		Major Spec.-2 Optional		Type		Manufacturing characteristic -1		Manufacturing characteristic -2		Manufacturing characteristic -3		Origin	
Code	Name	Code	Force (tons)	Code		Code	Control system	Code	Description	Code	Weight (tons)	Code	Main body material	Code	Max. Component Weight (tons)	Code	
13	Horn press-adjustable bed (drawing)	1	Upto 10			1	With numerical control	1	Single column (mechanical)	1	Upto 5	1	Chilled iron casting	1	Upto 1	1	Turkey
14	Straight-side press (forming, bending)	2	10-20			2	Without numerical control	2	Single column (hydraulic)	2	5-10	2	Grey iron casting	2	1-2	2	Imported
15	Straight-side press (drawing)	3	20-40					3	Double column (mechanical)	3	10-25	3	Alloy iron casting	3	2-5		
16	Straight-side press (extruding, flattening)	4	40-75					4	Double column (hydraulic)	4	25-50	4	Malleable iron casting	4	5-10		
17	Arch press (forming, bending)	5	75-150					5	Multi column (mechanical)	5	50-100	5	Spheroidal iron casting	5	10-15		
18	Arch press (drawing)	6	150-500					6	Multi column (hydraulic)	6	100-200	6	Carbon steel casting	6	15-25		
19	Pillar press (forming, bending)	7	500-1000					7	Horizontal (mechanical)	7	200-300	7	Alloy steel casting	7	25-50		
20	Pillar press (drawing)	8	1000-5000					8	Horizontal (hydraulic)	8	300-500	8	Non-ferrous casting	8	50-100		
		9	Above 5000					9	Others	9	Over 500	9	Steel fabrication	9	Over 100		

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SITC Code 736.22 - Metal forming machine-tools, Bending, forming, folding or flattening machines, metalworking

6-7		8		9		10		11		12		13		14		15	
Basic Machine Nomenclature		Major Specification (Capacity)		Major Spec.-1 Optional		Major Spec.-2 Optional		Type		Manufacturing characteristic -1		Manufacturing characteristic -2		Manufacturing characteristic -3		Origin	
Code	Name	Code	Force (tons)	Code		Code	Control system	Code	Description	Code	Weight (tons)	Code	Main body material	Code	Max. Component Weight (tons)	Code	
21	Piller press (extruding)	1	Upto 10			1	With numerical control	1	Single column (mechanical)	1	Upto 5	1	Chilled iron casting	1	Upto 1	1	Turkey
22	Press-brake (forming, bending)	2	10-20			2	Without numerical control	2	Single column (hydraulic)	2	5-10	2	Grey iron casting	2	1-2	2	Imported
23	Press-brake (drawing)	3	20-40					3	Double column (mechanical)	3	10-25	3	Alloy iron casting	3	2-5		
24	Press-brake (blanking)	4	40-75					4	Double column (hydraulic)	4	25-50	4	Malleable iron casting	4	5-10		
25	Press-brake (flattening, straightening)	5	75-150					5	Multi column (mechanical)	5	50-100	5	Spheroidal iron casting	5	10-15		
26	Press-brake (others)	6	150-500					6	Multi column (hydraulic)	6	100-200	6	Carbon steel casting	6	15-25		
		7	500-1000					7	Horizontal (mechanical)	7	200-300	7	Alloy steel casting	7	25-50		
		8	1000-5000					8	Horizontal (hydraulic)	8	300-500	8	Non-ferrous casting	8	50-100		
		9	Above 5000					9	Others	9	Over 500	9	Steel fabrication	9	Over 100		
	Special presses							1. Mechanical 2. Hydraulic									
27	High productior transfer press																
28	Dieing machine (forming, drawing)																
29	Dieing machine (blanking)																

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SITC Code 736.22 - Metal forming machine-tools, bending, forming, folding or flattening machines, metalworking

6-7 Basic Machine Nomenclature		8 Major Specification (Capacity)		9 Major Spec.-1 Optional		10 Major Spec.-2 Optional		11 Type		12 Manufacturing characteristic -1		13 Manufacturing characteristic -2		14 Manufacturing characteristic -3		15 Origin	
Code	Name	Code		Code		Code	Control system	Code	Description	Code	Weight(tons)	Code	Main body material	Code	Max. Component Weight(tons)	Code	
30	Multi-slide machines		SAME AS IN PAGE 4			1	With numerical control	1	Mechanical	1	Upto 5	1	Chilled iron casting	1	Upto 1	1	Turkey
31	Other presses					2	Without numerical control	2	Hydraulic	2	5-10	2	Grey iron casting	2	1-2	2	Imported
32										3	10-25	3	Alloy iron casting	3	2-5		
33			Max. thickness rolled (mm)		Max.width (mm)					4	25-50	4	Malleable iron casting	4	5-10		
34										5	50-100	5	Spheroidal iron casting	5	10-15		
35										6	100-200	6	Carbon steel casting	6	15-25		
35	Hand operated rolling machines	1	Upto 4	1	Upto 150					7	200-300	7	Alloy steel casting	7	25-50		
37	Power operated bending rolls (sheets and plates)	2	4-6	2	150-650					8	300-500	8	Non-ferrous casting	8	50-100		
		3	6-20	3	650-1000					9	Over 500	9	Steel fabrication	9	Over 100		
		4	20-50	4	1000-2000												
		5	50-100	5	2000-4000												
		6	Above 100	6	Above 4000												
38	Power operated bending rolls (angles, bars, shapes)																
39	Power operated bending rolls (tube bending)																
40	Power operated forming rolls																
41	Straightening rolls																
42	Rotary head and ram bending machines (for tubes and bars)																

¶ITC Code 736.22 - Metal forming machine-tools.
Bending, forming, folding or flattening machines, metalworking.

6-7		8		9		10		11		12		13		14		15	
Basic Machine nomenclature		Major Specification (Capacity)		Major Spec.-1 Optional		Major Spec.-2 Optional		Type		Manufacturing characteristic -1		Manufacturing characteristic -2		Manufacturing characteristic -3		Origin	
Code	Name	Code	Max. thickness welded(mm)	Code	Max.width (mm)	Code	Control system	Code	Description	Code	Weight(tons)	Code	Main body material	Code	Max. Component Weight(tons)	Code	
43	Bending and forming machines (others)	1	Upto 4	1	Upto 150	1	With numerical control	1	Mechanical	1	Upto 5	1	Chilled iron casting	1	Upto 1	1	Turkey
		2	4-6	2	150-650	2	Without numerical control	2	Hydraulic	2	5-10	2	Grey iron casting	2	1-2	2	Imported
		3	6-20	3	650-1000					3	10-25	3	Alloy iron casting	3	2-5		
		4	20-50	4	1000-2000					4	25-50	4	Malleable iron casting	4	5-10		
		5	50-100	5	2000-4000					5	50-100	5	Spheroidal iron casting	5	10-15		
		6	Abcve 100							6	100-200	6	Carbon steel casting	6	15-25		
										7	200-300	7	Alloy steel casting	7	25-50		
										8	300-500	8	Non-ferrous casting	8	50-100		
										9	Over 500	9	Steel fabrication	9	Over 100		

SITC Code 736.23 - Metal forming machine-tools.
Shearing, punching or notching machines metalworking.

6-7 Basic Machine Nomenclature		8 Major Specification (Capacity)		9 Major Spec.-1 Optional		10 Major Spec.-2 Optional		11 Type		12 Manufacturing characteristic -1		13 Manufacturing characteristic -2		14 Manufacturing characteristic -3		15 Origin	
Code	Name	Code	Max.thickness (mild steel) (mm)	Code	Max.length to be sheared (mm)	Code	Control system	Code	Description	Code	Weight(tons)	Code	Main body material	Code	Max. Component Weight(tons)	Code	
	Shearing machines	1	Upto 5	1	Upto 500	1	With numerical control			1	Upto 5	1	Chilled iron casting	1	Upto 1	1	Turkey
		2	5-10	2	500-1000	2	Without numerical control			2	5-10	2	Grey iron casting	2	1-2	2	Imported
01	Hand lever sheares	3	10-15	3	1000-1500					3	10-25	3	Alloy iron casting	3	2-5		
02	Mechanical guillotine sheare	4	15-20	4	1500-2000					4	25-50	4	Malleable iron casting	4	5-10		
03	Hydraulic guillotine sheare	5	20-25	5	2000-3000					5	50-100	5	Spheroidal iron casting	5	10-15		
04	Circular sheare	6	25-30	6	3000-4000					6	100-200	6	Carbon steel casting	6	15-25		
05	Slitting machines	7	Above 30	7	Above 4000					7	200-300	7	Alloy steel casting	7	25-50		
06	Trimming machines									8	300-500	8	Non-ferrous casting	8	50-100		
07										9	Over 500	9	Steel fabrication	9	Over 100		
08																	
	Shearing machines for steel plants																
09	Ingot, billet, slab sheare																
10	Scrap sheare																
11	Bar cropping sheare																
12																	

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SITC Code 736.23 - Metal forming machine-tools
Shearing, punching or notching machines metalworking.

6-7		8		9		10		11		12		13		14		15	
Basic Machine Nomenclature		Major Specification (Capacity)		Major Spec.-1 Optional		Major Spec.-2 Optional		Type		Manufacturing characteristic -1		Manufacturing Characteristic -2		Manufacturing characteristic -3		Origin	
Code	Name	Code	Max.thickness (Mild steel) (mm)	Code	Max.length to be sheared (mm)	Code	Control system	Code	Description	Code	Weight(tons)	Code	Main body material	Code	Max. Component Weight(tons)	Code	
	Special application shears	1	Upto 5	1	Upto 500	1	With numerical control			1	Upto 5	1	Chilled iron casting	1	Upto 1	1	Turkey
13	Round, flat, section cutting shears	2	5-10	2	500-1000	2	Without numerical control			2	5-10	2	Grey iron casting	2	1-2	2	Imported
14	Universal shears (nibbling)	3	10-15	3	1000-1500					3	10-25	3	Alloy iron casting	3	2-5		
15		4	15-20	4	1500-2000					4	25-50	4	Malleable iron casting	4	5-10		
16	Combined shearing, punching, notching machines	5	20-25	5	2000-3000					5	50-100	5	Spheroidal iron casting	5	10-15		
17	Punching machines	6	25-30	6	3000-4000					6	100-200	6	Carbon steel casting	6	15-25		
18	Notching machines	7	Above 30	7	Above 4000					7	200-300	7	Alloy steel casting	7	25-50		
19	Other power operated punching and shearing machines									8	300-500	8	Non-ferrous casting	8	50-100		
20										9	Over 500	9	Steel fabrication	9	Over 100		

APPENDIX 2

PRESS, PRESS BRAKE, GUILLOTINE MANUFACTURERS IN TURKEY

1. Before explaining the production capacities, technological developments and sales potentials of the firms which were investigated, some common problems like quality and capacity utilisation were considered.

2. There are two group of manufacturers in Istanbul and İzmir. In one, managers usually gained the necessary knowledge by apprenticeship while in the other engineers who had worked in large industrial companies used their experience to set up individual enterprises.

   In the first, engineering problems are solved by rule-of-thumb, machines usually lack precision and lack of engineering skill causes waste of material. The second group however, uses hydraulic and pneumatic parts for precision and produce aesthetically more attractive machines.

Both of them use mostly unqualified workers at 150-600 TL/man hour and as a result sell their machines at a low price.

3. In İstanbul and İzmir, there are more than 100 eccentic press manufacturers who manufacture 3-20 units/year. But with their present machine park and personnel, they can reach 15-65 units/year capacity. Although there are not many hydraulic press manufacturers, the present capacity seems enough to fulfil the demand. Most of the eccentric press manufacturers do not want to go in for hydraulic presses, because of the complicated parts which are not easily available.

4. Guillotines and press brakes can usually be manufactured in everyeccentric press factory. But because they can manufacture an eccentric press in considerably less time then required for guillotine or a press brake, they prefer to stick to eccentric presses.

5. Detailed information about the important manufacturers is given below:

5.1. İSTANBUL REGION

5.1.1. HIDROMODE- Hydraulic Machine Industry and Trade Co. They are manufacturing hydraulic presses, press brakes, guillotines and nibbling machines. They have good organization of supplies from 25 ancillary units. They are working at 40% of installed capacity. Their current programme is as under:

	CAPACITY		1982 PROD. PROGRAMME
Nibbling machines	- Max. 5 mm	-	120 units/year
Press brake mach.	- Max. 70 tons	-	15 units/year
Hydraulic press	- Max. 150 tons	-	9 units/year
Guillotines	- Max. 8 mm	-	8 units/year

Their market research indicates that, demand for nibbling machine will increase, they have made plans to increase their capacity to 1000 units/year.

5.1.2 . TOMRUK

They manufacture hydraulic presses from 50 to 1000 tons. Although they manufactured 40 hydraulic presses of different capacity in 1978, in 1981 they could sell only 4 presses of 150 tons. They are working at 39% of installed capacity.

They have some contracts for export to Iran, Iraq and Greece.

Prices of their standard presses are

150 ton hydr. - 4.000.000 TL (app. 26.700 $)
300 ton hydr. - 12.000.000 TL (app. 80.000 $)
600 ton hydr. - 20.000.000 TL (app. 133.400 $)

5.1.3. IMBAT Machine Industry

They are manufacturing hydraulic presses upto 1500 tons and a large number of manufacturers use their products.

They are also manufacturing eccentric presses under "Schuller " license from 25 to 400 tons and have a capacity of 25 units/year.

They produce injection presses also. They have capacity of 60 units/year for these machines.

5.1.4. GÖKMEN Machine Tools Co.

They are manufacturing hydraulic Presses, hydraulic press brakes and guillotines. Their capacity is as follows:

Hydraulic press brake - 10 units/year with max. capacity of 400 tons

Hydraulic guillotine - 20 units/year with max. capacity of 16 mm.

Their 120 ton 3000 mm hydraulic press brake are priced at 2.500.000 TL (appr. 16.670 $)

and

10 mm to 3000 mm hydraulic guillotine at 3.500.000 TL. (app. 23.350 $).

5.1.5. ERKEKOĞLU Press and Machines Co.

They produce old models of 15 ton to 150 ton eccentric presses. Their engineering skill is low.

5.2. İZMİR REGION

5.2.1. DİRİNLER Machine Tool Industry and Trade Co.

They are the most important press manufacturers in Turkey. They produce presses of high quality.

Their capacity is 500 units/Year but actual utilisation is only 30%.

Standard production programme includes presses from 15 to 150 tons and they estimate that they can sell 150 units of eccentric presses in 1982.

Current prices are as follows:

Capacity (Tons)

15 Tons - 185.000 TL (app. 1250 $)

25 Tons - 335.000 TL (appr 2235 $)

30 Tons - 360.000 TL (app. 2400 $)

50 Tons - 680.000 TL (app. 4535 $)

60 Tons - 760.000 TL (app. 5070 $)

80 Tons - 935.000 TL (app. 6235 $)

100 Tons - 1.700.000TL(app.11335 $)

150 Tons - 2.850.000TL(app.19000 $)

5.2.2. GENÇ MACHINE TOOLS IND. AND TRADE CO.

They are manufacturing eccentric presses and guillotines. Their capacity is 400 units/year but actual utilization is only 30% .

In 1982 they plan to manufacture 25 units of eccentric press and 25 units of guillotines. The range of eccentric presses is 25 ton to 100 ton while guillotines are with a capacity of Maximum 6mm and 2000-2500 mm table size.

Their 25 ton eccentric press is priced at 360.000 TL(app.2400 $) , 170 ton eccentric press at 3.000.000 TL(app.20.000 $) and 4 mm guillotine with 2000 mm table at 840.000 TL(app.5600 $).