OCCASION

This publication has been made available to the public on the occasion of the 50th anniversary of the United Nations Industrial Development Organisation.

DISCLAIMER

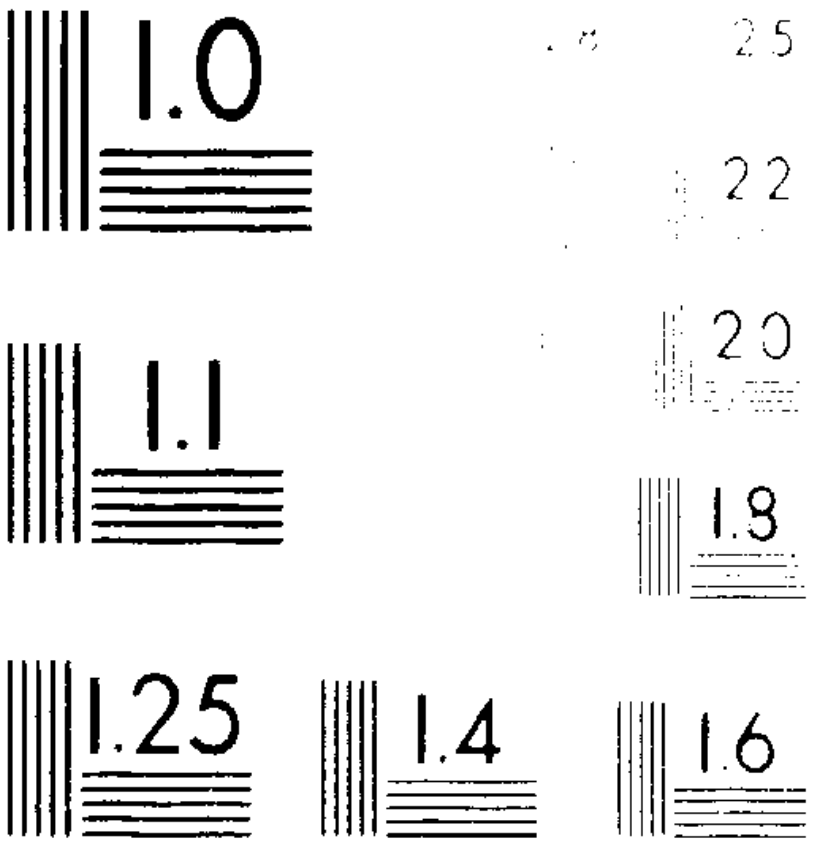
FAIR USE POLICY

CONTACT

Please contact publications@unido.org for further information concerning UNIDO publications.

For more information about UNIDO, please visit us at www.unido.org

UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION
Vienna International Centre, P.O. Box 300, 1400 Vienna, Austria
Tel: (+43-1) 26026-0 · www.unido.org · unido@unido.org


1.0
2.5
2.2
2.0
1.1
1.8
1.25
1.4
1.6

14263

DEVELOPMENT OF CAPITAL GOODS INDUSTRIES

DP/TUR/76/034

TURKEY

1983

Technical Report No. XXII

Turkey.

Technical Report on capacity for Capital Goods Manufacture in State Enterprises - Sugar Machinery Manufacturing Plants.

M.M. Luther

Birleşmiş Milletler Kalkınma Programı

UNITED NATIONS NATIONS UNIES

DEVELOPMENT PROGRAMME IN TURKEY

UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANISATION

RESTRICTED

Sept. 1983

English

DEVELOPMENT OF CAPITAL GOODS INDUSTRIES

DP/TUR/75/034

Technical Report No. XXI- Technical Report on capacity for Capital Goods Manufacture in State Enterprises - Sugar Machinery Manufacturing Plants.

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.

U.N. BUILDING, 197 ATATÜRK BULVARI P.O. BOX 407, ANKARA CABLES : UNDEVPRO TEL : 26 54 85 TELEX : 42684

LIST OF TABLES

./..

Birleşmiş Milletler Kalkınma Programı

UNITED NATIONS NATIONS UNIES

DEVELOPMENT PROGRAMME IN TURKEY

CAPITAL GOODS DEVELOPMENT PROJECT IN TURKEY

TABLE OF CONTENTS

U.N. BUILDING, 197 ATATÜRK BULVARI P.O. BOX 407, ANKARA CABLES : UNDEVPRO TEL : 26 54 85 TELEX : 42384

CAPITAL GOODS DEVELOPMENT PROJECT IN TURKEY

LIST OF ANNEXURES

CHAPTER I

INTRODUCTION

1.1. Capital Goods Development Project in Turkey was visualised for long term perspectives and short term strategies for this critical sector of economy. One of the important considerations in this study was the utilisation of capacity of existing state enterprises engaged in machine building.

1.2. In the State sector there are five machinery building units principally manufacturing sugar plant machinery for the State owned sugar plants all of which produce sugar from beet root.

1.3. Earlier project reports have already dealt with the important new units including Gerkonsan (for technological structures and transmission tower) Taksan (for metal working machine tools) Tumosan (for tractors, diesel engines and transmissions) a new plant for manufacture of earth moving machinery. This report deals with the 5 plants of Seker Makina Fabrikasi. These plants work under a Division head who reports to Deputy General Manager (Technical) who on them is responsible to the General Manager of Seker Fabrikalari A.S.

1.4. This study has been conducted under the guidance of Mr. M.M. Luther, Chief Technical Adviser, by Mr. Ferruh Tanyel, Mechanical Engineer who was initially working with the Eskisehir Seker Makina Fabrikasi and has been attached as a full-time SPO expert to the project since March '83.

1.5. The project management is grateful to Mr. Necdet Baykut, General Manager of Turkiye Seker Fabrikalari A.S. for open and frank discussions leading to agreed conclusions and recommendations.

1.6. Mr. Vahit Erdem, National Project Coordinator of the Project has been associated with all stages of development of this study.

M.M. LUTHER,
C.ENG.F.I.MECH.E.(LOND)F.I.PROD.E
CHIEF TECHNICAL ADVISER,
CAPITAL GOODS PROJECT IN TURKEY.

CHAPTER II

SUMMARY

2.1. There are at present 5 machine building units under Turkey Seke- Fabrikalari A.S. who have plans for expansion of the factories at Eskisehir and Erzincan but which have not been accepted by the Government yet.

2.2. All the plants have general purpose machinery.

2.3. Requirements for replacement in the next 5-8 years are negligable.

2.4. Ankara, Eskisehir and Erzincan factories need some balancing machinery to increase quality and quantity of their products.

2.5. Most of jigs, fixtures and dies are either supplied by the domestic manufacturers or designed and manufactured by the plants themselves.

2.6. A system for periodic inspection of jigs, fixtures and dies is recommended.

2.7. Currently the capacity utilisation in these factories is assumed 50%.

2.8. Capacity utilisation of these factories depend on the available load.

2.9. Since there is no planned demand for new sugar factories (upto 89) existing capacity of their machine building units may be utilized for meeting demands of other SEE's.

2.10. There are small size foundries in Eskisehir, Turhal and Erzincan plants. Eskisehir factory has a small steel foundry also. Small size non-ferrous castings are produced in Eskisehir, Turhal and Erzincan factories. Small size open forgings are produced in Eskisehir, Turhal and Erzincan factories.

2.11. Ankara machine factory has facilities to produce steel fabrication upto 160mm plate thickness and 120 tonnes in weight. On machine tools, it can handle 120 tonnes weight on lathes, 70 tonnes on planers and 70 tonnes on milling machines. Other factories have small and medium size general purpose machine tools.

2.12. It is recommended that urgent steps are taken by the management to introduce in these factories (i) modern techniques of production planning and control including long-term production planning .

(ii) Industrial engineering (for work measurement, plant layouts, organisation and methods etc.)

(iii) Effective quality control.

(iv) A system to get the feedback from users.

(v) A preventive maintenance system.

2.13. Basic data for standard operation times for each production process should be prepared by qualified industrial engineers and implemented by production management in order to make their products competitive. Assistance of international agencies like UNIDO may be sought for this purpose.

2.14. Carefully designed incentive schemes based on standard operation times by giving extra bonus to workers for their time savings over standards should be introduced to achieve maximum productivity.

2.15. Necessary policy measures should be taken to attract and retain capable technical staff.

2.16. Ratios of direct labor to total employees and total workers to engineers need improvement.

2.17. Formal training schemes should be introduced for workers to promote their skills, making use of technical training centers of the Government.

2.18. For steel fabrication, their plants have a combined capacity for 21710 tonnes p.a. while the anticipated load is expected to be around 3000 T p.a.

2.19. An effective marketting organisation is essential for these units. These should be supplemented by exchange of data about capacity and capabilities of other machine building SEE's. Specifically these units should meet the entire demand of SEKA plants both for spares as well as new units.

2.20. These factories should make urgent efforts to win customers. These in the immediate future may include, in addition to existing ones, supply of valves, pumps, truck scales to various state enterprises (eg. YSE, DSI, TCK, Toprak-Su, Municipalities, etc.) and machining services to some SEE's (eg. Cement industry, Azot Sanayii, Petkim).

2.21. Main production goods, raw materials and machine elements are purchased yearly according to production planned. To lower costs, inventories of both stocked and in-process components need constant check and control. Depending on availability of purchased items, the time for storage can be reduced by rationalised purchase procedures.

2.22. The cost of products is defined by material cost and operation cost based on working hours and unit operation cost plus running expenses and profit. The units could introduce a modern system (not necessarily costly) of financial management.

2.23. There is no linkage with R and D organisations in other countries and there is none in the sugar sector in Turkey. This should be developed so that of any improvements in thecnology of sugar beet manufacture come to the notice of machine factories who can adapt their products to improved technologies in time.

2.24. At present these factories operate as jobbing shops for sugar factories. Possibility for exports is limited, because many countries produce sugar from sugar cane and most countries which are using beet are either industrialised or have their own machinery factories. It is proposed that the management should make a market research, choose some items not necessarily for sugar plants for mass production if possible and reserve some machines for this purpose. In any case this market research should enable them plan utilisation of available capacity on a long term basis.

2.25. INVESTMENT PROPOSALS

2.25.1. The main policy for 1984 investments is to limit them to those required for increasing productivity and improving quality.

2.25.2. Investment proposals for creating additional capacity are not necessary for the time being.

2.25.3. Although shifting the factory in Erzincan and some shops in Eskisehir agreed to in principle, they will be taken up for consideration during the 5th. Five Year Plan period, in the following steps.

2.25.3.1. ERZINCAN

(i) Shifting of foundry,
(ii) Shifting of steel fabrication shop,
(iii) Shifting of machine shop, management offices and other facilities.

2.25.3.2. ESKISEHIR

(i) Shifting of foundry,
(ii) Shifting of steel fabrication shop,
(iii) Shifting of material storehouse and other facilities.

CHAPTER III

PRODUCTION FACILITIES

3.1. There are at present 5 machinery manufacturing units under the control of Turkiye Seker Fabrikalari A.S. The oldest one in Ankara was established in 1968, the one in Eskisehir in 1969 and those in Turhal, Erzincan and Afyon in 1977.

3.2. The units at Turhal and Erzincan were operating as maintenance workshops of sugar plants at these places till 1977. Their status was however changed in 1977 when they were made independent of the sugar plants.

3.3. The plant at Eskisehir is the largest at present and the one at Afyon the smallest. All the plants have the basic machinery and plant for manufacture of steel-fabricated equipment as well as general purpose metal cutting machines. Besides, Eskisehir, Turhal and Erzincan plants have small grey iron foundries and forging facilities. Eskisehir has a small steel foundry also.

3.4. The number of shifts operated in these plants vary. As of 1982, they were as under:-

	Machine shops	Other shops
Ankara	2	2 *
Eskisehir	2	2
Turhal	1	1
Erzincan	1	1
Afyon	1	2

* The welding section works in 3 shifts.

3.5. While these factories cater to the demands of sugar plants and take up other items as and when orders for them are available, broadly as a matter of deliberate management policy, they now specialise in manufacture as under:-

ANKARA	Steel fabricated equipment (eg. tanks, pressure vessels, heat exchangers).
ESKISEHIR	Gear boxes, pumps, blowers, truck trailers.
TURHAL	Valves from 350mm to 1000mm diameter.
ERZINCAN	Valves from 100mm to 300mm diameter.
AFYON	Conveyors.

3.6. Tables 1 and 2 shows the investments in these five plants at the time of investment as well as their book value in 1982.

3.7. EXPANSION PLANS

Table 3 shows the present plans for expansion of total land and covered area.

3.7.1. Investment proposals for creating additional capacity are not necessary for the time being.

3.7.2. Although shifting the factory in Erzincan and some shops in Eskisehir are agreed to in principle, they should be taken up for consideration during the 5th. Five Year Plan period, in the following steps.

3.7.2.1. ERZINCAN

(i) Shifting of foundry
(ii) Shifting of steel fabrication shop
(iii) Shifting of machine shop, management offices and other facilities.

3.7.2.2. ESKISEHIR

(i) Shifting of foundry
(ii) Shifting of steel fabrication shop
(iii) Shifting of material storehouse and other facilities.

TABLE 1

SUGAR MACHINE FACTORIES

FIXED INVESTMENT

LOCATION	YEAR OF FIRST INVESTMENT	LAND	BUILDINGS	MACHINERY AND PLANTS	OTHERS	TL	US $
ANKARA	1968	12 925 000	15 373 663	21 743 471	2 304 617	53 346 751	5 875 193
ESKISEHIR	1969	3 300 000	3 104 537	2 953 511	362 041	9 720 189	1 080 021
TURHAL	1977	116 000 000	33 [illegible] 597	20 319 370	14 972 935	185 120 952	10 284 497
ERZINCAN	1977	3 000 000	7 791 374	20 190 414	6 362 259	37 344 047	2 074 670
AFYON	1977	82 [illegible]	37 195 215	30 256 [illegible]	7 165 282	74 699 753	4 199 986

1. Land costs are estimated according to the market prices, the land belonged to sugar factories at these places,

2. The investments for buildings, machinery, plants and for others are still continuing.

3. 1 $ = 9.00 TL for years 1968 and 1969.

1 $ = 18.00 for 1977.

PRESENT BOOK VALUES

1 $ = 195 TL.

LOCATION	LAND	BUILDINGS	MACHINERY AND PLANT	OTHERS	TL	US $
ANKARA	775 000 000	197 797 875	437 071 784	17 077 012	1 428 546 671	7 325 880
ESKISEHIR	600 000 000	624 202 621	810 808 852	69 376 770	2 104 388 243	10 791 734
TURHAL	290 000 000	279 000 000	160 000 000	43 000 000	772 000 000	3 958 974
ERZINCAN	10 000 000	30 113 800	239 097 960	8 905 133	288 116 [illegible]93	1 [illegible]77 527
AFYON	4 121 383	44 250 000	32 750 000	8 800 000	89 921 383	[illegible]

1- Present book values are taken from the insurance values. (Except land costs).

2- Land costs are estimated as explained in Table I.

	LAND (m^2)	
	1980	1985
Ankara	500 000	500 000
Eskişehir	110 000	110 000
Turhal	58 000	58 000
Erzincan	5 900	15 000
Afyon	35 000	35 000

CONSTRUCTION WORK

	COVERED AREA (m^2)		
1990	1990	1985	1990
500 000	17 000	32 000	32 000
110 000	23 000	26 960	30 920
58 000	9 684	9 684	9 684
15 000	5 100	10 000	10 000
35 000	10 900	10 900	10 900

3.8. MACHINERY AND PLANT

3.8.1. Capital Goods Development Programme has evolved a 15 digit code for all equipment covered by its studies including metal cutting and metal forming machines. The relevant codes for metal cutting and metal forming machines are at Annex. I and II.

3.8.2. The number of machines availabe in these five plants at the beginning of each year from 1977 to 1981 along with their major specifications and 15 digit codes, is at Annexures III,IV,V,VI and VIII.

3.8.3. As will be noticed from these annexures

(a) the machines are basically general purpose, capable of handling a variety of items on relatively short production runs or jobbing work.

(b) there has been no expansion in the last five years.

3.8.4. Data on age groups of the machinery available is on Table 4. Considering the type of work being done and the age of these machines, requirements for replacements are likely to be negligible in Ankara, Eskisehir and Erzincan factories. In essence, proposals for additional machinery and plant prepared by the plant managements cover the following:-

Ankara plant	Flange drilling machine
	Warehouse gantry crane
	Automatic shot blasting unit.
Eskisehir plant	Automatic moulding machines
	Tooth grinding machine
Erzincan	Cylindrical grinding machine
	Horizontal boring and milling machine
	Gear hobbing machine

3.8.5. Procurement of these machines will assist the plants in improvement of capacity utilisation and quality and recommendations.

TABLE 4

STRUCTURE OF THE PLANTS (1981)

	0 - 5 Years						6-10 Years					
	Ank.	Esk.	Turh.	Erzin.	Afy.	TOTAL	Ank.	Esk.	Turh.	Erzin.	Afy.	TOTAL
Lathes	1	17	3	13	4	38	7	12	14	2	17	52
Milling Machine	1	2	-	1	1	5	4	9	3	1	2	19
Drilling Machine	-	4		2	2	8	8	1	2	-	2	13
Grinding Machine	-	3		-	-	3	-	-	-	-	-	-
Gear Miller	1	-	-	-	-	1	-	7	-	-	-	7
Slotter	-	3	1	1	-	5	1	-	-	-	1	2
Planer	-	-	-	-	-	-	-	-	-	-	-	-
Shaper	-	2		-	1	3	-	-	-	-	1	1
Double column plano-milling	-	-	-	-	-	-	-	-	-	-	-	-
Two wheel polishing machine	1	-	-	-	-	1	-	-	-	-	-	-
TOTAL	4	31	4	17	8	64	20	29	19	3	23	94

STRUCTURE OF THE PLANTS (1981)

11 - 20 years

	Ank.	Esk.	Turh.	Erzin.	Afv.	TOTAL
Lathes	12	11	6	8	-	37
Milling Machine	3	1	2	1	-	7
Drilling Machine	5	-	2	1	-	8
Grinding Machine	-	-	-	-	-	-
Gear Miller	-	1	-	-	-	1
Slotter	-	-	1	-	-	1
Planer	-	-	-	-	-	-
Shaper	1	2	3	1	-	7
Double column plano-milling	-	-	-	-	-	-
Two wheel polishing machine	-	-	-	-	-	-
TOTAL	21	15	14	11	-	61

TABLE 4

Over 20 Years

Ank.	Esk,	Turh.	Erain.	Afv.	TOTAL	GRAND TOTAL
-	16	10	3	-	29	[illegible]
-	5	1	1	-	7	36
-	4	4	2	-	10	38
-	-	-	-	-	-	3
2	-	-	-	-	2	11
-	1	-	-	-	1	10
-	1	-	-	-	1	1
-	1	-	1	-	2	13
1	-	-	-	-	1	1
-	-	-	-	-	-	[illegible]
3	[illegible]	15	7	-	59	[illegible]

3.8.6. JIGS, FIXTURES AND DIES

3.8.6.1. The sources of supplies of jigs fixtures and dies are as under:-

Factory	Own desing & manufacture	Turkish supplies	Imports
ANKARA	50%	50%	-
ESKISEHIR	40%	55%	5%
TURHAL	25%	70%	5%
ERZINCAN	25%	70%	5%
AFYON	30%	55%	15%

3.8.6.2. Turkish supplies include imported items such as dividing head, grinding attachments, chucks, magnetic tables and copying attachments.

3.8.6.3. A system of periodic check of these items at specified intervals will assist in controlling quality of production.

3.9. CASTINGS AND FORGINGS

3.9.1. Small facilities are available in different units and have been indicated in Chapter IV 'Production and Product Mix'.

CHAPTER IV

PRODUCTION AND PRODUCT - MIX

4.1. Capital Goods Development Programme has evolved 15 digit codes for all machinery and plant covered by its studies. They are in two broad categories, namely steel-fabricated equipment and machines.

4.2. STEEL FABRICATED EQUIPMENT

4.2.1. In the case of steel fabricated equipment the 13th and 14th digit represent the type of steel and maximum plate thickness used. A sample of the code for SITC code 69211 is at Ann. VIII.

4.2.2. Figures of production in terms of various permutations and combinations of 13th and 14 th digits of the codes as well as the total installed capacity for the past years are on Tables 5,6,7,8, and 9.

4.2.3. A summary of production figures and capacity in 1982 and capacity expected in 1986 and 1991 is at Table 10. The capacity utilisation in '82 was as under:-

ANKARA	49%
ESKISEHIR	67%
TURHAL	40%
ERZINCAN	61%
AFYON	54%
ALL PLANTS	52%

4.2.4. For 1986 and 1991 the total capacity expected to be available in these five plants is 21710 tonnes as against 17110 in 1981. Actual production, however, will depend on the load available. No load had been planned as such.

TABLE 5

FABRICATED EQUIPMENT

PRODUCTION/INSTALLED CAPACITY (Tons)

AT ANKARA FACTORY

Characteristic Code 13th & 14th Columns		1977	1978	1979	1980	1981	1982
21		3125	6903	5013	4708	6814	6150
22		3072	1218	678	608	442	610
Total	P	9197	8124	5691	5316	6806	6760
	C	9300	9300	9300	9300	9300	13900

FABRICATED EQUIPMENT

PRODUCTION/INSTALLED CAPACITY

AT ESKISEHIR FACTORY

CODE		1977	1978	1979	1980	1981	1982
11		1600	1710	1760	1750	1700	2022
61		1	1	2	2	2	5
21		8	11	14	18	23	25
31		8	10	10	12	12	12
Total	P	1617	1732	1786	1782	1737	2064
	C	3090	3090	3090	3090	3090	3090

FABRICATED EQUIPMENT

PRODUCTION/INSTALLED CAPACITY (Tons)

AT

TURIAL FACTORY

p: Production

c: Installed capacity

Code		1977	1978	1979	1980	1981	1982
11		1 100	920	544	475	894	566
12		200	160	43	43	56	40
TOTAL	P	1 300	1 080	587	518	950	606
	C	1 500	1 500	1 500	1 500	1 500	1 500

FABRICATED EQUIPMENT

PRODUCTION/INSTALLED CAPACITY (Tons)

AT

ERZINCAN FACTORY

P: Production

C: Installed capacity

Code		1977	1978	1979	1980	1981	1982
11		180	450	310	260	550	664
12		20	40	35	34	84	80
TOTAL	P	200	490	345	294	634	744
	C	1 220	1 220	1 220	1 220	1 220	1220

FABRICATED EQUIPMENT

PRODUCTION/INSTALLED CAPACITY (Tons)

AT

AFYON FACTORY

Code		1977	1978	1979	1980	1981	1982
11	P	420	500	626	1 045	1 125	1080
	C	1 500	1 500	1 500	2 000	2 000	2000

TABLE 10

FABRICATED EQUIPMENT

PRODUCTION/INSTALLED CAPACITY

P:Production

C: Installed capacity

		1982						1986 *						1991 *					
		Ank.	Esk.	Turhal	Erzin.	Afy.	TOTAL	Ank.	Esk.	Turhal.	Erzin.	Afy.	TOTAL	Ank.	Esk.	Turh.	Erz.	Afy.	TOTAL
11	P		2022	566	664	1080	4269												
12	P			40	80		140												
21	P	6150	25				6387												
22	P	610					442												
31	P		12				12												
61	P		5				2												
TOTAL	P	6760	2064	606	744	1080	11252												
	C	13900	3090	1500	1220	2000	21710	13900	3090	1500	1220	2000	21710	13900	3090	1500	1220		21710

* No production had been planned.

4.2.5. The limiting factors of production of steel fabricated equipment in each plant is as under:-

	Maximum thickness of steel fab.	Maximum weight of a single piece fab.
Ankara	160mm	120 tonnes
Eskisehir	20mm	20 "
Turhal	20mm	10 "
Erzincan	20mm	5 "
Afyon	20mm	10 "

MAXIMUM JOB WEIGHT HANDED ON

	Lathes	Planers	Milling machine
Ankara	120 tonnes	70 tonnes	70 tonnes
Eskisehir	7 "	5 "	8 "
Turhal	3 "	400 kg.	6 "
Erzincan	3 "	400 kg.	6 "
Afyon	5 "	400 Kg.	6 "

HEAT TREATMENT

	Max. dimensions	Max. weight
Ankara	14x4mt. or 7,5x7,5mt	60 Tonnes (Annealing)
Eskisehir	ϕ 500x700	1500 kg. (Age hardening)
	2,5x5 mt.	20 tonnes (Annealing)

4.2.6. The plants of Seker Makina Fabrikasi have a capacity of 21700 tonnes p.a. Planned demand for sugar factories in 1983 and 1984 is 4282 T and 931 T., while there is no planned demand for the period 1985-89. The average demand for spares however is 3000 T. p.a. It is recommended that after meeting the demands of sugar machinery, they should actively think in terms of meeting the entire demand of SEKA for pulp and paper machinery including spares-purchasing from other sources such items as are outside the range of their production facilities. Incidentally, the total planned demand for SEKA is 6784 tonnes in the years 1985-88 the years on 'nil' planned demand for sugar plants.

4.2.7. Gerkonsan who are planning to meet the entire demand of all technological structures for all SEE's including Petkim, Azot Sanayii, Cimento Fabrikasi, T.K.I., Etibank and TDCI but excluding SEKA and Seker Fabrikasi, has yet to take a number of organisational and other measures to reach production level of 9000 T p.a. of technological structures. During the Fifth Plan, Seker Makina Fabrikasi should fill up the gap, - particularly since they are already partly meeting the demand for technological structures for Petkim, Cimento and other SEE's.

4.3. CASTINGS AND FORGINGS

4.3.1. Capital Goods Development Programme has evolved 8 digit codes based on SITC 5 digit codes for iron castings, steel castings and forgings to provide for parameters of material, weight and complexity/type. These are at Ann. IX, X and XI.

4.3.2. GREY IRON CASTINGS

4.3.2.1. Iron foundries exist in Eskisehir, Turhal and Erzincan. Their production in the past in terms of 8 digit codes is at tables 11,12,13.

4.3.2.2. The consolidated picture of production and capacity are in Table 14. The utilisation of capacity particularly the small foundries at Turhal and Erzincan is good at being 70%of 99% and 94.5% in Eskisehir Turhal and Erzincan respectively.

4.3.2.3. As will be noticedfrom these tables, no expansions are planned.

4.3.2.4. These are small size foundries, particularly those in Turhal and Erzincan. There is, in general need to improve quality control and introduce elementary production planning and control procedures.

4.3.3. STEEL CASTINGS

4.3.3.1. Only Eskisehir has a small steel foundry with a capacity of 700 tonnes p.a. Its output in the past years as codified is at Table 15, utilisation being 55% in '82. No expansion is planned.

4.3.4. NON FERROUS CASTINGS

4.3.4.1. There are small facilities at Eskisehir, Turhal and Erzincan for jobbing work for spares and components and no expansions are planned.

4.3.5. FORGINGS

4.3.5.1. Open forging hammers are available at Eskisehir, Turhal and Erzincan for jobbing work for spares and components. No expansions are planned.

4.3.6. LIMITING FACTORS FOR CASTINGS AND FORGINGS

4.3.6.1. These are given on Table 16.

4.3.6.2. There are no casting or forging facilities at Ankara and Afyon factories.

IRON CASTINGS

PRODUCTION/INSTALLED CAPACITY (Tons)

IN ESKISEHIR FACTORY

YEARS

	1977	1978	1979	1980	1981
67941212	160	145	135	150	240
67941221	165	160	125	160	370
67941231	195	190	150	230	315
67941241	250	230	225	230	265
67941251	195	210	135	320	350
67941261	195	185	100	160	160
67941271	140	130	80	100	205
PRODUCTION	1300	1250	950	1350	1905
CAPACITY	2500	2500	2500	2500	2500

TABLE 11

1982
235
325
310
250
295
165
175
1755
2500

P: Production

C: Capacity

IRON CASTING

PRODUCTION AND INSTALLED CAPACITY
IN TONNES

IN TURIAL FACTORY

P:Production
C:Installed Capacity

CODE		1977	1978	1979	1980	1981	1982
67941212		60	74	82	77	87	111
67941221		97	68	85	88	98	119
67941231		80	83	116	71	115	140
67941241		45	125	101	109	167	190
67941251		55	128	137	112	165	184
Total	P	337	478	521	457	632	744
	C	750	750	750	750	750	750

IRON CASTING

PRODUCTION AND INSTALLED CAPACITY

IN TONNES

IN ERZINCAN FACTORY

P: Production
C: Installed Capacity

CODE		1977	1978	1979	1980	1981	1982
67941212		115	94	124	144	181	190
67941221		100	84	100	120	150	152
67941222		50	42	50	60	75	78
67941231		50	40	50	60	75	74
67941241		50	40	50	60	75	73
TOTAL	P	365	300	374	444	556	567
	C	500	500	600	600	600	600

		1982			
		Eskisehir	Turhal	Erzincab	TOTAL
67941212		235	111	190	536
67941221		325	119	152	596
67941231		310	140	78	528
67941241		250	190	74	514
67941251		295	184	73	552
67941261		165			
67941271		175			
TOTAL	P	1755	744	567	3066
	C	2500	750	600	3850

TABLE 14

IRON CASTING

Production/Installed Capacity

P: Production
C: Installed Capacity

1986				1991			
Eskisehir	Turhal	Erzincan	TOTAL	Eskisehir	Turhal	Erzincan	TOTAL
2500	750	600	3850	2500	750	600	3850

TABLE 15

PRODUCTION AND CAPACITY OF STEEL CASTINGS
IN ESKISEHIR FACTORY

SITE Code	1977	1978	1979	1980	1981	1982
67942112	14	18	13	17	21	18
67942121	36	32	23	32	43	31
67942131	28	26	25	29	33	28
67942142	38	36	30	34	39	33
67942152	54	55	50	57	67	54
67942162	20	23	22	21	31	21
67942172	64	61	51	61	67	59
67942241	18	16	14	21	31	19
67942251	24	20	22	21	31	23
67942261	24	23	18	24	29	24
67942151	52	50	40	49	64	47
67942141	28	30	32	29	34	28
Total Production	400	390	340	400	490	387
Capacity	700	700	700	700	700	700

TABLE 16

LIMIT FACTOR FOR CASTINGS AND FORGINGS

FACTORY	CASTINGS			FORGINGS
	GREY IRON	STEEL	NON-FERROUS	
ESKISEHIR	5000 Kg.	2000 Kg.	300 Kg.	175 Kg.m.
TURIAL	1300 Kg.	-	300 Kg.	150 Kg.m.
ERZINCAN	800 Kg.	-	300 Kg.	150 Kg.m.

4.4. SPECIALISATION

4.4.1. As mentioned in Chapter III, the management has already taken steps to promote specialisation in different factories as under:-

ANKARA	Steel fabricated equipment (eg. tanks, pressure vessels, heat exchangers).
ESKISEHIR	Gear boxes, pumps, blowers, truck scales.
TURHAL	Valves from 350mm to 1000mm. diameter.
ERZINCAN	Valves from 100mm to 300mm diameter.
AFYON	Conveyors

4.4.2. It is felt that truck scales could be transferred to Afyon so that Eskisehir concentrates on production of such machinery and plant which requires founding facilities and/or heavy machining.

CHAPTER V

PRODUCTIVITY AND RELATED FACTORS

5.1. PRODUCTION PLANNING AND CONTROL

5.1.1. In general, the plants do not have a modern system of production planning and control and this appears to be basically due to nonavailability of requisite quality and/or number of engineers and technicians.

5.1.2. As mentioned earlier, there are no long-term plans drawn up for production in these factories and this is handicapped not only because of lack of suitable personnel but also scientific norms of production based on modern concepts and principles of industrial engineering.

5.2. INDUSTRIAL ENGINEERING

5.2.1. Industrial engineering is meant to provide the management with not only optimum methods and layouts, production norms, but also studies to improve procedures in offices besides technological support to production planning and control and machine maintenance sections.

5.2.2. This discipline is non-existant in the workshops and if there are, in rare cases, engineers trained in this branch available, they are utilised in other areas such as production.

5.2.3. It is recommended that urgent steps be taken to create and nourish this discipline in the workshops as an essential step to improve capacity utilisation and productivity.

5.3. QUALITY CONTROL

5.3.1. The quality control personnel in the different factories is on Table 17.

5.3.2. In addition to dimension-measuring instruments, Ankara factory has an ultrasonic crack-detector, an x-ray testing unit for welding, and tensile-compressive strength tester.
Eskisehir has a chemical laboratory for analysis of castings, sand tester, optical pyrometer and a hardness tester. Sand is not however regularly tested. Eskisehir also has a stand to test pumps, air blowers and gearboxes and sugar centrifuges.

5.3.3. Quality control is at present generally limited to dimension measurement with universal measuring instruments, Each quality control operator records the drawing number, number of pieces measured, name of the consumer and defects, if any, The faulty parts are reported to production department to be manufactured again.

5.3.4. The modern concept of total quality control is increasing the consciousness among workers for controlling the quality of their work along with other formal records of rejection and rectifications. The plant in Ankara is making pressure vessels and heat exchangers for chemical plants demanding very high levels of quality. Even otherwise, it is necessary to supply quality products to sugar factories to minimise their breakdowns and loss of production.

5.3.5. The many-faceted subject of quality deals with supply of a product which gives complete customer satisfaction. It is in the ultimate analysis a summation of knowledge of the customer's needs, designs which can meet them, manufacture free of defects, a careful control over bought out components and parts, certified performance standards, meeting requirements of safe operation besides, where necessary, clear instruction manuals, suitable packaging, timely deliveries, a competent back-up service and a procedure to get feedback from users.

./..

ORGANISATION OF QUALITY CONTROL DEPARTMENTS

	Chief Engineer	Engineer	Foreman	Operators
Ankara	1	1	1	10
Eskisehir	-	1	1	11
Turhal	-	-	1	3
Erzincan	-	-	1	3
Afyon	-	1	1	2

5.3.6. Quality control to be effective has to get a lead from the top management. Unless the management right down the line is committed to total quality control, pressures of production frequently reduce the advantages that flow from it. The cost of poor quality of work quite apart from affecting production in user plants undoubtedly affects the output of the manufacturing shops- an effect which is generally not immediately apparent unless accurate records of rejections and rectifications are kept.

5.4. MAINTENANCE OF MACHINERY

5.4.1. The staff available in the maintenance department is at Table 18.

5.4.2. Machines are inspected and lubricated periodically every six months. The date of lubrication and inspection is recorded on identification cards of the machines with the name of the operator.

5.4.3. Uncommon complaints of machinery and plants are reported to the maintenance department by the operators and foremen. After the defect is removed, the time, the reasons and work made to remove the defect are recorded on the same report. One copy is sent to the foremen, and one copy is kept in maintenance department.

5.4.4. Considering that machines are mostly simple and general purpose, it would be easy to introduce comprehensive preventive maintenance besides lubrication with carefully determined check lists for each type of machine.

5.5. PRODUCTIVITY

5.5.1. The total production per employee in 1982 was under:

	Fabrication	Foundry
Ankara	9.630 Tonnes	-
Eskisehir	6.250 "	12.900 Tonnes
Turhal	4.300 "	11.800 "
Erzincan	8.500 "	11.600 "
Afyon	6.980 "	- "

ORGANISATION OF MAINTENANCE DEPARTMENT

	Chief Engineer	Engineer	Foreman	Operators
Ankara	1	2	1	61
Eskisehir	-	1	1	22
Turhal	-	-	1	4
Erzincan	-	-	1	4
Afyon	-	1	1	1

5.5.2. Turhal and Erzincan plats work 5 days a week with each shift of 9 hours and others work 6 days a week with each shift of 7.5 hours. On an average 22 days per month are taken as working days.

5.5.3. Since the type of work is different in these workshops, it is difficult to come to any definite conclusions on their productivity in the absence of scientifically derived time standards. In general, for plants of this type however, a rule of thumb figure is 12 tonnes per employee per year is a reasonal figure.

5.5.4. TIME STANDARDS

5.5.4.1. Time standards are at present arrived at by observation by workshop supervisors and frequently by discussions between them and the workers. In the context of promotion of exports, it is essential to ensure international standards of the quality but also the cost of production of which labour cost, directly and indirect are an important factor. To make goods competitive therefore, it is necessary to determine the time standards used for similar equipment in other countries and then to apply them as a matter of policy to all operations.

5.5.4.2. In order to derive basic data for various types of operations it is recommended that a composite team of industrial engineers be trained if necessary with help from international agencies like UNIDO. This data once available could be applied on a national basis to all factories doing similar jobs.

./..

5.5.5. INCENTIVE SCHEMES

5.5.5.1. When workers have been used to working to loose time standards, to get them to work to new regimes requires their willing cooperation. One of the means of doing this is to introduce carefuly worked-out incentive schemes which gives them a bonus for saving time over the standard with a limit on maximum earnings. It is proposed that an incentive scheme should be carefuly worked out, the cooperation for workers secured for it and introduced as early as possible.

5.5.6. PERSONNEL

5.5.6.1. Table 19 shows the organisation of the five plants as at present. Distribution of different categories of staff in 1977, 1980 is in Table 20 and that anticipated in 1985 and 1990 in Table 21.

5.5.6.2. Personnel policies

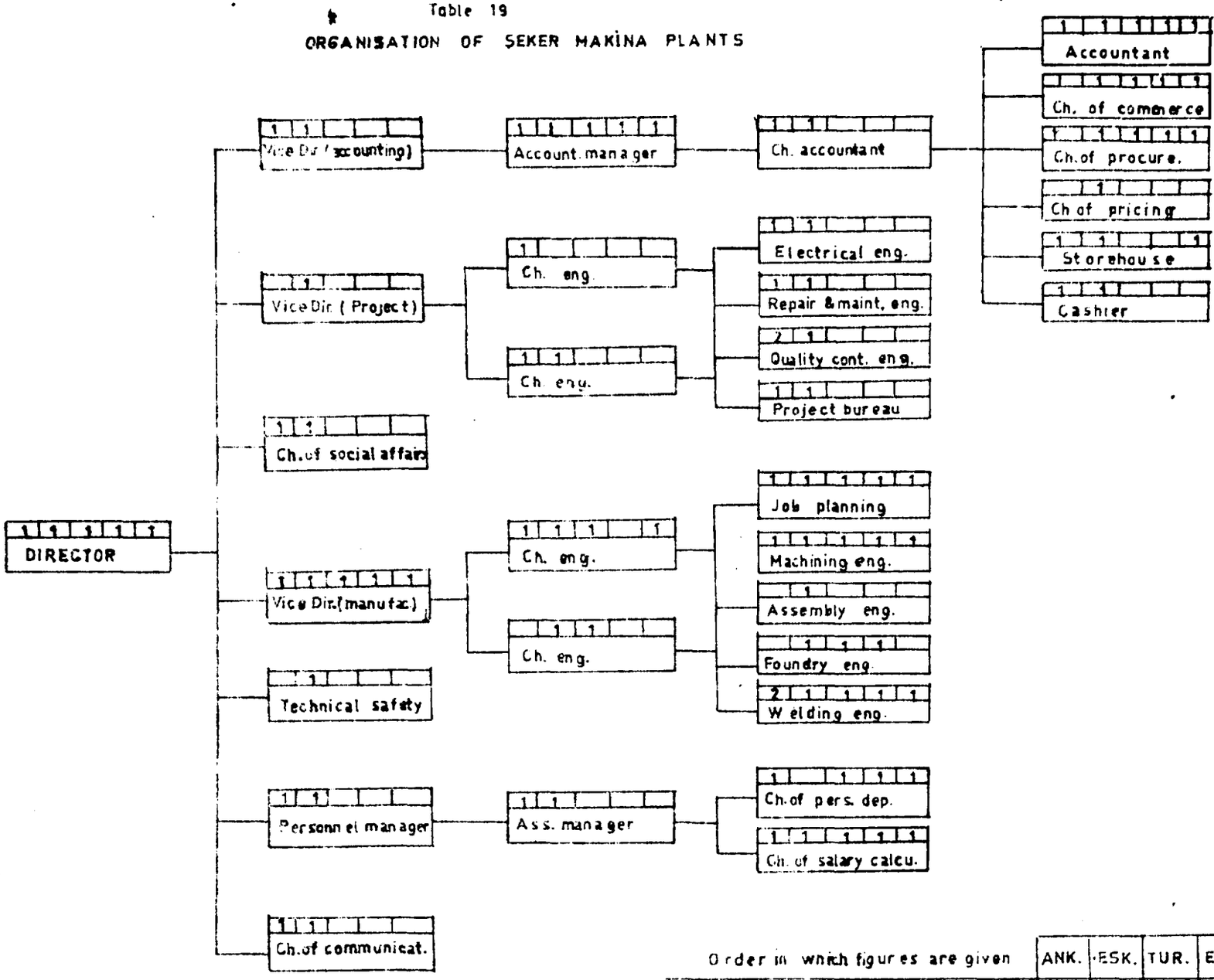
5.5.6.2.1. In the past there has been a gradual exodus of competent engineers to the private sector because of differentials in take-home pay. Some measures are however being taken to remedy this situation and it is hoped that this problem will be overcome and not only the exodus will be stopped, but bright engineers will be attracted to work in SEE's.

5.5.6.2.2. Some important ratios for personnel are given below:-

Total Workers	Ank.	Esk.	Turh.	Erzin.	Afy.
Supervisors & Engineers	15.5	22.9	19.9	14.1	18
Total workers & supervisors & engineers	54	70	57	40	38
Skilled workers : Unskilled workers	2.4	3.9	1	1	1
Direct labour : Total employees	0.57	0.58	0.61	0.60	0.61

Table 19

ORGANISATION OF ŞEKER MAKİNA PLANTS



Order in which figures are given	ANK.	ESK.	TUR.	ERZ.	AFY.
Total strength	702	957	425	219	204

PERSONNEL

	1977					
	Ankara	Esk.	Turhal	Erzincan	Afyon	TOTAL
Production Manager	3	3	1	1	1	9
Production Engineer	9	4	3	2	1	19
Industrial Engineer	-	-	-	-	-	-
Quality Control Eng.	1	-	-	-	-	1
Design Engineer	1	2	-	-	-	3
Technicians,Supervisors	15	20	5	8	2	50
Skilled Workers	300	490	160	130	40	1120
Unskilled Workers	150	60	90	90	60	450
Part-time Workers	-	-	-	-	-	-
Non-eng. Managers	1	6	2	2	2	13
Non-technical Staff	33	27	6	2	6	74
TOTAL	513	612	267	235	112	1739

TABLE 20

	1980				
Ankara	Esk.	Turhal	Erzincan	Afyon	TOTAL
3	3	2	2	2	12
6	7	5	3	3	24
-	-	-	-	-	-
2	1	-	-	-	3
1	2	-	-	-	3
26	24	12	8	3	73
430	700	194	99	91	1514
185	180	196	92	92	745
-	-	-	-	-	-
1	15	2	3	5	26
48	25	14	12	8	107
702	957	425	219	204	2507

PERSONNEL

	1985					
	Ank.	Esk.	Turh.	Erzin.	Afy.	TOTAL
Production Manager	3	3	2	2	2	12
Production Engineer	9	10	6	5	8	38
Industrial Engineer	2	3	1	1	-	7
Quality Control Eng.	5	3	1	1	1	11
Design Engineer	9	6	1	1	-	17
Technicians, Supervisors	30	25	20	12	8	95
Skilled Workers	650	750	210	110	90	1810
Unskilled Workers	150	120	120	90	90	570
Part - time Workers	-	-	-	-	-	-
Non-eng. Managers	1	15	5	5	5	31
Non-technical Staff	55	20	15	12	10	112
TOTAL	914	955	381	239	214	2703

TABLE 21

1990

Ank.	Esk.	Turh.	Erzin.	Afy.	TOTAL
3	3	2	2	2	12
9	10	7	7	8	41
2	5	1	1	1	10
5	3	1	1	1	11
9	6	1	1	-	17
30	30	25	15	10	110
650	750	220	120	90	1830
150	80	110	80	90	510
-	-	-	-	-	-
1	15	5	5	5	31
55	20	15	15	10	115
914	922	387	247	217	2687

5.5.6.2.3. Subject to a detailed industrial engineering study it would appear that

(i) The number of engineers in Ankara, Eskisehir, and Turhal factories is too low (a ratio of 1:40 is considered desirable).

(ii) The number of unskilled workers is high in Turhal, Erzincan and Afyon where a ratio of 3:1 would appear to be worth aiming at.

(iii) The ratio of direct employees (who are the real production workers) to total employees is low - a figure of 0.75 is representation of similar organisations competing in international markets.

5.5.6.3. TRAINING SCHEMES

5.5.6.3.1. There are at present no training schemes for workers. This is important not only for ensuring quality of work but also to provide an avenue for promotion to workers to rise to higher levels and this can be done only through formal training schemes including technical knowledge such as reading and understanding drawings and instructions and pratical work on machines or by hand.

5.5.6.3.2. These may be introduced for promotion of unskilled workers to skilled.

5.5.6.3.3. It would be desirable to create a small nucleus of highly skilled workers in some trades for specially difficult work (eg. welding of thick section of alloy steel, setting up jobs on NC or CNC machines). Training at Eskisehir and Ankara may be provided for this as well as for promotion to foremen/supervisors.

5.5.6.3.4. It is recommended that use may be made of technical training establishments set up by the Government at different places as far as possible to complement the training facilities in Seker Makina Factories.

5.6. MARKETTING

5.6.1. If these enterprises have to make full use of their capacity it will be critical for them to set up an aggressive maketting organisation which can effectively sell their goods and services initially to other SEE's and in special cases to the private sector (eg. large size gears). Marketting is a highly personalised activity and staff for it would have to be carefully chosen to be effective.

5.6.2. In the first instance a seminar may be organised where machine building SEE's can exchange information on their capacities and capabilities between themselves and also present them to important potential users of their goods and services in public and private sector.

5.6.3. From a broad study of the type and geographical spread of items chiefly spares required by SEE's the management should make a concented drive to secure orders for its factories following items:-

Valves from (i) YSE (Yol, Su,Elektrik)
(ii) DSI (Devlet Su Isleri)
(iii) Toprak Su
(iv) Iller Bankasi
(v) Municipalities
(vi) Petkim
(vii) Azot Sanayii

Truck Scales from (i) TCK
(ii) Traffic Directorate

Spares from Cement Industry

Castings including machining from other machine building units who either do not have foundries or may have demands for items beyond their range of manufacture.

CHAPTER VI

CAPACITY UTILISATION

6.1. Problems in achieving full capacity.

6.1.1. In reply to the questionnaire sent to the plants the ranking of the factors affecting production and productivity was as under:-

	Covered Area	Non-avail. of skilled workers	Non-avail. of financial assistance	Shortage of power	Indeterminate market	Repairs and Maintenance
Ankara		1		3		2
Eskisehir		3		2	1	
Turhal	1	2	3	4		
Erzincan	1	2	3	4		
Afyon		4	3	2	1	

6.2. It is quite clear that production capacity in Seker Makina Fabrikasi plants is likely to be considerably more than what will be required for new sugar plants and spares for existing ones. It is therefore essential for these units to take up a planned drive to get orders to use idle capacity.

6.3. With a fairly wide gap expected between available capacity and anticipated load, it is necessary for the management to take urgent measures to secure load for its machine building units on a coordinated basis- taking into account the specialisation already achieved by them. For this purpose setting up an aggressive marketting organisation and immediate high level contacts with potential customers in SEE's are recommended.

6.4. Amongst other direct and indirect effects of underutilisation, its impact on cost of production makes it imperative to optimally utilise the installed capacity to make the production costs competitive.

6.5. The plants have to fill up their order book to lower costs and since they cannot get orders unless their costs are competitive, it will be necessary for them to set up organisations and procedures which will make it possible for them to continuously take basic policy decisions on means to improve productivity and pricing. (Productivity is discussed in Chapter V.).

6.6. MACHINERY AND PLANT

6.6.1. It will be necessary for the units to take a careful inventory of existing facilities and plan procurement of MINIMUM additional machinery and plant that may be necessary to meet the quality and quantities of increased production, if there is near certainty of their full utilisation.

6.6.2. Specific provision should be made for the generally inexpensive but essential items for quality control. Of course, it is presumed that simultaneous steps will be taken to introduce modern concepts and practices for quality control amongst workers and managers.

6.7. The following suggestions are made to overcome these problems leading to under utilisation of

(i) Indeterminate market is the general problem of the economy. This can be overcome by the appropriate measures of the government directing public sector units to make use of capacity in state owned machine building units on the one hand and these latter plants to make supplies of the right quality at acceptable prices on the other.

(ii) The workers must be trained to improve their professional capabilities. New skilled workers, if recruited should be from Technical schools.

(iii) Layouts must be studied by modern industrial engineering methods and modified where necessary. It may be necessary to enlarge covered areas.

(iv) Priority should be given for power supply to these manufacturing establishments.

(v) These factories produce according to orders of the users. Mass production of some items however is possible and should be undertaken after a market research.

(vi) The cost of manufacture is high. This may be decreased by controlling running expenses, increasing the ratio of productive personnel to non-productive workers and staff and increasing the utilization and efficiency of work by introducing modern concepts of industrial engineering.

(vii) SEE's do not know thefacilities of each other. Coordination between all manufacturing SEE's is essential to optimally utilise their capabilities, capacities and facilities in a complementary fashion. This can best be done at the level of the Ministry of Industry and Technology.

Group 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)	Other Specification	Other Spec.-2 Optional	Type	Manufacturing characteristic -1	Manufacturing characteristic -2	Manufacturing characteristic -3	Origin
Code No. / 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)								

/..

SIC 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	Internal	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							4	25-50	4	Malleable iron casting	4	5-10		
18	Gear shaving machines (others)	5	500-700					1	External-Rotary	5	50-100	5	Spheroidal iron casting	5	10-15		
19	Gear honing machines (spur, helical)	6	Above 700					2	External-Rack	6	100-200	6	Carbon steel casting	6	15-25		
20	Gear honing machines (others)							3	Internal-Rotary	7	200-300	7	Alloy steel casting	7	25-50		
21	Gear lapping machines (spur, helical)							4	Internal-Rack	8	300-500	8	Non-ferrous casting	8	50-100		
22	Gear lapping machines (bevel, spiral bevel)									9	Over 500	9	Steel fabrication	9	Over 100		
23	Gear lapping machines (hypoid)							1	External								
24	Gear grinding machines (spur, helical)							2	Internal								
25	Gear grinding machines (worms)							1	External								
26	Gear grinding machines (bevel)							2	Internal								

5-7	8	9
Hoyt's Machine Nomenclature	Major Specification (Capacity)	
Code	Name	Code	Swing over bed or turning dia (mm)	Max. length of work (mm)
01	Tool room lathes	1. Upto 100	Upto 300
02	Chucking lathes	2. 100-300	300-1000
03	Centre lathes	3. 300-500	1000-2000
04	Facing lathes	4. 500-700	2000-8000
05	Horizontal turret lathes	5. 700-1000	8000-12,000
		6. 1000-1500	Above 12,000
06	Vertical turning and boring mills	7. 1500-2500	
		8. Above 2500	
07	Horizontal automatic lathes		
08	Vertical automatic lathes		
09	Automatic screw cutting lathes		
10	Special purpose lathes/ crank-shaft, duplicating, roll turning, and other special lathes		

736,13 - Metal cutting machine-tools.
Lathes, metalworking

10	11	12	13	14	15
Major Specific Optional	Type	Manufacturing characteristic -1	Manufacturing characteristic -2	Manufacturing characteristic -3	Origin
Code / Control system	Code / Description	Code / Weight(tons)	Code / Main base material	Code / Max. Component Weight(tons)	Code
1.With numerical control 2.Without numerical control	1.Single-station 2.Multi-station 1.Single-column 2.Double-column 1.Single-spindle 2.Multi-spindle 1.Single-spindle 2.Multi-spindle	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

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	1	Upto 250	1	With numerical control	1	Horizontal	1	Upto 5	1	Chilled iron casting	1	Upto 1	1	Turkey
		2	250-700	2	250-500	2	Without numerical control	2	Vertical	2	5-10	2	Grey iron casting	2	1-2	2	Imported
01	Hand feed millers	3	700-1000	3	500-700					3	10-25	3	Alloy iron casting	3	2-5		
02	Plain milling machines	4	1000-1500	4	700-1000					4	25-50	4	Malleable iron casting	4	5-10		
03	Universal milling machines	5	1500-5000	5	1000-1500					5	50-100	5	Spheroidal iron casting	5	10-15		
04	Ram type universal milling machines	6	Above 5000	6	Above 1500					6	100-200	6	Carbon steel casting	6	15-25		
05	Rotary head milling machines									7	200-300	7	Alloy steel casting	7	25-50		
06										8	300-500	8	Non-ferrous casting	8	50-100		
	Bed-type milling machines							1	Horizontal	9	Over 500	9	Steel fabrication	9	Over 100		
07	Simplex (1 spindle)							2	Vertical								
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																

STTC Code 736.15 - 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 2.10-25 3.25-35 4.35-50 5.50-80 6.Above 80	1.Upto 100 2.100-200 3.200-400 4.400-500 5.Above 500	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.Importe
01 Portable drills								
02 Up-right drilling machines								
03 Radial drilling machines								
04 Turret drilling machines								
05 Multi-spindle drilling machines								
06 Automatic production drilling machines								
07 Deep-hole drilling machines								
08 Horizontal drilling machines								
09	Spindle dia (mm)	Max.workable hight x width (mm)						
Boring machines								
10 Precision boring machines	1.Upto 10 2.10-50 3.50-100 4.100-150 5.150-200 6.Above 200	1.Upto 500 x 500 2.500-1000 x 500-1000 3.1000-1500 x 1000-1500 4.1500-2000 x 1500-2000 5.2000-2500 x 2000-2500 6.Above 2500 x 2500	1.With numerical control 2.Without numerical control	1.Table type 2.Floor type				
11 Horizontal boring machines								
12 Vertical jig borers								
13 Special boring machines								

SITC Code 736.16 - **Metal cutting machine-tools. Sawing (including friction or abresive 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 2 150-250 3 250-350 4 Above 350		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
	Circular sawing machines		Saw diameter (mm) 1 Upto 500 2 500-800 3 800-1500 4 Above 1500						
02	Circular sawing machines with circular blade								
03	Circular sawing machines with steel friction disc								
04	Circular sawing machines with abresive disc								
05	Circular sawing machines, others								
	Band sawing machines				1 Horizontal 2 Vertical				
06	Band saws with sawing blade								
07	Band saws with friction blade								
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 2 2000-4000 3 4000-6000 4 6000-8000 5 8000-10000 6 10000-12000 7 Above 12000	1 Upto 1500 2 1500-1750 3 1750-2000 4 2000-2250 5 2250-2500 6 2500-2750 7 Above 2750	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
01	Double column planers								
02	Open-side planers								
03	Pit-type planers								
04	Edge or plate planers								
05									
06									
	Shapers	1 Upto 150 2 150-300 3 300-450 4 450-600 5 600-750 6 750-1000 7 Above 1000	1 Upto 500 2 500-600 3 600-700 4 700-800 5 800-900 6 900-1000 7 Above 1000						
07	Horizontal-push cut shapers								
08	Horizontal-draw cut shapers								
09	Special purpose shapers								
10									
11									
	Slotters								
12	Key slotters								
13									
14									
15									
16		Broaching force (tons)	Broaching length (mm)						
	Broaching machines	1 Upto 2 2 2-10 3 10-20 4 20-40 5 40-50 6 Above 50	1 Upto 900 2 900-1000 3 1000-1200 4 1200-1600 5 1600-2000 6 Above 2000		1 External 2 Internal 3 External-Internal				
17	Pull broaching machines (Vertical-mechanical)								
18	Pull broaching machines (Vertical-hydraulic)								

./..

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	Internal	2	5-10			2	1-2	2	Imported
21	Push broaching machines (Mechanical)	3	10-20	3	1000-1200	2	Without numerical control	3	External-Internal	3	10-25	2	Grey iron casting	3	2-5		
22	Push broaching machines (Hydraulic)	4	20-40	4	1200-1600					4	25-50			4	5-10		
23		5	40-50	5	1600-2000					5	50-100	3	Alloy iron casting	5	10-15		
24	Continuous broaching machines (Surface broach-mechanical)	6	Above 50	6	Above 2000					6	100-200	4	Malleable iron casting	6	15-25		
25	Continuous broaching machines (Surface broach-hydraulic)									7	200-300			7	25-50		
26	Rotary broaching machines									8	300-500	5	Spheroidal iron casting	8	50-100		
27										9	Over 500	6	Carbon steel casting	9	Over 100		
												7	Alloy steel casting				
												8	Non-ferrous casting				
												9	Steel fabrication				

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		Manufacturing characteristics -1	Manufacturing characteristics -2	Manufacturing characteristics -3	
			Control system		Material (Work)			Accuracy
01 Hand operated threading machines (collet type-tool)	1 Up to 30	1 Up to 250	1 With numerical control		1 Up to 2	1 Cast iron	1 Up to 2	1 Ordinary
02 Automatic screw machines (turret lathes)	2 30-60	2 250-500	2 Without numerical control		2 2-5	2 Grey iron casting	2 2-3	2 Close limited
03 Thread milling machines	3 60-100	3 500-1000			3 5-10	3 Alloy iron casting	3 3-5	
04 Thread chasing machines	4 100-150	4 1000-2000			4 10-25	4 Malleable iron casting	4 5-10	
05 Flat die thread rolling machines	5 150-250	5 2000-3000			5 25-50	5 Spheroidal iron casting	5 10-15	
06 Round die thread rolling machines	6 Above 250	6 Above 3000			6 50-100	6 Carbon steel casting	6 15-25	
07 Tapping machines					7 100-200	7 Alloy steel casting	7 25-50	
08					8 200-300	8 Non-ferrous casting	8 50-100	
09 Thread grinders					9 300-500	9 Steel fabrication	9 Over 100	
10					10 Over 500			

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.

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	1	Upto 500	1	With numerical control			1	Upto 5	1	Chilled iron casting	1	Upto 1	1	Turkey
		2	100-150	2	500-1000					2	5-10			2	1-2		
		3	150-250	3	1000-1500	2	Without numerical control			3	10-25			3	2-5	2	Imported
01	External cylindrical grinders (plain)	4	250-350	4	1500-2500					4	25-50	2	Grey iron casting	4	5-10		
02	External cylindrical grinders (Universal)	5	350-450	5	2500-3000					5	50-100			5	10-15		
03	External cylindrical grinders (roll and centre-less)	6	450-600	6	3000-4000					6	100-200	3	Alloy iron casting	6	15-25		
04	External cylindrical grinders (Others)	7	Above 600	7	Above 4000					7	200-300			7	25-50		
										8	300-500	4	Malleable iron casting	8	50-100		
	Internal cylindrical grinders									9	Over 500			9	Over 100		
05	Internal cylindrical grinders (plain)											5	Spheroidal iron casting				
06	Internal cylindrical grinders (centerless)											6	Carbon steel casting				
07	Internal cylindrical grinders (others)											7	Alloy steel casting				
												8	Non-ferrous casting				
00												9	Steel fabrication				

./..

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.

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	
	Surface grinders	1	Upto 150	1	Upto 500	1	With numerical control	1	Horiz ontal spindle	1	Upto 5	1	Chilled iron casting	1	Upto 1	1	Turkey
		2	150-250	2	500-1000					2	5-10			2	1-2	2	Imported
09	Surface grinders (reciprocating table)	3	250-500	3	1000-1500	2	Without numerical control	2	Vertical spindle	3	10-25	2	Grey iron casting	3	2-5		
10	Surface grinders (rotary table)	4	500-750	4	1500-2500					4	25-50			4	5-10		
11	Surface grinders (others)	5	750-1000	5	2500-3000					5	50-100	3	Alloy iron casting	5	10-15		
12		6	1000-1500	6	3000-4000					6	100-200			6	15-25		
13	Tool and cutter grinding machines (universal)	7	Above 1500	7	Above 4000					7	200-300	4	Malleable iron casting	7	25-50		
14	Tool and cutter grinding machines (special purpose--drill, tool bit)		Max.workable diameter (mm)							8	300-500			8	50-100		
15	Tool and cutter grinding machines (jig grinding machines)	1	Upto 100							9	Over 500	5	Spheroidal iron casting	9	Over 100		
16		2	100-150									6	Carbon steel casting				
		3	150-250									7	Alloy steel casting				
		4	250-350									8	Non-ferrous casting				
		5	350-450									9	Steel fabrication				
		6	450-600														
		7	Above 600														

./..

SITC Code 736.19 - **Metal cutting machine-tools**
Sharpening, trimming, trucing, 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 Option		Major Spec.2 Optional		Type	Manufacturing Characteristic 1		Manufacturing Characteristic 2		Manufacturing Characteristics 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 [illegible] 2.500-[illegible] 3.[illegible]-1500 4.1500-2500 5.2500-[illegible] 6.[illegible]-[illegible] 7.Above [illegible]	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-[illegible] 8.[illegible]-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															

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.

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	Boring machines	1	Upto 100	1	Upto 500	1	With numerical			1	Upto 5	1	Chilled iron	1	Upto 1	1	Turkey
22	Lapping machines	2	100-150	2	500-1000		control			2	5-10		casting	2	1-2	2	Imported
23	Sharpening machines	3	150-250	3	1000-1500	2	Without			3	10-25	2	Grey iron	3	2-5		
24	Superfinishing and other abresing machines	4	250-350	4	1500-2500		numerical control			4	25-50		casting	4	5-10		
		5	350-450	5	2500-3500					5	50-100	3	Alloy iron casting	5	10-15		
		6	450-600	6	3500-4000					6	100-200	4	Malleable iron casting	6	15-25		
		7	Above 600	7	Above 4000					7	200-300			7	25-50		
										8	300-500	5	Spheroidal iron casting	8	50-100		
										9	Over 500	6	Carbon steel casting	9	Over 100		
												7	Alloy steel casting				
												8	Non-ferrous casting				
												9	Steel fabrication				

./..

ANNEX.II

Machines

SITC Code 736.21 - Metal forming machine-tools.
Forging machines and stamping 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	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	Imports
		3	20-40						3	10-25			3	2-5		
		4	40-75						4	25-50	3	Alloy iron casting	4	5-10		
03	Spring hammers	5	75-150						5	50-100			5	10-15		
04	Electromagnetic hammers	6	150-300						6	100-200			6	15-25		
		7	300-1000						7	200-300	4	Malleable iron casting	7	25-50		
05		8	1000-5000						8	300-500			8	50-100		
06		9	Above 5000						9	Over 500	5	Spheroidal iron casting	9	Over 100		
07	Forging machines						1	Mechanical			6	Carbon steel casting				
08	Forging presses						2	Hydraulic			7	Alloy steel casting				
09	Swaging machines										8	Non-ferrous casting				
10	Forging rolls										9	Steel fabrication				
11																
12																
13	Stamping presses															

Machine)

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		
05	Inclinable press-open back (drawing)	9	Above 5000					9	Others	9	Over 500	9	Steel fabrication	9	Over 100		
06	Inclinable press-open back (extruding, coining, flattening)																

./..

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

(-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	General 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	Single column (mechanical)	1	Upto 5	1	Chilled iron casting	1	Upto 1	1	Turkey
08	Non-inclinable presses (drawing)	2	10-20			2	Without numerical control	2	Single column (hydraulic)	2	5-10	2	Grey iron casting	2	1-2	2	Imported
09	Non-inclinable press (extruding, coining, flattening)	3	20-40					3	Double column (mechanical)	3	10-25	3	Alloy iron casting	3	2-5		
10	End-wheel press, closed back (Deepthroat press), (forming, folding)	4	40-75					4	Double column (hydraulic)	4	25-50	4	Malleable iron casting	4	5-10		
11	End-wheel press, closed back (Deepthroat press), (blanking)	5	75-150					5	Multi column (mechanical)	5	50-100	5	Spheroidal iron casting	5	10-15		
12	Horn press-adjustable bed (forming, bending)	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		

Page 24

./..

SITC Code 736.22 - Metal forming machine-tools. Bending, forming, folding or flattering 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		

./..

SITC [illegible] - 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	S-heroidal 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)															

./..

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										4	25-50	4	Malleable iron casting	4	5-10		
34			Max. thickness rolled (mm)		Max.width (mm)					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 farming rolls																
41	Straightening rolls																
42	Rotary head and ram bending machines (for tubes and bars)																

Page 67

./.

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

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 rolled(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.	Above 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		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	
	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 shears	4	15-20	4	1500-2000					4	25-50	4	Malleable iron casting	4	5-10		
03	Hydraulic guillotine shears	5	20-25	5	2000-3000					5	50-100	5	Spheroidal iron casting	5	10-15		
04	Circular shears	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 shears																
10	Scrap shears																
11	Bar cropping shears																
12																	

./..

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
		2	5-10	2	500-1000	2	Without numerical control			2	5-10	2	Grey iron casting	2	1-2	2	Imported
13	Round, flat, section cutting shears	3	10-15	3	1000-1500					3	10-25	3	Alloy iron casting	3	2-5		
14	Universal shears (nibbling)	4	15-20	4	1500-2000					4	25-50	4	Malleable iron casting	4	5-10		
15		5	20-25	5	2000-3000					5	50-100	5	Spheroidal iron casting	5	10-15		
16	Combined shearing, punching, notching machines	6	25-30	6	3000-4000					6	100-200	6	Carbon steel casting	6	15-25		
17	Punching machines	7	Above 30	7	Above 4000					7	200-300	7	Alloy steel casting	7	25-50		
18	Notching machines									8	300-500	8	Non-ferrous casting	8	50-100		
19	Other power operated punching and shearing machines									9	Over 500	9	Steel fabrication	9	Over 100		
20																	

UNIDO/CAPITAL GOODS DEVELOPMENT PROJECT IN TURKEY

12. ANKARA

NAME	MAJOR SPEC.	CODE
Lathe	480 Ø x 1600	736130233201231
		736130233201232
	80 Ø x 100	736130511211212
	1600 Ø x 1000	736130672212242
	14000 Ø x 4000	736130684127232
	6500 Ø x18000	736130386216292
	1870 Ø x10000	736130275202272
	1000 Ø x 8000	736130254202242
	3200 Ø x 2600	736130383211241
Universal Milling Mach.	1375 x 300	736140331211231
	1000 x 225	736140321211211
	1500 x 400	736140332211212
Horizontal Boring Mach.	1250 x 1250	736151143213232
	2500 x 4000	736151156215272
	7500 x 4000	736151166217282
Double column Plano Milling Machine	3050 x 7320	736141366206282
Gear Hobbing Machine	8000 Ø x 1300 M2	736120660217272
	1930 Ø x 1016 M2	736120660213232
Horizontal-push Cut Shaper	600 x 340	736170732201212
Key Slotter	Ø1000 x 1000	736171265202282
Radial Drilling Mach.	Ø 60	736150353203272
	Ø 125	736150364203272
	Ø 140	736150365203272
	Ø 30	736150233201211

ANNEX III

YEARS				
1977	1978	1979	1980	1981
10	10	10	10	10
1	1	1	1	1
1	1	1	1	1
2	2	2	2	2
1	1	1	1	1
1	1	1	1	1
1	1	1	1	1
1	1	1	1	1
2	2	2	2	2
1	1	1	1	1
1	1	1	1	1
1	1	1	1	1
2	2	2	2	2
1	1	1	1	1
1	1	1	1	1
1	1	1	1	1
1	1	2	2	2
-	1	1	1	1
1	1	1	1	1
1	1	1	1	1
6	6	6	6	6
1	1	1	1	1
1	1	1	1	1
5	5	5	5	5

UNIDO/CAPITAL GOODS DEVELOPMENT PROJECT IN TURKEY

NAME	MAJOR SPEC.
Circular Sawing Machine	Ø 400
Reciprocating Sawing Machine	Ø 400 Ø 150
Tool and cutter grinding Mach. (Special purpose-drill, tool bit)	Ø 420 Ø 100
Two wheel polishing Machine	Ø 150
Straight side press (Form, bend.)	100 x 2[illegible]
Press-brake	[illegible] Ton [illegible] Ton
Hand operated rolling Machines	[illegible] x 1
Power operated bending rolls	40 x 4000 65 x 2500 15 x 2000
Straightening Rolls	20 x 2500
Hydraulic Guillotine Shears	16 x 3250
Round, flat, section cutting shear	70 Ø

ANNEX III (CONTN.)

12. ANKARA

CODE	YEARS 1977	1978	1979	1980	1981
736160211201211	1	1	1	2	2
736160140201232	1	1	1	1	1
736160110201211	1	1	1	1	1
736191452211212	1	1	1	1	1
736191411211212	1	1	1	1	1
736192027202212	-	-	-	1	1
736221460243942	1	1	1	1	1
736222600225962	1	1	1	1	1
736222270226971	1	1	1	1	1
736223618211211	-	-	-	1	1
736223755226242	1	1	1	1	1
736223755222242	1	1	1	1	1
736223735212231	2	2	2	2	2
736224135223232	1	1	1	1	1
736223634202232	2	2	2	2	2
736223371202212	1	1	1	1	1

UNIDO/CAPITAL GOODS DEVELOPMENT PROJECT IN TURKEY

NAME	MAJOR SPEC.
Lathe	Ø 400 x 1000
	Ø 500 x 2500
	Ø 600 x 4000
	Ø 2500 x 500
	Ø 1250 x 1000
	Ø [illegible] x 100
Universal Milling Machine	1000 x 30
Horizontal Boring Machine	[illegible] x 1500
Drilling Machine	[illegible]
Grinders	[illegible]
Gear Milling	[illegible]
Slotter	650 x 650
Planer	2000 x [illegible]
Shaper	500 x 300

ANNEX IV

12. ESKISEHIR

CODE	YEARS 1977	1978	1979	1980	1981
7361302322112 11	4	4	4	4	4
7361302322112 12	19	19	19	19	19
7361303432112 11	10	10	10	10	10
7361303432112 12	7	7	7	7	7
7361303442112 12	4	4	4	4	4
7361304722012 11	-	-	-	1	1
7361304722012 12	3	3	3	3	3
7361306633122 12	3	3	3	3	3
7361306511211 212	5	5	5	5	5
7361306512115 212	8	8	8	8	9
7361306512112 212	8	8	8	8	8
7361306512112 212	7	7	7	8	9
7361306512112 212	1	1	1	1	1
7361306512112 212	-	1	1	1	1
7361306512112 212	-	1	1	1	1
7361306512112 232		6	6	6	6
7361306512112 232	1	2	2	2	2
7361306512112 212	4	4	4	4	4
7361307012112 212	1	1	1	1	1
7361307412012 12	5	5	5	5	5

NAME	MAJOR SPEC.
lathe	ϕ 222x1500
	ϕ 375x2500
	ϕ 375x1000
	ϕ 170x1100
	ϕ 600x2500
	ϕ 560x6000
	ϕ 420x4000
	ϕ 480x1100
	ϕ 2500x500
Milling m/c	350x1160
Boring m/c	1200x1200
Shaper	450x500
Slotter	600x600
Drilling m/c	ϕ 50
	ϕ 34
Sawing m/c	ϕ 400
	ϕ 150
Stamping press	ϕ 120 tons
Drop hammer	
Tool grinding	
Guillotine	16x2500
Bending rools	
Porming press	

12. TURHAL

CODE	YEARS 1977	1978	1979	1980	1981
736130223201111	4	9	9	9	9
736130233201111	-	4	4	4	4
736130232211211	3	6	6	6	6
736130223201112	4	4	4	4	4
736130344211212	2	2	2	2	2
736130244201112	1	1	1	1	1
736130233201112	-	1	1	1	1
736130511211212	2	2	3	3	4
736130474201111	1	1	1	2	2
736140322211112	2	4	4	4	4
736151133211112	1	1	2	2	2
736170731201112	3	3	3	3	3
736171212201112	1	2	2	2	2
736150342201112	2	4	4	4	4
736150232201112	4	4	4	4	4
736160140201112	3	3	3	3	3
736160610221112	-	-	-	1	1
736211350211111	1	1	1	1	1
736210110201112	2	2	2	2	2
736191321211112	-	-	-	-	1
736230245203921	2	2	2	2	2
736223734213931	2	2	2	2	2
736223831212921	1	1	2	2	2
736224334223932	1	1	1	1	1

UNIDO/CAPITAL GOODS DEVELOPMENT PROJECT IN TURKEY

NAME	MAJOR SPEC.
Lathe	ϕ 222x1500
	ϕ 375x2500
	ϕ 150x750
	ϕ 170x1100
	ϕ 600x3500
	ϕ 150x4000
	ϕ 520x1500
	ϕ 120x1500
	ϕ 2000x5000
Milling m/c	350x1160
Boring m/c	1200x1200
Shaper	450x500
Slotter	600x600
Drilling m/c	ϕ 50
	ϕ 34
Sawing m/c	ϕ 400
	ϕ 150
Stamping press	1500 Kgf
Drop hammer	
Press	
Tool grinding	
Guillotine	
Bending rolls	
Forming press	

ANNEX VI

12. ERZINCAN

CODE	YEARS 1977	1978	1979	1980	1981
736130223201111	-	10	10	10	10
736130233201111	-	1	1	1	1
736130222201112	2	2	2	2	2
736130223201112	7	7	7	7	7
736130244201112	1	1	1	1	1
736130224201112	1	1	1	1	1
736130243201112	1	1	1	1	1
736130223211112	1	1	1	1	1
736130474201111	1	1	1	1	2
736140322211112	2	3	3	3	3
736151133211112	1	1	1	1	1
736170731201112	2	2	2	2	2
736171242201112	-	1	1	1	1
736150342201112	1	1	1	1	1
736150232201112	2	4	4	4	4
736160140201112	3	3	3	3	3
736160610221112	-	-	-	1	1
736211310211111	1	1	1	1	1
736210110201112	1	1	1	1	1
736231321201112	1	1	2	2	2
736220250243232	-	-	2	2	2
736191321211112	-	-	-	-	1
736230245203921	1	1	1	2	2
736223734213931	1	2	2	2	2
736223831212921	1	1	2	2	2
736224334223932	1	1	1	1	1

UNIDO/CAPITAL GOODS DEVELOPMENT PROJECT IN TURKEY

NAME	MAJOR SPEC.
Lathe	Ø 400 x 1500
	Ø 630 x 1000
	Ø 500 x 3000
	Ø 710 x 3000
	Ø 550 x 5500
	Ø 500 x 1500
	Ø 500 x 2000
	Ø1000 x 5000
	Ø2500 x 500
Universal Milling Machine	1000 x 300
Horizontal Boring Machine	1000 x 1000
Slotter	500 x 600
Shaper	425 x 400
Drilling Machine	Ø 40
	Ø 70

ANNEX VII

12. AFYON

CODE	YEARS 1977	1978	1979	1980	1981
736130233201111	7	8	8	8	9
736130243201112	4	4	4	4	4
736130233201112	1	1	1	1	1
736130253201111	-	1	1	1	1
736130244201111	1	1	2	2	2
736130233201111	-	1	1	1	1
736130233201111	1	1	1	1	1
736130254201112	1	1	1	1	1
736130472201211	-	-	-	-	1
736140342211112	1	2	2	2	2
736151132221112	1	1	1	1	1
736171243205212	1	1	1	1	1
736170741201212	1	2	2	2	2
736150343201111	1	2	3	3	3
736115035420121	1	1	1	1	1

13		14		15	
Manufacturing characteristic -2		Manufacturing characteristic -3		Origin	
Code	Main body materials	Code	Plate thickness mm.	Code	
1	Mild steel upto 0.20 carbon (untested quality)	1	Upto 20	1	Turkey
2	Carbon steel above 0.20 C tested quality	2	20-40	2	Imported
3	Boiler steel	3	40-50		
4	Alloy steel	4	Over 50		
5	High alloy steel				
6	Stainless steel				
7	Non-ferrous materials				
9	Others				

UNITED NATIONS DEVELOPMENT PROGRAMME IN TURKEY

CAPITAL GOODS DEVELOPMENT PROJECT IN TURKEY

Annex. IX

CLASSIFICATION OF IRON CASTINGS

SITC GROUP	MATERIAL	CRITERIA 1 WEIGHT	CRITERIA 2 COMPLEXITY
67941	1. Cast Iron 2. Grey Iron 3. Alloyed Iron 4. Malleable 5. Spheroidal	1. Less than 3 kg. 2. 3-10 kg. 3. 10-40 kg. 4. 40-100 kg. 5. 100-500 kg. 6. 500-1000 kg. 7. 1000-5000 kg. 8. 5000-10000 kg. 9. More than 10000 kg.	1. Shaped, highly complex 2. Shaped, medium and low complexity 3. Centrifugal 4. Others

Page 73

UNITED NATIONS DEVELOPMENT PROGRAMME IN TURKEY

CAPITAL GOODS DEVELOPMENT PROJECT IN TURKEY

CLASSIFICA

SITC GROUP	MATERIAL
67942	1. Carbon steels 2. Alloy steels 3. High alloy steels

Annex. X

TION OF STEEL CASTIN

CRITERIA 1 WEIGHT	CRITERIA 2 COMPLE
1. Less than 3 kg.	1. Shaped, highly complex
2. 3-10 kg.	2. Shaped, medium and low complexity
3. 10-40 kg.	3. Centrifugal
4. 40-100 kg.	4. Others
5. 100-500 kg.	
6. 500-1000 kg.	
7. 1000-5000 kg.	
8. 5000-10000 kg.	
9. More than 10000 kg.	

UNITED NATIONS DEVELOPMENT PROGRAMME IN TURKEY

CAPITAL GOODS DEVELOPMENT PROJECT IN TURKEY

Annex. XI

CLASSIFICATION OF STEEL FORGINGS

SITC GROUP	MATERIAL	CRITERIA 1 WEIGHT	TYPE
67930	1. Carbon steels 2. Alloy steels 3. High alloy steels	1. Less than 3 kg. 2. 3-10 kg. 3. 10-40 kg. 4. 40-100 kg. 5. 100-500 kg. 6. 500-1000 kg. 7. 1000-5000 kg. 8. 5000-10000 kg. 9. More than 10000 kg.	1. Open forging 2. Die forging