



**TOGETHER**  
*for a sustainable future*

## OCCASION

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



**TOGETHER**  
*for a sustainable future*

## DISCLAIMER

This document has been produced without formal United Nations editing. The designations employed and the presentation of the material in this document do not imply the expression of any opinion whatsoever on the part of the Secretariat of the United Nations Industrial Development Organization (UNIDO) concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries, or its economic system or degree of development. Designations such as “developed”, “industrialized” and “developing” are intended for statistical convenience and do not necessarily express a judgment about the stage reached by a particular country or area in the development process. Mention of firm names or commercial products does not constitute an endorsement by UNIDO.

## FAIR USE POLICY

Any part of this publication may be quoted and referenced for educational and research purposes without additional permission from UNIDO. However, those who make use of quoting and referencing this publication are requested to follow the Fair Use Policy of giving due credit to UNIDO.

## CONTACT

Please contact [publications@unido.org](mailto:publications@unido.org) for further information concerning UNIDO publications.

For more information about UNIDO, please visit us at [www.unido.org](http://www.unido.org)

We regret that some of the pages in the microfiche copy of this report may not be up to the proper legibility standards, even though the best possible copy was used for preparing the master fiche.

06974

FS 391

UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION

S. F. PROJECT - IRA-16

C/F

COUNTRY: IRAN

MASTER DEMAND STUDY FOR  
MECHANICAL AND CAPITAL GOODS PRODUCTS

1972 - 1987

PART II

S/F MACHINERY  
METALWORKING

pp. 117

2. MACHINE TOOLS, METAL FORMING MACHINES, WOOD-  
WORKING MACHINES

Prepared by: Mr. J. Semsch

Counterpart: Mr. Sohanaki

Date: June 1973

## C O N T E N T

1. Methods of Estimating Requirements for Machine Tools and Metal Forming Machines - Introduction
  
  2. Machine Tools
    - 2.01 Drilling machines
    - 2.02 Horizontal boring machines
    - 2.03 Jig boring machines
    - 2.04 Lathes
    - 2.05 Vertical boring and turning mills
    - 2.06 Milling machines
    - 2.07 Shaping machines
    - 2.08 Slotting machines
    - 2.09 Planing machines
    - 2.10 Gear Cutting machines
    - 2.11 Grinding and polishing machines
    - 2.12 Sawing machines
    - 2.13 Thread cutting and forming machines
    - 2.14 Fine boring machines
    - 2.15 Single purpose machine tools
  
  3. Metal Forming Machines
    - 3.01 Hand and foot operated presses
    - 3.02 Eccentric presses
    - 3.03 Special eccentric presses
    - 3.04 Crank presses
    - 3.05 Toggle lever presses
    - 3.06 Screw presses
    - 3.07 Mechanical forming presses
    - 3.08 Hydraulic presses
    - 3.09 Hydraulic assembling presses
    - 3.10 Hydraulic scrap bailing presses
    - 3.11 Hydraulic hobbing and coining presses
    - 3.12 Other hydraulic presses
    - 3.13 Power hammers
-

3.14	Forging rolls
3.15	Plate and strip levelling rolls
3.16	Section levelling machines
3.17	Section coiling rolls
3.18	Tube bending machines
3.19	Hot type metal casting machines
3.20	Hot metal machines driven by electric motor or gas turbines
3.21	Tube bending machines for hot bending
3.22	Hot casting machines
3.23	Hot loading machines
3.24	Plate bending rolls
3.25	Rolling machines
3.26	Shears
3.27	Leaf shears
3.28	Guillotine shears
3.29	Circular shears
3.30	Section cropping machines
3.31	Slitting shears
3.32	Special metal forming machines
4.	<u>Wood-Working Machines</u>
4.1	Wood working machines - introduction
4.2	Wood saws
4.3	Wood drilling machines
4.4	Wood turning machines (lathes)
4.5	Wood moulding machines
4.6	Wood planing machines
4.7	Wood grinding and polishing machines
4.8	Multi-purpose wood-working machines
4.9	Portable wood-working machines
4.10	Special sharpeners
4.11	Needs of special wood-working machines and equipment
5.	<u>Components and Parts, Standard and Special Accessories of Machine Tools, Forming Machines and Wood-Working Machines</u>
5.1	Chucks and chucking devices of machine tools

5.2	Vices
5.3	Rests (stays)
5.4	Cooling equipment
6.	<u>Conclusions</u>
	Table 16

1. METHODS OF ESTIMATING REQUIREMENT  
FOR MACHINE TOOLS AND METAL FORMING  
MACHINES - INTRODUCTION



1. Methods of Estimating Requirements for Machine Tools and Metal Forming Machines - Introduction

Machine tools and forming machines are the most important ones being used in engineering, automotive and electric industries as well as <sup>in</sup> repair shops, maintenance shops and tool shops of all kind.

Until recently the major part of machine tools and forming machines in Iran was only installed in maintenance shops of textile factories, foodstuff plants, cement mills, refineries and in small artisan's shops that are scattered all over the country. As late as in the third and fourth five year plan there were being constructed large engineering, electrical and automobile plants equipped with modern machine tools and forming machines.

The calculation of the existing situation in machine tools and forming machines as well as the forecast of consumption for the years to come is based on the following data:

1. Summary statistics on industrial establishments in Iran in 1347 (1968/69) - see Table 1 and in Central Province - see Table 2.
2. Time series of the value of output, value added, total employees, wages and salaries by manufacturing in various years throughout Iran - see Table 3.
3. Total workers engaged in metal working industries according to the census in Iran in the year 1345 (1966/67) - see Table 4.
4. Imports of machine tools according to the foreign trade statistics of Iran - see Table 5.

On the basis of these data the author of this study has calculated the inventory of metal cutting tools in Iran in 1346 (1967/68) and 1351 (1972/73) - see Table 6,

and inventory of metal forming machines in Iran in 1346 (1967/68) and 1351 (1972/73) - see Table 8. Afterwards, the author worked out a comparison of the order of importance among metal cutting machine tools in different countries - see Table 7.

On the basis of total new investment during the fourth and fifth five year plan the author of this study has elaborated estimated value of machine tools and forming machines - see Table 11. The obtained value of machine tools and forming machines has been increased by value of machine tools and forming machines to be replaced in operation for the worn out machines. 18 per cent was subtracted from this total value, because many engineering, electrical and automobile plants will be under construction in 1356 (1977/78), and consequently the machine tools and forming machines will not be supplied and erected.

The final value was distributed by the planned investment plants into individual groups of machine tools and forming machines. The scope of demand on these machines in the year 1356 (1977/78) has been stipulated in the following chapters.

Forecast of demand and production for machine tools and forming machines in the years 1361 (1982/83) and 1366 (1987/87) has been made by the author of this study on the basis of the growth rates applied to the demand and production in the years 1346 (1967/68) until 1356 (1977/78). Projected growth rates were derived from correlation with expected levels of production of metal product industries, chemical equipment manufacturing industries and transport equipment industries.

In conclusion the tables quoted under were compiled for the years 1351 (1972/73) till 1366 (1987/87):

1. Inventory of metal cutting machine tools in Iran in 1351 (1972/73) until 1366 (1987/87) - Table 12.
2. Inventory of metal forming machines in Iran in 1351 (1972/73) until 1366 (1987/88) - Table 13.
3. Ratio of metal cutting tools to metal forming machines in Iran in 1351 (1972/73) until 1366 (1987/87) - Table 14.
4. Metal cutting and forming machines to employee ratios in 1351 (1972/73) until 1366 (1987/88) - Table 14.
5. Average growth rate in the consumption of machine tools and forming machines in 1346 (1967/68) until 1366 (1987/88) - Table 15.

The indices obtained have been compared with indices from other countries - Table 16 - and their development was found reasonable.

Table 1

Summary Statistics on Industrial Establishments in Iran in 1347 (1968/9) according to the "Iranian Industrial Statistics 1968", published by the Bureau of Statistics of the Ministry of Economy

	Metal Products Industries	Machinery Manufacturing Industries	Electrical Equipment Manufact. Industries	Transport Equipment Industries	Total
Total number of Establishments	22196	979	3062	9399	35636
from these large establishments	502	67	74	39	682
Total persons engaged from these owners, employers, and family members	67157	5149	14576	28488	115370
Estimate of fixed capital in total establishments before depreciation 10 <sup>6</sup> Rials	4752	1289	4128	12366	45347
Total new investment in the industrial establishments in 1347 (1968/9) 10 <sup>6</sup> Rials	1966	290	740	2116	5112
Value of gross output 10 <sup>6</sup> Rials	12779	2055	6912	12207	33983
Gross value added 10 <sup>6</sup> Rials	4422	487	2482	4374	11765

Table 2

Summary Statistics on Industrial Establishments Located in Central Province in 1347  
(1968/9) According to the "Iranian Industrial Statistics 1968"

	Metal Products Industries	Machinery Manufacturing Industries	Electrical Equipment Manufact. Industries	Transport Equipment Industries	Total
Number of establishments	7977	326	696	1516	10515
Total persons engaged from these owners, employers, and family members	33474	2715	7345	10927	54461
New investment (before depreciation) 10 <sup>6</sup> Rials	8085	345	820	2000	11250
Value of gross output 10 <sup>6</sup> Rials	926	175	249	317	1667
Gross value added 10 <sup>6</sup> Rials	8880	1802	5241	10969	26892
	2552	344	1595	3760	8251

Table 3

Time Series of the Value of Output, Value Added, Total Employees, Wages and Salaries by Manufacturing in Various Years Throughout Iran According to the "Iranian Industrial Statistics 1968" published by the Bureau of Statistics of the Ministry of Economy

	1341 (1962/3)	1342 (1963/4)	1343 (1964/5)	1344 (1965/6)	1345 (1966/7)	1346 (1967/8)	1347 (1968/9)
<u>Value of Output - 10<sup>6</sup> Rials</u>							
Metal Products industries	5993	5575	7625	7123	8342	10928	11328
Machinery manufacturing industries	95	142	253	465	598	1745	1907
Electrical equipment manufacturing industries	439	884	1182	2102	2959	7661	8046
Transport equipment industries	7134	6974	7959	8931	9527	11538	15558
T o t a l	13661	13575	17019	18621	21826	31872	38839
<u>Value Added - 10<sup>6</sup> Rials</u>							
Metal products industries	2496	3173	3009	2957	3361	4431	4422
Machinery manufacturing industries	75	229	323	345	393	429	487
Electrical equipment manufacturing industries	239	382	345	1305	1238	2646	2482
Transport equipment industries	2711	2601	2901	2722	3523	4992	4374
T o t a l	5521	6385	6578	7329	8515	12498	11765

Table 3

<u>Total Employees</u> <sup>†</sup>									
Metal products industries	27813	19287	21370	25057	31116	35337	39593		
Electrical equipment manu- facturing industries	1707	3184	4043	4826	7358	11923	10448		
Machinery and transport equipment industries	17554	18682	20103	22349	22656	25647	16122		
<b>T o t a l</b>	37174	41156	45516	55832	61132	72907	66163		
<u>Wages and Salaries - 10<sup>6</sup> Rials</u> <sup>†</sup>									
Metal products industries	454	479	650	863	896	1110	1496		
Electrical equipment manu- facturing industries	59	93	148	210	371	613	434		
Machinery and transport equipment industries	610	549	927	893	937	1086	656		
<b>T o t a l</b>	1123	1121	1755	1966	2204	2809	2526		

<sup>†</sup> without owners, employers and family members







Table 5

832A1	Hydraulic presses	††	pcs	24	30	57	79	37	62	92	38
			tons	140,0	82,0	133,5	317,5608,8	264,9	291,8	567,0	
832B21	Presses, not listed elsewhere		1000 Rls	13902	12877	14505	35916	79393	24931	38600	52954
			pcs	9	4	1	264	317	267	229	93
			tons	30,7	1,9	0,1	1116,1	781,9	1240,2	1215,8	52,3
			1000 Rls	5081	168	35	143760	55915	161187	6155	
845B29	Other non pneumatic machines and parts		tons	1031,0	1703,2	2030,6	5078,4	3038,8			
	there of		1000 Rls	150949	351321	503346	932184				
			pcs	-	32	19	23	16	24	12	25
845B11	Press-making machinery		tons	-	42,5	15,9	21,0	16,9	22,3	28,2	47,8
			1000 Rls	-	16637	5801	7248	5335	10671	12192	26603

† Including stone and wood grinding and polishing machines

†† Including hydraulic presses for plastics



Table 8

Inventory of Metal Forming Machines in Iran in 1346 (1967/8)  
and 1351 (1972/3) According to the Estimate of the Author of this  
Study

		1346 (1967/8)	1351 (1972/3)
Presses and press brakes <sup>+</sup>	pcs	880	2120
Shearing machines	pcs	1020	2240
Bending machines	pcs	950	2020
Forging machines	pcs	190	320
Others	pcs	160	500

<sup>+</sup> without hand and foot operated presses

Table 9

Ratio of Metal Cutting Machines to Metal Forming Machines  
in Different Countries

Country	USA		India	Iran	
	1958	1963	1963	1967/8	1972/3
Metal Cutting Machine Tools	% 77	76	85,7	85,6	85,5
Metal Forming Machines	% 23	24	14,3	14,4	14,5

Table 10

Metal Cutting and Forming Machines to Employee Ratios  
in Different Countries

Country	USA	India	Iran <sup>+</sup>	
	1965	1963	1967/8	1972/3
Machines per 100 employees	35,2	20,5	12,9	15,9

<sup>+</sup> Including owners, employers, family members and maintenance workers.

Table 11

Total New Investment During the Fourth and Fifth Five-Year Plan According to the Research Centre for Industrial and Trade Development of the Ministry of Economy with Estimated Value of Machine Tools and Forming Machines According to the Author of this Study

	1347-1351 (1968-1973)		1352-1356 (1973-1978)	
	Total New Invest-ment 10 <sup>8</sup> Rials	Machine Tools % of new Invest-ment 10 <sup>8</sup> Rials	Total New Invest-ment 10 <sup>8</sup> Rials	Machine Tools % of new Invest-ment 10 <sup>8</sup> Rials
Food, beverage, tobacco manufacturing industries	36000	0,8	51000	0,85
Textile, footwear and wearing apparel industries	26600	0,9	59100	0,95
Manufacture of leather and leather products	7100	0,9	1300	0,95
Manufacture of chemicals and chemical products	41900	1,0	110500	1,05
Non-metallic mineral industries	13900	1,0	18400	1,05
Basic metal industries and metal products industries	75800	3,0	169500	3,2
Manufacture of Machinery	9500	28,0	39800	30,0
Electrical equipment manufacturing industries	5200	25,0	23600	26,0
Transport equipment industries	14500	26,0	41000	28,0
				432
				562
				122
				1160
				193
				5424
				11940
				6126
				11480

Table 11 (Contd.)

Other industries	1100	3,0	33	5500	3,1	170
Mining	2600	0,8	224	98000	0,9	861
<b>T o t a l</b>	<b>259600</b>		<b>11710</b>	<b>617700</b>		<b>36460</b>

Table 12

Forecast in quantity of Metal Cutting Machine Tools in Iran in 1356 (1977/8) until 1366 (1987/8) according to the author of This Study

	1356 (1977/8)		1366 (1987/8)	
	Pcs	%	Pcs	%
Lathes	21600	32,8	34200	31,2
Drilling and boring machines	14800	22,4	21600	19,5
Milling machines	1400	2,1	5500	5,0
Gear cutting machines	200	0,3	600	0,6
Grinding machines	13200	20,0	21300	19,4
Others	14600	22,4	26800	24,3
<b>T o t a l</b>	<b>66000</b>	<b>100,-</b>	<b>110000</b>	<b>100,-</b>
			<b>160000</b>	<b>100,-</b>



Table 13

Forecast Inventory of Metal Forming Machines in Iran in 1356 (1977/8) until 1366 (1987/8) According to the Number of Each Strip

	1356 (1977/8)		1361 (1982/3)		1366 (1987/8)	
	Pcs	₹	Pcs	₹	Pcs	₹
Presses and press brakes	3450	30,5	5600	29,6	8800	29,4
Shearing machines	3230	28,6	5500	28,0	8200	27,3
Bending machines	3360	29,6	5700	29,1	8500	28,3
Forging machines	520	4,2	880	4,5	1380	4,6
Others	800	7,1	1720	8,8	3120	10,4
<b>Total</b>	<b>11360</b>	<b>100,-</b>	<b>19600</b>	<b>100,-</b>	<b>30000</b>	<b>100,-</b>

Table 14

Forecast Ratio of Metal Cutting Machines to Metal Forming Machines According to the Author of this Study

	1356 (1977/8)	1361 (1982/3)	1366(1987/8)
Metal cutting machine tools %	85,3	84,9	84,0
Metal forming machines %	14,7	15,1	16,0

Table 15

Forecast <sup>Ratio</sup> of Metal Cutting and Forming Machines to Employees According to the Author of this Study

	1356(1977/8)	1361(1982/3)	1366(1987/8)
Machines per 100 employees <sup>+</sup>	18,4	19,4	21,2

<sup>+</sup> Including owners, employers, family members and maintenance workers

2. MACHINE TOOLS

### Machine Tools

Machine tools are employed for machining purposes (i.e. turning, milling, boring, grinding etc.) of metallic components and parts made of grey iron castings, steel castings, steel forgings and stampings, steel and alloy steel bars and profiles, non-ferrous metal castings, forgings, stampings, bars and profiles etc. They are installed not only in mechanical engineering industry, electrical engineering industry and automobile industry, but also in repair shops and tool rooms of plants in other industries, like food industry, textile industry etc.

According to mechanization and automation of machine tools, these categories are distinguished:

hand-operated or foot-operated machine tools. These machine tools are no longer produced - they are surviving in old shops.

mechanical machine tools: for example universal centre lathes, shaping machines, bench and column drilling machines, universal, vertical and horizontal milling machines, double-wheel grinding machines etc. Workpiece or tool is mechanically driven whereas other operations, like supply of material, its clamping, chucking or jacking are done by the operator. Also movement of tool or workpiece in machining is fully controlled by operator. These machine tools are used for piece-production or small lots production.

semi-automatic machine tools of special design like turret lathes, constant lathes etc., or modification of mechanical machine tools - for example universal

milling machine with simple numerical control. Workpieces are machined in small lots; movement of tools or workpiece in machining is fully automatic or semi-automatic whereas, other operations like clamping, jawing or chucking are done by operator. These machine tools are used for medium-lots production.

automatic machine tools either of special design like automatic lathes, etc. or modification of universal machine tools with full numerical control, input and output magazine or with automatic control of the working cycle by means of a punched tape - for example universal centre grinder with numerical control and input magazine, milling machine with automatic control of the working cycle by means of a punched tape. Supply of raw material, its clamping, jawing or chucking and complete machining is done automatically. These machine tools are used in mass production.

According to the design and use of machine tools, these categories are recognized:

universal machine tools: for example universal centre lathes, turret and capstan lathes, shaping machines, bench and column drilling machines, double-wheel grinding machines, surface grinding machines etc. These machine tools are designed as universal as possible, i.e. they are used for different operations. Universal machine tools are mostly employed for small repair shops, tool rooms etc.

special machine tools: for example gear shaping machines, gear grinding machines, thread grinding machines, crankshaft grinders etc. These machine tools are designed only for one operation - for example gear hobbing. They are used in medium scale industry for medium and big lots.

- single purpose machine tools: these machine tools are designed for complete machining of one kind of component or part - for example - connecting rod. In a single purpose machine tool there are mostly combined different machining processes (for example boring, fine boring, milling, grinding etc.). These machine tools are mostly used in automobile industry and other mass production.

Description of the most important machine tools and their demand and production in Iran is quoted in the following chapters:

### 2.01. Drilling Machines

Drilling machines are simple universal machine tools for drilling and reaming operations; some drilling machines are also developed for thread cutting. They are used in mechanical shops, repair shops, tool rooms etc. There are these kinds of drilling machines:

- bench drilling machines: small drilling machines up to max. drilling capacity approx. 25 mm.
- column drilling machines: medium size drilling machines up to max. drilling capacity approx. 40 mm.
- pillar drilling machines up to max. drilling capacity approx. 50 mm.
- radial drilling machines: different sizes up to max. drilling capacity approx. 100 mm, max. radius of spindle centre line on arm approx. 5000 mm.

These machines are intended for drilling, boring and thread cutting operations in both single part manufacture and repetitive production. Some radial drilling machines are equipped with pre-selection of speeds and feeds (semi-automatic version) or with a programme control system (automatic version). Supplementary items for radial drilling machines are supporting column and tilting and swivelling table. Special designs of radial drilling machines are mobile radial drilling machines with bed and radial drilling machine for assembly with tilting of the drilling head.

- multi-spindle drilling machines are special machine tools. There are either two up to four spindle bench type gang drilling machines with common table or vertical or horizontal multi-spindle drilling machines with adjustable spindles. These machines are used for medium long and long production runs.

Import of Drilling Machines - see Table 5

Import statistics are not giving details about the types of drilling machines.

Drilling machines are already being produced in Iran:

Metallurgical and Engineering Plant in Tabriz

According to Detailed Project Report, this plant will produce at the end of the first phase of construction these drilling machines:

- bench type drilling machines, max. diameter of drilling 10 mm, 16 mm, 20 mm - 325 pcs/year

- column type drilling machines, max. diameter of drilling 16 mm, 20 and 25 mm - 125 pcs/year
- event. radial drilling machines, max. diameter of drilling 50 mm, capacity 50 pcs/year

All these drilling machines are or will be produced under Czechoslovak licence. The production has started in 1349 (1970/1) from imported components and parts. At present, the majority of components and parts are already produced at the plant.

All the above given drilling machines are precision, heavy duty bench and column type drilling machines, therefore the designing department designed one simple column drilling machine, which is completely produced at the plant.

Production of Drilling Machines in Metallurgical and Engineering Plant in Tabriz

	1350 (1971/2)	1351 (1972/3)
Bench and column drilling machines	240	446

It is intended to start the production of two sizes of radial drilling machines (max. dia of drilling 50 mm and 63 mm) from partly imported components and parts. Part of the production will be exported to Czechoslovakia.



Forecast of Demand, Capacity, Production and Shortage  
of such and such Drilling Machines

	1951 (1977/3)	1956 (1977/8)	1961 (1982/3)	1966 (1987/8)
Demand	1000	1450	1920	2300
Capacity	450	1500	2000	2500
Production	436	1400	1840	2200
Shortage	574	50	80	100

MPP Tabriz - existing capacity 700 pcs (2 shifts), additional capacity 700 pcs.

The rate of growth is relatively high due to the fact that drilling machine is one of the mostly used machine tools in all repair shops and tool rooms in all kinds of industry as well as in mechanical and assembly shops in automobile, electrical engineering and mechanical engineering industry. Many work shops are now equipped only with portable electric drilling machine and in the future they will improve their equipment. The extension of the existing capacity in the fifth five-year plan is envisaged in Metallurgical and Engineering Plant in Tabriz by adding the second shift and utilization of free capacity in other sectors.

Forecast of Demand, Capacity, Production and Shortage  
of Radial Drilling Machines

	1951 (1977/3)	1956 (1977/8)	1961 (1982/3)	1966 (1987/8)
Demand	35	90	190	260
Capacity	50	100	200	300
Production	-	80	180	250
Shortage	35	10	10	10

MPP Tabriz - existing capacity 80 pcs (2 shifts), additional capacity 20 pcs.

Radial drilling machines are very useful universal machine tools. In their combining with jigs and fixtures they are very often used instead of more expensive horizontal boring machines. Radial drilling machines will be used not only in mechanical shops in mechanical and electrical engineering industry, but also in big repair shops and tool rooms. The extension of the existing capacity in Metallurgical and Engineering Plant in Tabriz is envisaged by adding the second shift in the fifth five-year plan.

Gang drilling machines with two up to four spindles are now imported, but it is advisable to produce them in the future in Metallurgical and Engineering Plant in Tabriz since these drilling machines are actually two up to bench drilling machines placed on one common table made of grey iron casting. Gang drilling machines are particularly suited for production on long runs in electrical and mechanical engineering industries. The demand as well as production is included in bench and column drilling machines. (Till now, there are installed less than 20 gang drilling machines in Iran).

Vertical or horizontal multi-spindle drilling machines with adjustable spindles are suited for production on long runs in automobile industry. Up till now these machine tools are not yet installed in Iran and even in future the demand will remain low. For this reason these machine tools will be imported.

## 2.02. Horizontal Boring Machines

Horizontal boring machines are complicated universal machine tools. They are intended for drilling, jig drilling, facing, milling, thread cutting and similar operations in single-part and small-batch

production of medium heavy and heavy components and parts. Horizontal boring machines are mostly used in mechanical shops of heavy mechanical and electrical engineering industries and in big repair shops and tool room.

There are these horizontal boring machines:

- table type horizontal boring machines for medium-heavy components and parts, diameter of work spindle from approx. 50 mm up to 130 mm. The rotary table has a longitudinal and a cross slide.
- horizontal boring machines with cross-adjustable table for medium-heavy and heavy components and parts, diameter of work spindle from approx. 100 mm up to approx. 160 mm. The rotary table has only a cross slide
- floor type horizontal boring machines with a base-plate and cross-adjustable column for heavy and bulky workpieces which are directly clamped on the clamping floor plate or optional attachment, rotary table. Spindle diameter ranges from approx. 130 mm up to 250 mm.

Modern horizontal boring machines are equipped as follows:

- a) with optical projection equipment which facilitates precision setting of the coordinates or
- b) with digital read-out of position of spindle slide and of table longitudinally and across or
- c) with automatic setting in coordinates with manual pre-selection or
- d) with complete point- to-point numerical control system with automatic engaging of spindle speeds.

It is estimated that in Iran in 1351 (1972/3) there are installed approx. 60 pcs of horizontal boring machines: out of this quantity the majority is installed in the situated and Engineering plant in Tabriz, some of them are in Machine building plant in Arak and 5 pcs in ordinary in Ahwaz etc.

Forecast of Demand of Horizontal Boring Machines

	1351 (1972/3)	1356 (1977/8)	1361 (1982/3)	1366 (1987/8)
Demand	6	15	30	45

The demand is and will remain low for economical production and therefore it is not recommended to start the production of horizontal boring machines in the next fifteen years.

1.03. Jig-boring machines

Jig-boring machine is used for boring and drilling of holes to high dimensional accuracy, geometric precision and precise pitches as well as for milling plane and curved surface. It can be also used for measurements of centre-to-centre distances, accurate dimensions and geometric errors of precision-machined parts, as well as for layout of parts to close tolerances. It finds application in tool-rooms and mechanical shops for accurate manufacture without the necessity of using fixtures and jigs.

There are these kinds of jig-boring machines:

- a) with vertical spindle, single-column or double-column
- b) with horizontal spindle .

Double-column jig-boring machines with vertical spindle are being used mostly.

There are only four jig-boring machines installed in Iran up to 1351 (1972/3): 2 pcs in Metallurgical and Engineering Plant in Tabriz and 2 pcs in Machine Building Plant in Arak.

Forecast of Demand of Jig-Boring Machines

	1351 (1972/3)	1356 (1977/8)	1361 (1982/3)	1366 (1987/8)
Demand of jig-boring machines	-	1	2	2

All jig-boring machines in the future will be imported.

2.04. Lathes

Lathes are the most important and the most versatile machine tools. They are used in all kinds of mechanical shops, repair shops, tool rooms etc. Lathes are suitable for straight and transverse turning of different shapes, for example cylindrical turning and boring, taper turning and boring, ball turning, profile turning, copying, camshaft turning, thread cutting etc. Optional equipment and attachment enable some special machining operations such as milling of keyways and gears, grinding of external and internal cylindrical surfaces, boring of deep holes etc.

There are these kinds of lathes:

- universal centre lathes with or without thread cutting equipment, swing over bed from approx. 100 mm up to 4000 mm and distance between centres from approx. 400 mm up to approx. 80 000 mm or more, rough-turning lathes (heavy-duty universal lathes), finishing lathes etc.
- semi-automatic lathes, for example turret lathes, capstan lathes, semi-automatic chucking lathes, universal centre lathes with mechanical programme control, semi-automatic profiling lathes etc.
- automatic lathes, for example single-spindle automatic lathes, six-spindle bar automatic lathes, semi-automatic lathes with numerical control (for example turret lathe with numerical control), vertical semi-automatic lathes etc.
- special lathes, for example copying lathes, relieving lathes, piston-ring lathes, camshafts turning lathes, shaft duplicating lathes, multi-corned ingot lathes, gun-boring lathes, axle ending and centering lathes, wheel sets lathes, crank-pin lathes, axle-journal lathes, cartridge case lathes, stud lathes etc.

Import of lathes - see Table 5

Under import tariff No. 848B23 there are given all kinds of lathes - universal, semi-automatic, automatic and special lathes. It is estimated that till now universal centre lathes represent approx. 94-96%, all other lathes only 4-6% from imported quantity.

Based on the facts that import statistics of lathes are available from year 1341 (1962/3) and that

the average life of lathes in Iran is over 20 years, the estimated number of all kinds of lathes in operation in 1351 (1972/3) is 14900 pcs - see Table 6.

Universal lathes are already produced in Iran in Metallurgical and Engineering Plant in Tabriz.

According to Detailed Project Report the capacity in the first phase of construction is 250 universal high speed lathes, swing over bed 400 mm, 200 universal high-speed lathes swing over bed 500 mm and 50 pcs universal heavy-duty lathes, swing over bed 630 mm.

The production of universal centre lathes has started in 1350 (1971/2) from imported components and parts from Czechoslovakia; total number of assembled lathes was 250 pcs in 1350 (1971/2) and it is planned that the production in 1351 (1972/3) will reach 406 lathes, made from partly imported components and parts. The plan for 1351 (1972/3) seems to be high and most probably the target will be not reached.

Forecast of Demand, Capacity, Production and Shortage of Universal Centre Lathes

		1351 (1972/3)	1356 (1977/8)	1361 (1982/3)	1366 (1987/8)
Demand	pcs	1080	1850	2780	3800
Existing Capacity	pcs	500	500	500	500
New Capacity	pcs	-	1200	2500	3500
Production	pcs	350	1200	2400	3650
Shortage	pcs	730	650	380	150

It is advisable to extend the existing capacity in Tabriz in the future by adding the second shift and by the reconstruction of the existing building O2. The existing projected production programme should be extended and the plant should produce one smaller type of universal centre lathe (swing over bed approx. 280 or 320 mm) and two types of high speed centre lathes (swing over bed approx. 630 mm and 710 mm). As small bench type lathes for fine mechanics will represent in the future 2,5% - 3% of total demand of universal centre lathes, it is advisable to start the production of one type of these lathes with swing over bed approx. 160 mm at the end of the fifth five-year plan.

Forecast of Demand, Capacity, Production and Shortage of Semi-automatic Turret and Capstan Lathes

	1351 (1972/3)	1356 (1977/8)	1361 (1982/3)	1366 (1987/8)
Demand	60	190	380	580
Capacity (new)	-	120	250	400
Production	-	100	200	380
Shortage	60	90	180	200

Capstan and turret semi-automatic lathes are designed for small-lot production of components from bar stock and/or for turning of flange-type components held in chuck. Turret and capstan lathes are built up to swing over bed approx. 1000 mm and hole in spindle approx. 150 mm.

It is recommended to start the production at the end the fifth five-year plan in Metallurgical and



Engineering Plant in Tabriz of one up to two types of turret or capstan lathes, hole of spindle up to approx. 55 mm (bar capacity up to 50 mm) and max. swing over bed approx. 520 mm.

Larger and smaller types of semi-automatic and automatic turret and capstan lathes will be imported. Small quantity of local production could be exported.

Forecast of Demand, Capacity, Production and Shortage of Automatic Single-Spindle Lathes

	1351 (1972/3)	1356 (1977/8)	1361 (1982/3)	1366 (1987/8)
Demand	20	80	150	280
Capacity (new)	-	-	200	200
Production	-	-	70	180
Shortage	20	80	80	100

The demand on single-spindle automatic lathes is low for economical production in the fifth five-year plan, but it will be big enough in the sixth five-year plan. It is advisable to start the production of two up to three sizes of automatic single-spindle lathes in the sixth five-year plan and to extend it in the seventh five-year plan.

Special mechanical, semi-automatic or automatic lathes are and will be used in the future in small quantities and only occasionally - for example special automatic piston ring lathes will be installed only in one plant for production of piston rings, i.e. the demand will be limited to one or two <sup>per</sup> year. Other special lathes will be installed in different factories, but the demand will be one up to ten pieces per year - for

example semi-automatic and automatic copying lathes, relieving lathes etc. There are less than 100 special lathes of all kinds installed in Iran in 1351 (1972/3).

From economical point of view it is impossible to produce any kind of special lathes in Iran in the fifth up to seventh five-year plan.

### 2.05 Vertical Boring and Turning Mills

Vertical boring and turning mills are heavy-duty universal machine tools. They are designed for the machining of external and internal cylindrical or taper surfaces and face surfaces. By means of copying attachment it is possible to machine also workpieces of complex forms. These machines are used for the machining of medium-heavy and heavy workpieces of large cross sections in single-part and small-batch production. They are installed in heavy mechanical shops and repair shops.

Vertical boring and turning mills are

- single column - small vertical boring and turning mills with maximum turning diameter approx. 1600 mm
- double column - medium heavy and heavy vertical boring and turning mills with maximum turning diameter approx. 18000 mm and more.

Modern vertical boring and turning mills are equipped with mechanism which disengages automatically the power feed or they are numerically controlled.

It is estimated that in Iran in 1351 (1972/3) there are installed approx. 80 pcs of vertical boring and turning mills.

Forecast of Demand of Vertical Boring and Turning Mills

		1351 (1972/3)	1356 (1977/8)	1361 (1982/3)	1366 (1987/8)
Demand	pcs	6	18	40	70

The demand is and will remain low for economical production. It is recommended to import all vertical boring and turning mills to cover local demand.

2.06 Milling Machines

Milling machines are universal machine tools designed for milling, boring and drilling operations of small and medium - sized workpieces in single part and batch production.

There are these kinds of milling machines:

- universal, vertical and horizontal machines with working table up to approx. 500 x 3000 mm. Smallest and simplest milling machines have hand-operated table, other milling machines are with longitudinal, cross and vertical power table traverse. Some milling machines are equipped with automatic cycles of table movement for special execution or with automatic control of the working cycle by means of punched tape or numerical control systems. The majority of machines is equipped with ample special accessories such as dividing attachment for milling of gears, rotary table, copying attachment and the like.
- plano-milling machines with working table up to approx. 2000 x 6000 mm. They are designed as open side machine

with one horizontal milling head, open side machine with vertical milling head on the crossrail and horizontal head on the column and in plano-milling design with crossrail with one up to four heads.

- plain and vertical bed-type milling machines with working table up to approx. 1000 x 4000 mm. The design of these machines is close to open side plano-milling machines.
- universal and knee tool milling machines are intended for the milling of complicated shapes of tools, dies, templates, metal patterns etc.
- special milling machines for example copy milling machines for the milling of irregular shapes like turbine blades, die-sinking milling machines for milling of complicated and irregular shapes of forging dies, moulds, cams etc., thread and long - thread milling machines for milling of screw threads, key ways milling machines and one purpose milling machines.

Import of Milling Machines see Table 5

Under tariff No. 848B21 there are given all kinds of milling machines. The demand of milling machines in Iran till now was abnormally low. The ratio of milling machines to lathes in advanced countries is 1:2 up to 1:6 but in Iran the ratio in 1346 (1967/8) was 1:105 and in 1351 (1972/3) is 1:41. Milling machines are expensive complicated machine tools and their tools are expensive as well. It is uneasy to operate them, therefore milling operations are very often in Iran replaced by shaping, slotting and planing on shaping, slotting and planing machines and drilling and boring operations are performed on drilling machines or lathes.

It is estimated that the growth rate of demand of milling machines will be high in the future since modern factories with trained operators will be equipped with milling machines of all kinds,

The assembly of milling machines from imported components and parts will start soon in Metallurgical and Engineering Plant in Tabriz. According to the Detailed Project Report the capacity in the first phase of construction is 50 pcs/year of universal milling machines, 25 pcs/year of vertical milling machines and 25 pcs/year of horizontal milling machines, table size 300 x 1375 mm in one-shift operation.

Forecast of Demand, Capacity, Production and Shortage of Universal, Horizontal and Vertical Milling Machines

	1351 (1972/3)	1356 (1977/8)	1361 (1982/3)	1366 (1987/8)
Demand	65	260	510	780
Capacity	100	160 <sup>+</sup>	350	800
Production	-	160	350	600
Shortage	65	100	160	180

<sup>+</sup> Two-shift operations in Metallurgical and Engineering Plant in Tabriz

The existing capacity is big enough for the next five years. In the sixth five-year plan it will be possible to extend the capacity and event. to start the production of the second family of milling machines (universal - horizontal - vertical) and/or one type of universal tool milling machine.

Forecast of Demand of Plano-Milling Machines and Special  
Milling Machines

	1351 (1972/3)	1356 (1977/8)	1361 (1982/3)	1366 (1987/8)
Demand      pcs	6	30	70	120

The demand is and will remain low for economical production.

2.07 Shaping Machines

Shaping machines are simple universal machine tools designed for shaping, i.e. planing of small workpieces up to the max. length approx. 1000 mm. Some shaping machines are equipped with additional copying attachment for complex shaping. Shaping machines are mostly used in tool rooms, repair shops and some mechanical shops.

As it has been already mentioned, shaping machines are used in Iran very often instead of milling machines since they are cheaper and the operation is easier than that of milling machines; also the tooling is cheap and simple. Shaping machines are less versatile and their output is much lower than that of milling machines. From this reason they will be replaced by milling machines and the demand will remain more or less unchanged. It is estimated that the inventory of shaping machines in Iran in 1351 (1972/3) is approx. 1800 pcs.

Demand, Capacity, Production and Shortage of Shaping  
Machines

	1351 (1972/3)	1356 (1977/8)	1361 (1982/3)	1366 (1987/8)
Demand	110	300 <sup>+</sup>	450 <sup>+</sup>	650 <sup>+</sup>
Capacity	150	300	450	650
Production	-	300	450	650
Shortage	110	-	-	-

<sup>+</sup> including export

MEP Tabriz existing capacity 240 pcs  
(2 shifts), additional capacity 60 pcs.

The production of shaping machines will start soon in Metallurgical and Engineering Plant in Tabriz. According to the Detailed Project Report the capacity in the first stage of construction of this plant will be 110 pcs/year of shaping machines, stroke 630 mm and 40 pcs/year, stroke 400 mm in one-shift operation and will be extended in the fifth five-year plan by an additional shift.

2.08 Slotting Machines

Slotting machines are simple universal machine tools designed for vertical slotting of grooves in gears, pulley blocks etc. in single piece production or production of small series (for production of large series of grooves are used broaching machines).

Till now, there are installed less than 30 slotting machines in Iran and in the near future there will be no substantial change.

Forecast of Demand of Slotting Machines

	1951 (1972/3)	1956 (1977/8)	1961 (1982/3)	1966 (1987/8)
Demand of slotting machines	3	12	25	45

The demand is and will remain low in the future for economical production.

2.09 Planing Machines

Planing machines are simple universal machine tools for planing of medium-heavy and heavy workpieces in single piece and batch production. They are used in medium heavy and heavy mechanical workshops, and repair shops for planing components and parts like beds of lathes, frames of shoring machines etc. Some planing machines are equipped with copying attachment for planing of irregular shapes, with grinding and/or milling head for grinding or milling operations.

There are two types of planing machines:

- 1) - open side planing machines for medium-heavy workpieces - up to the max. width of table approx. 1500 mm
- 2) - double housing planing machines for heavy workpieces - up to the max. width of table approx. 4000 mm.



Forecast of Demand of Planing Machines

	1991 (1977/8)	1996 (1977/8)	1991 (1987/8)	1996 (1987/8)
Demand of Planing Machines	15	35	60	10

It is estimated that in Iran in 1991 (1977/8) there are installed approx. 280 pcs of planing machines mostly of old design. The demand on planing machines is and will be low for economical production.

2.10 Gear Cutting Machines

Gears (gearings) are machined either on milling machines by dividing method, (the simplest, low-speed gears) or on gear cutting machines. There are these gear cutting machines:

Machines for shaping of external or internal spur and helical gears:

- gear hobbing machines are machine tools for hobbing not only of helical and spur gears, but also spline shafts, sprocket wheel and other workpieces. They are used for machining of low and medium-speed gears up to the module 40 (or more).
- gear shaping machines are designed for spur and helical gears, segment gears, tooth couplings, ratchet wheels, cams and curve discs, polygonal holes etc.

They are used for machining of medium- and high-speed gears up to the module approx. 20.

- gear grinding machines are designed for the grinding of tooth flanks of spur and helical gears. They are used for machining of high speed precision gears

- gear shaving machine is used for the finishing of tooth flanks on external spur and helical gears by a shaving tool and an external pressure. The surface quality after milling is better than that of gears whose metric accuracy is better.

Machines for production of hypoid gears:

- bevel gear shapers for tooth cutting are the simplest, low-cost tooling gear cutting method. Generating by the copying and dividing method. In the machines are now replaced by tool on machine tools.
- bevel gear generators are designed for the milling of hypoid bevel gears. There are five different systems of bevel gears generators (for example Gleason, Oerlikon etc.) used for production of hypoid bevel gears. Gear produced by one method can't be replaced by gear produced by other method. In Iran there are in operation cars, trucks, buses, minibuses, tractors, machine tools and other machinery and equipment imported from different countries with hypoid bevel gears. In order to cover the production of hypoid bevel gears it would be necessary to install all five systems of bevel gear generators with special tools and complicated measuring instruments.
- bevel gears grinding machines are designed for the grinding of tooth flanks of hypoid bevel gears. This operation improves surface quality and geometric accuracy after milling. There are the same systems of grinding machines as at bevel gears generators.

Gear shops equipped with modern machine tools for shaping of spur, helical and bevel gears are only in two plants:

Machine Building Plant is equipped with gear cutting machines for cutting spur, helical, and worm gears, helical gears, bevel gears, and worm gears, gear hobbing machines and gear grinding machines. The plant has 20. This factory will be used for training of workers in the field of gear cutting.

Metallurgical plant is equipped with various gear cutting machines, gear shaping machines, gear grinding machines, gear hobbing machines, bevel gear generators, and bevel gear grinding machines of the same type. This shop is projected for production of 20 gears (including the spares) for machine tools produced in the plant plus 20% free capacity for the production of gears for other plants. At the present time it is the largest shop in Iran equipped not only with gear cutting machines, but also with special grinding machines for sharpening of gear cutting tools, with gear grinding machine and other measuring instruments.

Other factories in the country are also equipped. As it has been already mentioned, most of them are producing spur gears only, using all the machines by dividing method. It is estimated that all of them have together less than 20 gear cutting machines of all kinds (most of them are spur and helical gear hobbing and shaping machines). It is recommended to improve the situation in production of gears by constructing new central gear shops spread throughout the country (see Production of Gears).

Forecast of Demand of Gear Cutting Machines (All kinds)

		1351 (1972/3)	1376 (1977/8)	1381 (1982/3)	1386 (1987/8)
Demand	pcs	16	50	110	220

It is impossible to produce these machine tools in Iran since the necessary technology is not available.

#### Grinding and Polishing Machine Tools

Grinding and polishing machine tools are done on machine tools from the shop to specially designed machines up to special machines for grinding operations. There are the following groups of grinding and polishing machines:

- simple grinding and polishing machines. The machined part is held against a steady by hand, mechanical operations are carried out by the dry or wet grinding method. In this group there are table or bench type one or double wheel grinding and/or polishing machines, and the wheel cutting tool grinding machines etc.
- universal centre grinding machines are used for the grinding of external cylindrical and tapered surfaces by traverse and plunge grinding method. The accessories include chucking device, infeed device, follow-up gauge, grinding wheel dressing device, tilt-down wheel guard etc.
- automatic centre grinding machines are suitable for large lot production runs. The entire working cycle is automatic, including the wheel dressing and spark-out internal. These machines are equipped with input magazine and can be incorporated in conveyorized automatic production line.
- internal grinding machines and special grinding machines designed for cylindrical and tapered holes grinding both by the traverse and the plunge grinding method.

- centreless grinding machines are intended for through-feed work or plunge grinding of external rotation surfaces. They are suitable for series and quantity production runs as well as for automatic production runs. By employing special attachment, magazines and feeders they can be incorporated into transfer lines.
- surface grinding machines either with horizontal or vertical spindle are intended for grinding of flat surfaces.
- universal toolroom grinding machines are suitable for the sharpening of the most different types of tools, such as cylindrical and tapered reamers, plain and face-milling cutters with straight and helical cutting edges, backed-off milling cutters, milling heads, taps, countersinks, saws, cutting tools etc. The machined part is clamped on the work table either between the centres of two tail stocks or in work head with an indexing equipment, in vice or on magnetic plate.
- special grinding machines for sharpening of tools - for example grinding machines for sharpening of twist drills, saw tick sharpeners, copying grinders for sharpening of tools with carbide tips etc.
- special grinding machines - for example roll grinders (used for grinding of cylindrical, convex and concave surfaces of rolls, roll stands and their journals), tramcar wheel rim grinders, engine valve grinding machines, crankshaft grinders, camshaft grinding machines, plunge spiral edge grinding machines (for grinding spiral edges, especially on the injection from pistons of combustion engines), double-wheel surface grinding machines (on this machine two parallel end faces of parts in quantity production runs can be adapted for the grinding of the end faces of bearing rings, piston rings, rollers, compression springs etc.) and tens of other special grinding machines.

## Import of Grinding and Polishing Machines (see Table 5)

The production of grinding and polishing machines (grinding machines after the type of (1971/2) and polishing machines and buffing machines) is included in the scope of the Industrial Project Report on the production of the type of construction of the double-wheel grinding and polishing machines, outside diameter of grinding wheels 700 mm and 300 per cent of double-wheel grinding machines, polished type, outside diameter of grinding wheels 350 mm.

### Production of Double-wheel Grinding and Polishing Machines

	1950 (1971/2)	1951 (1972/3)
Grinding and polishing machines	94	116

Both types of grinding and polishing machines, produced in Metallurgical and Engineering Plant in Fabriz are medium-heavy machines, suitable for finishing, cleaning and de-barring of castings, forgings and weldings, for sharpening of tools, chisels and eventually, when used with leather or felt wheels, also for polishing. They are used in foundries, forges, steelworks, smith's shops, repair shops and toolrooms.

It is advisable to accept the production of one up to two types of small, light, bench type grinding and polishing machines and one up to two types of heavy grinding and polishing machines in order to utilize the existing capacity 1000 per cent of double-wheel grinding and polishing machines per year.

Forecast of Demand, Production and Shortage of Double-Wheel Grinding and Polishing Machines and Simple Tool Grinding Machines

	1351 (1972/3)	1356 (1977/8)	1361 (1982/3)	1366 (1987/8)
Demand	850	1300	1850	2450
Production	114	1150	1650	2200
Shortage	736	150	200	250

The firm Alizadeh Co. Tabriz produced small quantity of bench type polishing machines but the quantity produced is not known.

There exists no production of other types of grinding machines in Iran.

It is advisable to produce two types of centre grinding machine and two types of surface grinding machines (one with horizontal and one vertical spindle) in Metallurgical and Engineering Plant in Tabriz.

Forecast of Demand, Capacity, Production and Shortage of Centre Grinding Machines

	1351 (1972/3)	1356 (1977/8)	1361 (1982/3)	1366 (1987/8)
Demand	40	85	160	240
Capacity	-	100	100	200
Production	-	50	100	160
Shortage	40	35	60	80

Forecast of Demand, Capacity, Production and Shortage  
of Surface Grinding Machines

	1951 (1951/2)	1956 (1977/8)	1961 (1982/3)	1966 (1987/8)
Demand	35	50	140	140
Capacity	-	100	100	200
Production	-	50	100	140
Shortage	35	30	40	50

Other types of grinding machines will not be produced in the future since their demand is not big enough for economical production.

The demand of special grinding machines is not given because they will be used in the future in small quantities and only occasionally - for example special grinding machines for piston-rings etc.

(c) Sawing machines

Sawing machines are designed for cutting of metal bar stock of different cross-sections. There are these kinds of sawing machines:

Hack-sawing machines are simple universal machine tools suitable for small factories and repair shops. They are mostly used in Iran up till now.

Circular sawing machines are semi-automatic and automatic machine tools, suitable for cutting-off departments of medium-sized plants.

Horizontal bandsawing machines are designed especially for plants with batch production.

Anoda-mechanical saws are used for sawing materials which are difficult to be machined, such as sintered carbides, alloy tool steels, magnetic alloys etc.



It is estimated that the inventory of hack-sawing machines in Iran in 1351 (1972/3) is approx. 950 pcs. The demand of hack-sawing machines is big enough for economical production - see below:

Forecast of Demand, Capacity, Production and Shortage of Hack-Sawing Machines

	1351 (1972/3)	1356 (1977/8)	1361 (1982/3)	1366 (1987/8)
Demand	40	90	140	190
Capacity (new)	-	100	200	200
Production	-	90	140	190
Shortage	40	-	-	-

It is advisable to start soon the production of modern hack-sawing machines with hydraulically fed down frame in Metallurgical and Engineering Plant in Tabriz.

There are installed only 40-50 semi automatic and automatic circular sawing machines in Iran at present, but it is estimated that in the future the demand will be big enough for economical production.

Forecast of Demand, Capacity, Production and Shortage of Circular Sawing Machines

	1351 (1972/3)	1356 (1977/8)	1361 (1982/3)	1366 (1987/8)
Demand	15	50	75	110
Capacity (new)	-	-	50	100
Production	-	-	40	100
Shortage	15	50	35	10

It is possible to start the production of a new product with the circular sawing machine. The circular sawing machine is a universal machine which can be used for a wide range of operations.

The circular sawing machine is a universal machine which can be used for a wide range of operations. It is possible to start the production of a new product with the circular sawing machine.

The circular sawing machine is a universal machine which can be used for a wide range of operations. It is possible to start the production of a new product with the circular sawing machine.

### Thread Cutting and Forming Machine

Threads are very important elements of machines and equipment. The majority of universal machines are equipped with normal or optional equipment for the production of internal or external threads and are used for centre lathes, turret and capstan lathes, automatic lathes, collar and radial drilling machines, etc. The most important types of machines are:

For the production of threads, the following types of machines are used: internal and external thread cutting and forming machines:

- internal thread-cutting machines are intended for the cutting of threads in nuts. They are suitable for quantity production: one unit has mostly more than one handle.
- external thread-cutting machines are intended for the cutting of threads in bolts. These machine tools are generally replaced by more versatile automatic lathes with optional equipment.
- long-thread milling machines are designed for the milling of long external threads such as leading screws etc.

- thread grinding machines are used for the grinding of external precision threads such as thread gauges, leading screws etc.
- thread rolling machines are intended for cold forming of external threads on bolts etc. There are installed approx. 60 pcs of thread cutting and forming machines of all kinds in Iran, from this quantity only one long-thread milling machine and one thread grinding machine - both installed in Metallurgical and Engineering Plant in Tabriz.

The demand will remain low for economical production, but it is recommended to increase in the future the number of installed thread cutting and forming machines, particularly thread rolling machines and thread grinding machines.

#### 2.14 Fine Boring Machines

Fine boring machines are designed for finishing operations with high accuracy and surface quality of internal and external cylindrical surfaces.

There are vertical and horizontal fine boring machines with one or more spindles being mostly used for machining of cylinders of engines etc.

There are installed approx. 15 pcs of fine boring machines in Iran, mostly in car and truck repair shops. In the future they will be also installed in other factories producing engines, their components and parts, but the demand will remain low for economical production.

### Single Purpose Machine Tools

Single purpose machine tools are special machines designed to produce one component or part in mass production.

They are built of typical units such as hydraulic boring, fine-boring, milling, feeding and thread cutting units. Sometimes single purpose machine tools are installed in automatic machining lines.

Single purpose machine tools are installed in Iran only in Metallurgical and Engineering Plant in Tabriz, Dorman Manufacturing Co. Tabriz and Iran Diesel Engine Motors Co. Tabriz. Up till now, there are installed approx. 20 pcs of single purpose machine tools, but it is estimated that in the future the demand of these machine tools will be higher because many factories will start the mass production of components and parts of petrol and diesel engines, gear boxes, compressors for refrigerators, electric motors etc.

Single purpose machine tools are complicated machines and it is therefore recommended to import all of them from abroad.

3. METAL FORMING MACHINES

### Metal Forming Machines - Cold

Metal forming machines are designed for cold or hot forming of ferrous and non-ferrous metals.

The operations performed are pressing, blanking, rolling, drawing, shearing, trimming, coining, sizing, levelling, embossing, heating etc. of metals in cold condition. Machines used for these operations are eccentric presses, crank presses, toggle lever presses, horizontal presses, vertical presses, hydraulic hobbing presses, rolling presses, stamping presses, fold-presses, tube forming machines, tube bending machines, plate levelling mills, coil levelling shears, rotary shears, section cropping machines etc.

Hot metal operations are smith forming, hot die casting, hot rolling of roughs, forging on mandrels, hot extension, hot trimming, shouldering, hot bending, hot chipping, drawing, drawing-out etc. Machines used for these operations are power hammers, air-steam operated hammers, hydraulic drop hammers, double-wheel hot hammer systems, hydraulic forging presses etc.

Imports of Metal Forming Machines - see Table 5

There are many firms in Iran producing permanently or occasionally (for a special occasion) metal forming machines. The biggest firms are as follows:

#### Metallurgical and Engineering Plant in Tabriz

According to the Detailed Project Report the capacity in the first phase of construction is 150 pcs/year of eccentric presses nominal <sup>pressure</sup> 12,5 tons, 100 pcs/year of eccentric presses nominal pressure 25 tons and 100 pcs/year of eccentric presses nominal pressure 63 tons.

11. 2. 52

The production of eccentric presses will start soon (1352-1353) from imported components from Czechoslovakia. Production programme of metal forming machines will be extended in the future to other machines (see below).

The plant has its own foundry and forge shop as well as modern machinery and equipment. It would be possible to produce metal forming machines with some additional machinery and equipment up to the weight approx. 15 tons.

#### M. Sarkaki Factory, Teheran

The main production programme of this firm lies in the manufacture of woodworking machines (see Woodworking Machines). Sheet metal machines produced in this factory are sheet bending machine, hand operated, bending length 2000 mm, thickness of plate 4 mm and press brake, nominal pressure approx. 40 tons.

Production of metal forming machines is approx. 20-30 pieces per annum. Details about the installed machinery and equipment and characteristic features of products see Woodworking Machines.

#### Machine Building Plant in Arak

Hand operated presses are produced in small quantities in the training centre of this plant. There is a possibility to produce also other types of the metal forming machines.

#### Saadat Iran Teheran

Saadat Iran is a small workshop producing three types of low speed eccentric presses up to nominal pressure approx. 50 tons. Many eccentric presses (18 pcs) produced by this firm are installed in Azmayesh Co. Teheran.

Mobtaker Teheran, Shahreri 42

This workshop is producing hand operated folding and bending machines, working length 2000 mm, thickness of sheet max. 2 mm, hydraulic moulding presses for thermosetting plastics and hydraulic injection moulding presses for thermoplastics.

The firm employs 10 workers and has approx. 200 sq. m of floor space.

Mohandes Mehvarian, Teheran

This factory is producing guillotine shears, working length 2000 mm, thickness of sheet max. 4 mm, hydraulic presses of different sizes, eccentric presses up to 50 tons and woodworking band saw dia of wheel 750 mm.

The factory employs approx. 50 workers and it is one of the biggest producers of metal forming machines in Iran.

Degaveh Hydraulic, Teheran

This is a small workshop producing hydraulic presses up to 500 tons. The number of employees as well as production are not known.

Kayko Technical, Teheran

This workshop is producing guillotine shears, eccentric presses and mechanical press brakes. Technical specification of forming machines produced as well as the number of employees, capacity and production are not known.



Machine Sazi Mobtaker, Teheran

This firm is producing hydraulic presses up to the nominal pressure 250 tons and hydraulic moulding presses for thermoplastic materials. Capacity, production as well as number of employees are not known.

Stefanian, Teheran

This workshop is producing guillotine shears - thickness of sheet up to 10 mm, sheet bending machines and woodworking machines. Technical specification of forming machines produced, number of employees as well as capacity and production are not known.

Aliashkar Teheran

Production (assembly) of metal forming machines, and die-casting machines. Technical specification of produced machines, number of employees as well as capacity and production are not known.

3.01 Hand and Foot Operated Presses

Hand and foot operated presses are small machines up to max. nominal pressure 15 tons, employed in repair shops for assembly and disassembly of shafts with bearings and the like as well as for pressing, blanking etc. of small components and parts.

There are different systems of hand operated presses such as screw presses, lever presses, toggle lever presses etc.

Producers of hand operated presses are training centre at Machine Building Plant in Arak and a few of small workshops. It is estimated that the total production of hand operated presses (for metal working industry) was approx. 60-70 pcs in 1350 (1971/2).

Forecast of Demand, Capacity, Production and Shortage of Hand and Foot Operated Presses

	1351 (1972/3)	1356 (1977/8)	1361 (1982/3)	1366 (1987/8)
Demand	180	320	450	720
Capacity	250	350	500	800
Production	100	300	450	700
Shortage	80	20	30	20

The existing capacity is big enough for the present as well as future demand. The demand and production of hand and foot operated presses for other industries (i.e. glass, ceramics, bookbinding etc.) - see machinery and equipment for these industries. From technological point of view it is possible to combine the production of hand and foot operated presses for metal working industry with production of hand operated presses for other industries.

3.02 Eccentric Presses

Eccentric presses are mostly employed mechanical presses. They are installed in mechanical engineering, electrical engineering and automobile industries. They are used for cold forming operations such as blanking, bending, shallow drawing and embossing. Eccentric presses are designed up to nominal pressure approx. 500 tons.

Forecast of Demand, Capacity, Production and Shortage of Eccentric Presses

	1351 (1972/3)	1356 (1977/8)	1361 (1982/3)	1366 (1987/8)
Demand	130	280	460	580
Capacity	400	400	400	600
Production	40	200	350	540
Shortage	90	80	110	140

There are many firms producing permanently or occasionally eccentric presses. The biggest producer will be in the near future Metallurgical and Engineering Plant in Tabriz. It is presupposed that this plant will produce in the future eccentric presses with stationary bed as well as high speed inclinable eccentric presses up to universal pressure 100 tons. The existing capacity of workshops (350 eccentric presses/year) could be extended by the additional second shift.

Other producers are manufacturing eccentric presses only occasionally. Brief description of existing firms has been mentioned above.

The demand on eccentric presses with nominal pressure over 100 tons will be low for economical production and from this reason it is recommended to import these

presses from abroad.

### 3.03 Special Eccentric Presses

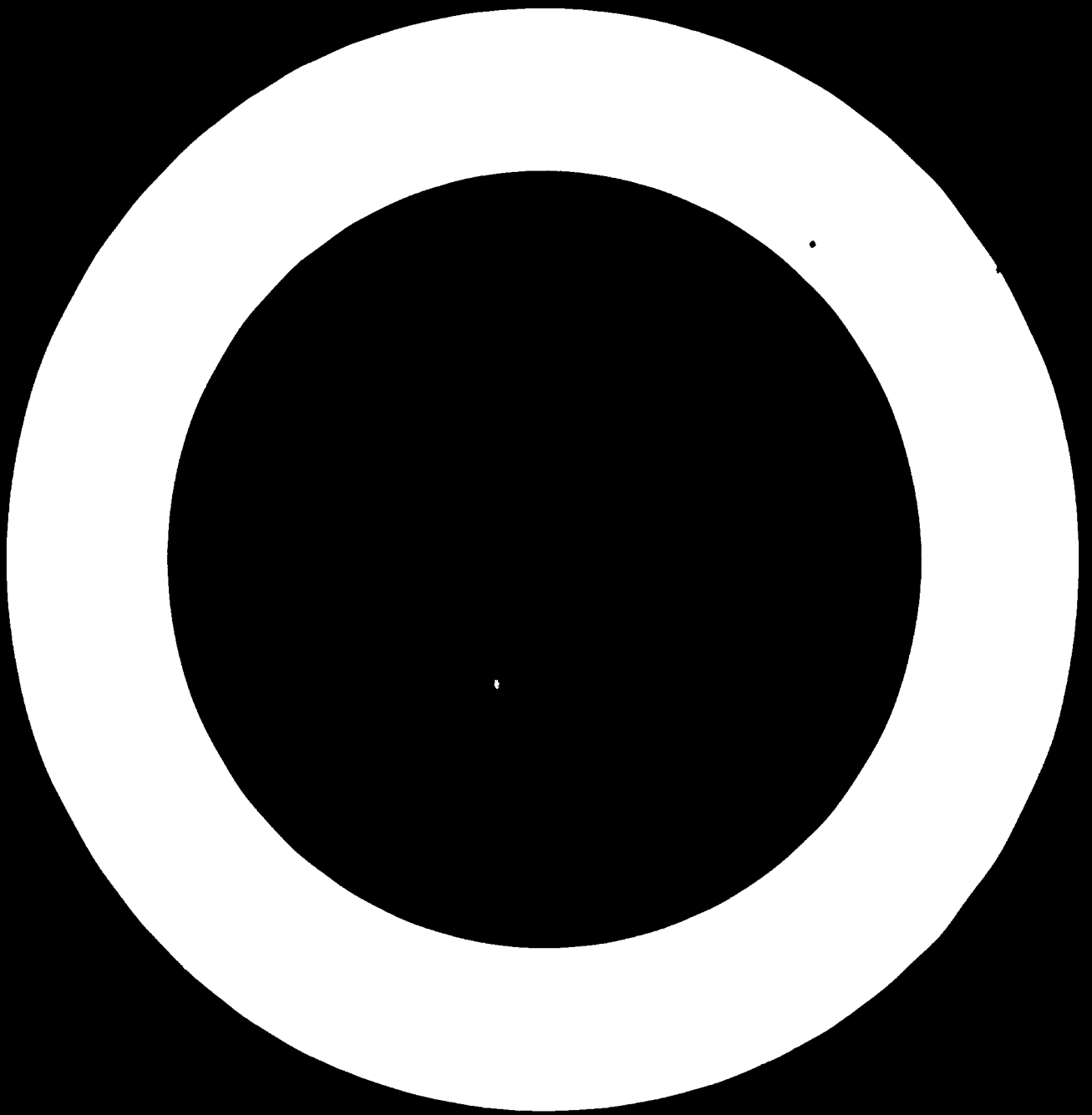
Special eccentric presses are quoted as follows:

- turret punching presses. These presses are employed for progressive punching of round or other holes in plates or blanks (without preliminary marking-off) especially in the electric industry. The demand on these presses will be low for economical production and consequently all presses will be imported.
- mechanical press brakes are intended for bending, levelling, round bending, seaming, shearing and punching of sheet metal. They are used in the production of steel door frames, window elements, doors, structures, metal furniture, cars and also perforated and corrugated sheet metal.

#### Forecast of Demand, Capacity, Production and Shortage of Mechanical Press Brakes

	1351 (1972/3)	1356 (1977/8)	1361 (1982/3)	1366 (1987/8)
Demand	10	20	36	60
Capacity	20	30	30	50
Production	8	15	25	45
Shortage	2	5	11	15

The demand is low for economical production, but there are already firms, producing mechanical press brakes, such as M. Sakkaki Factory Teheran and others (see above). The biggest press brakes will be imported.



3.05 Toggle lever presses:

The following types of toggle lever presses are distinguished:

- toggle lever coin presses are used for precision cold and hot stamping and sliding, extension and leveling of flat products. They are suitable for mass production of cutleryware, tools, coins, keys, precision engineering and the like;
- toggle lever presses with sliding table are designed for special stamping, sliding, extension and heading operations of thin hollow semi-products of steel in cold condition.

The demand on both types is low for economical production (approx. 1-2 pcs/year), and therefore all these presses will be imported from abroad.

Screw presses

Screw presses are suitable for piercing, trimming bending and straightening, both hot and cold and for hot die forging. There are different systems of screw presses as follows:

- double-wheel friction screw presses. They are intended for standard forming operations in press shops and forges. These presses are simple machines with a high stroke, great forming speed and variable pressure. They are used up to nominal pressure approx. 1000 tons;
- friction screw wheelless presses. They are intended for the same operations as double-wheel friction screw presses, only the drive is modernized;

- friction screw presses with hydraulic drive. These presses are intended for precision die forging as well as for cold working, such as sizing, embossing straightening, bending and forming of sheet metal. They are used up to nominal pressure approx. 4000 tons.

Forecast of Demand of Screw Presses

		1351 (1972/3)	1356 (1977/8)	1361 (1982/3)	1366 (1987/8)
Demand	pcs	16	30	50	75

The demand will be relatively high, but it will be spread to many types and sizes and therefore it will not be economical to produce them in Iran.

3.07 Mechanical Forging Presses

Mechanical forging presses are intended for precision hot die forging and sizing. These mechanical forging presses are recognized:

- vertical forging presses driven by different systems of mechanism. They are especially suitable for the series production of parts of cars, tractors and agricultural machines.
- horizontal forging presses. They are suitable for the series production of precision forgings with minimum allowances in the car production, in the production of tractors, antifriction bearings, fittings etc.

The demand is and will be low (on average one piece/year) and therefore all presses will be imported from abroad

3.08 Hydraulic Presses

Hydraulic presses are designed for:

- cold forming operations - for example hydraulic assembling presses, hydraulic scrap bailing presses, hydraulic wheel presses, hydraulic hobbing and coining presses, hydraulic presses for working sheet metal, hydraulic bending presses, hydraulic extension presses etc.
- hot forming operations - horizontal or vertical hydraulic forging presses up to nominal pressure approx. 12000 tons, hydraulic extension presses etc.
- cold and hot forming operations - for example hydraulic general-purpose presses, hydraulic deep drawing presses, hydraulic presses for making boiler heads, hydraulic straightening presses etc.

3.09 Hydraulic Assembling Presses

Hydraulic assembling presses are suitable for cold straightening and bending of parts, forcing-in pins and bushes as well as for similar operations in car repair shops and maintenance workshops. Maximum working pressure is approx. 100 tons.

Forecast of Demand, Capacity, Production and Shortage of Hydraulic Assembling Presses

	1351 (1972/3)	1356 (1977/8)	1361 (1982/3)	1366 (1987/8)
Demand	20	45	75	120
Capacity (new)	-	60	60	120
Production	-	30	55	90
Shortage	20	15	20	30



Up till now there is no production of typical hydraulic assembling presses in Iran. The demand on these hydraulic presses will be big enough for economical production.

The production of hydraulic assembling presses could be combined with the production of other types of hydraulic presses - for example hydraulic presses for thermosetting plastics, hydraulic injection moulding presses for thermoplastics, hydraulic presses for production of ceramics etc. It is also possible to produce these presses in Metallurgical and Engineering Plant in Tabriz because the installed machinery and equipment is suitable for this production.

Special type of hydraulic assembling presses are hydraulic wheel presses. These presses are employed for forcing shafts and axles into and out of railway wheels. The demand on these special presses will be approx. 3 pcs in the fifth, sixth and seventh five year plan.

### 3.10 Hydraulic Scrap Bailing Presses

Hydraulic scrap bailing machines are intended for the bailing of metal scrap in scrap yards (see Metal Scrap). At present there are installed only four small hydraulic scrap bailing presses in Iran. It is estimated that in the fifth up to seventh five-year plan there will be installed 10-18 new big hydraulic scrap bailing presses.

### 3.11 Hydraulic Hobbing and Coining Presses

These presses are especially intended for forming die and mould impressions by cold foreign a shaped punch into steel blocks as well as for coining metal coins and medals. The demand is limited to less than 10 pcs in the fifth up to seventh five-year plan.

### 3.12 Other Hydraulic Presses

Other hydraulic presses for cold forming operations and hot forming operations are used only rarely. It is estimated that average demand will be approx. 3-5 pcs/year. All these presses will be imported from abroad.

### 3.13 Power Hammers

Power hammers are designed for hot forming operations such as smith forging, die forging and sizing. These kinds of power hammers are recognized:

- leaf spring power hammers. They are the simplest and smallest power hammers designed for smith forging of small parts.
- pneumatic power hammers. These hammers are designed for smith forging of medium-sized parts. They are suitable for forges and maintenance workshops; the max. nominal weight of falling parts is over 1 ton.
- hydraulic drop hammers. They are designed for precision die forging, sizing as well as smith forging. The weight of ram is up to 2 tons, energy of single blow is 5000 mkg or more.

- steam drop hammers are no longer used since their drive is bound to high pressure steam boiler.
- counterblow forging hammers are air or air-steam operated counterblow hammers designed for die forging. They are especially suitable for finish-forging of large-size parts of intricate section as for example crankshafts.

Forecast of Demand, Capacity, Production and Shortage of Leaf Spring and Pneumatic Power Hammers

	1351 (1972/3)	1356 (1977/8)	1361 (1982/3)	1366 (1987/8)
Demand	25	45	70	125
Capacity (new)	-	60	60	100
Production	-	30	50	90
Shortage	25	15	20	35

The demand on leaf spring and pneumatic power hammers is given under one heading because both power hammers are employed in small forge shops and maintenance workshops. It is anticipated that in the future pneumatic power hammers will replace leaf spring hammers.

It is estimated that at present there are installed approx. 180 up to 220 power hammers of both types in Iran.

As the demand is big enough for economical production, it is advisable to produce both types of power hammers in Iran. In the case that the production will start in the sixth or seventh five-year plan

it would be better to produce only pneumatic power hammers since the demand of leaf spring power hammers will be still low for economical production.

As it has been already mentioned both types of power hammers are simple machines produced on heavy universal machine tools. It is desirable to produce them in one of existing workshops or in Metallurgical and Engineering Plant in Tabriz.

The demand on other power hammers will remain low for economical production and therefore all of them will be imported from abroad. It is estimated that the demand on other power hammers in the fifth up to seventh five-year plan will be approx. 80-100 pcs.

#### 3.14 Forging Rolls

Forging rolls are employed for forging of blanks by longitudinal rolling-draw-out, the blanks being further worked in vertical forging presses, eventually for continuous finish rolling of less intricate flat forgings, such as wrenches, cutlery etc. There are two types of forging rolls: forging rolls with overhung roll-dies and with roll-dies placed between the stands.

Up till now there are installed only two forging rolls in Iran. It is estimated that total demand in the fifth up to seventh five-year plan will be approximately 20-25 forging rolls.

3.15 Plate and Strip Levelling Rolls

Plate and strips levelling rolls with seven or more rolls are intended for cold levelling of steel and non-ferrous metal plates and strips. They are suitable for sheet and plate mills, heavy engineering shops, e.g. for the manufacture of chemical plants, sheet metal structures and ship-building.

There are installed approximately 30 pcs of plate and strip levelling rolls in Iran, most of them in factories producing welded pipes. The firm Sepanta in Teheran is producing strip levelling rolls for a use in its own repair shop whereas other machines i.e. big plate levelling rolls are imported.

It is estimated that the same situation will be in the future, i.e. simple strip levelling rolls will be produced in Iran and complicated plate (and strip) levelling rolls will be imported from abroad.

Forecast of Demand, Capacity, Production and Shortage of Plate and Strip Levelling Rolls

	1351 (1972/3)	1356 (1977/8)	1361 (1982/3)	1366 (1987/8)
Demand	3	4	5	5
Capacity	5	5	5	5
Production	1	2	2	2
Shortage	2	2	3	3

### 3.16 Section Straightening Machines

Section straightening machines with horizontal roller axis are intended for straightening bars and profiles of different sections. They are mostly used in metallurgical works.

#### Forecast of Demand, Capacity, Production and Shortage of Section Straightening Machines

	1351 (1972/3)	1356 (1977/8)	1361 (1982/3)	1366 (1987/8)
Demand	2	3	3	4
Capacity	4	4	4	4
Production	1	1	1	2
Shortage	1	2	2	2

The firm Sepanta in Teheran is producing simple section straightening machines for a use in its own repair shop. Other section straightening machines are imported. It is estimated that the same situation will remain in the future.

### 3.17 Section Bending Rolls

Section bending rolls with horizontal or vertical axis of their bending rolls are intended for bending squares, flats, angles, I, V, T-sections as well as tubes. They are used in factories producing steel structures and machinery and equipment for chemical and food-stuff industry.

Forecast of Demand of Section Bending Rolls

	1951 (1972/3)	1956 (1977/8)	1961 (1982/3)	1966 (1987/8)
Demand	12	25	43	68

The demand of section bending rolls is small for economical production and from this reason it is advisable to import them from abroad.

3.18 Tube Bending Machines

There are two types of tube bending machines:

- tube bending machines for cold bending of tubes without filling and without mandrel. The tube is bent by being enveloped around a former. These machines are suitable for the manufacture of metal furniture, installation of distribution piping and also for bending of round bars.
- tube bending machines for hot bending with filling and mandrel. These machines are suitable for bending of tubes of big diameter or big thickness of tube in the production of boilers and machinery and equipment for foodstuff and chemical industries.

3.181 Hand Operated Tube Bending Machines

These machines are intended for cold bending of tubes up to dia 100 mm and of steel conduits. They are employed in small workshops and in plumber's shops.

Forecast of Demand, Capacity, Production and Shortage  
of Hand Operated Tube Bending Machines

	1351 (1972/3)	1356 (1977/8)	1361 (1982/3)	1366 (1987/8)
Demand	50	90	155	210
Capacity	60	150	150	200
Production	50	90	145	190
Shortage	-	-	10	20

The simplest designs of hand operated tube bending machines (with leverage or geared transmission) are already being produced in Iran. It is advisable to produce also hand-operated tube machines with hydraulic transmission.

3.182 Tube Bending Machines Driven by  
Electric Motor or Diesel Engine

These machines are intended for cold bending of tubes up to dia approx. 150 mm. They are employed in repair shops in foodstuff and chemical industries, in the manufacture of metal furniture etc. Some machines are suitable also for bending of steel bars. For large lot production are used tube bending machines with numerical control.

Forecast of Demand, Capacity, Production and Shortage  
of Mechan. Driven Tube Bending Machines

	1351 (1972/3)	1356 (1977/8)	1361 (1982/3)	1366 (1987/8)
Demand	16	35	60	95
Capacity (new)	-	50	50	80
Production	-	30	45	60
Shortage	16	5	15	35



The demand is big enough for economical production. It is advisable to start the production in Iran in the fifth five-year plan in one of the existing workshops or in Metallurgical and Engineering Plant in Tabriz.

### 3.188 Tube Bending Machines for Hot Bending

Tube bending machines for hot bending are installed in Machine Building Plant in Arak and in repair shops of refineries. It is estimated that in the fifth up to seventh five-year plan there will be installed less than ten machines for hot bending of tubes.

### 3.19 Bars Bending Machines

Bars bending machines are intended for cold bending of bars. They are mostly employed in building industry, civil engineering etc. for the making of steel parts of reinforced concrete. These machine are mostly hand operated.

#### Forecast of Demand, Capacity, Production and Shortage of Bars Bending Machines

	1351 (1972/3)	1356 (1977/8)	1361 (1982/3)	1366 (1987/8)
Demand	45	130	245	320
Capacity	50	180	250	300
Production	20	110	240	300
Shortage	25	20	5	20

The simplest design of bars bending machines is produced in Iran. It is advisable to produce more types of these bending machines either in the existing workshops or in Metallurgical and Engineering Plant in Tabriz.

### 3.20 Sheet Bending Machines

Sheet bending machines are used for the manufacture of sheet metal products by cold bending (folding), such as door and window frames, profiles for welded structure, steel furniture, box frames etc. There are either hand operated sheet bending machines or driven by electric motor.

#### Forecast of Demand, Capacity, Production and Shortage of Sheet Bending Machines

	1351 (1972/3)	1356 (1977/8)	1361 (1982/3)	1366 (1987/8)
Demand	22	45	75	110
Capacity	20	50	80	100
Production	12	35	55	90
Shortage	10	10	20	20

Sheet bending machines for cold bending, hand operated are already being produced in Iran in small workshops (see above). It is advisable to start the production of machines driven by electric motor up to the operating width approx. 2000 mm and thickness 6 mm. (see above given forecast of production). These machines will be produced either in the existing work-

shops or in Metallurgical and Engineering Plant in Tabriz.

#### 4.1 Plate Bending rolls

Plate bending rolls are used for cold and/or hot roll bending of cylindrical and slightly conical shells of sheet metal for the manufacture of tanks, boilers, tubes, and similar parts. They are designed with three or four rolls and are hand operated up to the working length approx. 2000 mm and the thickness of sheet approx. 3 mm or driven by electric motor (bigger dimensions of sheets).

Cold roll bending is used for plates up to the thickness approx. 80 mm, whereas hot roll bending is used for plates having thickness over 50 mm.

#### Forecast of Demand, Capacity, Production and Shortage of Plate Bending rolls

	1351 (1972/3)	1356 (1977/8)	1361 (1982/3)	1366 (1987/8)
Demand	22	45	75	110
Capacity	20	50	80	100
Production	12	30	55	90
Shortage	10	15	20	20

Hand-operated plate bending rolls are already being produced in Iran. It is advisable to start the production of plate bending rolls for cold bending, driven by electric motor up to thickness of plate approx. 6 mm in the existing workshops or in Metallurgical and Engineering Plant in Tabriz.

These are not installed plate bending rolls for hot bending in Iran up till now. It is estimated that in the fifth up to seventh five-year plan there will be installed up to four plate bending rolls for hot bending. The biggest plate bending rolls for cold bending installed till now in Iran are in Machine Building Plant in Arak - working with 4000 mm, max. thickness of sheet 40 mm.

#### Seaming Machines

Seaming machines are intended for standard tinsmith's work and similar operations in various branches of engineering industry, foodstuff industry etc. They are used for curling prior to welding, to seal vessel bottoms, tins, rib stiffening of guards, doors, covers and other components of sheet metal. There are two types of seaming machines:

- hand operated seaming machines, used for sheet metal and chips up to 1 mm thickness mostly of bench type
- seaming machines driven by electric motor used for thicker sheets special seaming machines used for production of tins

#### Forecast of Demand, Capacity, Production and Shortage of Seaming Machines

	1351 (1972/3)	1356 (1977/8)	1361 (1982/3)	1366 (1987/8)
Demand	18	45	70	95
Capacity (new)	-	60	60	100
Production	-	25	50	60
Shortage	18	20	20	15

The demand is big enough for economical production. It is therefore advisable to start production of small, bench type, hand operated seaming machines and to extend the production to other types in the existing workshops or in Metallurgical and Engineering Plant in Tabriz. Special seaming machines for production of tins will be imported from abroad.

### 3. 21 Shears

Shears are used for cutting, shearing and trimming of sheets, plates, ships, coils, bars, sections etc. According to the process used, there are recognized:

- shears for hot shearing, cutting etc. - these shears are used only in rolling mills and exceptionally in forging shops (see Rolling Equipment).
- shears for cold shearing, cutting and trimming. These shears are very often used in different mechanical and electrical engineering shops. There are different kinds of shears for cold operations such as lever (alligator) shears, guillotine shears, circular shears, slitting shears, section cropping machines etc.

#### 3. 231 Lever Shears (Alligator Shears)

Lever (alligator) shears are hand operated shears intended for cutting of either

- thin metal sheets up to the length of cut approx. 2000 mm and thickness of sheet approx. 2 mm, or
- bars and wires up to dia approx. 12 mm
- strips up to thickness approx. 8 mm.

Lever shears for thin metal sheets are used in tinsmith's shops and automobile repair shops; lever shears for bars or strips are very often employed in building industry, civil engineering etc. for the production of steel parts of reinforced concrete.

Forecast of Demand, Capacity, Production and Shortage of Lever Shears

	1351 (1972/3)	1356 (1977/8)	1361 (1982/3)	1366 (1987/8)
Demand	90	160	270	370
Capacity	120	200	300	400
Production	65	130	250	350
Shortage	25	30	20	20

Data given here (demand, production etc.) are for lever shears used for metal sheets, bars and wires only; other types of lever shears such as paper lever shears etc. see respective machinery and equipment.

It is advisable to extend the production of lever shears in the fifth up to seventh five-year plan in the existing workshops or in Metallurgical and Engineering Plant in Tabriz. Production of lever shears for metal sheets could be combined with production of shears for paper etc.

3.232 Guillotine Shears

Guillotine shears are intended for shearing of plates and strips of sheet metal, They are used in the series production in the engineering industry as well as in repair shop.

Forecast of Demand, Capacity, Production and Shortage  
of Guillotine Shears

	1351 (1972/3)	1356 (1977/8)	1361 (1982/3)	1366 (1987/8)
Demand	55	105	180	260
Capacity	50	150	200	200
Production	25	85	145	200
Shortage	30	20	35	60

It is advisable to extend the production of guillotine shears in the fifth up to seventh five-year plan, but only up to the length of cut 2500 mm and max. thickness of sheet approx. 6 mm; bigger machines will be imported from abroad.

3. 233 Circular Shears

Circular shears are designed for shearing of discs and annuli from sheets. They are either hand operated (up to the thickness of sheet approx. 1 mm) or driven by electric motor. They are used for production of metal dishes, in electrical engineering industry etc.

Forecast of Demand, Capacity, Production and Shortage  
of Circular Shears

	1351 (1972/3)	1356 (1977/8)	1361 (1982/3)	1366 (1987/8)
Demand	8	14	24	36
Capacity (new)	-	20	20	40
Production	-	8	20	28
Shortage	8	6	4	8

II. 2. 77

It is advisable to start the production of circular shears in one of the existing plants producing lever shears, or in Metallurgical and Engineering Plant in Tabriz.

### 3.234 Section Cropping Machines

Section cropping machines are designed for cutting and placing of sheets, bars and various sections. They are used in construction industry, manufacture of steel structures, transport equipment etc.

#### Forecast of Demand, Capacity, Production and Shortage of Section Cropping Machines

	51 (1972/3)	1356 (1977/8)	1361 (1982/3)	1366 (1987/8)
Demand	15	35	50	95
Capacity (new)	-	50	50	100
Production	-	25	45	80
Shortage	16	10	15	15

It is advisable to start the production of one type of section cropping machines in one of the existing plants producing guillotine shears, or in Metallurgical and Engineering Plant in Tabriz at the end of the fifth five-year plan.

### 3.235 Slitting Shears

Slitting shears are used for slitting of plates or coiled strip into several strips. They are in-



corporated into slitting lines in engineering plants and trimming lines in sheet rolling mills (see Rolling mill, section 11.2.78) and will remain low cost. The machines are simple in design, and therefore all slitting jobs will be accepted.

### Special Metal Forming Machines

#### Automatic Nail Making Machines

Automatic nail making machines are used for the manufacture of standard types of nails with various shapes of heads.

#### Double-bloc Cold-Headers

Double-bloc cold-headers are designed for manufacture of rivets and bolts for precision screws and similar parts of wire and round bars up to dia 8 mm in cold condition.

#### Automatic Bolt Heading Machines

There are two types of automatic bolt heading machines.

- 1 - for the manufacture of bolts for head screws and for similar parts from wire or round bars up to dia 16 mm in cold condition;
- 2 - for the manufacture of bolts for head screws from round bars from dia 12 mm and more in hot condition.

#### Automatic Nut Forming Machines

Automatic nut forming machines are used for cold

pressing of profiles of various sections made from  
 steel, aluminium and other alloys.

Automatic machines for the production of chains

Automatic machines for the production of chains are used  
 for the production of various types of chains.

Automatic machines for the production of chains

Automatic chain link rollers and rollers are designed  
 for the production of various types of chains.

Automatic Machines for production of Roller Chains

Automatic machines for the production of roller  
 chains consist of various types of presses design-  
 ed for the production of components and parts and  
 for the assembly of roller chains.

Automatic machines for the production of Barbed Wire

Automatic machines are designed for the making of  
 wire of different sizes and different shapes.

Automatic machines for the production of fence netting,  
 screens and the like

These machines are designed for the making of  
 different shapes of fence netting, screens, various  
 diameters of wires and the like.

Automatic and semi-automatic machines for the production  
 of helical springs

There are two types of automatic and semi-aut-  
 omatic machines for the production of helical springs:

- for the making of helical springs up to dia of wire 8 mm in cold condition;
- for the making of helical springs from dia 8 mm and more in hot condition.

The enumeration of special forming machines is not complete, there is a lot of other machines, which are not mentioned in this survey.

All these machines are and will be installed in Iran in the years to come. Nevertheless, the need will be so low that the establishment of production is not worth while from economical point of view.

4. WOOD-WORKING MACHINES

4.0 Wood-working Machines - Introduction

Wood-working machines are used for machining (cutting, drilling, sanding, turning etc.) of wooden components and parts. They are installed in carpentry or joiner's workshops as well as in repair shops, pattern shops etc.

According to design and use of wood-working machines, these categories are recognized:

- universal wood-working machines such as band saw, circular saw, single-spindle bottom moulding machine, surface, thicknessing machines, double surface planer etc. Universal wood-working machines are employed in small carpentry and joiner's workshops or repair shops.
- special wood-working machines such as wood wool cutting, frame saws, wood peeling machines etc. These machines are designed only for one operation - for example wood peeling, wood wool cutting etc. They are used in specialised factories or wood-working workshops.
- single purpose wood-working machines are designed for complete machining of one kind of component or part - for example foot of chair etc. In one single purpose wood-working machine there are mostly combined different processes (for example moulding with turning and drilling etc.).

Description of the most important wood-working machines and their demand and production in Iran is quoted below:

Import of Wood-working Machines

Tariff No.	1344 (1965/6)	1345 (1966/7)	1346 (1967)	1347 (1968/9)	1348 (1969/70)	1349 (1970/1)	1350 (1971/2)
848B22							
Carpentry cutting machines	pcs 145	179	305	231	284	704	925
	kg 41740	83389	58616	67448	46663	231968	333634
	1000 Rls 4250	10190	7539	8102	8207	32708	49628
848B24							
Wood planing machines	pcs 4	1	28	23	13	75	93
	kg 1866	70	14891	12111	22706	73666	52303
	1000 Rls 169	35	1585	1015	2422	9071	5155

Source: Foreign Trade Statistics of Iran.

Existing Manufacturing FacilitiesM. Sakkaki Factory, Teheran

It is the biggest firm in Iran producing wood-working machines. The production programme embraces wood-working machines, metal forming machines and printing machines.

Wood-working machines: Band saws - 2 sizes - dia of wheel 600 mm and 1000 mm, smoothing planer, thicknessing machine, spiral spirale bottom moulding machine and two sizes of multi-purpose wood-working machines - smaller one with one motor, combination of smoothing planer, horizontal circular machine and circular saw, bigger one with three electric motors, combination of smoothing planer, horizontal and vertical moulding machine and circular saw.

Metal forming machines: Sheet bending machine, hand operated, working length 2000 mm, thickness of sheet 4 mm, 2 mechanical press brakes, capacity approx. 50 tons.

Printing machines: Different types and sizes of simple printing machines. Capacity: 60 band saws dia 600 mm and 1000 mm per annum, 60 other wood working machines per annum, 30 metal forming machines per annum and 10 printing machines per annum.

Characteristics of products: Rigid machines, mostly of old design. Quality good or medium (the best in Iran) but parts not interchangeable - not produced in tolerances.

Machinery and equipment: 1 horizontal boring machine dia 110 mm, 2 planing machines, 4 lathes up to dia 630 mm, 3 shaping machines, 1 radial drilling up to dia 40 mm, 1 column drilling machine dia 32 mm, 3 arc welding machines, 1 hack-saw, 2 alligator shears, hand operated, 1 compressor, 1 overhead crane, capacity 3 tons.

11. 2. 84

Cooperation: The firm co-operates with Pars + Metal in castings (patterns are produced in the factory) and gears are made in co-operation with other engineering firms.

Floor area: 1200 sq. m incl. office rooms; free available space for expansion

Employees: 20 workers, 3 technicians.

Kergah Pauni va Tarashkai Reza Sayah, Esfahan

Production programme: Wood circular saws, wood grinding machines, weaving machines width 120 cm and 180 cm

Capacity: 20-30 weaving machines/year and 10-15 wood-working machines/year

Employees: 12 workers and 1 foreman

Floor area: approx. 120 m<sup>2</sup>

Equipment: 3 lathes, 2 drilling machines, 1 milling machine, 1 shaping machine, 1 welding machine (transformer), 1 compressor, 1 hearth

K. NIRU FACTORY, TEHERAN

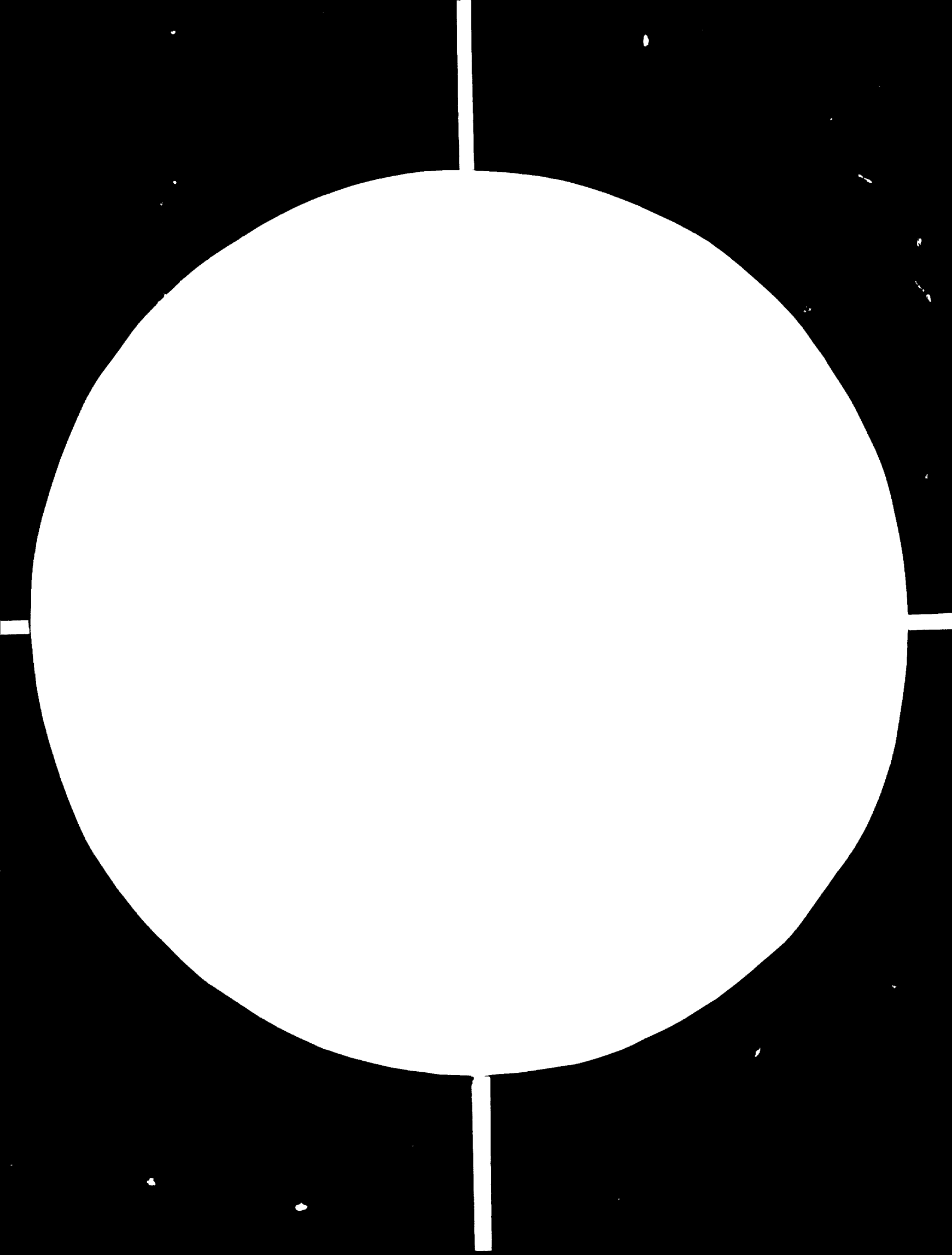
Production Programme: This firm specialized only in the production of band saws, produces 3 sizes of band saws: dia of wheel 500 mm, 800 mm, 1000 mm; saws are of rigid construction. In the year 1347 (1968) it produced 75 pieces/year, in 1348 (1969) 80 pcs per year.



**G-347**

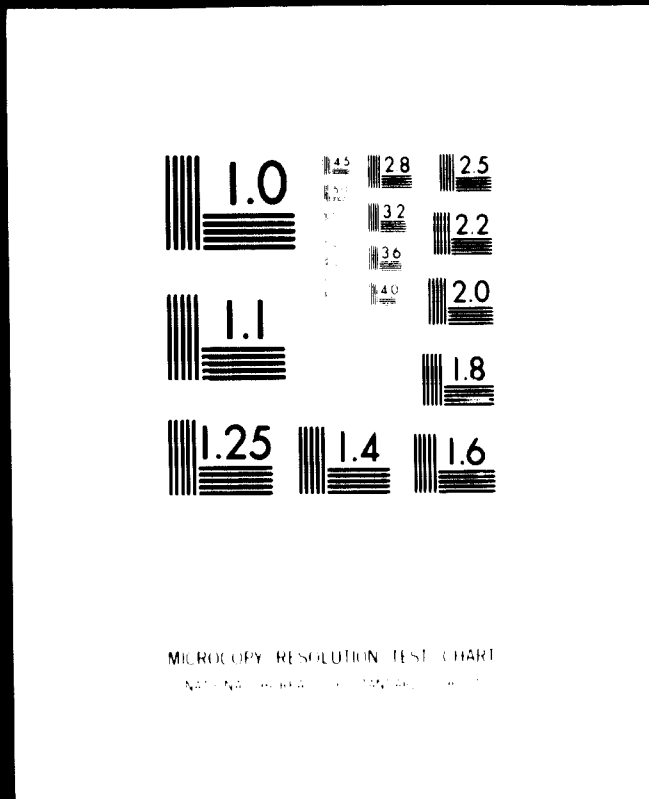


**77. 10. 07**



2 0 F 2

0 6 9 7 4



24 x

A

Co-operation: This firm co-operates with small foundries in Teheran in castings.

Machinery and Equipment: 2 lathes, 2 shaping machines, 1 column drilling machine, 1 double-wheel grinding machine, large welding machine, 1 hand-operated alligator shears, 1 compressor

Floor area: approx. 280 sq. m., no possibility for expansion

Employees: 8 workers

Metallurgical and Engineering Plant in Tabriz

The production of simple light wood-working machines started in 1349 (1970/1) in the Training Centre. The first wood-working machines, produced in the Training Centre are simple multi-purpose wood-working machines of old design. Production in the year 1351 (1972/3) was 25 pieces of these machines.

HOVSEP AND SARKIS, SIEMETRI STR TEHERAN

The firm is specialized in the production of wood-working machines

Production Programme: Band saws, dia 1000 mm and 1150 mm, single spindle bottom moulding machine, additional equipment to band saws

Capacity: Approx. 45-50 band saws, 4-6 bottom moulding machines, occasionally 1 additional equipment to band saw.

II. 2. 86

Characteristics of Products: Old, simple design; castings replaced by welded frames

Machinery and Equipment: 4 universal lathes (max. dia 1200 mm), 1 shaping machine, 1 planing machine 800x2500 mm, 1 column drilling machine, 1 bench drilling machine, 1 arc welding machine

Floor Area: Approx. 100 sq. m., no possibility for expansion

Employees: 7 workers

Other shops producing wood-working machines:

Sargedi Tabriz

The main production programme is the making of multi-purpose and other wood-working machines; parameters of these machines are not known. Number of employees: 15 - 20

Mohandes Mehriyan Siemetri Str. Teheran

This firm is producing not only metal forming machines, but also wood-working band saw, dia of wheel 750 mm

Arva Nazi. Abed Str. Teheran

This firm is producing not only universal wood-working machines, but also other types of machines and other small shops in Teheran, Tabriz etc.

Production of Wood Working Machines in India  
to Statistics Department of the Ministry of

Wood Sawing Machines	Quantity (per)
Hand Saws	131
Circular Saws	90
Vertical Spindle Saws	100
Moulding Machines	83
Multi-purpose Woodworking Machines	no data
Smoothing Planers	115
Thicknessing Machines	26
Other Machines	90
	110

Estimate of the Requirement of Wood-Working  
Machines in Iron (in 1972/3) According to the Assumptions  
in this Study

Hand Saws	approx. 200-250
Circular Saws	no data
Vertical Spindle Saws	
Moulding Machines	approx. 30-40 per year
Multi-purpose Woodworking Machines	approx. 40-50 per year
Smoothing Planers	approx. 30-40 per year
Thicknessing Machines	approx. 20-30 per year
Other Machines	approx. 30-40 per year

The estimate of the demand of universal machines as special wood-working machines in the years 1972/3 (1972/3) until 1975/6 (1975/6) is based on the estimated growth rate of investment and production of the wood industry in India. See Master Demand Study of the Wood Goods Industry, 1964-67, Part I. 5, Wood Industry.

### Universal Wood-Working Machines

The most important groups of universal wood-working machines are:

1. Wood saws
2. Wood drilling machines
3. Wood turning machines (lathes)
4. Wood moulding machines
5. Wood planing machines
6. Wood grinding and polishing machines
7. Multi-purpose wood-working machines
8. Portable wood-working machines
9. Special sharpeners

#### 4. 1. Wood Saws

Wood saws are the simplest universal wood-working machines used for sawing wood and similar raw materials. There are different types of wood saws as follows:

- band saw is the most used wood-working machines in Iran. Heavy band saws are used instead of frame saws (see Wood-Working Industry), smaller types of band saws are very often used instead of circular saws
- circular saw is the simplest universal wood-working machine. Up till now these machines are used only occasionally, and not so often as in other countries. It is believed that in the future this disproportion will partly disappear.
- arm saw serves as a precision dimension circular cutting saw, particularly in the manufacture of parts with slanting or angle cuts.
- multiple blade rip saw is multiple circular saw. suitable primarily for multiple production of bars and balks.

Forecast of Demand, Capacity, Production and Shortage of Band Saws

	1951 (1972/3)	1956 (1977/8)	1961 (1982/3)	1966 (1987/8)
Demand: Wood-working Industry	410	460	480	480
Repair shops	20	20	20	20
Other shops	10	10	10	10
<b>Total demand</b>	<b>440</b>	<b>490</b>	<b>510</b>	<b>510</b>
<b>Capacity</b>	<b>400</b>	<b>500</b>	<b>520</b>	<b>520</b>
<b>Production</b>	<b>400</b>	<b>490</b>	<b>510</b>	<b>510</b>
<b>Shortage</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>

The existing capacity is in line with the demand. In the future small workshops will be required in order to cover the whole demand.

Forecast of Demand, Capacity, Production and Shortage of Circular Saws

	1951 (1972/3)	1956 (1977/8)	1961 (1982/3)	1966 (1987/8)
Demand: Wood-working Industry	100	160	200	180
Repair shops	30	40	50	60
Agriculture and others	50	100	150	200
<b>Total demand</b>	<b>180</b>	<b>300</b>	<b>400</b>	<b>440</b>
<b>Capacity</b>	<b>300</b>	<b>400</b>	<b>500</b>	<b>500</b>
<b>Production</b>	<b>180</b>	<b>300</b>	<b>400</b>	<b>440</b>
<b>Shortage</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>



It is presupposed that all simple circular saws will be produced in Iran in small workshops; some circular saws will be produced in joiner's shops (the frame will be made of wood).

Forecast of Demand, Capacity, Production and Shortage of Arm Saws

	1351 (1972/3)	1356 (1977/8)	1361 (1982/3)	1366 (1987/8)
Demand	4	12	16	20
Capacity (new)	-	-	20	20
Production	-	-	16	20
Shortage	4	12	-	-

It is advisable to start the production of arm saws in the sixth five-year plan in a modern shop or factory.

Forecast of Demand, Capacity, Production and Shortage of Rip Saws

	1351 (1972/3)	1356 (1977/8)	1361 (1982/3)	1366 (1987/8)
Demand	5	14	20	25
Capacity	-	20	20	30
Production	-	14	20	25
Shortage	5	-	-	-

It is advisable to start the production of rip saws in the fifth five-year plan in a modern factory.

Other saws like gang saws, special cross-cutting saws, special edging saws - see Special Wood-Working Machines.

#### 4.2. Wood Drilling Machines

Wood drilling machines are simple mechanical hand-operated machines developed for the drilling of all kinds of wood; they are very efficient for industrial operations in joinery and carpentry etc.

Wood drilling machines are of the bench type with one or more spindles.

#### Forecast of Demand, Capacity, Production and Percentage of Wood Drilling Machines

	1972/3 (1972/3)	1975/6 (1977/8)	1981/2 (1982/3)	1986/7 (1987/8)
Demand	10	25	40	50
Capacity	-	30	40	50
Production	-	25	40	50
Percentage	10	-	-	-

It is advisable to start the production of wood drilling machines in the fifth five-year plan in one of the existing shops or factories.

#### 4.3. Wood Turning Machines (Lathes)

Turned pieces of wood like parts of furniture, toys, water pipes, handles for tools, shovels etc. are produced in Iran in small shops. Most of these are produced with wood cutting lathes, some of them are using only tools driven by rope (kharrafi). All kharrafi will be soon replaced by wood lathes with foot pedals, operated by steady hand.

Some modern wood lathes are equipped with copying equipment.

Forecast of Demand, Capacity, Production and Shortage  
of Wood Lathes

	1351 (1972/3)	1356 (1977/8)	1361 (1982/3)	1366 (1987/8)
Demand	30	45	60	70
Capacity (new)	-	50	70	70
Production	-	30	60	70
Shortage	30	15	-	-

It is advisable to start the production of wood lathes in the fifth five-year plan in one of the existing factories producing wood-working machines.

4.4. Wood Moulding Machines

Wood moulding machines are intended for the moulding of profiles and mortising, both on straight parts and on variously curved ones. These machines are used in joiner's shops, carpentry and pattern shops. These wood moulding machines are recognized:

- single-spindle bottom moulding machines are the simplest and most used wood moulding machines. They are designed for the moulding of profiles and mortising.
- horizontal-spindle moulding machines are used for the same operations as bottom moulding machines
- pattern maker's moulding machines are designed for accurate machining of patterns. The table with work-piece has transverse, longitudinal and circular power feeds.

-two-up to six spindle moulding machines with hor. spindles or vertical spindles are intended for quantity and multiple production of bats, moldings and profiles for windows, frames, components of doors, etc.

Forecast of Demand, Capacity, and Production in 1957-1960 of Single-Spindle Bottom Moulding Machines

	1957 (1957/5)	1958 (1957/5)	1959 (1957/5)	1960 (1957/5)
Demand	90	100	120	140
Capacity	90	90	120	140
Production	90	100	120	140
Shortage	0	-	-	-

The existing capacity is not fully utilized. It is advisable to extend the capacity and production in the fifth, sixth and seventh five-year plan, and to design new, modern types of single-spindle bottom moulding machines.

The demand for horizontal single-spindle moulding machines will remain low, because these machines are replaced by multi-purpose wood-working machines.

It is not recommended to produce horizontal-spindle moulding machines and two-up to six spindle moulding machines.

Pattern maker's moulding machines will be not produced either, since the demand will remain low for economical production (see below).

Forecast of Demand of Pattern Maker's Moulding Machines

	1351 (1972/3)	1356 (1977/8)	1361 (1982/3)	1366 (1987/8)
Demand	2	3	4	5

4. 5. Wood Planing Machines

Wood planing machines are universal wood-working machines designed for planing, smoothing and thickening of wood. They are used in joiner's shops, pattern shops and in repair shops. The following types of wood planing machines are recognized:

- smoothing planers are single-cutter planers used for smoothing of one side of planks etc. These machines are replaced in Iran very often by multipurpose wood-working machines.
- double surface planers are two-up to four-cutter planers used for thickening of planks, i.e. smoothing on both sides.
- four-side planers are used for machining of planks and beams on all four sides. Special designed machines of this type are used for surfacing of parquets. These machines are used rarely in Iran up till now.

Forecast of Demand, Capacity, Production and Shortage of Smoothing Planers

	1351 (1972/3)	1356 (1977/8)	1361 (1982/3)	1366 (1987/8)
Demand	60	100	140	160
Capacity	60	120	150	200
Production	40	90	140	160
Shortage	20	10	-	-

H. 2. 95

As it has been already mentioned, sandblasting machines being presently produced in Iran are of old design. It is advisable to start the production of modern sandblasting machines in one of the existing plants or in Metallurgical and Engineering Plant in Tabriz and by doing so to extend the existing capacity and production.

Forecast of Demand, Capacity, Production and Shortage of Double Surface Planers

	1981 (1360)	1983 (1362)	1985 (1364)	1988 (1367)
Demand	35	40	50	55
Capacity	40	60	60	80
Production	25	25	50	40
Shortage	10	15	-	-

The production of double surface planers is in the same situation as that of single surface planers. It is therefore advisable to start the production of modern design of double surface planers in one of the existing plants or in Metallurgical and Engineering Plant in Tabriz.

The demand on four side planers will remain low for economical production and from this reason all these machines will be imported.

4.6. Wood Grinding and Polishing Machines

Wood grinding and polishing machines are intended for fine grinding and polishing of solid as well as veneered parts. They are primarily in furniture industry.

There are these types of wood grinding and polishing machines:

- band and broad band grinding machines are intended for fine grinding of solid and veneered flat parts. The grinding band runs over two rollers - one driving and one tensioning roller. The grinding band is pressed to ground surface either by hand (simple design) or by a pneumatic oscillating mechanism (semi-automatic machine)
- two-roller grinders are used for equalizing surface grinding of solid and veneered furniture parts as well as for grinding to desirable thickness. Thicknessing is used with great advantage on blockboard before veneering and on chipboard.
- drum senders are used for grinding of small wooden parts

Forecast of Demand, Capacity, Production and Shortage of Band Grinding Machines

	1351 (1972/3)	1356 (1977/8)	1361 (1982/3)	1366 (1987/8)
Demand	15	35	45	55
Capacity	20	40	60	60
Production	5	30	45	55
Shortage	10	5	-	-

Band grinding machines are produced in small workshops and in joiner's shops (the frame and the table are made of wood). It is presupposed that the production will be extended in the fifth up to seventh five-year plan.

The demand of two-roller grinders will be low for economical production and consequently all of them will be imported from abroad.

Forecast of Demand, Capacity, Production and Shortage  
of Drum Sanders

	1351 (1972/3)	1356 (1977/8)	1361 (1982/3)	1366 (1987/8)
Demand	12	25	35	45
Capacity (new)	-	-	50	50
Production	-	-	30	45
Shortage	12	25	5	-

Drum sanders are not yet produced in Iran, but it is advisable to start this production in the sixth five-year plan,

4.7. Multi-purpose Wood-Working Machines

Multi-purpose wood-working machines are universal machines designed for many operations. In one unit there are combined more simple wood-working machines - for example smoothing planer, horizontal and vertical spindle moulding machine and circular saw. These machines are especially suitable for small joiner's shops. They represent the cheapest way of mechanization in the smallest workshops.

There are different combinations of simple wood-working machines in one multi-purpose unit (the most complicated multi-purpose machine produced abroad is a combination of seven simple wood-working machines).

In Iran there are being made two basic types of multi-purpose machines:

- 1 - simple one, consisting of smoothing planer, horizontal moulding machine and circular saw
- 2 - bigger one, consisting of smoothing planer, horizontal and vertical moulding machine and circular saw



Forecast of Demand, Capacity, Production and Shortage  
of Multi-Purpose Wood-Working Machines

	1351 (1972/3)	1356 (1977/8)	1361 (1982/3)	1366 (1987/8)
Demand	60	120	150	190
Capacity	80	120	160	200
Production	50	110	150	190
Shortage	10	10	-	-

It is presupposed that the production of multi-purpose wood-working machines will be extended in the fifth up to seventh five-year plan and that modern, more universal machines will be produced.

4. 8. Portable Wood-Working Machines

Portable wood-working machines are small universal machines being employed very often not only in wood industry, but also in repair shops, carpentry workshops etc. They are driven by electric motors, petrol engines or they are pneumatic.

Pneumatic portable wood-working machines-see Pneumatic Tools, electric portable drilling machines are included in Electric Portable Tools. Portable chain saws driven by petrol engine, operated by one or two operators are mostly employed in forests for cutting down trees.

Portable chain saws driven by electric motor, operated by one or two operators are used in saw mills, carpentry shops etc.

Portable circular saws driven by electric motor are used in carpentry and joiner's shops for sawing wood and similar raw materials.

Portable chain mortisers driven by electric motor are used in joiner's shops for mortising wooden parts.

Portable smoothing planers driven by electric motor are used in carpenter's shops for smoothing wooden floor, parquets laid etc.

Forecast of Demand, Capacity, Production and Shortage of Portable Chain Saws Driven by Petrol Engine

	1351 (1972/3)	1356 (1977/8)	1361 (1982/3)	1366 (1987/8)
Demand	35	70	150	250
Capacity (new)	-	-	-	400
Production	-	-	-	250
Shortage	35	70	150	-

The demand on portable chain saws driven by petrol engine will be big enough for economical production in the seventh five-year plan. It is possible to produce these machines in specialized plant with production of other portable wood-working machines and machine tools (see below).

The demand on portable chain saws driven by electric motor will remain low (approx. 20-25 pcs/year in the seventh five-year plan), but it is possible to produce them along with other chain saws.

Forecast of Demand, Capacity, Production and Shortage  
of Portable Circular Saws, Chain Mortisera and  
Smoothing Planers

	1351 (1972/3)	1356 (1977/8)	1361 (1982/3)	1366 (1987/8)
Demand: Circular saws	45	90	150	210
Chain mortisera	20	50	80	110
Smoothing planers	15	30	70	90
Total demand	70	170	300	410
Capacity (new)	-	-	500	500
Production	-	-	300	410
Shortage	70	170	-	-

. It is possible to start the production of these portable wood-working machines provided they will be produced in the same factory as portable machine tools (see Portable Machine Tools).

#### 4.9. Special Sharpeners

Sharpeners used in wood-working industry for sharpening of tools are actually metal-working machine tools. Universal sharpeners, such as double-wheel grinding machines, universal toolroom grinding machines etc. are included in this study in metal machine tools (see Grinding Machines).

In this chapter there are mentioned only special sharpeners of tools for wood-working machines, since these sharpeners are mostly produced by the same producers as wood-working machines.

Special sharpeners used in wood-working industry are as follows:

- Saw blade and band saw strip semi-automatic automatic sharpeners are designed for sharpening of circular saw blades, band saw blades and chains for light as well as heavy frame saw and portable band. These machines are employed in well mechanized factories and workshops.
- Semi-automatic or automatic cutter sharpeners are intended for precision sharpening of flat cutters with a straight edge; they are suitable for sharpening of cutters of carbide blocks and cutter bars.
- Saw chain grinders for engine driven saws are intended for the sharpening of teeth and limiting bases of saw chains.
- Semi-automatic saw blade sharpeners are designed for sharpening of circular saw blades etc.

Forecast of Demand, Production, Capacity and Shortage of Cutter Sharpeners

	1951 (1972/3)	1956 (1977/8)	1961 (1982/3)	1966 (1987/9)
Demand	10	25	45	65
Capacity (new)	-	-	50	80
Production	-	-	40	63
Shortage	10	25	5	-

It is possible to start the production of cutter sharpeners in the sixth five-year plan and to extend it in the seventh five-year plan in one of the existing plants producing wood-working machines or in

## Metallurgical and Engineering Plant in Tabriz.

Forecast of Demand, Capacity, Production and Shortage  
of Saw blades and band saw strips sharpeners

	1351 (1972/3)	1356 (1977/8)	1361 (1982/3)	1366 (1987/8)
Demand	15	45	60	80
Capacity (new)	-	-	80	80
Production	-	-	50	80
Shortage	15	45	10	-

The demand of saw blades and band saw strip sharpeners in the sixth five-year plan will be big enough for economical production. It is possible to start the production of saw blades and band saw strips sharpeners in one of the existing plants producing wood-working machines or in Metallurgical and Engineering Plant in Tabriz.

The demand on saw chain grinders for engine driven saws will remain low for economical production and therefore all grinders will be imported.

Characteristic of Existing Machinery, Equipment and Process

Characteristic of existing machinery and equipment - see the description of existing plants. In order to achieve the production of modern, accurate wood-working machines the machinery and equipment should be modernized in the future.

Plants and workshops will be equipped with precise universal machine tools of medium size, such as centre lathes, column and radial drilling machines, horizontal

boring machines, shaping machines, double column planing machines with grinding heads, centre grinding machines with wheel-head for internal grinding, surface grinding machines, hack saws and circular saws, universal, vertical and horizontal milling machines and even. with turret and capstan lathes.

Spur, helical and bevel gears are used only occasionally, mostly for low speed only therefore gear cutting machines are employed rarely; these components are mostly purchased from other factories.

Mechanical shop are mostly without overhead cranes, only assembly shop is equipped with one or two light overhead cranes.

Inspection department and measuring centre are of utmost importance. <sup>100%</sup> Equipped with measuring instruments, tool room and sharpening centre.

The majority of components and parts are made of grey iron castings; steel castings, non-ferrous metal castings and forgings are used only occasionally. Small components and parts are made of carbon or alloy steels round or hexagonal bars. These components are very often heat treated.

Semi-automatic and automatic wood-working machines are equipped with complicated outfit such as remote control switchboard, controlling panel etc. Components, parts and subassemblies are purchased in special factories and then assembled in assembly shop.

Last operations are surface treatment, running in and then the machine is packed and dispatched.

4.10 Needs of Special Wood-Working Machines and Equipment

Since there is plenty of special wood-working machines and equipment, it is impossible to mention all of them, only the outstanding ones are given

Machinery and Equipment	Unit	1352-56 (1973-8)	1357-61 (1978-83)	1362-66 (1983-88)
Band saws with automat. carriage	pcs	5	7	7
Portable saw mills (heading with circular saw, saw mill carriage, feed works, log turner, saws, edger, swing saw)	sets	3	5	7
Gang saws (incl. clamping trucks)	pcs	6	8	12
Special cross-cutting saws	pcs	12	15	18
Special edging saws	pcs	12	16	18
Log turners	pcs	4	6	8
Prism shifters and manipulators	pcs	2	4	6
Inclined elevators	pcs	2	4	6
Slat-type timber classifiers	pcs	1	2	3
Gravity conveyors	pcs	4	8	12
Loaders and chain loaders	pcs	9	12	15
Loader lifts and lifters	pcs	16	23	24
Unloaders	pcs	2	4	6
Double carriers	pcs	20	27	27
Stoppers	pcs	6	8	8
Veneer peeling machines	pcs	6	6	8
	pcs	9	11	12
		15	17	20

Machinery and Equipment	Unit	1952-56 (1973-8)	1957-61 (1978-83)	1962-66 (1983-88)
veneer or splint slicing machines	pcs	3	4	4
	pcs	8	10	10
		11	14	14
Splint chopping machines	pcs	9	11	11
Reeling and unreeeling equipment	pcs	15	17	20
Veneer-clipping machines incl. transporters	pcs	6	6	8
Belt driers *	pcs	15	17	20
Hydraulic platforms for veneer	pcs	6	6	8
Knot boring and patching machines	pcs	18	24	30
Veneer guillotine joiners (or milling mach.)	pcs	8	8	9
	pcs	10	15	20
		18	23	29
Glueing machines	pcs	7	7	8
	pcs	2	3	4
	pcs	1	1	1
	pcs	15	20	25
		25	31	38
Special dimensioning saws	pcs	6	6	8
	pcs	3	4	5
	pcs	2	2	2
	pcs	10	15	20
	pcs	21	27	35

\* Other types of driers see "Driers"



Machinery and Equipment	Unit	1352-56 (1973-8)	1357-61 (1978-83)	1362-66 (1983-88)
Other special saws (ie. salt etc.)	pcs	4	6	8
Thickening rollers	pcs	7	7	8
	pcs	2	3	4
	pcs	1	1	1
	pcs	10	17	13
Knife and hammer mills (chippers)	pcs	2	3	4
	pcs	6	9	9
	pcs	3	3	3
		11	15	16
Bark strippers and bark washing drums	pcs	2	3	4
	pcs	2	3	4
	pcs	1	1	1
	pcs	5	7	9
Particle spreaders	pcs	2	3	4
Particle boards setting mach.	pcs	4	6	8
Defibrators	pcs	2	2	3
Raffinators	pcs	2	2	3
Pouring machines	pcs	2	2	3
Block boards jointing mach.	pcs	1	1	1
Wood wool cutters	pcs	4	6	8
Round milling machines	pcs	6	8	10
Oval-copying milling machines	pcs	5	6	8
End trimming and plan- ing machine (for parquets)	pcs	1	1	1
Timber pile dismantling mach.	pcs	5	10	15
Routing equipment	pcs	5	10	15
Separating equipment	pcs	5	10	15
Swingle machines	pcs	2	-	-

II. 2. 107

The production of special wood-working machines and equipment is not advisable as the needs of these machines and equipment are very low.

**5. COMPONENTS AND PARTS, STANDARD AND SPECIAL  
ACCESSORIES OF MACHINE TOOLS, FORMING MACHINES  
AND WOOD-WORKING MACHINES**

5. Components and Parts, Standard and Special Accessories of Machine Tools, Forming Machines and Wood Working Machines

5.1 Chucks and Chucking Devices of Machine Tools

There are these kinds of chucks and chucking devices of machine tools:

Drill chucks and self-tightening drill chucks are used at all kinds of drilling machines incl. portable electric and hand operated drilling machines.

Three-jaw self centering scroll chucks are used at universal lathes, capstan and turret lathes, automatic and special lathes, cylindrical grinding machines etc.

Chuck plates with four jaws are used at universal centre lathes.

Collet chucks are used at capstan and turret lathes, automatic lathes and sometimes at universal lathes.

Forecast of Demand of Drill Chucks and Self-Tightening Drill Chucks

	1351 (1972/3)	1356 (1977/8)	1361 (1982/3)	1366 (1987/8)
<b>Demand:</b>				
New column and bench drilling machines	446	1400	1840	2200
portable electric or pneumatic drilling machines	-	3000	6000	12000
hand-operated drilling machines	-	4000	6000	12000
Replacement	2554	4600	8160	8800
<b>Total demand</b>	<b>3000</b>	<b>11000</b>	<b>20000</b>	<b>35000</b>

Demand is and will remain low for economical production, it is not therefore advisable to start the production in Iran in the fifth up to seventh five-year plan.

Forecast of Demand of Three-Jaw Self Centering Scroll Chucks

	1351 (1972/3)	1356 (1977/8)	1361 (1982/3)	1366 (1987/8)
<u>Demand:</u>				
New universal centre lathes	650	2200	4400	6600
capstan and turret lathes	-	200	380	700
Automatic lathes	-	-	120	300
centre grinding machines	-	100	180	300
Replacement and other machines	150	300	520	800
<b>Total demand</b>	<b>800</b>	<b>2700</b>	<b>5600</b>	<b>8700</b>

Most of lathes are equipped with two self-centering chucks. Also in this case it is not advisable to start the production of three-jaw self centering scroll chucks in Iran in the fifth up to the seventh five-year plan since the demand is and will remain low for economical production.

Forecast of Demand and Production of Chuck Plates

	1351 (1972/3)	1356 (1977/8)	1361 (1982/3)	1366 (1987/8)
<u>Demand:</u>				
New universal lathes	350	1200	2400	3650
Replacement and other machines	100	200	400	650

Total demand	450	1400	2800	4300
Production	-	800	2800	4300
Shortage	450	600	-	-

Production of chuck plates is less complicated than the production of drill chucks and three-jaw self centering scroll chucks and therefore it is advisable to produce them in Iran. Metallurgical and Engineering Plant in Tabriz is equipped for the production of chuck plates. From this reason the whole demand in the future will be covered by local production.

Forecast of Demand, Production and Shortage of Collet Chucks

	1351 (1972/3)	1356 (1977/8)	1361 (1982/3)	1366 (1987/8)
<u>Demand:</u>				
New universal lathes	120	350	650	950
capstan and turret lathes	-	100	200	380
automatic lathes	-	-	70	180
Replacement and other machines	30	50	80	140
Total demand	150	500	1000	1650
Production	-	450	900	1600
Shortage	150	50	100	50

It is advisable to produce collet chucks in Iran either in Metallurgical and Engineering Plant in Tabriz or in Small Scale Industry.

5.2 Vices

Vices are devices for clamping of workpieces at machining. There are these kinds of vices:

Hand vices are used at hand operations - for example tool maker's vices, tube vices, leg vices etc.

Machine vices are used at drilling machines, mill machines, shaping machines etc. Most of machine vices are simple parallel jaw vices, the other are inclined vices, vices with swivel base, etc.

Forecast of Demand, Capacity, Production and Shortage of Vices

	1351 (1972/3)	1356 (1977/8)	1361 (1982/3)	1367 (1987/8)
<u>Demand:</u>				
Hand vices of all kinds	6000	9500	12000	15000
New machine vices				
- for drilling machines	400	1400	1800	2200
- for milling machines	-	300	650	1100
- for shaping machines	-	300	450	650
- replacement and for other machines	100	200	400	650
<b>Total demand</b>	<b>6500</b>	<b>11700</b>	<b>15300</b>	<b>19600</b>
<b>Capacity</b>	<b>2000</b>	<b>10000</b>	<b>15000</b>	<b>20000</b>
<b>Production</b>	<b>1800</b>	<b>6000</b>	<b>14000</b>	<b>18000</b>
<b>Shortage</b>	<b>4700</b>	<b>5700</b>	<b>1300</b>	<b>1800</b>

Existing Manufacturing Facilities

There is no specialized factory producing hand or machine vices in Iran at present.

Metallurgical and Engineering Plant in Tabriz is producing hand and machine vices in its training centre. In the years 1348 (1969) until 1351 (1973) there were produced approx. 6000 pcs of vices from this amount approx. 3500 pcs of fork vices (Czechoslovak design) and approx. 2500 pcs of vices of own design.

The existing capacity in training centre in Metallurgical and Engineering Plant in Tabriz is not adequate for local demand, and therefore it is advisable to build a new specialized medium scale plant for the production of hand and machine vices.

There will be co-operation in castings and forgings with the existing foundries and forge plants (for example with Metallurgical and Engineering Plant in Tabriz). Components and parts will be machined partly on semi-automatic and automatic machine tools, partly on special machine tools (body of the vice etc.). Training centre of Metallurgical and Engineering Plant will be specialized in the production of special machine vices - for example inclinable vices, vices with swivel base etc.

### 5.3 Rests (Stays)

Steady rest (fixed stay) and travelling stay are used at turning or cylindrical grinding of long work-pieces of small diameter.

#### Forecast of Demand, Capacity, Production and Shortage of Rests (Stays)

	1351 (1972/3)	1356 (1977/8)	1361 (1982/3)	1366 (1987/8)
<u>Demand:</u>				
New lathes	600	2100	4300	6800
Centre grinding machines	-	50	100	150
Replacement and other machines	50	100	200	350
<b>Total demand</b>	<b>650</b>	<b>2250</b>	<b>4600</b>	<b>7300</b>
<b>Capacity</b>	<b>400</b>	<b>1000</b>	<b>3000</b>	<b>6000</b>
<b>Production</b>	<b>200</b>	<b>1000</b>	<b>3000</b>	<b>6000</b>
<b>Shortage</b>	<b>450</b>	<b>1250</b>	<b>1600</b>	<b>1300</b>



It is advisable to produce steady rests and tooling stays in the same factory, producing lathes and centre grinding machines, i.e. in Metallurgical and Machine Engineering Plant in Tabriz.

#### 5.4 Cooling Equipment

The edge of cutting tool in machine tools must be cooled down by a coolant, otherwise it would be overheated. From this reason the majority of machine tools is provided with cooling equipment comprising coolant pump mostly driven by single-phase electric motor up to max. output 0,5 kW, coolant distribution system, strainer and sometimes even electromagnetic filter. Only some small drilling machines, double-wheel grinders, shaping and slotting machines, and planing machines do not have this equipment.

#### Forecast of Demand, Capacity, Production and Shortage of Cooling Equipment

	1351 (1972/3)	1356 (1977/8)	1361 (1982/3)	1366 (1987/8)
<u>Demand:</u>				
New bench and column drilling machines	200	600	800	1000
Radial drilling machines	-	80	180	250
Universal lathes	350	1200	2400	3650
Semi-automatic lathes	-	100	200	380
Automatic lathes	-	-	70	180
Milling machines	-	160	350	600
Centre grinding machines	-	50	100	160
Surface grinding machines	-	50	100	140
Hack-sawing machines	-	90	140	190
Circular sawing machines	-	-	40	100
Replacement and other products	100	170	320	550

Total demand	650	2500	4700	7200
Capacity (new)	-	5000	5000	5000
Production	-	1500	4000	5000
Shortage	650	1000	700	2200

---

It is advisable to start the production in the fifth five-year plan and to extend it in the sixth and seventh five-year plan in the factory producing pumps. Electric motors will be produced in the factory for production of fractional horse-power motors.

Other electrical outfit see Electrical Engineering Industry.

### Conclusions

It is clearly seen from the above mentioned data that the production of machine tools and forming machines in the coming third year will be possible to a great extent. It will be possible to produce a lot of new machines for production of which was not yet considered either in Metallurgical and Engineering Plant in Tabriz or in the country.

The author in 17 quotes recapitulation of the present production, existing capacity, and shortage of capacity. It is obvious from this that neither the second shift in Metallurgical and Engineering Plant in Tabriz nor a common extension of capacity in the existing plants till 1956 will be able to solve the problem of capacity shortage, regardless this fact that the lack of capacity will be a serious problem in the years to come.

In order to adopt measures within a short time to remove these disproportional capacities there are several possible solutions. For example, the construction of another specialized factory for the production of machine tools and forming machines and the like.

The author of this study is of the opinion that the most profitable method is as follows:

1. To increase the number of shifts in Metallurgical and Engineering Plant in Tabriz within a short time to two full working shifts in the production of machine tools and forming machines.

2. To reconstruct the building O2 in Metallurgical and Engineering Plant in Tabriz, mechanical shops - originally designed for the manufacture of all products, i.e. machine tools and forming machines, diesel engines, electric motors, compressors and pumps - only for the production of machine tools and forming machines. The production of other products, i.e. diesel engines, electric motors, compressors and pumps should be transferred to new halls either in Metallurgical and Engineering Plant or to new plants.
  
3. In the sixth five year plan the production program of machine tools and forming machines in Metallurgical and Engineering Plant in Tabriz should be gradually restricted only to more complicated machines. The production of simple machine tools and forming machines should be provided in other factories. The existing production program of Metallurgical and Engineering Plant in Tabriz should discontinue the manufacture of double-wheel grinders, possibly drilling machines and eccentric presses.
  
4. To establish "Mechanical Engineering Research Institute" at MEP Tabriz which would assist through its advising activity in developing the production of smaller machine tools and forming machines in small-scale industry.
  
5. Within the framework of small-scale industry to establish plants specialized for the production of standard and special accessories for machine tools, and for the manufacture of jobbers.

6. In the seventh Five-year plan to start the construction either of a new hall in Metallurgical and Engineering Plant in Tabriz or still better a new plant for the production of medium - heavy and heavy machine tools and forming machines such as horizontal boring and milling machines, planing machines, mechanical hydraulic presses above 100 tons etc. The products from this plant will be in the market as late as in the eight Five-year plan.
  
7. The existing capacity of plants producing wood-working machines is not fully utilized, but as most of these plants are producing only simple universal wood-working machines of old design, it is advisable either to modernize and enlarge the capacity of one of the existing plants or to build a new, modern plant for production of modern universal, as well as special wood-working machines.



TABLE 16 (Contd.)

	1	2	3	4	5	6	7	8	9	10	11	12
Power hammers	-	30	50	90	-	-	-	50	-	10	10	30
Plate and strip levelling rolls	1	2	2	2	-	-	5	5	4	3	3	3
Section straightening machines	1	1	2	2	-	-	4	4	3	3	2	2
Hand operated tube bending machines	50	90	145	190	-	-	60	150	10	60	5	40
Mechan.driven tube bending machines	-	30	45	60	-	-	-	50	-	20	5	10
Bars bending machines	20	110	240	300	-	-	50	180	30	70	60	120
Sheet bending machines	12	35	55	90	-	-	20	50	5	15	5	40
Plate bending rolls	12	30	55	90	-	-	20	50	5	20	5	40
Seaming machines	-	25	50	80	-	-	-	60	-	35	10	20
Lever shears	65	130	250	350	-	-	120	200	55	70	50	150
Guillotine shears	25	55	145	180	-	-	50	150	25	55	5	50
Circular shears	-	5	20	28	-	-	-	20	-	12	-	2
Section chopping machines	-	25	45	80	-	-	-	50	-	25	5	30

Shortage (or surplus) of capacity in 1351 (1972/3) is given as total existing capacity in 1351, i.e. in Metallurgical and Engineering Plant in Tabriz at one shift operation plus capacity of other plants in 1351 minus projected production in 1351 (1972/3).

Shortage (or surplus) of capacity in 1356 (1977/8) is equal to total existing capacity in 1356, i.e. in Metallurgical and Engineering Plant in Tabriz at two-shift operation plus capacity of other plants in 1356 minus projected production in 1356 (1977/8).

Shortage (or surplus) of capacity in 1361 (1972/3) is given as total existing capacity in 1356 (see above) minus projected production in 1361 (1982/3).

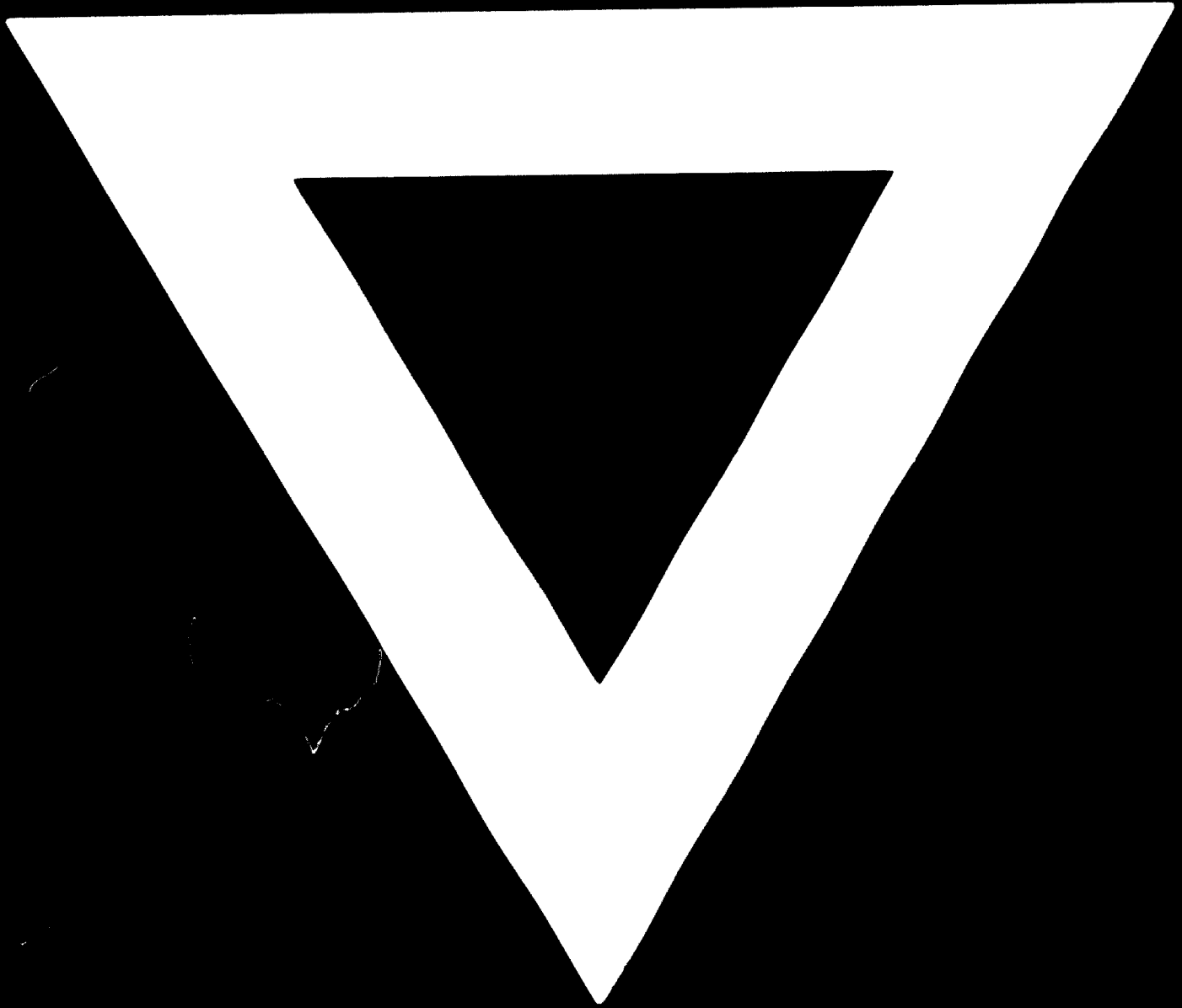
Shortage (or surplus) of capacity in 1366 (1987/8) is given as total existing capacity in 1356 minus projected production in 1366 (1987/8).

6. CONCLUSIONS





**G-347**



**77. 10. 07**