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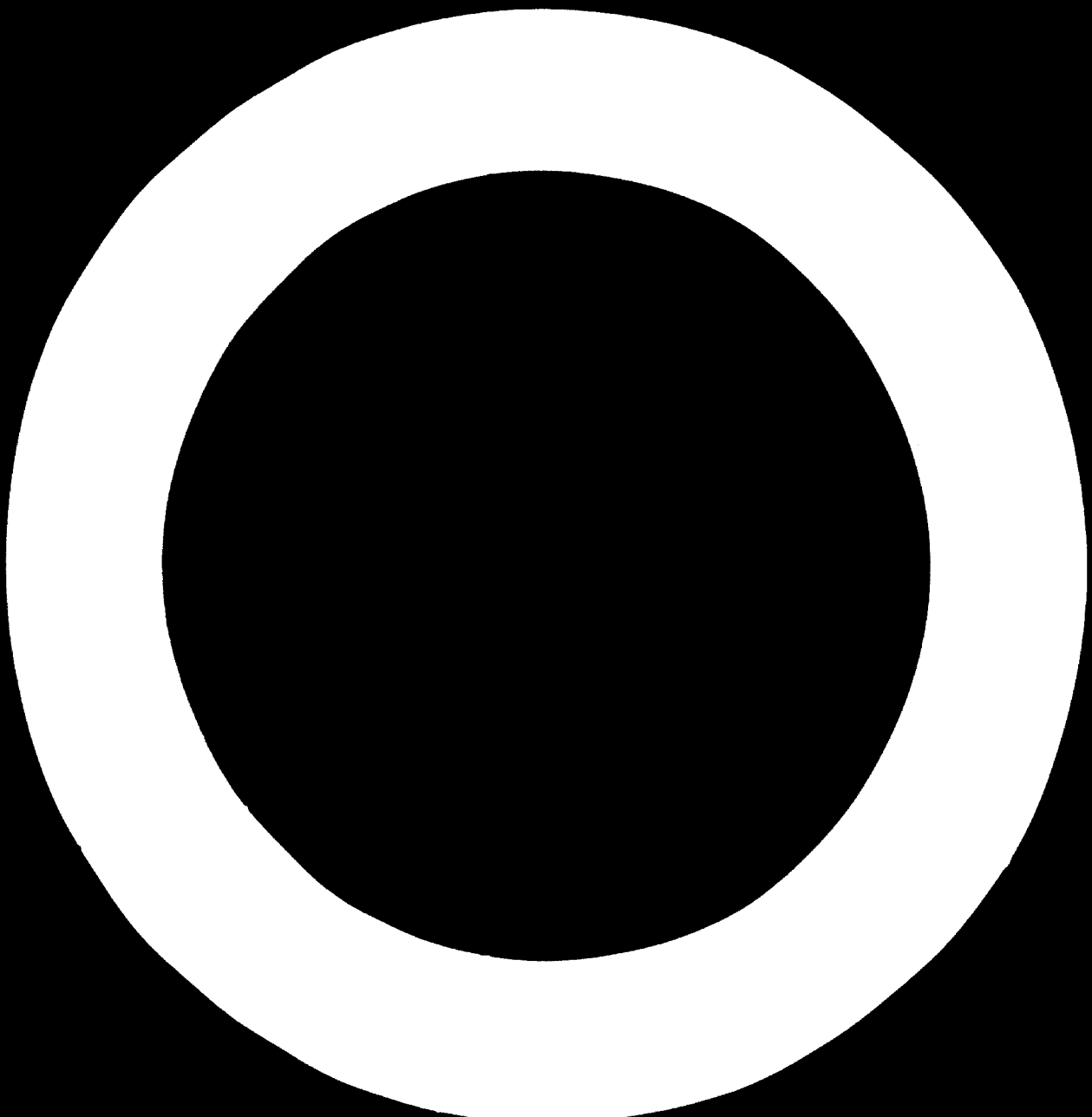

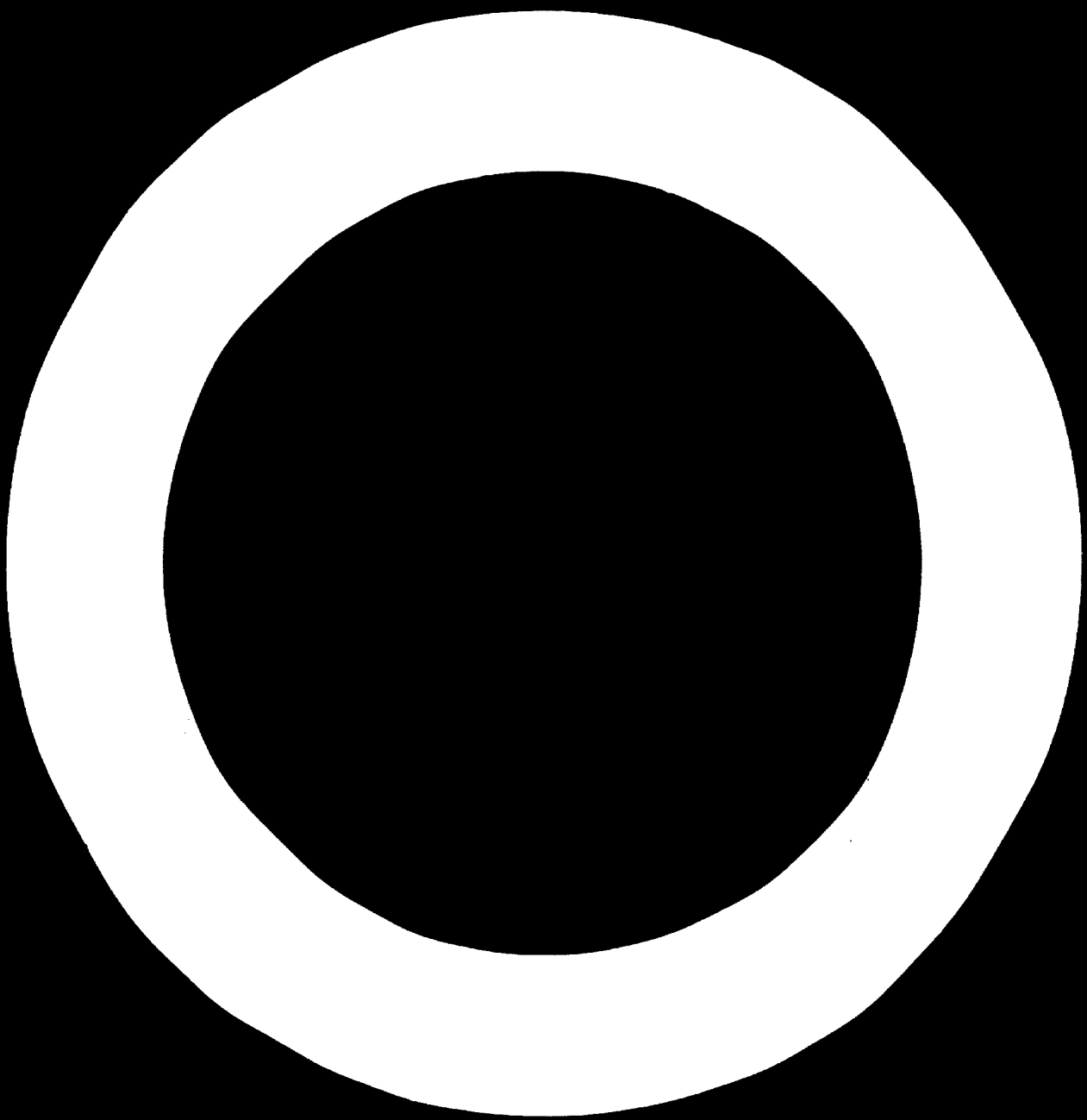

UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION

S.F. PROJECT : BRA/[illegible]

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392

MASTER DEMAND STUDY FOR

MECHANICAL & ELECTRICAL GOOD EQUIPT

1972 - 1981

PART I

pp. 167

3. TRANSPORT EQUIPMENT INDUSTRIES

S/F AUTOMOTIVE INDUSTRY

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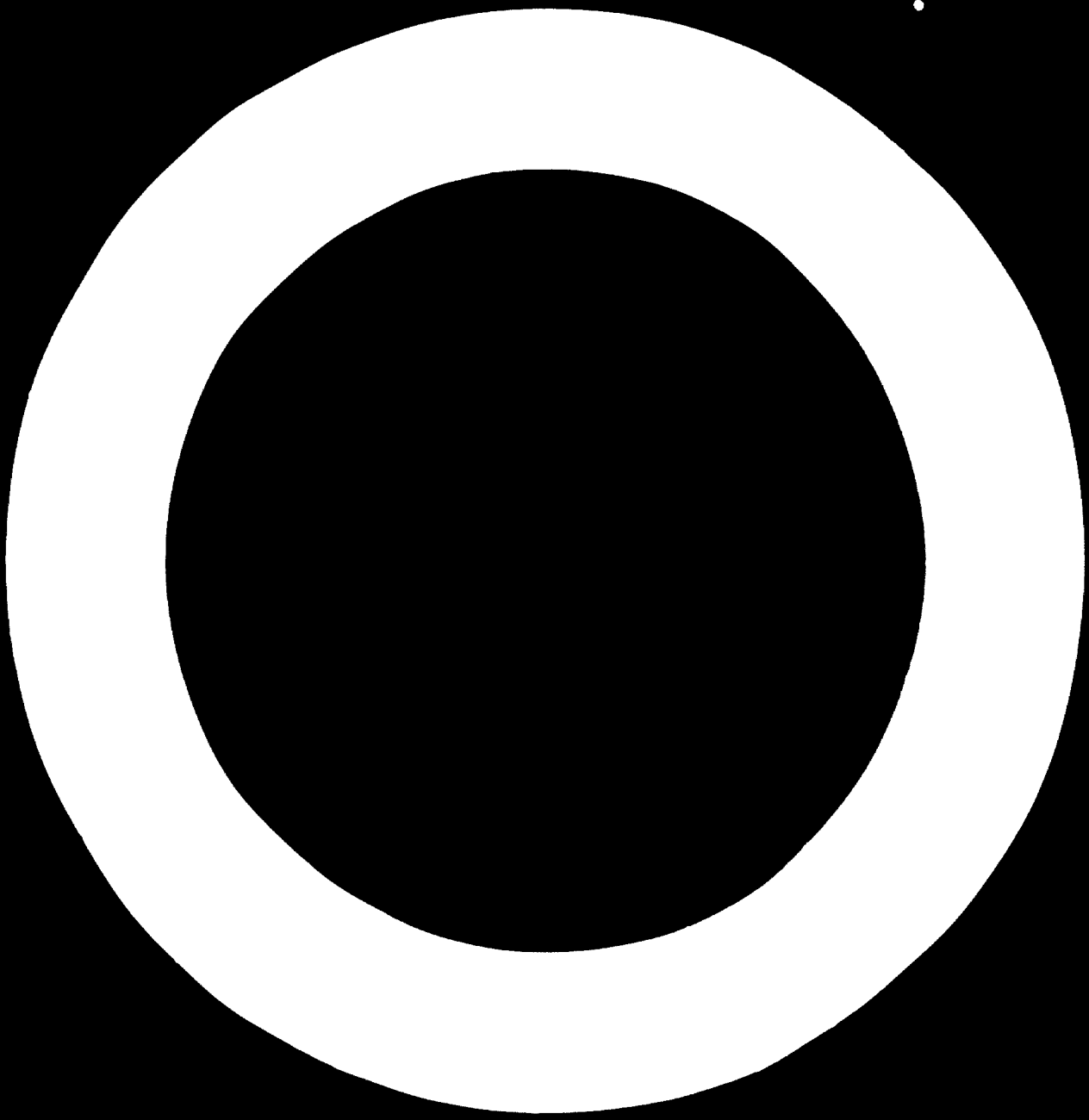

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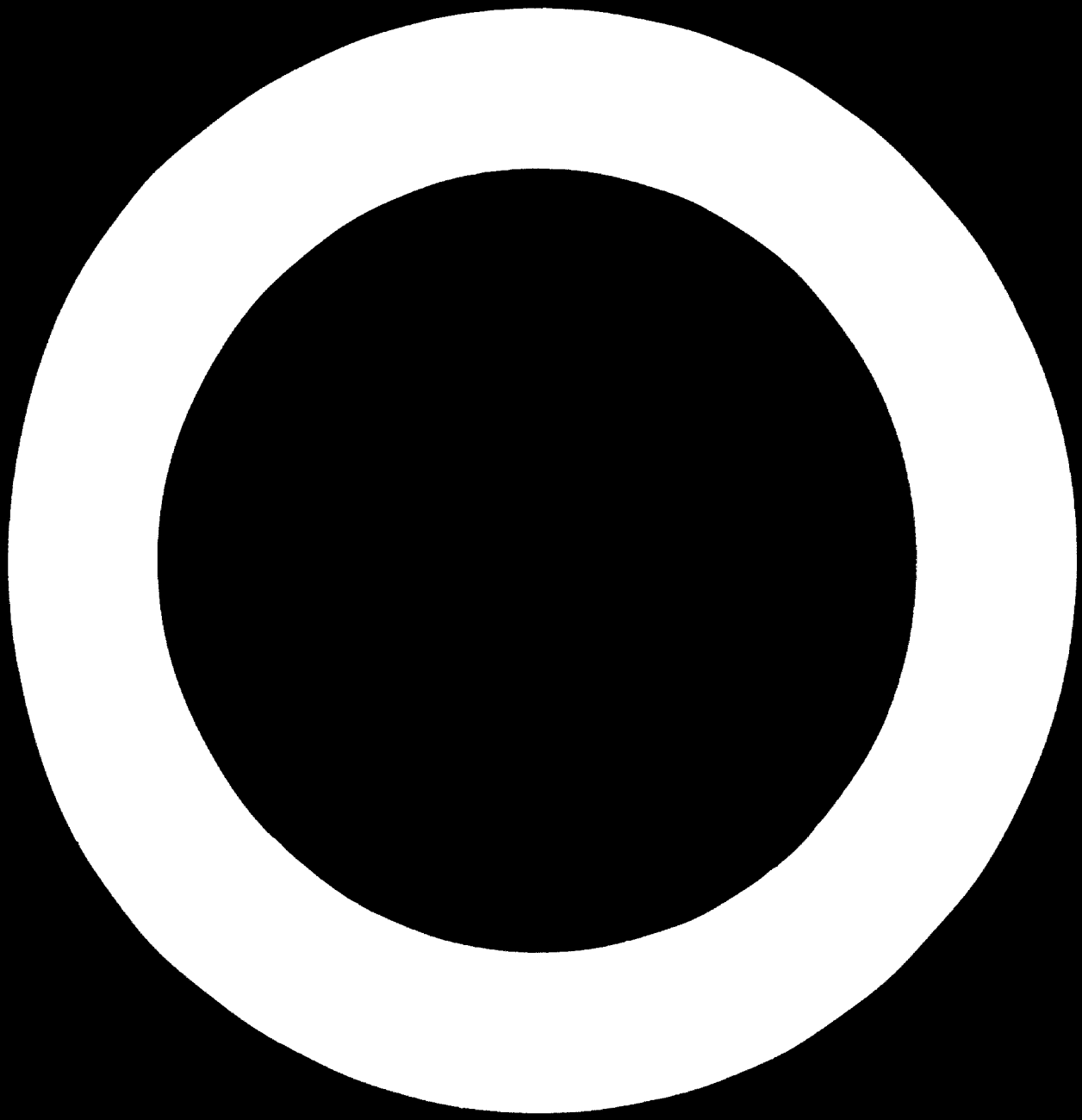
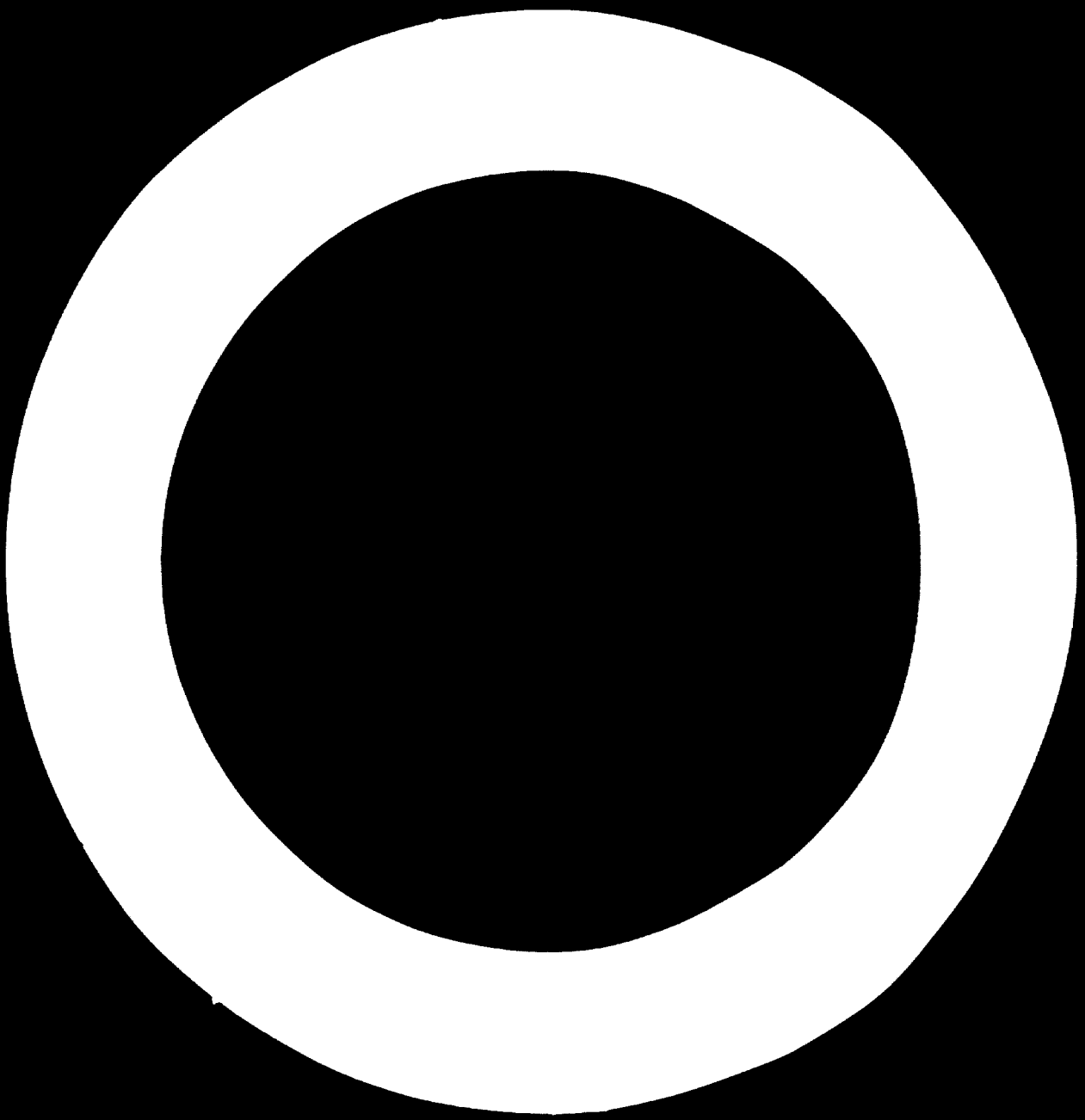


1. INTRODUCTION



INTRODUCTION

Transport equipment industry is one of the youngest industries in Iran. It started 12 years ago but due to the nigh growth rate in the last years represents important part of Iranian economy - see Tables 1, 2.

The number of assembled cars, buses, trucks and vannettes is being increased each year and is replacing the imports - see Tables 3, 4 and 5.

Also the number of cars, trucks, buses, motorcycles etc. operation in Iran was substantially growing in the last decade - see Tables 6, 7, 8 and 9.

Production programme of automotive industry in Iran is too complicated and wide range of types of cars, buses, minibuses, vannettes, trucks, tractors, mopeds and motorcycles produced in Iran unbearable for a relatively small market. At present there are produced or will be produced in the near future, 6 types of passenger cars (including pick-up and station wagons), 10 - 11 types of vannettes (only 4 are variations of passenger cars), 8 types of buses and minibuses, 13 types of trucks, 6 types of tractors, 5 types of mopeds and 6 types of motorcycles (variations are not included). All these types of cars, vannettes, buses, minibuses, trucks, tractors, mopeds and motorcycles need 22-23 different types of petrol engines and 22-23 types of diesel engines(!). If we added petrol engines and diesel engines for earthmoving machinery and equipment and for agricultural machinery and equipment (tillers etc.) produced or assembled in Iran we could get 75-80 petrol and diesel engines in total (!). In future there should be a tendency to reduce the number of types produced in Iran instead of giving new licenses for new products.

Recommendations:

1. It is advisable to reduce step by step the number of types produced in Iran in all categories, mainly types of cars, trucks, motorcycles and buses to a minimum.

Now, there is a tendency to cover maximum of demand (95-97%) by local production. From the commercial point of view it is cheaper to produce only few types of cars, trucks, buses, mopeds, motorcycles etc. in big lots. In this way it will be possible to cover only approximately 70-75% of local demand, but bigger import of cars etc. might be compensated by the export of cheap cars, buses, lorries etc. produced in Iran.

Reduction of number of types of cars etc. produced in Iran will also enable to produce more components and parts locally. It is much easier and more economical to produce big lots of few types of components and parts in one factory than to produce the same quantity spread to tens of types.

2. It is advisable to raise the local content of cars, trucks etc. produced in Iran to the maximum. Now most of producers are producing only some components and parts of body; other assembled groups like engine, gear box, clutch, etc. and apparatuses like carburettors, dynamos, starters etc. are imported. The advantages of production of groups, apparatuses, their components and parts:

2. 1 Production of some components and parts for automobile industry will enable the start of production of technologically similar groups, apparatuses, components and parts for other industry. Some examples:

Production of hydraulic elements for automobile industry will enable in the future the production of hydraulic elements for other machines, machine tools, presses etc.; production of compressors for trucks, tractors, buses and minibuses will enable economical production of stationary and portable compressors etc.

2. 2 Some components and parts are copper (and its alloys), aluminium (or its alloys) or lead intensive i.e. the production of these components and parts will partly utilize the surplus of these raw materials produced in Iran. Copper (and its alloys) intensive products; radiators, electrical wiring, dynamos, alternators,

starters, carburettors, etc. Aluminium (and its alloys) intensive products; pistons, filters, cylinders of some types of engines etc. lead intensive products; welt batteries.

2.3 There will be possibility to export some components and parts, mainly those items, which will be made of cheap, local raw materials.

2.4 Local production of components and parts will reduce the need of foreign currency.

2.5 Components and parts for automobile industry are mostly labour intensive, i.e. the production of the above mentioned items will bring plenty of jobs for workers and technicians.

2.6 Components and parts for automobile industry are mostly complicated and precision work products. After mastering this production it will be possible to start also other complicated and precision work engineering products, as there will be trained staff available in Iran.

Table 1

Summary Statistics on Industrial Establishment of Transport Equipment Industries* in Iran According to the Iranian Industrial Statistics 1968 published by the Bureau of Statistics of the Ministry of Economy

	Central Province	Esfahan and Yazd Province	Total Iran
Number of establishments	1516	1616	9399
Total persons engaged	10927	4307	28488
from this: Owners, employers, family members and other unpaid workers	2000	1909	12366
Salary and wage earners - operatives	7984	2398	14993
others	943	-	1129
New investment (before depreciation) 1000 Rls.	317014	5215	358435
Value of gross input "	7208606	190525	7833311
Value of gross output "	10968788	265628	12206925
Gross value added "	3760182	75103	4373614

* includes repair and maintenance shops.

Table 2

Time Series of the Value of Output and Value Added According to 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)
Value of output	10^6Rls.	7134	6974	7959	8931	9927	11538	15558
Value added	10^6Rls.	2711	2601	2901	2722	3523	4992	4374

Table 3

Time Series of Production of Cars, Vannettes, Trucks, According to the Research Centre for Industrial and Trade Development of the Ministry of Economy

		1343 (1964/5)	1344 (1965/6)	1345 (1966/7)	1346 (1967/8)	1347 (1968/9)	1348 (1969/70)	1349 (1970/1)
Passengers cars	pcs.	2332	2152	2458	8218	20278	28258	29989
Vannettes, station wagons and automobiles	pcs.	1525	1540	1435	1430	2121	1755	6615
Buses & minibuses	"	1101	1000	1843	1325	2784	3161	3986
Trucks	"	1063	1640	1679	1977	2693	3195	2805

Table 4

Time Series of Demand of Cars, Vannettes, Trucks etc. According to the Research Centre for Industrial and Trade Development of the Ministry of Economy

	1343 (1964/5)	1344 (1965/6)	1345 (1966/7)	1346 (1967/8)	1347 (1968/9)	1348 (1969/70)	1349 (1970/1)
Passenger cars	17049	16199	18107	20010	32295	32629	33125
Vannettes, station wagons and ambulances	3346	3110	2679	3384	6726	6879	10230
Buses & minibuses	1767	1726	2333	2565	2785	2973	3841
Trucks	1484	2308	2865	3255	4235	3920	3819

Table 5

Production and Sale of Cars, Vannettes, Trucks, etc. in the Year 1351 (1972/3) According to the Research Centre for Industrial & Trade Development of the Ministry of Economy

	9 months		Forecast of Production 12 months
	Production	Sale	
Passenger cars including station wagons	35533	33964	45000
Vannettes	8940	8616	11600
Minibuses	1397	1388	1900
Buses	620	661	900
Ambulances	50	110	100
Trucks	2361	2359	3200

Table 6

Registered Cars, Trucks, Buses, etc. (without Armed Forces Vehicles) According to the Public Licencing Department

Year	Passenger Cars	Trucks	Buses	Ambulances	Motorcycles & 3-wheelers	Grand Total
1341 (1982/3)	106, 919	35, 319	8, 776	126	11, 654	162, 794
1342 (1963/4)	116, 231	35, 568	9, 851	149	9, 535	171, 338
1343 (1964/5)	127, 761	37, 197	10, 843	38	4, 804	180, 553
1344 (1965/6)	139, 211	40, 490	11, 816	81	6, 554	198, 152
1345 (1966/7)	153, 299	43, 153	12, 660	53	22, 766	231, 931
1346 (1967/8)	165, 438	45, 240	13, 817	275	43, 587	268, 357
1347 (1968/9)	191, 723	53, 376	14, 599	347	133, 751	393, 796
1348 (1969/70)	250, 289	64, 533	18, 512	337	134, 196	467, 867
1349 (10 months) (1970/1)	271, 741	71, 605	20, 896	337	151, 001	515, 580

Table 7

Registered Passenger Cars - Details

Year	Diplomatic	Services	Private	Rental	Taxi	Government
1341 (1962/3)	377	760	78,858	7,466	15,628	3,830
1342 (1963/4)	541	812	87,726	7,090	16,232	3,830
1343 (1964/5)	541	812	99,204	6,831	16,543	3,838
1344 (1965/6)	541	812	111,127	6,947	14,854	4,930
1345 (1966/7)	541	812	122,267	6,483	17,165	6,031
1346 (1967/8)	541	812	135,939	6,538	17,477	7,131
1347 (1968/9)	599	1,890	156,385	6,995	17,316	8,578
1348 (1969/70)	599	1,890	210,320	6,543	18,857	12,120
1349 (10 months)	913	1,890	222,712	8,032	22,456	15,638

Table 8

Registered Trucks and Buses - Details

	Trucks			Buses		
	Private	Rental	Govern't	Private	Rental	Govern't
1341 (1962/3)	3,982	30,337	1,000	909	7,767	100
1342 (1963/4)	3,976	30,592	1,000	966	8,785	100
1343 (1964/5)	5,159	30,840	1,108	1,303	9,385	155
1344 (1965/6)	7,640	31,235	1,515	1,652	9,993	171
1345 (1966/7)	9,942	31,267	1,944	2,010	10,411	239
1346 (1967/8)	11,247	31,658	2,335	2,360	11,170	287
1347 (1968/9)	13,438	36,412	3,526	2,741	11,415	443
1348 (1969/70)	15,129	46,021	3,377	3,342	14,776	394
1349 (10 months) (1970)	18,767	49,458	3,380	3,373	17,122	401

In the year 1348 (1969/70) the four figure licence plates were changed to those of five figures and therefore data of number of vehicles in use in 1348 (1969/70) are more reliable than previous ones. In Iran the Police Registration Department concerns itself only with new registrations; it is not informed when the vehicle is scrapped.

Table 9

Summary Statistics on Transport Equipment Industries* in Iran in 1347 (1968/9) According to the Iranian Industrial Statistics 1968 published in Bureau of Statistics, Ministry of Economy

	Iran
Total number of establishments	9399
- from these large establishments	39
Total persons engaged	28488
- from these owners, employers and family members	12366
Estimate of fixed capital in total establishments before depreciation 10^6 Rials	10477
Total new investment in the industrial establishments in 1347 (1968/9) 10^6 Rials	2116
Value of gross output 10^6 Rials	12207
Gross value added 10^6 Rials	4374

* Includs repair and maintenance shops

Table 10

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

	Central Province
Number of establishments	1516
Total persons engaged	10927
- from these owners, employers, and family members	2000
New investment (before depreciation) 10^6 Rials	317
Value of gross output 10^6 Rials	10969
Gross value added 10^6 Rials	3760

Table 11

Time Series of the Value of Output and Value Added, by Transport Equipment Industries 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)
Value of output - 10^6 Rials	7134	6974	7959	8931	9927	11538	15558
Value added - 10^6 Rials	2711	2601	2901	2722	3523	4992	4374

Table 12

Comparison of Implementation of the Fourth and Fifth Five-Year Plans in Transport Equipment Industries - According to the Fifth Five-Year Plan

	The Fourth Five-Year Plan	The Fifth Five-Year Plan
Total new employment	17300	38700
Total new investment - in 10^6 Rials	14500	41000
Total value added - in 10^6 Rials	10100	23400
The annual growth rate of employment - %	5, 5	9, 0
The growth rate of investment - %	21, 2	23, 2
The growth rate of production - %	26. 1	21, 0
The growth rate of value added	26, 5	21, 0
Ratio of capital to labour - 1000 Rls. per person	828, 1	1059, 4
Ratio of value added to labour 1000 Rials per person	583, 8	604, 1
Ratio of capital to value added	1, 43	1, 70

Table 13

Forecast of Production of Motor Vehicles in Iran until the year 1366 (1987/8)
According to the Author of this Study

	1351 (1972/3)	1356 (1977/8)	1361 (1982/3)	1366 (1987/8)
Passenger cars	42300	90000	150000	210000
- from these small cars	3800	6800	10000	14000
medium cars	35300	72000	115000	153000
large cars	4200	11200	25000	43000
Buses and minibuses	2800	4100	4800	6000
- from these minibuses	1900	2600	3000	3600
buses	900	1500	1800	2400
Trucks	3200	7800	13000	21000
Vannettes, station wagons, ambulances	13400	21400	32000	45000
- from these vannettes	11600	18800	28000	39000
station wagons and ambulances	1800	2600	4000	6000
Tractors	6000	8000	10500	13500
Tillers	2300	2700	3100	3800
Mopeds	18000	45000	80000	110000
Motorcycles	16000	40000	90000	120000
Bicycles	15000	180000	290000	350000
Trailers	3200	5600	9000	13000
Stationary diesel engines	1200	5000	7800	10800
Automobile diesel engines	4900	9800	14800	22500
Automobile petrol engines	-	65000	105000	150000
Tractor diesel engines	-	5000	9000	10500

Table 14

Forecast of Average Operation of Motor Vehicles in Iran in 1000 km/year

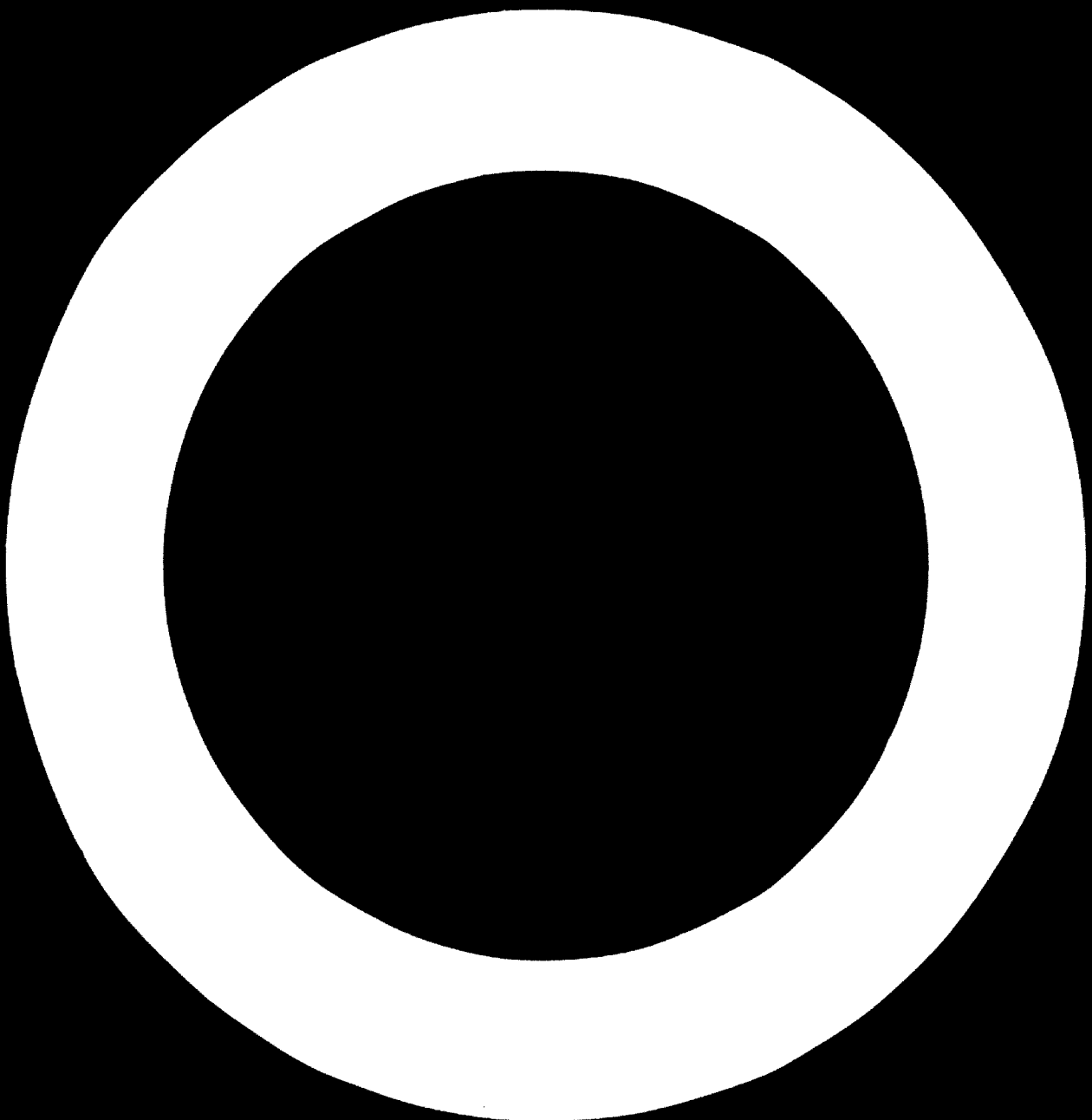
	1351 (1972/3)	1356 (1977/8)	1361 (1982/3)	1366 (1987/8)
Taxis	120	120	120	120
Cars	24-25	25-26	26-28	28-30
Station wagons and vannettes	50	55	60	65
Buses and minibuses	80	80	80	80
Lorries	120	120	120	120
Tractors	15	18	20	22
Motorcycles	24-25	25-26	26-28	28-30

Table 15

Repairs of Different Parts and Groups of Motor Vehicles will be performed after the average operation in 1000 km

	1000 km
Brake lining	30
Brake pneumatic system	30
Front and rear shock absorbers	30
Gear box	60
Propeller shaft	60
Pneumatic suspension - governor calves	60
Engine	120
Injection pumps	120
Rear axle	120
Front axle including steering tie-rods	120
Electric equipment	120
Checking instruments	120
Hydraulic system	120
Water cooling system	120
Pneumatic system	120
Body ventilation	120
Body work - door, windows, upholstery, grid inspection, warnish	120
Body work - floor exchange, headlights, side wall, bottom sheets	240

2. MOTOR VEHICLES MANUFACTURE



PASSENGER CARS

The assembly of passenger cars started in 1340 (1961/2) in Savka Co., Tehran (Fiat) - now closed and in 1341 (1962/3) in Jeep Co., Tehran and Moratab Co. (Landrover), Tehran. At present, there are five factories producing passenger cars (including pick-up).

	1343 (1964/5)	1344 (1965/6)	1345 (1966/7)	1346 (1967/8)	1347 (1968/9)	1348 (1969/70)	1349 (1970/1)
Production	2332	2152	2458	8218	20278	28268	29989
Import	14717	14081	15655	11794	12026	4407	3353
Export	-	7	6	2	9	36	217
Apparent Consumption	17049	16199	18107	20010	32295	32629	33125

Source: Research Centre for Industrial & Trade Development of the Ministry of Economy.

Production of Cars - Details

	1343 (1964/5)	1344 (1965/6)	1345 (1966/7)	1346 (1967/8)	1347 (1968/9)	1348 (1969/70)	1349 (1970/1)
Jeep Co. Rambler, Tehran	1296	1300	1337	1278	6221	6665	6082
Iran National, Tehran	-	-	-	5833	12738	16829	19794
Savka Co. (Fiat) Tehran	608	570	600	600	779	959	-
Moratab-Landrover, Tehran	428	282	521	507	497	827	1049
Iran Citroën, Tehran	-	-	-	-	43	2978	3064
Total	2332	2152	2458	8218	20278	28268	29989

Forecast of Prodaction of Passenger Cars

		1351 (1972/3)	1356 (1977/8)	1361 (1982/3)	1366 (1987/8)
Production of small cars (up to 1000 ex. cm.)	pcs.	3800	6800	10000	13000
medium cars (up to 2000 ex. cm.)	pcs.	35300	72000	115000	154000
large cars (six-cylinder)	pcs.	4200	11200	25000	43000
Total production of cars	pcs.	43300	90000	150000	210000

The above given forecast of production of passenger cars has been made by the author of this study on the base of the following assumptions:

Forecast of the production in the year 1351 (1972/3) is based on the nine months production exterpolated to twelve months (see Table 5).

Forecast of the production in the years 1356 (1977/8) and 1361 (1982/3) is based on the demand of passenger cars given in Metra's study, "Automobile industry" minus imports and production of station wagons.

Using 1361 (1982/3) as the base year and the historical annual rate of increase of production of passenger cars, figures for the year 1366 (1987/8) were exterpolated, by the author of this study.

Iran National Industrial Manufacturing Co., Tehran

This factory is producing passenger car Paykan from partly imported components and parts from Rootes Motors Birminghan, U.K. Paykan is a variation of Hillmann Hunter, having these parameters:-

Type of Car: Paykan - Hillmann Hunter, 5 seater, with front engine driving the rear wheels.

Engine: Petrol, four-cylinder in line, water-cooled, four-stroke, overhead valve, 68 HP, Volume 1724 ccm, Bore 81,5 mm, 4500 rpm

Gear Box: Four speed and one reverse

Paykan is now produced in 4 variations Paykan Standard, Paykan De Luxe, Paykan Automatic and Paykan Sports (plus Paykan Vannettes - see vannettes). In the future approximately in 1352 (1973/4) this model will be replaced by two models having petrol engine, water-cooled, four stroke, 1,500 cu.cm and 1,800 cu.cm. The foundry and the production of engines is already designed for these new models.

Description of Machinery, Equipment and Process

Press shop for production of components and parts of body is well equipped, mostly with normal and special single action as well as triple hydraulic presses upto 1,500 tons. Transport between presses (operations) is mannual. In this shop are produced outside and inside body panels, doors, flat floor pans, bumpers etc.

Special shops are manufacturing trim, table harness, dash boards, seat frames and overlays etc.

Components and parts, subassemblies and assemblies are transported to assembly shop, which is equipped with assembly conveyor. Body is welded with mechanical or semi-automatic spot welding machines; many operations are mechanized (electric screw drivers etc.).

Components and Parts Produced in the Plant: Outside and inside body panels, running boards, flat pans, trim, table harness, dash boards, seat frames and overlays, petrol tank etc.

Components and Parts Purchased in Iran: Batteries, radiators, exhaust system, rear leaf springs, components made of glass (safety and normal glass) rubber (tyres, tubes, floor coverings, sealing etc.) and plastics. Also raw materials are purchased in Iran - oils, paints, varnishes etc.

The production of engines will start in the year 1353 (1974) (see Petrol Engines) and approximately in 1357 (1978) the production of gearboxes (see Gear Boxes). It is expected that growth rate of production of cars in this factory will be substantially higher than in other factories (the same trend was in last year).

Vannettes, produced in this factory are variations of Paykan passenger cars (see vannettes).

Jeep Co. - Rambler - Tehran

This factory is producing passenger cars Aria and Shahin from partly imported components and parts from American Motors Corp., Kenosha USA and Jeep from Kaiser Jeep Corp., Toledo, Ohio, USA. Aria and Shahin are Rambler American 6805 and 6805. 5.

Produced Cars - Parameters

Type of Car	Aria, Shahin - 6 seater Rambler-American 6805, 6805. 5	Shahbar-Jeep CJ5 open body	Jeep Gladiator wagonette
Engine Type	Petrol	Petrol, Hurrican F4	Petrol, Hi-Torgue 6
Cylinder No.	6 - in line	4 - in line	6 - in line
H. P.	125	75	145
Volume cem	3105	2198	3800
Bore mm	79. 5	79. 5	79. 5
R. P. M.	water	water	water
Strokes	four	four	four

Aria (de luxe version of Shahin) is supplied in two variants, with and without automatic transmission.

Shahbar - Jeep CJ5 is produced in two variants, hard top and canvas top forms. Jeep Gladiator is included in statistics in the group of station wagons. It is presupposed that Aria and Shahin will be in the future replaced by other types of large cars, having four and six-cylinder engine. Types and sizes to be produced are not yet decided.

Description of Machinery, Equipment and Process

Press shop is well equipped with mechanical presses up to 1800 tons capacity. Transport between presses (operations) as well as finishing operations are manual. Leaf spring manufacturing shop is equipped with universal machines and is designed to cover requirements of own factory (there is no free capacity for other plants - see Leaf Springs). Also wheel rim manufacturing shop is designed to cover requirements of own factory only.

Blacksmiths' shop is designed for production of seats, trim, mufflers, wiring harness etc. There are two assembly shops, one for Aria and Shahin, one for Jeep, both equipped with spot welding machines and painting machinery and equipment for degreasing, phosphating and painting of individual panels.

Components and Parts Produced in the Plant

All pressed components and parts of body, fuel tank, mufflers, seats and interior trim, wiring harness, brake and fuel lines, wheels and rear leaf springs.

Components and Parts Purchased in Iran

Radiators, battery and tubes, glass, padding for seats, carpets, vinyl for seat covers and trim, canvas, paints, oils etc.

There is no decision about the production of engines and gear boxes; see petrol engines, gear boxes, etc.

Moratab Co. - Land-Rover, Tehran

Moratab Co. is one of the oldest factories in Iran, producing pick-up cars, and station wagons, Land-Rover, in collaboration with Rover Co. Ltd., Warwickshire, G.B. Parameters of the cars; Land-Rover ½ ton pick-up car with canvas hood with petrol engine

4-cylinder, 77 HP at 4000 rpm, volume 2286 cu.cm.,
bore 90.49 mm, water cooled, four stroke.

Land-Rover 7-seats station wagon with the same petrol engine (4-cylinder)
Land-Rover 1 ton pick-up with or without canvas hood with petrol engine,
6 cylinder, bore dia. 90.49 mm, water cooled, four stroke.

Description of Machinery, Equipment and Process:

Small press shop is equipped with hydraulic press, capacity 300 tons, crank presses and bending machines. In glass fibre shop are mannually produced roof sections made of glass fibre. Small items, like the petrol tank, exhaust system including silencer, humpers, door frames etc. are made (mostly mannually) in the blacksmith's shop. Paint shop consist of a degreasing plant and painting conveyor.

In sub-assembly shop panels and frames are spot welded to a complete body and in assembly shop are completed on a production line.

Components and Parts Produced in the Plant

Body including fibre-glass panels, trim, wiring harness, cross-members, seat frames and overlays, petrol tank, exhaust system, brake lines, bumper etc.

Components and Parts Produced in Iran

Radiator, battery, tyres and tubes, safety as well as normal glass, springs, body seats, trim materials, paints, oil etc.

There is no decision about the production of engines and gear boxes, see Petrol Engines, Gear Boxes, etc.

Iran Citroën Co., Tehran

Iran Citroën Co., Tehran started the assembly of passenger cars from imported components and parts at the end of 1347 (1968/9).

Parameters of the car: Djyan Citroen 2 CV passenger car, 4 seater with petrol engine, 2-cylinder, 18 HP, 425 cu. cm volume, bore dia. 66 mm, 5000 rpm, air cooled, four-stroke.

Citroën is now produced in three variations: AY saloon car, AYK pick-up and Mihary utility vehicle (see Vannettes). Production of this one started in 1350 (1971).

Description of Machinery, Equipment and Process:

Press shop is equipped partly with mechanic presses, partly with hydraulic presses (315 tons, and triple action press 1000 tons). Mufflers, trim, seat frames and harness are produced in special shop. Components and parts of body are assembled (spot welded as well as bolted) and then the body is painted on bogies on a track.

There are two assembly lines, body assembly line and chassis assembly line. Final assembly is done on extended chassis assembly line.

Components and parts produced in the plant

All pressed body panels, petrol tanks, bumpers, seat frames, seats trim, mufflers, battery boxes, assembly of spring units and suspensions, the wiring harness.

Components and parts purchased in Iran

Battery, tyres and tubes, safety and normal glass, paints, brake and fuel lines, seat coverings, foam, trim materials, mats, some plastic beading.

There is no decision about the production of engines and gear-boxes; most probably this factory will cooperate with other factory - see petrol engines, gear boxes, etc.

Sayka Co., Tehran

This factory was assembling passenger cars Fiat 850. Due to the fact that this firm did not produce any components or parts in Iran, its activity was stopped by authorities in 1348 (1969/70). The existing factory is now changed into repair shop for all Fiat cars.

VANNETTES, STATION WAGONS AND AMBULANCES

There are 7 factories producing vannettes, station wagons and ambulances from partly imported components and parts in Iran.

Production, Import, Export and Apparent Consumption of Vannettes, Station Wagons and Ambulances in pcs.

	1343 (1964/5)	1344 (1965/6)	1345 (1966/7)	1346 (1967/8)	1347 (1968/9)	1348 (1969/79)	1349 (1970/71)
Production	1525	1540	1435	1430	2121	1755	6615
Import	1822	1570	1244	1954	4605	5132	3629
Export	- 1	-	-	-	-	8	14
Apparent Consumption	3346	3110	2679	3384	6726	6879	10230

Source: Research Centre for Industrial & Trade Development of the Ministry of Economy.

Production of Vannettes, Station Wagons and Ambulances - Details

	1343 (1964/5)	1344 (1965/6)	1345 (1966/7)	1346 (1967/8)	1347 (1968/9)	1348 (1969/70)	1349 (1970/71)
Iran National Co. Teheran	50	50	260	847	177	778	2947
Jeep Co. Rambler Teheran	1361	920	725	1033	1595	651	1203
Iran Citroën Co. Teheran	-	-	-	-	349	147	1437
Others	114	570	450	50	-	-	-
Iran Leyland Co. Teheran	-	-	-	-	-	82	14
Zamiad-Volvo Co. Teheran	-	-	-	-	-	97	907
Moratab-Landrover Co. Teheran	-	-	-	-	-	-	107
T o t a l	1525	1540	1435	1430	2121	1755	6615

Substantial growth of consumption in 1349 (1970/1) is due to the decision of the Government that three-wheelers will not be allowed for the transportation of goods in Tehran.

Import of three-wheelers - pcs.

Tariff No.		1344 (1965/6)	1345 (1966/7)	1346 (1967/8)	1347 (1968/9)	1348 (1969/70)	1349 (1970/71)
890C24	3-wheelers with cab fitted	475	559	2244	2466	785	125
891-3	3-wheeler chassis with cab fitted	758	180	250	551	142	100
891-4	3-wheeler chassis without cab fitted	25	50	350	368	400	100
Total import of three-wheelers		1258	789	2844	3375	1327	325

Source: Foreign Trade Statistics of Iran.

Forecast of Production of Vannettes, Stations Wagons and Ambulances

		1351 (1972/3)	1356 (1977/8)	1361 (1982/3)	1366 (1987/8)
Production of vannettes	pcs.	11600	18800	28000	39000
Production of station wagons and ambulances	pcs.	1800	2600	4000	6000
T o t a l	pcs.	13400	21400	32000	45000

The above given forecast of production of vannettes, station wagons and ambulances has been made by the author of this study on the base of following assumptions:

1. Forecast of the production in the year 1351 (1972/3) is based on the nine months production exterpolated to twelve months.

2. Forecast of production for vannettes, station wagons and ambulances in the years 1356 (1977/8) until 1366 (1987/8) has been made on the basis of the growth rate applied to imports and production in the years 1344 (1965/6) until 1350 (1971/2). Projected growth rate were derived by correlation with expected levels of gross national product. In the future there will be tendency to use vannettes with substantially higher tonnage than now, i.e. the growth rate of demand and production of vannettes in pieces will be lower than growth rate of transported goods in tonkilometers.

Iran National Co, Teheran

Vannettes produced by this factory are variations of passenger cars Paykan (Hillman Hunter), i.e. they have the same engine, only the body is changed.

The similarity of most components and parts enables the plant to use the same machinery and equipment as for the production of passenger cars, t use higher mechanisation, etc. Components and parts, produced in the plant as well as purchased in Iran are the same as for passenger cars.

A small quantity of vannettes produced by this company are Benz vannettes 0. 309 (the same design as minibuses produced by this company). They are produced in two variations - high ground clearance and low ground clearance. Description of process, and production of components and parts - see Buses and Minibuses.

Zamtad-Volvo Co., Tehran

Vannettes produced by this company are special designed vehicles Nissan Junior with gasoline or diesel engine in collaboration with Nissan Motor Co., Ltd.

Type pf Vannette	Nissan Junior (gasoline) 2 tonner L140 1. 5 tonner NL140	Nissan Junior (diesel) 2 tonner QL 140
Engine	Gasoline H 20 (R)	Diesel SD22
Displacement	1982 cu. cm	2164 cu. cm
Type	water cooled OHV-4-cylinder	Water cooled OHV 4-cylinder
Bore x Stroke	87. 2 x 83. 0 mm	83 x 100 mm
Max BHP	91HP at 4800 rpm	65 HP at 4000 rpm

Description of Machinery, Equipment and Process:

New plant has well equipped press shop with six single action hydraulic presses from 160 tons upto 800 tons and 3 eccentric presses and other machines like stretch forming press, roller shears, guillotines etc. The press shop is producing not only components and parts for body and chassis, but also for mufflers, petrol tanks and air tanks (for trucks) etc. Components and parts are subassembled, then the body is assembled by welding and painted in paint shop with conveyor system. The final assembly is performed on three conveyors (one for trucks, one for vannettes, one for tractors).

Components produced in the paint

All pressed components and parts of body, some components of chassis, cross-members, petrol tanks, some trim items, harnesses etc.

Components and parts purchased in Iran

Battery, tyres and tubes, radiator, seats, safety and normal glass, body seats, paints, some plastic articles etc.

Moratab Co. - Landrover, Tehran

Vannettes produced in this factory are variations of the same pick-up car Land Rover produced in the factory, i.e. the process and most of the components and parts are the same. Stronger type is produced as well

Payloads	2 persons and 1525 kg.
Engine	Gasoline, 6 cylinder, bore x stroke 77.8 mm x 92 mm displacement 2625 cu.cm, BHP 88 at 4500 rpm, water-cooled, four stroke
Body interior length x width	3.14 x 1.61 m

Description of machinery and equipment and components and parts produced in the factory as well as purchased in Iran - see Passenger Cars - the same factory.

Kaveh Co. - Mack, Tehran

The factory is producing vannettes model CS 40000, general Motors, USA.

Payloads	2534 kg
Load room	3352 x 2171 mm
Engine	8 cylinder, gasoline, water-cooled, four-stroke, 170 HP at 4000 rpm
Number of wheels	6

As this vannette has not found good market in Iran, the factory will stop production of this model in the near future.

Iran Citroen Co., Tehran

This factory is producing vannettes Citroën AYK Fourgonette and Mihary utility and vehicle with these parameters:

Type of Engine:	Gasoline, two-cylinders, four-stroke, air-cooled 24 HP at 4500 rpm, displacement 602 cu.cm, bore dia. 74 mm, stroke 70mm

Load (including driver)	500 kg
Load room	1420 x 1620 mm
Number of wheels	4

Description of machinery, equipment and process - see Passenger Cars - the same factory. Components and parts produced in the plant as well as purchased in Iran are the same as at the production of passenger cars.

Jeep Co. - Rambler, Tehran

Vannettes Simorgh 500 and Simorgh 1000 are variations of Shahbaz Jeep CJ5 with the same gasoline engine Hurricane F4 and of Jeep Gladiator with gasoline engine Hi-Torque 6. The advantages of the similarity of most components and parts enable to use the same machinery and equipment as for production of passenger cars (pick-up and wagonette).

Vannette Simorgh 500 has a load capacity of 500 kg. Simorgh 1000 has a load capacity of 1000 kg.

Iran Leyland Co., Tehran

There are 2 types of vannettes produced in this factory:

Leyland Triumph - Pirouz, capacity 1,5 tons four-wheel drive, with gasoline engine 65 HP. It is also produced in station wagon, ambulance and fire-fighting forms.

Leyland FG 550 - capacity 3 tons with gasoline engine 87 HP at 3000 rpm. Previously this vannette was produced with diesel engines but now all vannettes are obliged to operate only with gasoline engines.

Description of machinery, equipment and process as well as components and parts produced in the plant and purchased in Iran, see Trucks.

Khalidj Co., Tehran (Iran Mazda)

This factory was previously producing three-wheelers but after the decision by the Government that three-wheelers will not be allowed for transportation of goods in Tehran, it will start in 1351 (1972) the

assembly of vannette Mazda 800 pick-up (BSA 55), seating capacity 2, pay load 400 kg, body interior length x width 1500 x 1220 mm.

Type of engine SA gasoline, 4 cylinders, water-cooled, four-stroke, displacement 782 cu.cm. 37 HP at 5000 rpm. License was issued for 1000 pcs/year.

Description of Machinery, Equipment and Process

The plant will be equipped with press shop and metal working shop, body assembly shop with spot welding units, paint shop and vehicle assembly shop with one assembly line.

The plant will be put into operation in two stages: in the first stage pressed parts of driver's cabin will be imported and in the plant only painted, welded and assembled. In the second stage also these pressings will be produced in the plant with these components and parts: Load platform and box, bumper, fuel tank, piping, cooling fan and water pump pulley and upholstery.

Components and parts purchased in Iran:

Battery, radiator, air cleaner, exhaust system, leaf springs, safety and normal glass, tyres and tubes, wiring, paints, oils etc.

BUSES AND MINIBUSES

The assembly of buses and minibuses started in 1342 (1963/4) in one factory - Iran National, Tehran. Now there are five factories assembling buses and minibuses from imported components and parts.

Production, Import, Export and Apparent Consumption of Buses and Minibuses in pcs.

	1343 (1964/5)	1344 (1965/6)	1345 (1966/7)	1346 (1967/8)	1347 (1968/9)	1348 (1969/70)	1349 (1970/71)
Production	1101	1000	1843	2325	2784	3161	3986
Import	666	727	497	242	106	70	35
Export	-	1	7	2	105	258	180
Apparent consumption	1767	1726	2333	2565	2785	2973	3841

Source: Research Centre for Industrial & Trade Development of the Ministry of Economy

Production of Buses and Minibuses - Details

	1343 (1964/5)	1344 (1965/6)	1345 (1966/7)	1346 (1967/8)	1347 (1968/9)	1348 (1969/70)	1349 (1970
Iran National Tehran	800	900	1650	1665	2320	2590	3643
Pars Lux, Tehran	-	10	153	152	206	268	191
Bus Manuf. Consort. Tehran	-	-	-	468	203	238	73
Iran Pavna Tehran	80	90	40	40	55	65	61
Arjang Tehran	-	-	-	-	-	-	18
		1000	1843	1325	2784	3161	3986

Forecast of Production of Buses and Minibuses

		1351 (1972/3)	1356 (1977/8)	1361 (1982/3)	1366 (1987/8)
Production of buses	pcs.	900	1500	1800	2400
minibuses	"	1900	2600	3000	3600
Total production	pcs.	2800	4100	4800	6000

The above given forecast of buses and minibuses has been made by the author of this study on the base of the following assumptions:

Forecast of the production in the year 1351 (1972/3) is based on the nine months production exterpolated to twelve months (see Table 5).

Using 1351 (1972/3) as the base year and the historical annual rate of increase of demand and production of buses and minibuses from the year 1343 (1964/5) until 1350 (1971/2), figures for the years 1356 (1977/8) until 1366 (1987/8) were exterpolated by the author of this study.

This forecast is higher than Metra's forecast for the years 1351 (1972/3) until 1361 (1982/3) in the study. "Automobile Industry" but substantially lower than the forecast of the Research Centre for Industrial and Trade Development for the years 1351 (1972/3) and 1356 (1977/8).

Iran National - Tehran

This factory is producing minibuses and buses in collaboration with Daimler Benz A.G. Stuttgart, G.F.R.

Minibuses - type O 309, equipped with diesel OM 314, 85HP, is designed for 12 - 17 passengers (short or long wheel based form). Engine, gear box and transmission are front mounted.

Buses - type O 302, city or inter-city versions, equipped with diesel engines OM 352 - 126HP or the OM 360 - 145HP, are designed for 42 up to 50 passengers. Engine, gear box (five speed and reverse) and transmission are rear mounted.

Buses, minibuses and trucks are assembled in other building than passenger cars. Some components and parts are produced in the central press shop or in the shop for production of seats etc., but assembly of chassis and body is carried out without moving assembly line. For welding of chassis are used universal electric rotary welding sets, for welding of body are used electric spot welding machines as well as electric rotary welding sets. Painting is done manually by spray guns.

The extent of components and parts produced in the plant and purchased in Iran is higher than in the production of cars, as diesel engines for buses, minibuses and trucks are already produced in Iran (see Diesel Engines).

The production of diesel engines already started in IDEM Co. Tabriz (see Automotive Diesel Engines); production of gear boxes see Gear Boxes etc.

Pars Lux, Tehran:

This factory is assembling minibuses and buses in collaboration with Kloeckner Humboldt Deutz A.G. (Magirus), Ulm, G.F.R.

Minibus - front and rear engined with 70E6 diesel engine, 4 cylinder, 110 HP air-cooled.

Buses for 32 and 43 passengers rear engined with diesel engine 150 E 10 and 200 E 12 165 HP, 6 cylinder, air-cooled.

Bus Manufacturing Consortium, Tehran

This factory was collaborating with two different factories. Buses produced in this factory were Consul Blissing, capacity 41 passengers, with diesel engine U7D, 167 HP, 2400 rpm.

Minibus is produced in collaboration with Fiat Co., Torino, Italy - it is OM Lupetto (OMID 94) minibus for 23 - 25 passengers with four-cylinder diesel engine 85 HP at 2400 rpm. Variation of the minibus OMID 94 is ambulance OMID 94 for 2 person and 8 beds.

The factory was in financial difficulties but in 1351 (1972/3) was continuing again in the production. The production is labour intensive due to low mechanisation.

The factory is claiming that the production in 1351 (1972/3) was nearly 250 pcs. of minibuses and that in 1352 (1973/4) it will be over 300 pieces.

Instead of the Bus Consul Blissing the factory started in 1352 (1973/4) the production of OM Tigrotto (Sariea) bus (Fiat) with four-cylinder diesel engine, bore 110 mm, stroke 130 mm, 2600 rpm, 110 HP, capacity 30 seats.

The factory also changed the name: Iran Industrial Vehicle Manufacturing Private Co. Tehran - Khodrowsazan Iran, Tehran.

Iran Peyma Co., Tehran

Iran Peyma Co. is primarily transport corporation. It is producing buses and minibuses for its own needs. This company is buying chassis of buses and minibuses mostly from Iran National Co., Tehran, and is producing only the body. The production is labour entensive due to low mechanisation.

Iran Leyland Co., Tehran:

This factory started in 1351 (1973) production of double decker buses. The production in 1351 (1972/3) was 23 double decker buses; it will be extended in 1352 (1973/4).

TRUCKS

There are four factories producing trucks from imported components and parts in Iran at present. The production started in one factory in 1340 (1961/2).

Production, Import, Export and Apparent Consumption of Trucks in pcs.

	1343 (1964/5)	1344 (1965/6)	1345 (1966/7)	1346 (1967/8)	1347 (1968/9)	1348 (1969/70)	1349 (1970/1)
Production	1063	1640	1679	1977	2693	3195	2809
Import	422	669	1187	1278	1542	725	1011
Export	1	1	1	-	-	-	1
Apparent consumption	1484	2308	2865	3255	4235	3929	3819

Source Research Centre for Industrial & Trade Development of the Ministry of Economy

Production of Trucks - Details

	1343 (1964/5)	1344 (1965/6)	1345 (1966/7)	1346 (1967/8)	1347 (1968/9)	1348 (1969/70)	1349 (1970/1)
Khavar Co. Benz, Tehran	487	787	763	910	1390	1979	1761
Iran Leyland Co., Tehran	450	650	492	700	532	481	353
Zamiad Co. Volvo, Tehran	112	200	219	250	308	338	224
Kaveh Co., Mack, Tehran	14	23	182	90	250	387	233
Others	-	-	23	27	213	10	238
Total	1063	1640	1679	1977	2693	3195	2809

Khavar Co. - Benz, Tehran

The biggest producer of trucks in Iran at present, collaborating with Daimler Benz A.G., Stuttgart, G.F.B. It is producing different types and sizes of trucks.

Types produced with parameters

Type	Kind of Truck	Permissible gross weight tons	Engine
LS2624	Refrigerating Truck	26 tons	Diesel OM355
LS2624	Tanker	26 tons	Diesel OM355
LS1924	Refrigerating truck	19 tons	Diesel OM355
LK1921	Front Tipper	19 tons	Diesel OM355
L 1921	Dropside body	19 tons	Diesel OM355
LAK911	Front tipper	9 tons	Diesel OM352
LK 911	Front tipper	9 tons	Diesel OM352
L 911	Dropside body, tanker, van	9 tons	Diesel OM352
LP 808	Dropside body, van	8 tons	Diesel OM314
LP 608	Dropside body, van	6 tons	Diesel OM314

Description of Existing Machinery and Equipment:

Pressing shop is equipped with 15 mechanical presses, the biggest are two presses à 800 tons capacity, 5 bending machines, 4 guillotine shears, etc. Welding shop has 15 pcs of welding machines of different kinds and sizes. Machining shop is equipped with lathes, milling machine, drilling machines, grinding machines, saws, etc.

Iran Leyland Co., Tehran:

This factory is producing trucks from partly imported components and parts from Leyland Motors Ltd., Lancashire, G.B. Parameters of produced trucks are:

Type of Chassis	Type of Truck ,	Gross weight	Diesel Engine
Super Comet 14BSC1L	Front tipper, dropside body	18 tons	169 HP DE400
Alamd	"	17 tons	OE401
Super Hypo 305M5L	Trailer with tractor	30 tons	210 HP DE680
305M7L		48 tons	DE681
900FG	Dropside body, van	9 tons	105 HP
	Sewerage trucks, 800 and 15000 gallon capacity, garbage trucks with 20, 35 and 50 cu.yd. capacities, Tankers for water and petroleum products of 10000, 12000 14000 and 18000 litres capacity		

Diesel engines are water-cooled, four-stroke, their production see Automotive Diesel Engines.

Description of Machinery, Equipment and Process:

A press shop is equipped with 16 mechanical and hydraulic presses, from this with 1 hydraulic press 900 tons, five 150 ton eccentric presses, one brake press and one stretch press, for cutting sheets and plates one four meters long guillotine shear is installed. In this shop pressed components and parts for cabs, body and chassis are produced.

Diesel engines are assembled with gear boxes and drive units in mechanical components assembly shop, equipped with dynamometer engine test facilities, and diesel injection equipment testing facility.

The other shops are sub-assembly and final assembly shop where cabs, body and chassis are sub-assembled and after painting operations assembled to complete truck.

Total number of workers in 1348 (1969/70) - 532, from these 166 non-operative and 366 operative workers.

Capacity of plant is approximately 1200 vehicles/annum/one shift operation.

Components and parts, produced in the plant: Body panels, drivers cab, some components and parts of chassis, seats, wiring harness, trim.

Components and parts purchased in Iran, Batteries, radiators, leaf springs, safety and normal glass, tyres, tubes (except 8.25 x 17.14 ply tyres).

Zamiad Co. - Volvo, Tehran

This factory is producing trucks in collaboration with A. B. Volvo, Goetenburg, Sweden. Parameters of produced trucks are:

Type of Chassis	Type of Truck	Gross weight capacity	Diesel Engine
N88	Trailer with tractor, front tipper, drop side body	18 tons gr.w.	185 HP 270 HP
NB88	Trailer with tractor, fron tipper, drop side body	22 tons gr.w.	185 HP 270 HP
N85	Front tipper, drop side body	14.5 t gr.w.	160 HP, 195 HP
F85	Front tipper, drop side body	6 tons capacity	118 HP

Diesel engines are water-cooled, four-stroke; their production is not presumed.

The factory was employing in 1348 (1969/70) 409 operative and non-operative workers.

Description of machinery, equipment and process as well as components and parts produced in the plant and purchased in Iran - see Vannettes - the same firm.

Kaveh Co. Mack, Tehran

Most of the components and parts are imported from Mack Trucks, Inc. Pennsylvania, Allentown, USA. The factory is producing only one type of truck

Type of Chassis	Type of Truck	Capacity	Diesel Engine
R611ST	Trailer with tractor	40 tons	250 HP

Diesel Engine is water-cooled, four-stroke; its production is not presumed.

The factory was employing 521 workers in 1348 (1969/70)

Forecast of Production of Trucks

		1351 (1972/3)	1356 (1977/8)	1361 (1982/3)	1366 (1987/8)
Production of trucks	pcs	3200	7800	13000	21000

The above given forecast of production of trucks has been made by the author of this study on the base of the following assumptions:

1. Forecast of the production in the year 1351 (1972/3) is based on the nine months production exterpolated to twelve months.

2. Forecast of production for trucks in the years 1356 (1977/8) until 1366 (1987/8) has been made on the basis of the growth rate applied to imports and production in the years 1343 (1964/5) until 1350 (1971/2).

3. Projected growth rate were derived by correlation with expected levels of gross national product.

4. The majority of goods will be transported by trucks, but there will be lower growth rate for transportation by trucks than by railway.

5. In the future there will be tendency to use trucks with substantially higher tonnage than now, i.e. the growth rate of demand and production of trucks in pieces will be lower than the growth rate of transported goods in ton kilometers.

There are some firms, buying ready chassis of trucks with engine etc. and producing only body - for example tanks etc. The biggest of these producers are Luleh Va Machine Sazi Iran Company, Tehran and Azari Tank Factory, Tehran.

Code No. 38319 Fire-Fighting Trucks

There is one factory assembling fire-fighting trucks in Iran at present - Cyrus Arjomand Tehran. This firm is importing assembled chassis with engine and it is only producing body (cabin, tank) and fire-fighting equipment (pump). The production started in 1341 (1962/3).

Import, Production and Demand of Fire-Fighting Trucks

Tariff No.			1342 (1963/4)	1343 (1964/5)	1344 (1965/6)	1345 (1966/7)	1346 (1967/8)	1347 (1968/9)
890E1-3	Import	pcs	5	5	8	7	3	18
	Production	"	50	20	30	40	45	50
	Demand	"	55	25	38	47	48	68

Source: Research Centre for Industrial & Trade Development of the Ministry of Economy.

The firm has no collaboration with any producer, it is purchasing different trucks according to the needs of the Iranian market.

Forecast of Demand and Production of Fire-Fighting Trucks

	1351 (1972/3)	1356 (1977/8)	1361 (1982/3)	1366 (1987/8)
Demand of fire-fighting trucks	75	110	150	190
Production of firefighting "	55	90	130	180

Using 1347 (1968/9) as the base year and the historical annual rate of increase of demand and production of fire-fighting trucks, figures for the years 1351 (1972/3) until 1965 (1987/8) were exterpolated by the author of this study. The production of fire-fighting trucks could be combined with the production of other special trucks like motor extension ladders (Tariff No. 890E1-4), motor sprinkling machines (Tariff No. 890E1-2), motor sweepers (Tariff No. 890E1-1) etc.

Import of Special Trucks

Tariff No.		1344 (1965/6)	1345 (1966/7)	1346 (1967/8)	1347 (1968/9)	1348 (1969/70)	1349 (1970/1)	1350 (1971/
890E1-1	Motor sweepers pcs.	12	9	4	8	14	67	4
890E1-2	Motor sprinkling machines pcs.	-	4	-	9	2	2	61
890E1-4	Motor extension ladders pcs.	1	6	-	-	-	6	2

Motor Lift Trucks

There is no production of motor lift trucks now, but John Deer Co. in Arak got licence for the assembly of model SD480. The assembly started in 1351 (1972/3) - 32 pcs/year and in 1352 (1973/4) the full capacity will be reached 36 pcs/year.

Import of Lift Trucks

Tariff No.		1345 (1966/7)	1346 (1967/8)	1347 (1968/9)	1348 (1969/70)	1349 (1970/1)	1350 (1971/2)
833 B2	Lift Trucks pcs	89	171	168	182	222	149

Source: Foreign Trade Statistics of Iran.

The production of lift trucks in Arak will cover less than 20% of total demand.

Forecast of Demand, Production and Shortage of Lift Trucks

		1351 (1972/3)	1356 (1977/8)	1361 (1982/3)	1366 (1987/8)
Demand	pcs	210	330	480	680
Existing capacity	"	36	36	36	36
New capacity	"	-	300	300	500
Production	"	32	160	330	520
Shortage	"	178	170	150	160

Using 1350 (1971/2) as the base year and the historical annual rate of increase of imports, figures for the years 1351 (1972/3) until 1365 (1987/8) were exterpolated, by the author of this study.

It is advisable to extend the existing capacity in the Fifth and in the Sixth Five-year Plans.

MOTORCYCLES AND MOPEDS

Till now, there are only two firms producing motorcycles from imported components and parts:

Khalidj Company - Teheran

This factory is collaborating with Piagio and Company Spt, Genova Italy, producing Vespa motorcycle 90 cu. cm., 7,5 HP air-cooled, two-stroke. The licence was issued for a production of 1500 pcs/year, but the production in 1348 (1969/70) was only 419 pcs. and approximately 300 pcs. in 1349 (1970/71).

The factory got also a licence for the production of three-wheelers, 1000 pcs/year (Vespa 11 HP, 125 cu. cm.) but as three-wheelers are prohibited to be used in Teheran, three-wheelers will not be produced and most probably even the production of motorcycles will be stopped in 1350 (1971/2) (the factory will assemble vannettes instead of three-wheelers - see Vannettes).

Taheri Industrial Company - Teheran

The production started in mid - 1350 (September 1971). Production program is now limited to two types:

Moped - Towsan 50 cu. cm., 3 HP, air cooled, two stroke, total weight 47 kg.

Motorcycle Zoobin 100 cu. cm., 6 HP, air cooled, two stroke, 4 speeds, total weight 67 kg.

Both products are made in collaboration with Ducati S.A. Italy. In the future, they would like to produce also motorcycle 125 cu. cm. It is

expected that the production in 1350 (1971/2) will reach 3000 pieces (in January 1972 only 300 pcs. were sold), in 1351 (1972/3) approximately 12000 pieces. The capacity of the plant is approximately 24000 pieces/year in one shift (15000 pieces of Towsan and 9000 pieces of Zoobin).

At present time the factory is producing the whole frame of motorcycles and mopeds, tanks, mudguards, silencers, wheel rims and front shock absorbers. The rear shock absorbers will be produced later. Footrests, handles, stop light covers and shield, made of plastics are also produced in the factory. Tyres and tubes are supplied by Iran Yasa Teheran, seats by Moazemi Mashad and die castings by Arseshkar Teheran.

Moped 50 cu. cm. and motorcycle 100 cu. cm. do not have battery. Motorcycle 125 cu. cm. has a battery. When motorcycle 125 cu. cm. will be produced in the plant, the battery will be supplied by Nirou Company, Teheran.

All other components and parts, i.e. complete engine with gearbox chain and chain wheels, all electrical outfit, rear shock absorber etc., are now imported. In the future some of these components and parts will be produced in the factory.

Description of Existing Machinery and Equipment

The factory is equipped with special machines for production of wheel rims, pipe reducing, cutting and bending machines, horizontal drilling machines, frame assembly machine with spot and butt welding machines; components and parts made of sheets are pressed on 500 tons hydraulic press and 63 tons mechanical press. Frame after welding is sand blasted, then phosphated, painted and dried in tunnel drier. Wheel rims, mudguards, silencers etc., are metal plated (degreasing, copper, nickel and chrome coating).

Motorcycles and mopeds are assembled on belt conveyor.

Total number of employees 50, total floor space 4000 sq. m.

Dealan Rex Co. Ltd. Tehera

The company was est[illegible] in 1343 (1964) and got the licence for production of 2500 mopeds [illegible] cm. The firm is collaborating with Sachs A.G. West Germany.

The factory is claiming that the capacity of the plant is 10000 pcs./ye in one shift operation.

The Production of Mopeds	1347 (1968/69)	1348 (1969/70)	1349 (1970/71)	1350 (1971/72)	1351 (1972/73)
Production of Mopeds pieces	4252	5657	7527	9153	12500

Source : Research Centre for Industrial and Trade Development of the Ministry of Economy.

At present time the factory is producing the frame of moped, tank, wheel rims, shock absorber, mudguards, silencers, footrests, handles etc. Tyres and tubes are supplied by Iran Yasa Co. Teheran, seats by Maarun Mashad. All other components and parts, i.e. complete engine with gear box, chain and chain wheels, all electrical outfit, brakes etc., are now imported.

In the future some of these components and parts will be produced in the factory.

The existing machinery and equipment is mostly the same as at Taheri Industrial Co. Teheran. The total number of employees (workers, clerks, experts) is 80.

The other factory for production of motorcycles and mopeds (motorpedals cycles) is under construction:

Iran Bicycle and Motorcycle Manufacturing Co. Qazvin

This factory will produce motorcycles, mopeds and bicycles. Mopeds (motorpedale cycles) will be produced in collaboration with Motobecane-Joint Stock Co. Pantin, St. Denis, France. The licence was issued for a production of mopeds (motorpedale cycle), engines 0 cu. cm. up to 125 cu. cm. air-cooled, two stroke, 25000 pieces per year in the first stage and 40000 in the second stage.

The production of three types of mopeds - AV50S - AV50VS and AV 92 biplace will start at the end of 1351 (1972/3) by assembly of imported components and parts and then step by step the whole moped will be produced in the factory, including some components of engine. Saddles, valves, pumps, chains, freewheels, flywheel magnetos and various electrical equipment, carburettors, taps, plugs, speedometers, pistons and rings will not be produced in the factory.

The production of mopeds in the first stage will be 25000 pieces/year, the full capacity will be 40000 pieces/year in one shift.

The licence for production of motorcycles was issued for 15000 pieces in the first stage and 35000 pieces in the second stage.

Motrocycles will be produced in collaboration with Yamaha Motor Company Ltd., Japan. The production will comprise models with gasoline engines 50 cu. cm. 80 cu. cm., 100 cu. cm., 125 cu. cm., 250 cu. cm., 350 cu. cm. and 650 cu. cm. The production will start with approximately 15000 pieces of motorcycles per year and the final capacity will be 35000 pieces/year in one shift.

Description of Machinery and Equipment

The factory will be equipped with modern mechanical presses (2 pieces @ 200 tons, 1 piece @ 300 tons, 1 piece @ 500 tons), welding equipment (spot welding machines), assembly conveyors, tunnel kiln for enammelling, testing equipment etc. In the third stage of construction (after 2 years) the multi-spindle lathes will be installed. Total employment (including the production of bicycles) will be 740 workers and 52 techniciane, clerks and experts.

Import of Motorcycles and Pedalcycles Motor Assisted*

Tariff No.	1343 '64/65	1344 '65/66	1345 '66/67	1346 '67/68	1347 '68/9	1348 '69 70	1349 70/1
894-1 Motorcycles - pieces	8301	17257	19896	15093	23558	35708	40381
894-2 Pedalcycles Motor Assisted - pieces	4528	7554	12969	22594	31889	28039	44094

*Pedal cycles motor assisted include mopeds and bicycles with small auxiliary engine.

Source : Foreign Trade Statistics of Iran

Yamaha Company Qazvin

Ministry of Economy issued in 1351 (1972/3) new licence to Yamaha Company in Qazvin for production of motorcycles. Projected capacity of this new plant is 23200 motorcycles per annum. This factory is collaborating with Yamaha Company Japan, and will produce motorcycles from 90 cu. cm. up to 600 cu. cm. The production will start most probably in 1353 (1974/5); the first type to be produced will be motorcycle Yamaha 250 cu. cm.

Forecast of Demand, Capacity, Production and Shortage of Motorcycles

	1351 (1972/73)	1356 (1977/78)	1361 (1982/83)	1366 (1987/8)
Demand	48000	70000	100000	120000
Existing Capacity	30000	73000	73000	73000
New Capacity	-	-	50000	80000
Production	16000	40000	90000	120000
Shortage	32000	30000	10000	-

Forecast of Demand, Capacity, Production and Shortage of Mopeds

	1351 (1972/73)	1356 (1977/78)	1361 (1982/83)	1366 (1987/88)
Demand	40000	70000	90000	110000
Existing Capacity	35000	50000	50000	50000
New Capacity	-	-	50000	80000
Production	18000	45000	80000	110000
Shortage	22000	25000	10000	-

The above given forecast of demand and production of motorcycles and mopeds has been made by the author of this study on the basis of the growth rate applied to imports and production in the years 1344 (1965/66) until 1350 (1971/72). Projected growth rates were derived by correlation with expected levels of per capita income.

BICYCLES

Until now, there was only small production of bicycles from imported components and parts. The majority of demand was covered by imports.

...t of Bicyles According to the Foreign Trade Statistics of Iran

	1345 ('66/67)	1346 ('67/68)	1347 ('68/69)	1348 ('69/70)	1349 ('70/71)	1350 ('71/72)
1 Bicycles - pieces	77,396	73,153	118,380	133,256	141,937	111,358
2 Tricycles not motorized - pieces	2,897	2,211	2,989	3,006	1,871	2,206
2 Parts of bicycles - kg.	627,208	764,640	639,575	786,058	959,500	748,827

...r construction is new, modern factory:

Iran Bicycle and Motorcycle Manufacturing Company - Ghazvin

The factory will start the production of bicycles in 1351 (1972) pa from imported components and parts. The production programme will inc 5 sizes of bicycles - 14", 20", 22", 26" and 28" and also motorcycles an mopeds (see Motorcycles and Mopeds).

The capacity of the plant will be 120,000 pcs. of bicycles per ye in the first stage and 200,000 pieces per year in the second stage.

In the second stage all components and parts, except chains will b produced in the factory or will be purchased in Iran.

Forecast of Demand, Capacity, Production and Shortage of Bicycles

	1351 (1972/3)	135? (1977/78)	1361 (1982/83)	1366 (1987/88
Demand - pieces	130,000	200,000	290,000	350,000
Existing Capacity - pieces	120,000	200,000	200,000	200,000
Planned Extension - pieces	-	-	100,000	200,000
Production - pieces	15,000	180,000	290,000	350,000
Shortage - pieces	145,000	20,000	-	-

Using 1350 (1971/2) as the base year and the historical annual ra of increase of imports, figures for the years 1351 (1972/3) until 1366 (19 were exterpolated by the author of this study. Projected growth rates wer derived by correlation with expected levels of per capita income.

It is advisable to extend the existing capacity in the sixth and sev five-year plan.

TRACTORS

There are three firms assembling tractors from imported components and parts in Iran at present.

Tractor Plant in Tabriz

This factory is assembling tractors Universal U650, (two-wheel drive) U651 (four wheel drive), from imported SKD (semi knocked-down) components and parts from Romania.

Description of Tractor Universal U650, U651:

Engine:

Type	Diesel D 103
Cylinder No.	4
Bore mm.	128
Volume cu. cm.	3780
R. P. M.	1200/2800
Cooling	water
Strokes	four

The assembly started at the end of the year 1348 (1970). The production was 30 pieces in 1348 (1969/70) and 3032 tractors in 1349 (1970/71) but a large part of the production remained unsold. In 1350 (1971/2) the assembly was again 3000 pieces - orders were placed by Bongah, state owned organizetion for marketing and servicing agricultural tractors. Until now (1351) no components and parts are produced in Iran. There are now 475 employees and the total covered aree is 12000 sq. m. Under construction are halls for pressing shop, welding shop, tool room and gear shop - the additional covered area will be 35,000m^2. After completion of the whole plant, the total area covered will be 173,510m^2. The existing machinery consists of only one assembly conveyor, onepainting boot, 3 testing machines for transmission system and relatively small training centre.

Contract for machinery and equipment for production of comp
and parts was signed in 1351 (1972); in 1352 (1973) will start pressing
welding and painting operations and after five to six years the product
will reach 5000 pieces/year i.e. the full capacity of the first stage of
construction and the local content of components will be 80-90%. dies
engines will be produced in the plant (or in other plants in Iran).

In the detailed project report it was assumed that this plant
have its own foundry, capacity 14,000 tons/year, and forge plant but, u
now no decision has been taken if these shops will be built. In the f
lack of castings and forgings may cause troubles.

It is estimated that after 10 to 15 years the production will
10,000 pieces/year i.e. the full capacity of the second stage of constr

John Deere Co., Arak

The factory is assembling tractors from imported SKD compo
(semi knocked-down).

Type of Tractor	Diesel Engine
920	40 HP, water-cooled, four
2120	76 HP, water-cooled, four
3120	86 HP, water-cooled, four
4020	106 HP, water-cooled, four

The assembly started in 1349 (1970), the production was 100
In 1355 (1976/77) local content of components will be 30% - this is ve
and should be improved in the next years. It is estimated that at the
production, type 2120 (76 HP) will represent 65% (1350 pieces/year);
quantity is big enough for production of diesel engines in one of the e
(or under construction) factories.

This factory is also assembling combines, planters and other agricultural machinery and equipment and in future it will produce motor graders, wheel and crawler loaders, forklifts, crawler dozers etc. (see Agricultural Machinery and Equipment; Machinery and Equipment for Building Industry).

Jarnrad - Volvo, Teheran

This factory was assembling until 1349 (1970/71) from SKD (semi knocked-down) components tractors Volvo T600 with 65 HP diesel engine, water-cooled, four-stroke, but from the year 1350 (1971/2) it is assembling tractors Volvo T650 with 72 HP diesel engine, water-cooled, four-stroke. The licence was issued for maximum 2000 pieces/year, the assembly started in the year 1344 (1965/66).

Production of Volvo Tractors

	1344 ('65/6)	1345 ('66/7)	1346 ('67/8)	1347 ('68/9)	1348 ('69/70)	1349 ('70/71)
Production of Tractors pieces	400	400	400	400	400	550

It is estimated that the production in 1350 (1971/2) was 500 pieces and in the near future the maximum will be 600 pieces/year.

Until now there is no local production of components and parts and even in the future the local content of components and parts will remain very low.

Import, Production, and Consumption of Tractors - pieces

Tariff NO.		1344 ('65/6)	1345 ('66/7)	1346 ('67/8)	1347 ('68/9)	1348 ('69/70)	1349 ('70/1)
889-1	Import of Tractors	3879	3093	3247	2985	4809	3038*
	Production of Tractors	400	400	400	400	900	3682
	Consumption	4279	3493	3647	3385	5709	5720*

Source : Research Centre for Industrial and Trade Development of the Ministry of Economy.

* Estimates

Forecast of Demand, Capacity, Production and Shortages of Tractors - pieces

	1351 ('72/3)	1356 ('77/8)	1361 ('82/3)	1366 ('87/8)
Demand of Tractors	6250	8700	11100	15000
Capacity of Existing Plants approximately	6000	8000	12000	14000
Production	6000	8000	10500	13500
Shortage	250	700	600	1500

The above given forecast of demand and production of tractors in the years 1356 (1977/8) until 1366 (1987/8) has been made on the basis of the growth rate applied to imports and production in the years 1344 (1965/6) until 13 (1970/1).

TILLERS

Tillers are small tractors equipped with plough or other kind of agricultural implements, driven by diesel or petrol engine and hand operated by operator walking after.

There is one factory assembling tillers from imported components and parts in Iran at present.

Ashtad Iran Manufacturing Ind. Co. Ltd. - Teheran

The factory is located 64 km. from Teheran on the road Karadj - Qasvin and is assembling the following tillers from imported CKD components and parts from Mitsubishi Company Japan. Some components are already produced in the factory.

Import of Components and Parts for Tillers

Type of Tiller	Engine	1347 ('68/9)	1348 ('69/70)	1349 ('70/1)	1350 ('71/2)	1351 ('72/3)
T 83SD6	Diesel, 8HP	200	380	20	-	-
T 83M85	Diesel 8, 5HP, 2200 RPM	-	-	-	240*	400*
T331M4HE	Diesel, 4, 5HP, 2200 RPM	-	-	-	600*	330*
T331ST3HE	Kerosene 4, 5HP, 1600 RPM	1,400	300	-	400*	250*
T331ST3HE	Kerosene 4, 5HP	500	-	-	-	-
T331SD3HE	Diesel 4, 5HP	-	300	-	-	-
T531K5A	Kerosene 7HP, 2200 RPM	200	270	60	50*	120*
T531M7	Diesel 7HP, 2200 RPM	-	-	-	500*	1200*
T531SD5	Diesel 7HP, 2200 RPM	950	1040	160	-	-
	Total	3250	2290	240	1800*	2300*

* Estimates

Diesel engines as well as kerosene engines are four-stroke, water-cooled, one cylinder. License was issued for production of 6000 pieces, but there is no market for such a large quantity. Two types of tillers are partly produced in the factory, the local content is approximately 27%. In the future the third type will be partly produced in Iran. The factory asked for licence for production of small diesel and kerosene engines up to 8, 5HP - see Engines for Tillers.

When tiller is working in field in shallow water or in mud, wheels with tyres are replaced by special wheels made of steel sheets and tubes. There are three types of these special wheels (for mud and shallow water); all of them are 100% locally made.

Import and Production of Tillers

Tariff No.		1346 ('67/8)	1347 ('68/9)	1348 ('69/70)	1349 ('70/1)	13[illegible] ('71[illegible]
889-2	Import of Tillers - pieces	2,570	2,309	920	154	[illegible]
	Production of Tillers - pieces	-	3,250	2,290	240	1,[illegible]
	Demand - pieces	2,570	5,659	3 210	394	2,[illegible]

Source : Research Centre for Industrial and Trade Development of the Ministry o Economy.

Forecast of Demand and Production of Tillers

	1351 (1972/3)	1356 (1977/8)	1361 (1982/3)	1366 (1987/8)
Demand	2900	3200	3550	4200
Production	2320	2700	3100	3800
Shortage	580	500	450	400

Forecast of demand and production for tillers in the years 1351 (1972/3) until 1366 (1987/8) 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 (1967/8) until 1349 (1970/1)

Description of Existing Plant

Total covered area is 14,000 sq. m. (including offices and stores); total number of employees is 164, (including production of trailers, treshers, rice dryers and agricultural implements). The factory is equipped with modern universal machine tools and presses.

TRAILERS

There are different types of trailers produced in Iran at present starting from small two-wheel trailers up to the biggest trailers having the capacity of 100 tons (8 axes, 32 wheels)

Import of Trailers

Tariff No.		1344 ('65/6)	1345 ('66/7)	1346 ('67/8)	1347 ('68/9)	1348 ('69/70)	1349 ('70/1)	1350 ('71/2)
898B-1	Trailers - pieces	338	868	726	1,008	800	563	624

Source : Foreign Trade Statistics

Production of Trailers According to the Bureau of Statistics of the Ministry of Economy

CODE NO.		1345 (1966/67)	1346 (1967/68)
383414	Production of Heavy Trailers - pieces	1,971	1,414
383415	Production of Light Trailers - pieces	116	226

There are many firms in Iran at present, producing trailers for trucks as well as for tractors. The biggest are:

Mahmoud Ghand Chie, Teheran

Production in 1348 (1969/70) - 325 pieces of trailers, mostly for industrial purposes, the biggest trailers having a capacity of approximately 40 tons.

Hozzeinzadeh - Isfahan

This factory produced in 1349 (1970/71) - 20 pieces of agricultural trailers. Other products - agricultural machinery and equipment.

Aras Factory - Teheran

Production programme : trailers, tow and four wheelers, annual production 50 pieces. This firm is also producing agricultural machinery and equipment.

Kabeh Company Shiraz

Production programme : trailers, mostly for agriculture, production in 1349 (1970/71) - 50 pieces. Other products - agricultural machinery and equipment.

Daghigh - Shiraz

This workshop is producing trailers for agriculture, production in 1349 (1970/71) was 10 pieces.

Hadadian - Shiraz

This workshop produced only one (1) agricultural trailer in 1349 (1970/71). Main production programme : agricultural machinery and equipment.

Khalesi - Shiraz

This workshop is producing agricultural trailers - production in 1349 (1970/71) - 10 pieces.

Milani - Tabriz

Trailers for agriculture, production in 1349 (1970/71) - 3 pieces.

Ensaft - Rasht

Production programme - trailers for agriculture, capacity not given.

Machine Roll - Technical Production - Road and Construction Machines - Teheran

This firm is producing:

(1) Trailers drop side body, capacity 4 tons, 5 tons, 10 tons.
(2) Trailers front tipper, drop side body with hydraulic tipper, capacity 4 tons, 5 tons, 10 tons.
(3) Special trailers for garbage, covered, with doors on the top.
(4) Caravan trailers - two sizes 8m x 2, 5m x 2, 4m and 6m x 2, 5m x 2, 4m.

The quantity produced is not known.

Kaveh Company - Teheran

This factory is producing also trailers for trucks produced in the factory. The biggest trailer produced in the plant has a capacity of 100 tons (8 axes, 32 wheels).

Ashtad Iran Manufacturing Ind. Co. Ltd. - Teheran

This factory is producing two types of small two-wheel trailers, having capacity of 750 kg.

Production of Trailers in Ashtad Iran Manufacturing Ind. Co. Ltd.

	1350 (1971/2)	1351 (1972/3)
Production of Trailers	600*	400*

*Estimates

Mostafa Ghand Chie, Teheran

Production in 1348 (1969/70) - 216 pieces of trailers - mostly for industrial purposes.

Sharbah Co. - Sari

Production in 1348 (1969/70) - 126 pieces of trailers.

Tolima Co. Teheran

Production in 1348 (1969/70) - 45 pieces of trailers.

Dars Co. - Teheran

Production in 1348 (1969/70) - 30 pieces of trailers.

Hamasaeb Co. Teheran

Production in 1348 (1969/70) - 29 pieces of trailers.

Truck Rah Company - Teheran

Production of caravan trailers 4 x 12m - suitable for office etc. and 5 sizes of trailers from capacity 0,7 tons up to 10 tons.

Hosseinzadeh and Dadkhah - Esfahan

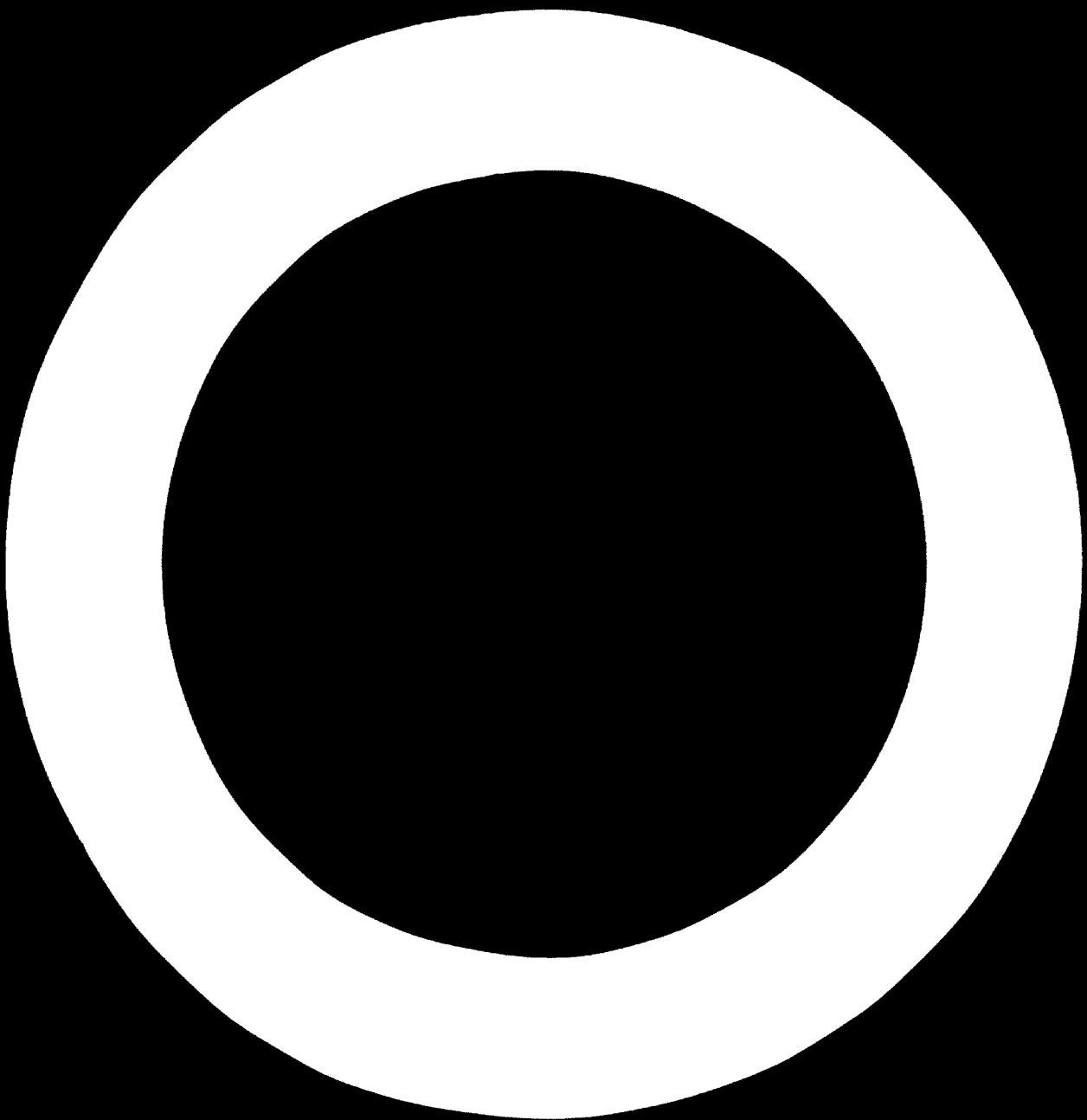
Production of agricultural trailers, production in 1349 (1970/1) - 20 pieces.

Forecast of Demand and Production of Trailers

	1351 (1972/73)	1356 (1977/8)	1361 (1982/83)	1366 (1987/8)
Demand - pieces	3,200	5,600	9,000	13,000
Production - pieces	2,800	5,300	8,750	12,800
Shortage - pieces	400	300	250	200

The above given forecast of demand and production of trailers has been made by the author of this study on the basis of the growth rate applied to imports and production in the years 1344 (1965/6) until 1349 (1970/71). Projected growth rates were derived by correlation with expected growth rates of demand of tractors and trucks.

3. AUTOMOTIVE AND STATIONARY PETROL AND DIESEL ENGINES INCLUDING GEAR BOXES, THEIR COMPONENTS AND PARTS



AUTOMOTIVE PETROL ENGINES

All cars and station wagons and some vannettes assembled in Iran are driven by petrol engines.

Until now there is neither production of petrol engines nor of components and parts in Iran. All petrol engines are imported completely assembled. In the future there will be production of petrol engines for Peykan-Hillman Hunter produced in Iran National Company Teheran.

Iran National Industrial Manufacturing Company Teheran

Petrol engine used now for completion of passenger car Peykan-Hillman Hunter is four-cylinder, water-cooled, four-stroke, 68HP, volume 1724 ccm, bore 81,5 mm, 4500 r.p.m.

New models, which will be produced in the future will be equipped with two different petrol engines: 1500 ccm (normal Peykan) and 1800 ccm (the hi-line Peykan model); both engines will be four-stroke, four-cylinder, water cooled.

Project prepared by Iran National Industrial Manufacturing Company is designed for production of approximately 62000-65000 pieces of petrol engines per year, i.e. machines and facilities have been proposed within project to cater for 15 engines per hour nett capacity on 2 shifts working and assembly tooling and facilities at 30 per hour nett capacity on single shift working. Foundry for grey iron castings will have a production rate of 15 sets per hour double shift.

In the first stage there will be cast and machined these components and parts: cylinder blocks, cylinder heads, bearing caf, fan pulley hub,

water pump impellor, exhaust-manifold, flywheel, timing wheels-camshaft, alternator pulley, brake drums, brake discs-timing wheels-cranshaft.

In the second stage the following components and parts will be machined (castings and forgings will be imported from Chrysler United Kingdom Limited)= camshaft, coun rod assembly, distributor and oil pump pinion, rockers, tappet, lining cover, crankshaft, rocker shaft, starter ring, induction manifold, water pump body, and rocker pedestal.

The average capacity of melting facilities (oil fired rotary melting furnace) will be 6,5 tons/hour with 30% spare capacity (based on 80 hours per week); the maximum capacity is 8 tons/hour.

All other components and parts, not mentioned above will be either purchased from U.K. or from other firms in Iran.

Forecast of Demand Production and Shortage of Petrol Engines in Iran National Industrial Manufacturing Company, Teheran According to the Author of This Study

	1351 (1972/73)	1356 (1977/78)	1361 (1982/83)	1366 (1987/88)
Demand - pieces	35,300	72,000	115,000	153,000
Existing Capacity - pieces	-	65,000	65,000	65,000
New Capacity - pieces	-	-	55,000	55,000
Production - pieces	-	65,000	90,000	120,000
Shortage - pieces	35,300	7,000	25,000	43,000

Before the new plant will reach the planned capacity (it is doubtful if it will be in 1356) it will be already small for existing demand.

It is recommended to enlarge facilities under construction to cover not only bigger demand but also to produce more components and parts to avoid imports.

Other Automotive Petrol Engines

Other firms, producing cars, station wagons and vannettes with petrol engines, have no intention to produce petrol engines in Iran. At present the demand of these cars, station wagons and vannettes is low, below threshold for production of petrol engines and even in the future there will be no improvement in this respect. Some details about existing factories:

Iran Citroen Company Teheran

Iran Citroen Company Teheran is producing cars, pick-ups and in 1350 (1971-72) started the production of vannettes, all with the same petrol engine 2-cylinder, four-stroke, air cooled, 425 cu. cm. volume, bore diameter 66 mm., 5000 r.p.m. 18 HP.

Production of Citroen Cars and Vannettes

	1347 (1968/69)	1348 (1969/70)	1349 (1970/71)	1350 (1971/72)
Cars	43	2978	3064	2742*
Vannettes	-	-	-	2443*
Total	43	2978	3064	5185*

* 11 months only.

Forecast of Demand of Petrol Engines in Iran Citroen Company Teheran According to the Author of this Study

	1351 (1972/73)	1356 (1977/78)	1361 (1982/83)	1366 (1987/88)
Petrol Engines - pieces	3800	6800	10000	14000

The demand of petrol engines in Iran Citroen Company Teheran will remain below the threshold even after 15 years. Production of these petrol engines could be solved only in bigger unit with production of other petrol engines (for example small stationery petrol engines etc.)

Jeep Company Rambler, Teheran

This firm is producing cars, station wagons and vannettes with these petrol engines:

Aria, Shahin, cars with petrol engine 6-cylinder, four-stroke, water-cooled, volume 3105 cu. cm. bore diameter 79, 5 mm. 4200 r.p.m. 125 HP. The production was in 1350 (1971/2) - 11 months - 3639 pieces. It is not pre-supposed that this petrol engine will be produced in Iran, as the demand is and will remain low for economical production.

Shahbar-Jeep CJ5, open body with petrol engine 4-cylinder, four-stroke, water-cooled, volume 2198 cu. cm. bore diameter 79, 5 mm. 4000 r.p.m. 75 HP

Jeep Gladiator wagonnette with petrol engine 6-cylinder, four-stroke, water-cooled, volume 3800 cu. cm. bore diameter 79, 5 mm. 4400 r.p.m. 145 HP.

The production of both Jeep in 1350 (1971/72) - 11 months was 2683 pieces. There is no possibility to produce these petrol engines in Iran.

Moratab-Landrover Company Teheran

This factory is producing pick-up cars and vannettes with the same petrol engine 4-cylinder, four-stroke, water-cooled, volume 2286 c.c. cm., bore diameter 90,49 mm. 4000 r.p.m. 77 HP. The production of pick-up cars and vannettes was 1978 pieces in 1350 (1971/72) - 11 months.

AUTOMOTIVE DIESEL ENGINES

Trucks, buses, mini-buses, tractors and tillers assembled in Iran are mostly driven by diesel engines. The growing production of these vehicles stirred up the production of automotive diesel engines. In operation or under construction are the following plants:

IDEM - Iran Diesel Engine Motors Company Tabriz

This factory will produce all diesel engines for Benz trucks, buses and mini-buses, i.e.

Type	OM314	OM352	OM355	OM360
Application	Truck 608, 808 Mini-bus 309	Bus 980 Truck 911	Truck 1921, 1924, 2624 Buses 1313, 1317	Bus 915
Cylinder No.	4	6	6	6
Bore mm.	97	97	128	115
HP	30-85	45-120	115-220-, 115-240	80-192
RPM	1200-2800	1200-2800	1200-2200	1200-2300
Weight kg.	290	382	792	620
Cooling	- Water-cooled -			

The buildings are complete, but the production started only by assembly of diesel engines made of imported CKD components in 1349 (the beginning of 1971), production approximately 5 sets/day. In 1350 (1971/72) the production is 80 up to 100 pieces/week. When the factory will reach full capacity (approximately after 4 years) it will produce 12000 sets/year

in two shifts. Components and parts will be produced in the factory in the second up to the fifth stage of production. In the second stage of product beginning of 1351 (April 1972) some small components and parts and compo water pump and oil pump will be produced, in the third stage of production 1351 (1972) medium size components and parts including fly wheel and gear for starter will be machined, in the fourth stage of production timing gears and crankshaft will be produced and in the fifth stage of production the crar case and cylinder head will be produced in the factory.

In the fifth stage of production the content of components and parts produced in the factory will be approximately 45-50%.

Fuel injection pumps including fuel feed pump, governors and nozzles, filters, crankshafts etc., will be imported (or purchased in Iran).

Production of Trucks, Buses, Mini-buses with Benz Diesel Engines in 1349 (1970/71)

	Trucks	Buses	Mini-buses	Total
Iran National Teheran pieces	-	924	2736	3660
Khavar Company Benz Teheran - pieces	2470	-	-	2470
				6130

Forecast of Demand of Benz Diesel Engines

	1351 (1972/73)	1356 (1977/78)	1361 (1982/83)	1366 (1987/88)
Demand of diesel engines - pieces	4900	9800	14800	22500
Production of diesel engines - pieces	4900	9800	14800	22500

From the above given data it is seen that the full capacity of the factory will be utilized in 1359 (1980/81). In the next years it will be necessary to increase the production by additional shift and/or by installation of new capacities.

Existing Machinery and Equipment

There is only assembly line and 16 testing stands in operation at present. Line for production of water pumps and oil pumps will be equipped with special machine tools as well as universal machine tools.

Leyland Diesel Iran Tabriz

This plant should produce diesel engines for Leyland trucks and vannettes, i.e.

Type	OE 680,681	OE 400,401
Application	Truck	Truck, Vannette
Cylinder No.	6	6
Bore mm.	127	107, 19
HP	200-240	125-149
RPM	2400	2600
Weight kg.	800	536
Cooling	Water-cooled	

The plant is under construction, the buildings are ready, but the machinery and equipment will be installed at the end of 1973 (1352) (if there will be the continuation of this project).

Detailed project report was prepared and buildings were built for capacity of 6000 sets/year in two shifts. The plant is designed without own foundry and forge. As the demand in the near future will be substantially lower than the capacity (see forecast of demand below), the capacity as well as the machinery and equipment for production of components and parts will be most probably reduced. Crankshafts and timing gears will be not produced in the plant.

Production of Trucks and Vannettes with Leyland Diesel Engines in 1349 (1970/71)

	Vannettes	Trucks	Total
Iran Leyland Company Teheran	316	334	650

In future vannettes will be produced with petrol engines (only vannettes with petrol engines will be allowed in towns), therefore the demand of diesel engines will be substantially reduced.

Forecast of Demand of Leyland Diesel Engines According to the Author of This Study

1351 (1972/73)	1356 (1977/78)	1361 (1982/83)	1366 (1987/88)
300	580	1100	2000

From the above given forecast of demand it is seen that the plant with a capacity of 6000 sets/year will be fully utilized after approximately 30 years. Even when the capacity of the plant will be substantially reduced, the plant will not face an adequate market. There are three possibilities how to utilize the free capacity:

(1) Export of diesel engines to Turkey, where the same diesel engines are needed for completion of Leylands trucks and tractors.

(2) Production of diesel engines in licence for other trucks, vannettes, tractors, buses etc. - for example for John Deer Volvo, Tractor Plant in Tabriz etc.

(3) Substitution of diesel engines in some trucks, vannettes, tractor and buses assembled in Iran by Leylands' diesel engines.

It will not be easy to solve any of these variants.

Tractor Manufacturing Company Tabriz

This plant will produce complete tractor Universal U650, U651 including diesel engine, i.e.

Type	D103
Application	Tractor U650, U651
Cylinder No.	4
Bore mm.	97
HP	60
RPM	1200-2800
Cooling	Water-cooled

As the production of diesel engines is combined with the production of tractors to one plant, all data see Production of Tractors.

Other Automotive Diesel Engines

Other firms, producing buses, mini-buses, vannettes, trucks, tillers and tractors with diesel engines have no intention to produce diesel engines in Iran. In all cases the production of buses, mini-buses, vannettes and tractors is low. Only tractors produced by John Deer Company in Arak will be produced in bigger quantity (see Tractors).

Other Firms, Producing Buses, Mini-buses, Vannettes and Tractors with Diesel Engines - Production 1349 (1970/71)

	Buses	Minibuses	Vannettes	Trucks	Tractors	Total
Pars Lux	100	124	-	-	-	224
Jamia-Volvo Teheran	-	-	180	275	550	905
John Deer Co. Arak	-	-	-	-	100	100
Kaveh Co. Mack Teheran	-	-	144	100	-	244
Total	100	124	324	375	650	1473

In future some diesel engines for these vannettes, trucks etc. might be produced in Leyland Diesel Iran Tabriz (see above) or in Dorman Diesel Iran Tabriz (see stationary Diesel Engines) some of them even co-operated in the frame of RCD countries.

STATIONARY AND MARINE DIESEL ENGINES

Stationary diesel engines in Iran are mostly used for agricultural irrigation and power generation; a substantially smaller quantity is used for pumps in dwelling houses, connected to other machines like compressors, concrete mixers, welding sets, cranes etc. Stationary diesel engines are also used in road rollers, small dump cars etc.

According to "Water Requirements for Agricultural Irrigation in Iran" prepared by Stanford Research Institute, there were installed 36,426 diesel engines for agricultural irrigation in 1346 (1967/68). From the import statistics it is estimated by the author of this study that total number of all kinds of stationary diesel engines in operation (including engines used in irrigation) in the year 1349 (1970/71) was 80,000 - 85,000 pieces (without tillers).

Import of Stationary Diesel Engines

Tariff No.		1342 ('63/4)	1343 ('64/5)	1344 ('65/6)	1345 ('66/7)	1346 ('67/8)	1347 ('68/9)
823B3	Stationary diesel engines for agricultural workings / pieces	141	123	210	227	371	191
	tons	87	65	210	153	293	158
823B5	Stationary explosion or internal combustion engines / pieces	20471	5500	10872	9074	11937	18112
		3492	4364	6941	5035	7349	7139

Tariff No.		1348 ('69/70)	1349 ('70/71)	1350 ('71/72)
823B3	Stationary diesel engines for agricultural workings / pieces	246	572	1327
	tons	158	203	648
823B5	Stationary explosion or internal combustion engines / pieces	14282	13094	18282
		6202	6019	5179

Source : Foreign Trade Statistics of Iran

Tarifi No. 823B5 include petrol engines. From detailed list of imports of different countries, the imported stationary diesel engines as well as stationary petrol and kerosene engines in the last two years were grouped by the author of this Study as follows:

	1348 (1969/70)		1349 (1970/71)	
	pcs.	%	pcs.	%
1. Engines up to 7 HP	3750	25.8	2390	17.5
2. Engines 7 up to 40 HP	8970	61.8	9415	68.9
3. Engines 40 up to 240 HP	1630	11.2	1670	12.2
4. Engines over 240 HP	178	1.2	191	1.4
TOTAL	14528	100.0	13666	100.0

The marine diesel engines as their design is very close to stationary diesel engines are also included in this chapter.

Import of Marine Engines

Tariff NO.		1345 ('66/7)	1346 ('67/8)	1347 ('68/9)	1348 ('69/70)	1349 ('70/1)	1350 ('71/2)
823A1-3	Light marine engines - pieces	29	7	53	11	3	5
	tons	13.6	8.7	9.9	12.9	11.6	4.5
823A1-4	Boat engines - pcs.	41	81	65	216	199	117
	tons	10.0	8.2	6.2	9.6	10.1	4.9
823A1-5	Parts of marine and boat engines						
	tons	8.5	14.2	11.6	10.3	10.0	84.3

Source : Foreign Trade Statistics of Iran

Tariff No. 823A1-3 and 823A1-4 include also petrol engines. The imported marine and boat engines were grouped by the author of this study as follows:

Tariff No.		1345 ('66/7)	1346 ('67/8)	1347 ('68/9)	1348 ('69/70)	1349 ('70/71)
823A1-3	Light marine engines					
	7-40 HP - pieces	-	-	52	5	-
	40-240 HP - pieces	29	7	1	6	-
	over 240 HP - pieces	-	-	-	-	3
823A1-4	Boat engines					
	up to 7 HP - pieces	23	69	53	215	194
	7-40 HP - pieces	3	9	11	1	5
	40-240 HP - pieces	3	3	1	-	-

Boat engines up to 7 HP (the majority of imported engines) are mostly petrol engines, all other groups (light marine engines as well as boat engines) are mostly diesel engines.-

1. Stationary Engines up to 7HP

This group of import includes diesel and kerosene engines for tillers, representing the biggest part of imports. These engines are technologically closer to tractor engines than to stationary diesel engines. Ashtad Iran Manufacturing Company Limited Teheran imported the following quantities of diesel and kerosene engines 4,5 HP up to 11 HP for their assembly of tillers and as ancilliary engines for agricultural machinery and equipment (pumps threshing machines, etc.)

		1347 (1968/69)	1348 (1969/70)	1349 (1970/71)
Tillers	pcs.	2421	2580	859
Ancillary Engines	pcs.	1918	301	977
TOTAL	pcs.	4339	2881	1836

These engines range in sizes between 4.5 HP up to 11 HP. It is estimated that the consumption of diesel and kerosene engines up to 7 HP in this factory was as follows:

		1347 (1968/69)	1348 (1969/70)	1349 (1970/71)
Kerosene Engines up to 7 HP	app. pcs.	2100	1000	500
Diesel engines up to 7 HP	app. pcs.	950	1500	1100
TOTAL	app. pcs.	3050	2500	1600

The difference between total estimated demand (import) of diesel and kerosene engines up to 7 HP in 1348 (1969/70) and 1349 (1970/71) and the sales of the same engines by Ashtad Iran Manufacturing Company Limited are diesel as well as kerosene engines up to 7 HP imported from other countries (Italy, France, etc.)

The estimated total number of diesel engines up to 7 HP imported in the years 1347 (1968/69) up to 1349 (1970/71) was as follows:

	1347 (1968/69)	1348 (1969/70)	1349 (1970/71)
Diesel Engines up to 7 HP	1450	2250	1650

Most of these diesel engines are four-stroke, water-cooled, one cylinder. It is estimated that approximately 80% are water-cooled, the remainder are air-cooled diesel engines.

In the future there will be tendency to use even more diesel engines compared with kerosene and petrol engines.

Forecast of Demand of Diesel Engines up to 7 HP (including Tillers)

	1351	1356	1361	1366
Diesel Engines up to 7 HP pcs.	2300	3070	4000	5100

There is no production of stationary diesel engines up to 7 HP and according to the forecasted demand there will be no adequate market in the future. Production of stationary diesel engines up to 7 HP might be considered in connection with production of other engines (for example with kerosene engines for tillers etc.) Other possibility is to solve this production for all RCD countries.

The licence for production of petrol and diesel engines up to 5 HP was issued in 1351 (1972/3) to the Ashtad Iran Manufacturing Industries Company Limited Teheran. The capacity of the plant will be 10,000 pieces of petrol and diesel engines for tillers etc. and could be extended up to 20,000 pieces/year.

The factory is collaborating with Mitsubishi Company Japan (see Tillers).

2. Stationary Engines 7 HP up to 40 HP

It is estimated that this group of import statistics includes 10% up to 14% petrol engines, the remainder are diesel engines, i.e. the import of diesel engines 7 up to 40 HP in 1348 (1969/70) and 1349 (1970/71) was as follows:

	1348 (1969/70)	1349 (1970/71)
Stationary diesel engines 7 HP up to 40 HP	7920	8120

It is estimated, that roughly [illegible] are water-cooled, the remainder are air-cooled diesel engines.

Previously these diesel engines were used only for agricultural irrigation, and as prime mover motors connected to generators for the production of electricity. In the future, these diesel engines will be used more for direct driving of different machines (compressors, mixing machines, road rollers, small dumpers, etc.) The forecast of demand of stationary diesel engines for the use of different kinds of machinery and equipment is estimated as follows:

Forecast of Demand of Stationary Diesel Engines 7 up to 40 HP for Different Kinds of Equipment

Item		(1972/3)	(1977/8)	(1982/3)	(1987/8)
1	Tillers (8,5 HP, 11 HP)	420	650	950	1200
2	Road Rollers	70	100	160	230
3	Compressors	150	200	300	420
4	Pumps	3520	4450	5660	7260
5	Mix. machines	80	120	160	200
6	Prime movers and generators	3600	3200	2800	2400
7	Other machines and equipment and replacements**	300	450	600	800
	Total	8140	9170	10630	12510

* Special group of diesel engines; the demand of these diesel engines should be covered in the same way as the demand of diesel engines up to 7 HP (i.e. it is not recommended to produce these diesel engines in a separate factory).

** In this group are diesel engines for ships and boats and agricultral machinery (but not prime movers) and replacement of diesel engines for items, 2, 3, 4, 5.

Most of these diesel engines are four-stroke, water-cooled, one and two cylinders [illegible] are air-cooled diesel engines.

There is no production of [illegible] in Iran until now. The detailed project of the [illegible] Engineering Plant in Tabriz has the provision for production of water-cooled Slavia diesel engines 1S100K (one-cylinder, 9 HP), 2S100K (two-cylinder, 18 HP) and 3S100K (three-cylinder, 27 HP) total capacity 4500 pieces year. All castings and forgings including crank-shafts, camshafts, pistons, cylinder liners etc., could be completely produced in the plant.

It was decided to produce other types of small diesel engines most probably 1 up to 4 cylinders, 8 HP up to 32 HP. The last decision of type to be produced will be known at the end of 1352 (1974). The number of produced diesel engines could be in the future increased up to 7000 pieces/year (provided there will be adequte production of machinery and equipment driven by stationary diesel engines in Iran - (pumps, compressors, generators, etc.) to cover whole demand of diesel engines in Iran. (The difference between the forecasted demand and production in years 1361 (1982/83) and 1366 (1986/88) will be special diesel engines for tillers and other special diesel engines).

3. Stationary Diesel Engines 40 up to 240 HP

There is one factory producing stationary diesel engines from 40 up to 240 HP in Iran:

Dorman Diesel Iran, Tabriz:

This factory started the assembly of diesel engines at the beginning of 1350 (March 1971) from imported SKD (semi-knocked down) components and parts.

Types of Produced Diesel Engines

		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	6LDT	6LE	6LET
Cylinder No.		2	[illegible]	4	[illegible]	[illegible]	[illegible]	6	6
HP		48.5	72.	[illegible]	[illegible]	14	127	191	227
Bore	mm	127	127	[illegible]	[illegible]	[illegible]	127	127	127
Stroke	mm	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	149.2	149.2	149.2
R.p.m.		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	1800	1800	1800
Weight	kg.	[illegible]	745	[illegible]	[illegible]	[illegible]	1139	1206	1362
Cooling		- water cooled -							

Some of the above given diesel engines will be produced as marine diesel engines.

The factory was designed for production of 4000 diesel engines/ year in 2 shifts (approximately 16,000 cylinders). Step by step it is planned to start the production of components and parts.

In the first stage of production the following components and parts were produced in the factory: chasis, side channels, fan guards, tie bar, heat shield, starting handles, flanges, support plates.

At present the factory is importing the following blank castings: crank case, cylinder heads, water pumps housing, oil pump housing, sum exhaust and inlet manifolds. The following are purchased from Iranian foundries: Blank castings of fly wheel, fly wheel housing, engine legs and engine covers. Castings are machined in the factory and then assembled with other components and parts. Also pipes, bolts, nuts and brackets will be machined in the factory (or purchased in Iran).

In the next phase there will be produced all gears, water pump spindle and bushes, bearing housing, oil pump cover plate and impellor.

In the last phase there will be production of engine front cover, camshaft, crankshaft pulley, connecting rod etc.

The question of [illegible] is not yet solved (see Foundries and Forge [illegible]

Forecast of Demand of [illegible] Engines up to 240 HP for Different Kinds of Equipment

		1351 (1972/73)	1356 (1977/78)	1361 (1982/83)	1366 (1987/88)
Road rollers	pcs.	50	100	160	220
Compressors	pcs.	150	250	380	530
Pumps	pcs.	640	800	1020	1310
Crushers and grinders	pcs.	50	80	120	180
Prime movers and generators	pcs.	250	300	250	200
Ships and boats	pcs.	10	20	30	40
Other machines and equipment	pcs.	400	550	700	800
Total	pcs.	1660	2100	2600	3260

Based on the actual forecast of demand of diesel engines it is seen, that the factory will have inadequate market. Even small number of diesel engines produced in the first three months were not sold. The biggest problem is that machines, like pumps, generators, compressors for completion of sets are till now not produced in Iran. First products of these kind are deep well pumps produced in Pearless Company Teheran and in the future some centrifugal pumps produced in Metallurgical Engineering Plant in Tabriz.

The factory should also produce marine diesel engines for boats built in the future in Iran.

Overproduction could be eventually utilized in the frame of RCD countries (there is no production of these diesel engines in Turkey and Pakistan).

4. Stationary Diesel Engines over 240 HP

The quantity of diesel engines over 240 HP imported in the last years is large, but with continuing electrification of the quantity will be substantially reduced. In the future, diesel engines will be predominantly used as stand by engines in factories where the supply of electrical energy cannot be stopped. It is recommended to solve the production of diesel engines over 240 HP in the frame of RCD countries. The local production of these diesel engines is not recommeneed for Iran in the near future.

Forecast of Demand of Stationary Diesel Engines over 240 HP

		1351 (1972/73)	1356 (1977/78)	1361 (1982/83)	1366 (1987/88)
Stationary diesel engines over 240 HP	pcs.	190	180	170	160

Summary and Recommendations

Stationary Diesel Engines up to 7 HP

It is not recommended to produce these diesel machines in Iran in separate factory as there will be no adequate market in the future.

Stationary Diesel Engines 7 up to 40 HP

1. The existing capacity in Metallurgical Engineering Plant (4300 pieces/year) should be expanded in the sixth five-year plan to approximately 7000 pieces/year by an additional shift and in the seventh five-year plan to approximately 10,000 pieces/year by the additional machinery and equipment.

2. To cover the maximum of demand it is recommended to produce in the Metallurgical and Engineering Plant in Tabriz two families of stationary diesel engines, one up to four cylinder:

   2.1. water-cooled, medium speed stationary diesel engines, one up to four cylinders.

   2.2. air-cooled, high speed stationary diesel engines, one up to four cylinders.

3. The production could be eventually combined with production of small engines for tillers etc.

Stationary diesel engines 40 up to 240 HP

The factory Dorman Diesel Iran Tabriz with existing capacity 4000 pieces/year will have inadequte market even in the seventh five-year provided there will be no new production programme in this plant or big export to other countries (RCD, etc.)

There are two possibilities to utilise the existing capacity at an earlier date:

1. Production of diesel engines in licence for tractors, trucks, vannettes, buses etc., in the range of 40 up to 240 HP.

2. Production of stationary as well as automotive diesel engines below 40 HP.

Both mentioned variants will face big organisational as well as commercial difficulties.

Stationary Diesel Engines over 240 HP

It is not recommended to produce these diesel machines in Iran as there will be no adequate market in the future.

Recapitulation of Stationary Diesel Engines

	1351 (1972/73)	1356 (1977/78)	1361 (1982/83)	1366 ('87/8)
Demand - Diesel Engines up to 7 HP*	2300	3070	4000	5100
7 up to 40 HP*	8140	9170	10630	12510
40 up to 240 HP	1660	2100	2600	3260
over 240 HP	190	180	170	160
Production - Diesel engines up to 7 HP	-	-	-	-
7 up to 40 HP	-	4300	7000	10000
40 up to 240 HP	1200	2100	2600	3260
over 240 HP	-	-	-	-
Gap: Diesel engines up to 7 HP	2300	3070	4000	5100
7 up to 40 HP	7540	4770	3630	2510
40 up to 240 HP	420	-	-	-
over 240 HP	190	180	170	160

* Including diesel engines for tillers.

PISTONS FOR AUTOMOTIVE AND STATIONARY ENGINES

Pistons for automotive and stationary engines are now mostly made of special Al-Si-Ni-Mg-Cu alloy castings; small quantity is made of special cast iron castings, aluminium alloy castings with bonded steel and iron inserts or some big pistons are forged.

Imported cars, vannettes, buses, minibuses, trucks, tractors, tillers and stationary diesel engines are equipped mostly with pistons of special aluminium alloys with content of silicon upto 21% and low content of Ni, Mg, Cu.

The calculation of demand of pistons is based on new engines produced in Iran plus replacement of old ones after approximately 120,000 km. and the assumption that pistons are renewed on an average during the life duration of each engine 1,8 times.

Forecast of Demand, Capacity, Production and Shortage of Pistons

	1351 (1972/3)	1356 (1977/8)	1361 (1982/3)	1366 (1987/8)
Demand: New				
automotive petrol engines	-	260,000	420,000	600,000
automotive diesel engines	24,200	50,000	75,000	115,000
tractor diesel engines	-	20,000	36,000	42,000
stationary diesel engines	4,800	15,000	24,000	33,000
motorcycles and mopeds	-	75,000	155,000	200,000
Replacement - all types plus other products	641,000	1,090,000	1,830,000	2,910,000
Total demand	670,000	1,510,000	2,540,000	3,900,000
Capacity	-	1,000,000	2,000,000	2,000,000
Production	-	600,000	1,000,000	2,800,000
Shortage	670,000	910,000	940,000	1,100,000

The sizes of pistons are from diameter 36 mm (mopeds and motorcycles) upto approximately diameter 160 mm (stationary diesel engines). Till now, there is no production of pistons in Iran (except piece production of pistons for low speed stationary diesel engines). The demand of pistons already in the Fifth Five-Year Plan is over the threehold of modern production line. It us therefore recommended to start the production of pistons from diameter 36 mm upto approximately diameter 130 mm in the Fifth Five-Year Plan and to enlarge the capacity in the Sixth and Seventh Five-year Plan.

Bassd on "Feasibility Report on Cast Iron and Aluminium Piston and its Accessories in the RCD Countries" by Research Centre for Industrial and Trade Development - Ministry of Economy in 1347 (1968), Associated Engineering Ltd. (U.K.) Mahler A.G. (GFR) and Skodaexport (Czechoslovakia) prepared in 1347 (1968/9) studies for above mentioned items, mostly with capacity 1,500,000 pistons/year with the adequate quantity of piston rings, piston pins, cylinder liners, bearings etc. The Industrial and Mining Development Bank of Iran is now negotiating with different firms for the setablishment of the piston manufacturing plant.

Description of Machinery, Equipment and Process:

Two main types of pistons will be produced from aluminium alloy ingots - plain aluminium alloy-pistons and aluminium alloy pistons with a cast iron insert ring carried (for example for Jeep Gladiator, engine Hi-Torque 6 etc.).

Aluminium-alloy ingots are melted down in oil-fired or electric induction furnaces, the molten metal is transferred to oil-fired or electric induction bale-out furnaces and pistons are cast in multi-head or single die casting machine. Cast pistons are trimmed and heat treated.

The machining starts at the open end of piston and subsequent operations use this as a location. The outside diameter is semi-finished, grooves cut and crown finished at the next operations. This is followed by piston pin hole boring, cutting of circlip grooves, drilling of oil holes and chamfering of the piston pin hole. The most complex operation is

finishing of the outside diameter on the special piston centre grinder and special diamond turning lathe, because the piston is of closely controlled ovality, which is varying along the piston length. The final machining operation is finishing of the piston pin hole carried out on the special machine tool. After machining, the pistons may be tin plated or anodised.

Pistons from the point of view of raw material are aluminium intensive products. As aluminium blocks will be produced in Iran in near future, it is recommended to study the possibility to export the finished pistons to other countries in the Sixth Five-Year Plan.

PISTON PINS FOR AUTOMOTIVE & STATIONARY ENGINES

Piston pins are connecting elements between pistons and connecting rods. They are made of bar or thick walled seamless tube of alloy steel. As the life of piston pin is the same as of the piston, the demand of piston pins will be the same.

Forecast of Demand, Capacity, Production and Shortage of Piston Pins

	1351 (1972/3)	1356 (1977/8)	1361 (1982/3)	1366 (1987/8)
Demand for new engines	29,000	420,000	710,000	990,000
for replacement and other products	641,000	1,090,000	1,830,000	2,910,000
Total demand	670,000	1,510,000	2,540,000	3,900,000
Capacity	-	1,000,000	2,000,000	3,000,000
Production	-	600,000	1,600,000	2,800,000
Shortage	670,000	910,000	940,000	1,100,000

There is no production of piston pins in Iran at present but as the demand in the Fifth Five-year Plan will be over threshold for semi-automatic production, it is recommended to start the production of piston pins in the same extent as the production of pistons.

Feasibility Report on Cast Iron and Aluminium Piston, and its Accessories in the RCD Countries prepared by Research Centre for

Industrial and Trade Development, Ministry of Economy is dealing the demand and the production of piston pins in RCD countries. Based on too optimistic data given in the above mentioned study demand of piston pins in 1353 (1974/5) was given as 1080289 pieces. Studies of Associated Engineering Group, Mahle AG and Skodaexport were prepared with a capacity of 1,500,000 piston pins/year/two shift operation.

Description of Machinery, Equipment and Process

Machinery, equipment and process depends on the quantity produced and on semi-product used. For small and medium lots are adopted semi-automatic machine tools, with some special machines, for big lots are used automatic machine tools and special machine tools. Small and medium lots are produced for example on two-spindle lathes, capstan lathes, three spindle drills, two-spindle broaching machines, grinding machines, lapping machines and special machines for the removing pip, centering, taper boring, chamfering etc. Big lots are produced for example on five-spindle automatic lathes, special machines for chamfering, drilling machine with 8-spindle head, centreless grinding machine and lapping machine.

In both cases, semi-finished piston pins before grinding and lapping are heat treated, i.e. mostly case hardened.

PISTON RINGS

Piston rings are made of different kinds of materials; mostly used are special cast irons - alloy irons, high tensile irons and ductile irons. Some piston rings are made of alloy steels or special sintered iron materials.

The average life of a piston ring in the vehicle engine is 60,000 km. The calculation of demand of piston rings is based on new engines produced in Iran plus replacement of worn-out piston rings approximately 3,6 times during the life of one engine.

Forecast of Demand, Capacity, Production and Shortage of Piston Rings

	1351 (1972/3)	1356 (1977/8)	1361 (1982/3)	1366 (1987/8)
Demand: New				
Automotive petrol engines	-	780,000	1,260,000	1,800,000
Automotive diesel engines	72,600	150,000	225,000	345,000
Tractor diesel engines	-	60,000	108,000	126,000
Stationary diesel engines	14,400	45,000	72,000	99,000
Motorcycles and mopeds	-	225,000	465,000	600,000
Replacement - all types plus other products	1,282,000	3,270,000	5,490,000	8,730,000
Total demand	1,340,000	4,530,000	7,620,000	1,170,000
Capacity	-	-	6,000,000	8,000,000
Production	-	-	4,200,000	8,000,000
Shortage	1,340,000	4,530,000	3,420,000	3,700,000

Feasibility of production of piston rings was studies in "Feasibility Report on Cast Iron and Aluminium Pistons and Its Accessories in the RCD Countries" by Research Centre for Industrial and Trade Development - Ministry of Economy in 1347 (1968). Based on optimistic forecast of demand in Iran and on export to Turkey and Pakistan it was recommended to produce piston rings as soon as possible.

According to the above forecast it is advisable to start the production of piston rings not sooner than in the Sixth Five-year Plan, as the threshold for modern production of piston rings is approximately 6,000,000 up to 6,000,000 pieces/year/two shift operation.

Description of Machinery, Equipment and Process

Modern casting process is the casting of individual piston rings. It starts with the sand moulding of a number of rings arranged around a central runner. The casting is removed as a "tree" with central trunk from which radiate piston castings. The castings are removed from the trunk and they are cleaned by sand blasting.

The grinding on both sides of the ring simultaneously commence the machining process. Then the rings are machined on the periphery to a non circular shape (peripheral grooving machines etc.). A section of the ring is cut out and, after closing, the inside of the ring is bored. The rings are then finish machined on the periphery and the gap finish machined to correct size (lapping machines). Various kinds of surface finish are carried out to improve the existing properties:

a) To improve the running-in: ferroxing, phosphatizing, oxydizing, tinning

b) To increase the service life: ferroxing, sulphonitrizing, hard and porous chromium plating.

CYLINDER LINERS

There are different types of cylinder liners: wet or dry, plain or flanged, sand moulded, shell moulded, centrifugal casted etc. Cylinder liners are made of special cast irons, soft or hardened or differentially hardened.

Imported as well as locally produced engines for cars, vannettes, buses, minibuses, trucks, tractors, and tillers are mostly equipped with cylinder liners: modern designs of engines are very often without cylinder liners.

Dorman Diesel Iran Tabriz

Stationary diesel engines produced in the plant are equipped with cylinder liners and most probably the existing design of the engine will be produced also in the future. The factory does not intend to produce in the future cylinder liners in its workshop.

Iran Diesel Engine Motors Co. Tabriz

All automotive diesel engines are equipped with cylinder liners. It is not known if the new design of diesel engines produced in 1352 (1973/4) will be with or without cylinder liners. It was never presupposed that cylinder liners will be produced in the factory.

Metallurgical Engineering Plant in Tabriz

The factory will soon start the production of stationary diesel engines, but till now it is not decided which types of diesel engines will be produced. Slavia diesel engines, originally proposed for production in this plant are equipped with cylinder liners and there was intention to produce them in the plant.

Iran National Manufacturing Co., Tehran

The existing petrol engine in Peykan (1724 cu. cm.) is without cylinder liners and it is presupposed that also new models of engine (1500 cu. cm and 1800 cu. cm) produced in 1353 (1974/5) will be without cylinder liners.

Tractor Plant in Tabriz

The existing diesel engine in tractor U650, U651 is with cylinder liners and it is believed that the engine will be produced also in the future with them.

The demand of cylinder liners is calculated as a maximum, i.e. according to the designs of engines at time being. The reality will be much lower. The average life of cylinder liners was taken into account as 120,000 k

Forecast of Demand, Capacity, Production and Shortage of Cylinder Liners

	1351 (1972/3)	1356 (1977/8)	1361 (1982/3)	1366 (1987/8)
Demand: New				
Automotive petrol engines	-	-	-	-
Automotive diesel engines	24,200	50,000	75,000	115,000
Tractor diesel engines	-	20,000	36,000	42,000
Stationary diesel engines	4,800	15,000	24,000	33,000
Motorcycles and mopeds	-	-	-	-
Replacement - all types	101,000	105,000	185,000	210,000
Total demand	130,000	190,000	320,000	400,000
Capacity	10,000	10,000	10,000	10,000
Production	-	-	-	-
Shortage	130,000	190,000	320,000	400,000

Low demand in 1356 (1977/8) is due to the fact that most of cars in operation in Iran (Peykan) will be without cylinder liners, i.e. the replacement will be low.

Feasibility Report on Cast Iron and Aluminium Piston and its Accessories in the RCD Countries prepared by Research Centre for Industrial and Trade Development, Ministry of Economy in 1347 (1968) has not taken into account new designs of engines witnout cylinder liners and has given the demand of cylinder liners in 1356 (1977/8) too high - 529300 pieces; the production capacity for new plant was given 800,000 pcs/year/two shift operation.

Taking into account that the threshold for this production is now 300,000 - 400,000 pcs/year/two-shift operation it is not advisable to start the production of cylinder liners in Iran.

INTAKE AND EXHAUST VALVES

Intake and exhaust valves are part of any four-stroke petrol diesel or gas engine, i.e. for one cylinder there is a need of one set of valves (one intake and one exhaust valve).

Imported cars, vannettes, buses, minibuses, trucks, tractors and tillers are equipped nearly 100% with four-stroke engines. There is a tendency in the whole world to reduce the use of two-stroke engines to minimum as there is an incomplete combustion in these engines and thus the polution is dangerous to the pedestrians. Some countries are discouraging the use of two-stroke engines. In the future two-stroke engines with small swept volume will be used for mopeds and motorcycles.

All engines produced (or intended to be produced) in Iran for cars, vannettes, buses, minibuses, trucks and tractors as well as all stationary diesel engines are four-stroke engines. Contrary to this all engines for mopeds and motorcycles will be two-stroke engines.

The calculation of demand of valves is based on new engines produced in Iran plus replacement of old ones after approximately 120,000 km of operation (Some worn-out exhaust valves will be repaired and used as intake valves).

Forecast of Demand, Capacity, Production and Shortage of Intake and Exhaust Valves

	1351 (1972/3)	1356 (1977/8)	1361 (1982/3)	1366 (1987/8)
Demand - New				
automotive petrol engines	-	520,000	840,000	1,200,000
automotive diesel engines	48,400	100,000	150,000	230,000
Tractor diesel engines	-	40,000	72,000	84,000
Stationary diesel engines	9,600	30,000	48,000	66,000
Replacement - all types	1,282,000	2,180,000	3,660,000	5,810,000
Total demand	1,340,000	2,870,000	4,770,000	7,400,000
Capacity	-	2,000,000	4,000,000	6,000,000
Production	-	1,100,000	3,200,000	5,800,000
Shortage	1,340,000	1,770,000	1,570,000	1,600,000

Presently there is no factory producing intake and exhaust valves in Iran, but there are some firms interested in this production. As the quantity of intake and exhaust valves of one type (engine for Peykan) demanded in 1356 (1977/8) will be over the threshold of modern production line with forge shop equipped with high frequency heating equipment and special upsetting press, it is advisable to start the production in the Fifth Five-year Plan and extend it in the Sixth and Seventh Five-year Plan.

Description of Machinery Equipment and Process:

Bars of alloy steel with high content of Cr (approximately 15%) and Ni (approximately 60%) are cut to prescribed length on circular saw (or other cutting machine). Some intake and exhaust valves are made of two different steels - the head is made of Cr-Ni alloy steel and the stem is made of cheaper alloy steel; they are butt welded on butt welding machine. One end of the

material is heated on high-frequency generator (20 KVA or more) and then the head is pressed on vertical upsetting press (approximately 150 tons). The pressing is then heat treated, machined on automatic lathes, hardened, machined on grinding machines, polishing machines etc. The hollow stem valves will not be produced in the plant at least in the first stage of construction.

One automatic upsetting press has capacity approximately 500, 000 - 600, 000 pcs/year/two-shift operation.

CAMSHAFTS

Intake and exhaust valves of four-stroke engines are activated by forged or casted camshaft. Camshaft's drive is derived from crankshaft through gears or chain.

There are no apecial producers of camshafts; producer of engine is also producing camshaft. Present situation in Iran.

Iran Diesel Engine Motors Co, Tabriz

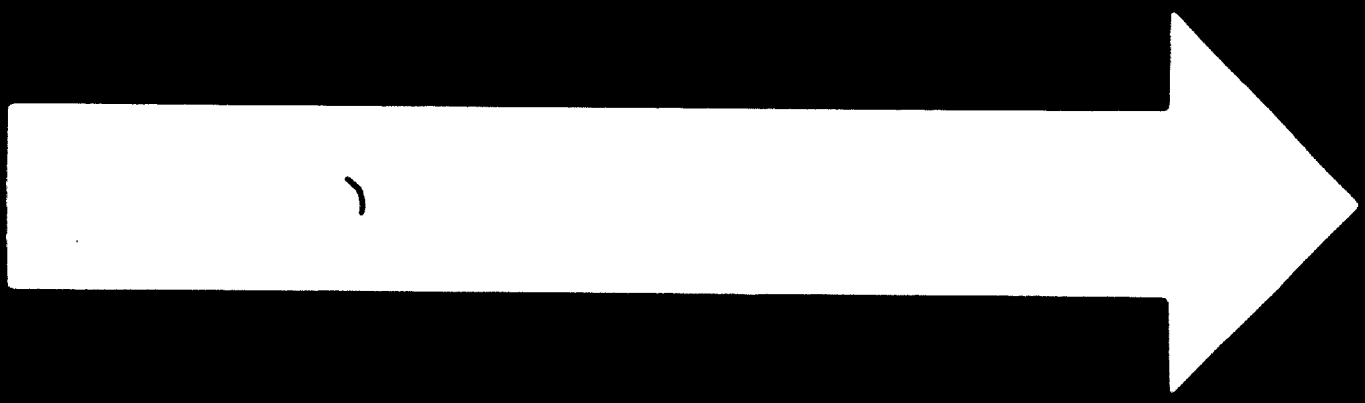
The production of camshaft started in 1351 (1972) on modern machinery and equipment. The capacity of the production line is big enough to cover the demand of camshafts for new diesel engines produced in the plant now as well as in the future.

Dorman Diesel Iran Tabriz

The factory started the production of camshafts in 1351 (1972). The production line is equipped mostly with universal machine tools, only three machines are special automatic machines.

Metallurgical and Engineering Plant in Tabriz

The factory has not yet started the production of stationary diesel engines, but the machinery and equipment for production of camshafts is already installed in the shop. It consists of universal as well as special machine tools.



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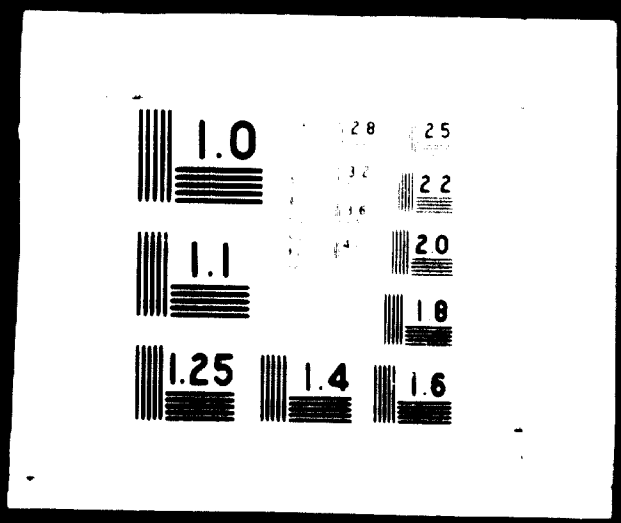


Iran National Manufacturing Co. Tehran

The production of petrol engines will start in 1353 (1974/5). Camshaft for these petrol engines will be produced in the first stage of production of petrol engines.

Forecast of Demand, Capacity, Production and Shortage of Camshafts

	1351 (1972/3)	1356 (1977/8)	1361 (1982/3)	1366 (1987/8)
Demand: New				
automotive petrol engines	-	65,000	105,000	150,000
automotive diesel engines	4,900	9,800	14,800	22,500
Tractor diesel engines	-	5,000	9,000	10,500
Stationary diesel engines	1,200	5,000	7,800	10,800
Replacement - all types	3,900	8,200	13,400	21,200
Total demand	10,000	93,000	150,000	215,000
Capacity (new)	-	100,000	160,000	200,000
Production	-	70,000	140,000	200,000
Shortage	10,000	30,000	10,000	15,000

Description of Machinery, Equipment and Process

As already mentioned, camshafts are either forged or casted. Semi-products will be supplied by foundries or forge plants. There is a tendency to replace forgings by castings in the future.

Camshafts are machined on semi-automatic or automatic lathes and then ground on cylindrical and special camshaft grinding machines and/or tapping machines.

CONNECTING RODS

Connecting rod is an element for connecting crankshaft with piston. It is transmitting power from piston to crankshaft.

Connecting rods are either forged of carbon or alloy steels (Jeep Hurricane F4) or are casted of perlitic malleable iron (Jeep Hi-Torque 6).

Forecast of Demand, Capacity, Production and Shortage of Connecting Rods

	1351 (1972/3)	1956 (1977/8)	1361 (1982/3)	1366 (1987/8)
Demand: New				
automotive petrol engines	-	260,000	420,000	600,000
automotive diesel engines	24,200	50,000	75,000	115,000
tractor diesel engines	-	20,000	36,000	42,000
stationary diesel engines	4,800	15,000	24,000	33,000
motorcycles and mopeds	-	75,000	155,000	200,000
Replacement - all types plus other products *	11,000	20,000	30,000	40,000
Total demand	40,000	440,000	740,000	1,030,000
Capacity	6,000	6,000	400,000	800,000
Production	-	-	400,000	800,000
Shortage	40,000	440,000	340,000	230,000

* For example compressors of medium size.

There is no production of connecting rods in Iran at present and there is even no intention to produce them in the Fifth Five-year Plan.

It is advisable to start the production of connecting rods at the beginning of the Sixth Five-year Plan and to develop it in the Seventh Five-year Plan.

Description of Machinery, Equipment and Process

The demand at the end of the Sixth Five-year Plan will be big enough for application of one-purpose special machines interconnected by conveyor. (connecting rods for automotive petrol engines) or semi-automotive machines (connecting rods for stationary diesel engines, tractor diesel engines etc.). Main operations are milling of outer surface, boring and fine boring of connecting rod head, surface grinding and polishing etc.

CRANKSHAFTS

Crankshafts of petrol as well as diesel engines are either forged from one or more pieces of steel or casted from malleable iron. Forged crank shafts will be most probably replaced in the future by casted ones.

There are some special producers of crankshafts in other countries but in Iran there will be tendency to produce crankshafts in the same factory with engines.

Metallurgical and Engineering Plant in Tabriz

The factory has own forge plant for production of forginga as well as machining facilities for complete crankshaft. It is possible to start the production of crankshafts in the shortest time.

Iran Diesel Engine Motors Co. Tabriz

The factory is not producing cranshaft till now, but the production will start in the Fifth Five-year Plan. Forgings will be supplied in the first period of production from West Germany, afterwards will be secured from Iran.

Iran National Manufacturing Co. Tehran

The production of petrol engines will start in 1353 (1974/5), but the crankshaft casted from malleable iron, will be produced in the second stage of production, i.e. in the Sixth Five-year Plan.

Tractor Plant in Tabriz

In the detailed project report it was assumed that this plant will produce complete diesel engines, i.e. also crankshafts. It is presupposed that the production of diesel engines will start in the Fifth Five-year Plan, but crankshafts will be produced in the Sixth Five-year Plan and the production will be extended in the Seventh Five-year Plan.

Crankshafts for Motorcycles and Mopeds

Motorcycles and mopeds are equipped with simple crankshaft (eccentric shaft or eccentric sheave). Though the production of petrol engines for motorcycles and mopeds will start in the Fifth Five-year Plan, crankshafts will be produced in the Sixth Five-year Plan and the production extended in the Seventh Five-year Plan.

Forecast of Demand, Capacity, Production and Shortage of Crankshafts

	1351 (1972/3)	1356 (1977/8)	1361 (1982/3)	1366 (1987/8)
Demand: New				
automotive petrol engines	-	65,000	105,000	150,000
automotive diesel engines	4,900	9,800	14,800	22,500
tractor diesel engines	-	4,000	9,000	10,500
stationary diesel engines	1,200	5,000	7,800	10,800
motorcycles and mopeds	-	75,000	155,000	200,000
Replacement - all types plus other products*	11,900	21,200	28,400	36,200
Total demand	18,000	110,000	320,000	430,000
Capacity	6,000	20,000	300,000	450,000
Production	-	15,000	290,000	410,000
Shortage	18,000	55,000	30,000	20,000

* for example crankshafts for compressors of medium size.

Description of Machinery, Equipment and Process

Crankshafts are turned on special lathes and ground and lapped on special grinding and lapping machines. Oil grooves are drilled on special drilling machines.

CRANKSHAFT AND CONNECTING ROD BEARINGS

Crankshaft and connecting rod bearings of modern petrol as well as diesel engines are mostly thin walled half bearings; only some high-pressure diesel engines have thick walled bearings.

Forecast of Demand, Capacity, Production and Shortage of Crankshaft and Connecting Rod Bearings

	1351 (1972/3)	1356 (1977/8)	1361 (1982/3)	1366 (1987/8)
Demand: New				
automotive petrol engines	-	455,000	735,000	1,050,000
automotive diesel engines	44,000	90,000	120,000	205,000
tractor diesel engines	-	35,000	63,000	73,000
stationary diesel engines	8,400	30,000	47,000	65,000

Forecast of Crankshaft and Connecting Rod Bearings (Continued)

	1351 (1972/3)	1356 (1977/8)	1361 (1982/3)	1366 (1987/8)
Replacement - all types and other vehicles	967,600	1,820,000	2,835,000	4,307,000
Total demand	1,020,000	2,430,000	3,800,000	5,700,000
Capacity	-	-	6,000,000	6,000,000
Production	-	-	4,000,000	6,000,000
Shortage	1,020,000	2,430,000	-	-

Crankshaft and connecting rod thin walled half bearings are made of white metal on steel, tin-aluminium alloys on steel, bronze and copper lead alloys on steel, bronze, copper lead alloys on steel overlay plated with lead tin alloy and sintered copper lead and bronze lined strip.

There is no production of thin walled half bearings, but there was intention to produce them in Iran. Associated Engineering Ltd. (U.K.) and Mahle A.G. (GFR) prepared in 1347 (1968) study for these products, but accor has not been reached yet.

Local demand will be on the threshold of an economical production at the end of the Sixth Five-year Plan, but as thin walled bearings are made partly of copper and its alloys, it is recommended to start this production at the beginning of the Sixth Five-year Plan from local raw materials and to develop it in the Seventh Five-year Plan; overproduction will be exported.

Description of Machinery, Equipment and Process:

Coil of strip is uncoiled on uncoiler; rectangular blanks are blanked fro strip and formed into semi cylindrical shells on special press. The ends of th shell are faced and chamfered on a facing and chamfering machine and a locati nick is formed in it. The joint faces are broached on joint face broach to give an accurate peripheral length and the bore is broached to give the close tolerance required on wall thickness (wall thickness guage). Oil holes and grooves are added to many bearings on nicking and grooving machine.

Some thinwalled bearings are tin plated on the steel back, and many copper lead lined thinwalled bearings are also overlayplated in the bore with a layer of lead tin.

WRAPPED BUSHES AND THRUST WASHERS

Wrapped bushes are made of white metal on steel, sintered copper lead alloys on steel, bronze alloys on steel or tin-aluminium alloys on steel. These are used instead of solide bronze bushes in motor vehicles (cam shafts, ring pins, gear boxes and control linkages) as well as in agricultural, textile and printing machinery.

There is no production and even no intention to produce these bushes in Iran. The demand is and will remain in the Fifth Five-year Plan, not big enough for economical production, even for the smallest capacity (800, 000 pcs/year/one shift). The production of gear boxes for cars will start in the Sixth Five-Year Plan but even then the demand of bushes will remain low.

It is recommended to start the production of small plain jointed non-face machined wrapped bushes in large quantities (approximately 6, 000, 000 pcs/year/one shift) made of local raw materials (sintered copper lead alloy or bronze alloy on steel) in the Seventh Five-year Plan partly for local demand and predominently for export.

The calculation of local demand is not given, as the wrapped bushes are used in different machines and there is a wide range of raw materials and diameters used for their production. It is estimated that the demand of wrapped bushes of the similar kind and size will reach in the Seventh Five-year Plan 2, 0 up to 2, 5 million pieces/year. The remaining quantity will be exported.

Description of Machinery, Equipment and Process:

The bimetal strip is cut to blanks which are pressed on special presses to fully formed round bushes. If required, oil grooves and holes are produced during the pressing operations. Some bushes are finished by a barrelling operation while others are machined on the end faces and some are finally bored. Bushes with clinched joints are ground on the outside diameter.

GEAR BOXES

Gear boxes for all cars, vannettes, buses, lorries, tractors, motorcycles, mopeds, tillers, etc. produced (assembled) in Iran are imported.

A license has been issued for production of gear boxes in Iran in the Fifth Five-Year Plan.

Forecast of the Demand of Gear Boxes

	1351 (1972/3)	1356 (1977/8)	1361 (1982/3)	1366 (1987/8)
New				
cars pcs	42300	90000	150000	210000
vannettes, station wagons-pcs	13400	21400	32000	45000
buses, minibuses - pcs	2800	4100	4800	6000
trucks - pcs	3200	7800	13000	21000
mopeds - pcs	18000	45000	80000	110000
motorcycles - pcs	16000	40000	90000	120000
tractors - pcs	6000	8000	10500	13500
tillers - pcs	2300	2700	3100	3800
Replacement & other vehicles pcs	7000	12000	16600	20700
T o t a l pcs	111000	251000	400000	550000

Gears, made of alloy steels are either forged or made of bars, machined on automatic lathes and gear shaping machines. After heat treatment they are ground on internal grinding machines, special spline grinding machines and gear grinding machines.

Spline shafts made of alloy steels are machined on automatic turning lathes, milling machines or broaching machines. After heat treatment they are ground on universal centre grinding machines and spline grinding machines.

Gear housing is made of castings. It is mostly machined on single purpose machine tools or on universal machine tools equipped with special tools, jigs and fixtures.

WATER COOLING SYSTEM OF PETROL AND DIESEL ENGINES

Water cooling system of petrol as well as diesel engines consists of these main groups:

1. Fan
2. Automobile radiator
3. Water pump
4. Thermostat
5. Water temperature indicator - See Measuring Gauges

FAN FOR WATER COOLED ENGINES

Fans for water cooled petrol and diesel engines are used for forced circulation of cooling air through radiator at automotive as well as stationary engines. Fan is driven by V-belt from the engine. Producer of water cooled engines is mostly producing also fans. The production of fans for water cooled engines started just recently in the factories for the production of stationary as well as automotive engines.

Iran Diesel Engine Motors Co, Tabriz

The production of complete fan including pulley started in 1351 (1972). The shop is equipped with modern machinery and equipment. The capacity is big enough to cover all needs of fans now as well as in the future.

Dorman Diesel Iran Tabriz

The production of complete fan including pulley started in 1350 (1971). The shop is well equipped and has enough capacity to cover all needs of fans now as well as in the future.

Metallurgical and Engineering Plant in Tabriz

In the case this plant will start the production of water cooled diesel engines, fans will be produced in the factory.

Iran National Manufacturing Co. Tehran

The production of water cooled engines for Peykan will start in 1353 (1974/5). Already in the first stage of production of engines it is envisaged to produce also fan.

Forecast of Demand, Capacity, Production and Shortage of Fans for Automobiles and Stationary Engines

		1351 (1972/3)	1356 (1977/8)	1361 (1982/3)	1366 (1987/8)
Demand New cars	pcs.	39100	83200	140000	196000
vannettes, station wagons	pcs.	9200	17100	26000	37000
buses and minibuses	pcs.	2700	4000	4700	5900
trucks	"	3200	7800	13000	21000
tractors	"	6000	8000	10500	13500
tillers	"	2300	2700	3100	3800
stationary diesel engines	"	1200	5000	7800	10800
Replacement - all types	"	3300	6200	14900	22000
Total demand		67000	134000	220000	310000
Existing capacity		20000	95000	95000	95000
New capacity		-	-	65000	165000
Production		8000	90000	150000	250000
Shortage		58000	44000	70000	60000

As all producers of water cooled engines are producing or will soon start the production of fans, it is not possible to produce them in a specialized unit (for example small scale plant).

Description of Machinery, Equipment and Process

Fans for water cooled engines are made either from steel sheets and steel bars by pressing, rivetting or welding and machining, or from non-ferrous metals (aluminium) by die-casting and machining.

AUTOMOBILE RADIATORS

Most types of cars, vannettes, trucks, buses, minibuses, tractors and tillers produced (assembled) in Iran are equipped with water-cooled engines, thus needing radiators; only Citroën cars and vannettes produced by Iran Citroën Co. Tehran and Magirus buses produced by Pars Lux Tehran are equipped with air-cooled engines.

It is not yet decided whether stationary diesel engines produced in the Metallurgical and Engineering Plant in Tabriz will be water-cooled or air-cooled. The calculation of demand of radiators given under is based on assemption, that two families of stationary diesel engines will be produced, air-cooled as well as water-cooled. Stationary diesel engines produced by Dorman Diesel Iran Tabriz are also water-cooled.

Imported cars, vannettes, trucks, buses, minibuses, tractors and tillers are equipped predominantly with water-cooled engines; also imported stationary diesel engines are mostly water-cooled (92-95%).

Few years ago Volkswagon cars, equipped with air-cooled engines, were imported in bigger quantity, but now the import of these cars is substantially reduced.

There is one factory producing automobile radiators in Iran:

Iran Radiator Co. Ltd., Tehran

This factory is producing approximately 30 types of radiators for all types of cars, trucks, buses and some tractors produced in Iran with

water-cooled engines as well as radiators for some other types of vehicles imported in last years to Iran. Radiators are imported only for stationary diesel engines produced by Dorman Diesel Iran in Tabriz, for tractors U650, U651 assembled in Tractor Plant in Tabriz and tillers assembled in Ashtad Iran Manufacturing Ind. Co. Ltd. Tehran (due to big price difference between imported radiators and locally produced ones).

Production of Automobile Radiators

	1345 (1966/7)	1346 (1967/8)	1347 (1968/9)	1348 (1969/70)
Production of automobile radiators - pcs	13176	15840	n.a.	50000*

* Estimate

This factory will be relocated and the new plant presently under construction will have a capacity of 80,000 pcs/year in one shift.

Description of Machinery, Equipment and Process:

Modern mechanical and semi-automatic machinery and equipment; rolling machines for profiles, special machines for punching and shaping, eccentric presses, manual assembling of components and parts, manual soldering, tincoating etc. In new factory some manual operations will be replaced by mechanical or semi-automatic operations.

...st of Demand, Capacity, Production and Shortage of Auto... ...tors

	1351 (1972/3)	1356 (1977/8)	1361 (1982/3)	1366 (1987/8)
...nd New				
...rs - pcs	39100	83200	140000	196000
...nettes, station wagons-pcs	9200	17100	26000	37000
...ses and minibuses - pcs	2700	4000	4700	5000
...ucks* - pcs	3200	7800	13000	21000
...ctors - pcs	6000	8000	10500	13500
...ers - pcs	2300	2700	3100	3800
...tionary diesel engines-pcs	1200	5000	7800	10500
R...placement - all types**-pcs	16300	32200	64900	112000
Total demand - pcs.	80000	160000	260000	400000
Existing capacity (in two-shift operation) pcs	160000	160000	160000	160000
New capacity - pcs	-	-	80000	200000
Production - pcs	64000	135000	220000	360000
Shortage - pcs.	16000	25000	40000	40000

Special trucks, like fire-fighting trucks, lift trucks, dumpers etc. are not included, as most of them are equipped with stationary diesel engines which are included in stationary diesel engines, or are imported as complete sets with engine (fire-fighting trucks).

The average life of one radiator is approximately 6 years, but old, worn out radiators are repaired in the shops in bazaar, therefore the production of radiators for replacement will remain low. The ratio of radiators produced for replacement to radiators for new vehicles will be higher each year as the shops in bazaar will give up step by step the repair activity in cases when worn out radiator must be completely rebuilt.

In the above given forecast demand and production of radiators there is not included export of complete radiators. Radiators are copper-intensive products and as Iran in the future will be big producer of refined copper and copper semi-products like sheets etc. it would be possible to export radiators to other countries. At present time the treshold for completely automatic production line for one type of automobile radiators is approximately 200,000 up to 250,000 pcs/year in two-shift operation.

Recommendation In the Sixth Five-Year Plan, when already copper semi-products made in Iran will be available, the possibility of export of automobile radiators should be studied.

WATER PUMPS FOR AUTOMOBILES AND STATIONARY ENGINES:

Water-cooled petrol as well as diesel engines must be equipped with centrifugal water pump for forced circulation of cooling water through cooling jacket of cylinder block and cylinder head to a radiator and back to the water pump

The production of water pumps for automobiles and stationary engines started just recently in the factories for the production of stationary as well as automotive engines.

Iran Diesel Engine Motors Co. Tabriz

The production of complete water pumps for all models of diesel engines produced in the factory started in 1351 (1972). The shop for production of water and oil pumps is equipped with modern special machine tools arranged in the line. The capacity of the line is big enough to cover all needs of pumps for new diesel engines produced in the plant as well as for replacement of worn-out pumps or their components and parts.

Dorman Diesel Iran, Tabriz

This factory started the production of water pumps in two stages: In the first stage in 1350 (1971/2) there was produced only spindle of water pump with pulley, in the second stage in 1351 (1972/3)

...ere are complete water pumps produced. The shop for production of ...ter pumps is equipped with modern, universal machine tools. The ca...ity far exceeds the present demand.

Metallurgical Engineering Plant in Tabriz

The factory will soon start the production of stationary diesel ...gines but till now it is not decided whether produced stationary engines ...ll be water-cooled or air-cooled. In the case water-cooled engines will ... produced, the production of water-pumps will start in the first phase, ...s universal machine tools for their production are already installed.

...n National Manufacturing Co. Tehran

The production of petrol engines for Paykan will start in 1353 (1974/5). ...ter pump will be produced in the first stage of production of petrol engines.

Forecast of Demand, Capacity, Production and Shortage of Water Pumps for Automobiles and Stationary Engines

		1351 (1972/3)	1356 (1977/8)	1361 (1982/3)	1366 (1987/8)
Demand: New					
Cars	pcs	39,100	83,200	140,000	196,000
Vannettes, station wagons	pcs	9,200	17,100	26,000	37,000
Buses and minibuses	"	2,700	4,000	4,700	5,900
Trucks	"	3,200	7,800	13,000	21,000
Tractors	"	6,000	8,000	10,500	13,500
Tillers	"	2,300	2,700	3,100	3,800
Stationary diesel engines	"	1,200	5,000	7,800	10,800
Replacement - all types	"	6,300	12,200	24,900	42,000
Total demand	"	70,000	140,000	230,000	330,000
Existing capacity	"	20,000	95,000	95,000	95,000
New capacity		-	-	65,000	165,000
Production	"	8,000	90,000	140,000	260,000
Gap	"	62,000	50,000	90,000	70,000

Relatively low quantity of replaced water pumps at present time is due to the fact that water pumps are repaired by small repair shops in the bazaar, i.e. they are using worn out parts and only adopting them for further use. In the future the ratio of water pumps for replacement to water pumps for new vehicles and stationary engines will be higher as it will be cheaper to use components and parts, produced in the factory.

As all producers of petrol and diesel engines are producing or will soon start the production of water pumps, it is not possible to produce water pumps in a specialized unit (for example small scale or medium scale plant).

Thermostat for Water-Cooled Engines

Thermostat in water-cooled engine is apparatus, which is regulating the flow of cooling water to radiator (when water is cold, the thermostat is closing the flow of water to the radiator). Each water-cooled engine is equipped with one thermostat. The demand of thermostat for new vehicles and stationary engines is the same as in the case of water pumps or radiators.

The demand of thermostat for replacement is higher, as thermostats are worn-out after 4-5 years of operation (depends on the quality of water used in the water-cooling system).

Forecast of Demand of Thermostats

	1351 (1972/3)	1356 (1977/8)	1361 (1982/3)	1366 (1987/8)
Demand:				
New vehicles and stationary engines	63,700	127,800	205,100	288,000
Replacement - all types	26,300	52,200	94,900	142,000
Total demand pcs	98,000	180,000	300,000	430,000

There is no production of thermostats in Iran at present and it is not adviseable to start this production in next years, as thermostat is from the point of view of process a complicated apparatus. In the case the production of thermostats will be started, it should be connected with production of thermostats for other purposes.

FUEL SYSTEM OF PETROL AND DIESEL ENGINES

Fuel system of petrol engines consists of:

Air filter with intake silencer
Fuel tank
Fuel filter
Petrol fuel pump
Carburettor

Fuel system of diesel engines consists of:

Fuel tank
Fuel pump
Fuel filter
Air filter
Injection pump with regulator
Nozzles and nozzle holders

FUEL TANKS

Fuel tanks are already produced or the production will start soon in existing factories producing motor vehicles in Iran.

Details about the production of fuel tanks see description of existing factories, producing cars, trucks, buses, minibuses, tractors, motorcycles, mopeds, etc.

AIR FILTERS WITH INTAKE SILENCERS

Air filters are filtering air coming into the carburettor (petrol engines) or into the nozzles (diesel engines). They consist of body, made mostly of non-ferrous castings and of filtering insert, made of paper etc. Air filters are mostly combined with intake silencer.

Air filters for motorcycles and mopeds are mostly situated in carburettor, i.e. sometimes producer of carburettors for motorcycles and mopeds is also producing air filters.

Body of air filter has the same life as the car, truck, tractor, bus etc., filter inserts are changed after approximately 20000 - 30000 kms.

Forecast of Demand, Capacity, Production and Gap of Air Filters

		1351 (1972/3)	1356 (1977/8)	1361 (1982/3)	1366 (1987/8)
Demand: New					
Cars	pcs	42,300	90,000	150,000	210,000
vannettes, station wagons	"	13,400	21,400	32,000	45,000
buses, minibuses	"	2,800	4,100	4,800	6,000
trucks	"	3,200	7,800	13,000	21,000
mopeds	"	18,000	45,000	80,000	110,000
motorcycles	"	16,000	40,000	90,000	120,000
tractors	"	6,000	8,000	10,500	13,500
Tillers	"	2,300	2,700	3,100	3,800
Stationary diesel engines	"	1,200	5,000	7,800	10,800
Replacement - all types*	"	4,800	8,000	12,800	19,900
Demand - total	"	110,000	232,000	404,000	560,000
Capacity	"	-	100,000	400,000	600,000
Production	"	-	120,000	320,000	520,000
Gap	"	110,000	112,000	84,000	40,000

* Replacement of complete air filter.

There is no production of air filters in Iran at present, but there are already some firms interested in this production. As the demand is far over threshold for economical production, it is recommended to start the production soon, from imported components and parts and to extend it in the Sixth and Seventh Five-Year Plan. At the end of the Seventh Five-Year Plan there should be production of 100% components and parts including filtering inserts, which will be produced in other specialised factory.

Production of air filters could be combined with production of other filters.

FUEL FILTERS

Fuel filters are filtering fuel coming from fuel tank into fuel pump. Mechanical impurities are separated from fuel by special sieve, mud and water are sedimenting in a glass tank flask. They are used at cars, vannettes, station wagons, buses, minibuses, trucks, tractors and tillers.

Forecast of Demand, Capacity, Production and Shortage of Fuel Filters

		1351 (1972/3)	1356 (1977/8)	1361 (1982/3)	1366 (1987/8)
Demand:					
New Cars	Pcs	42,300	90,000	150,000	210,000
vannettes, station wagons	"	13,400	21,400	32,000	45,000
buses, minibuses	"	2,800	4,100	4,800	6,000
trucks	"	3,200	7,800	13,000	21,000
tractors	"	6,000	8,000	10,500	13,500
tillers	"	2,300	2,700	3,100	3,800
Replacement* and other vehicles	"	3,600	6,000	9,600	15,700
Total demand	"	68,600	140,000	223,000	315,000
Capacity	"	-	100,000	200,000	300,000
Production	"	-	60,000	160,000	260,000
Shortage	"	68,600	80,000	63,000	55,000

*only complete fuel filters; replacement of components and parts like glass flask, sieves etc. is not included.

There is no production of fuel filters at present in Iran. The demand is big enough for commercial production and therefore it is advisable to produce them in Iran. The production should start already in the Fifth Five-Year Plan (partly from imported components and parts).

PETROL FUEL PUMPS

Petrol fuel pump is supplying petrol from fuel tank into carburettor. It is a diaphragm pump; the diaphragm is moved in one direction by a cam situated at the end of a camshaft. The motion of the diaphragm in a reverse direction is performed by a helical spring.

The mostly used petrol pumps are supplying up to 30 l hour of petrol; the supplying light is 1, 5 m. Some cars having petrol engine are without fuel pump. In this case fuel tank must be situated over carburettor and engine and fuel is streaming to the carburettor and engine by gravity.

Forecast Demand, Production and Shortage of Petrol Fuel Pumps

		1351 (1972/3)	1356 (1977/8)	1361 (1982/3)	1366 (1987/8)
Demand	New cars	38, 500	83, 200	140, 000	196, 000
	vannettes, station wagons	10, 800	10, 700	25, 000	35, 000
	Replacement - all types	2, 700	4, 100	7, 000	9, 000
Total demand		52, 000	104, 000	172, 000	240, 000
Capacity		-	100, 000	200, 000	200, 000
Production		-	60, 000	150, 000	200, 000
Shortage		52, 000	44, 000	22, 000	40, 000

* Only complete petrol fuel pumps, replacement of some components and parts which are soon worn out, like diaphragm etc. is not included.

There is no production of petrol fuel pumps in Iran at present and there is no project to produce them in the future. As the demand of petrol fuel pumps is over the threshold for economical production, it is advisable to start the production in the Fifth Five-year Plan (at least for petrol engines produced in Iran National Co. Ltd. Teheran) and to extend the production in the Sixth and Seventh Five-Year Plan. Also the local content will grow substantially during this period.

Description of Machinery, Equipment and Process

Main components and parts of petrol fuel pumps are non-ferrous castings (mostly aluminium alloy). Castings and other parts will be machined on semi-automatic machine tools and afterwards assembled on assembly line.

CARBURETTORS

Carburettors are used at each petrol engine for carburetting petrol before it flows to intake valve of engine. Bigger engines (some four-cylinders,

[illegible] cylinders, eight-cylinders are equipped with [illegible] carburettors for better [illegible] of petrol [illegible] vanettes, produced in Iran, [illegible] equipped with [illegible] Peykan sports is equipped with [illegible] carburettors. It is proposed that [illegible] new models of cars and [illegible] will be equipped with [illegible] carburettors or dual-action carburettors. [illegible] of demand of carburettors is based on old designs [illegible] the demand [illegible] below is the minimum.

[illegible] of Demand, Capacity, Production and Shortage of Carburettors

		1351 (1972/3)	1356 (1977/8)	1361 (1982/3)	1366 (1987/8)
Demand	New cars	43,000	92,000	155,000	230,000
	vannettes	13,400	21,000	41,000	43,000
	mopeds	18,000	45,000	80,000	110,000
	motorcycles	16,000	40,000	90,000	120,000
	tillers	400	500	600	700
	Replacement	6,200	13,500	23,400	36,300
Total demand		97,000	212,000	390,000	540,000
Capacity=		-	200,000	300,000	500,000
Production		-	120,000	300,000	450,000
Shortage		97,000	92,000	90,000	90,000

Replacement of whole carburettors is low as carburettors are repaired in the way that only the worn-out parts are replaced.

There is no factory in Iran producing carburettors and even there is no intention to produce them in the near future. As the demand is already big enough for semi-automatic production, it is recommended to start this production in the Fifth Five-year plan and to extend it in the sixth and seventh five-year plan.

Description of Machinery, Equipment and Process:

Components and parts are made of copper and brass (float toggle and butterfly, log spindle, jets, needle valve, butterfly spindle, gaskets and washers) the remaining parts (body etc.) are made of light metals by die casting or of steel. All materials will be available locally at the end of the fifth five-year plan.

The main operations are die casting (body and other parts) and pressing

from strips (float toggle etc.). After assembly all carburettors are tested.

INJECTION PUMPS WITH REGULATORS

Injection pumps of piston type are supplying fuel under pressure 80 up to 300 atmr. to the nozzles and then to the cylinders of diesel engines. To each cylinder of the diesel engine corresponds one piston of the injection pump. Piston of injection pump is driven by the camshaft.

Each pump is equipped with regulator. Pistons are shaped and it is possible to adjust them by regulating rod so, that they are supplying the quantity needed into each cylinder of diesel engine.

Fuel under high pressure is opening the valve and is supplied to the nozzle where it is distributed into the cylinder of diesel engine.

Forecast of Demand, Capacity, Production and Shortage of Injection Pumps

		1351 (1972/3)	1356 (1977/8)	1361 (1982/3)	1386 (1987/8)
Demand: New					
automative diesel engines	pumps	4,900	9,800	14,800	22,500
	pistons	24,200	50,000	75,000	115,000
stationary diesel engines	pumps	1,200	5,000	7,800	10,800
	pistons	4,800	15,000	24,000	23,000
tractor diesel engines	pumps	-	4,000	9,000	10,500
	pistons	-	20,000	36,000	42,000
Replacement *	pumps	18,900	31,200	48,400	76,200
*	pistons	91,000	125,000	235,000	360,000
Total demand	pumps	25,000	50,000	80,000	120,000
	pistons	120,000	210,000	370,000	550,000
Capacity	pumps	-	-	100,000	100,000
	pistons	-	-	500,000	500,000
Production	pumps	-	-	30,000	90,000
	pistons	-	-	140,000	430,000
Shortage	pumps	25,000	50,000	50,000	30,000
	pistons	120,000	210,000	230,000	120,000

only complete pumps, components and parts for repair of pumps, i.e. cylinders and pistons etc., are not included.

Injection pumps with regulator are complicated, high precission products; it is therefore advisable to start their production in the sixth five year plan when the demand will be big enough for economic production and also high skilled workers will be already available (from other mechanical engineering plants). The same will be with other elements of fuel supplying system at diesel engines, i.e. nozzles and nozzle holders.

Description of Machinery, Equipment and Process:

Complicated elements like pistons, valves, cylinders etc. are made of special alloy steels; cam shaft is forged and housing of injection pump is mostly made of aluminium castings.

Components and parts made of bars of special alloy steels are machined on automatic lathes and after heat treatment are ground on centre grinding machines and then tapped on tapping machines etc. Housing of pump is machined on one-purpose machines.

As already mentioned, most of components are made with accuracy 0.001 mm and therefore the plant should be equipped not only with precision machine tools, but also with precision measuring instruments. Also laboratory for testing of raw materials should be well equipped.

NOZZLES AND NOZZLE HOLDERS

Fuel under high pressure from injection pump is supplied by pipe to a nozzle holder and nozzle. Nozzle is actually a small valve, where nozzle needle is opened by high pressure of fuel and fuel is distributed to the cylinder. There are two types of nozzles: with one opening used up to pressure approximately 200 atm. at diesel engines with antichamber (precombustion) and with more bores, for highest pressures at engines with direct injection.

Forecast of Demand, Capacity and Shortage of Nozzles and Nozzle Holders

		1956 (1981-82)	1961 (1982-83)	1966 (1987-88)
Demand: New automotive diesel engines - nozzle holders	24,200	50,000	75,000	115,000
nozzles	24,200	50,000	75,000	115,000
Tractor diesel engines nozzle holders	-	20,000	36,000	42,000
nozzles	-	20,000	36,000	42,000
Stationary diesel engines nozzle holders	1,400	15,000	24,000	33,000
nozzles	4,800	15,000	24,000	33,000
Replacement - nozzle holders	91,000	125,000	235,000	360,000
nozzles	181,000	245,000	465,000	720,000
Total demand - nozzle holders	120,000	210,000	370,000	550,000
nozzles	210,000	330,000	700,000	910,000
Capacity - nozzle holders	-	-	400,000	400,000
nozzles	-	-	800,000	800,000
Production - nozzle holders	-	-	160,000	400,000
nozzles	-	-	320,000	800,000
Shortage - nozzle holders	120,000	210,000	240,000	150,000
nozzles	210,000	330,000	380,000	110,000

As already mentioned, nozzles and nozzle holders are complicated, high precision products and therefore it is advisable to start their production in the Sixth Five-year Plan when high skilled workers will be already available and to extend it in the Seventh Five-year Plan.

Description of Machinery, Equipment and Process:

Nozzles as well as nozzle holders are made of special alloy steels. All components and parts are made of bars; they are machined on automatic lathes, drilled on special drilling machines and after heat treatment are ground on centre grinding machine and then tapped on tapping machines. The factory should be equipped with precision machine tools, tools and measuring instruments.

PRESSURE LUBRICATING SYSTEM OF ENGINES

Four-stroke petrol as well as diesel engines are lubricated by pressure ...ing system. Two-stroke engines are mostly without pressure lubricating ...m, as they are lubricated directly by the mixture of fuel with oil.

Pressure lubricating system of engines consists of:

1. oil filter
2. oil pump
3. oil coolers (only big engines)
4. oil pressure and/or temperature gauge - see Measuring Gauges

1. OIL FILTERS

Oil filters are filtering lubricating oil in lubricating system, i.e. they ...removing mechanical impurities. Oil filters are situated either before ...pump (in this case pump is fed by filtered oil, but dismounting of oil filter ...complicated) or after oil pump. Some trucks and buses are equipped with ...oil filters.

A filtering medium which uses mostly special filtering paper, is ...placed after approximately 30000 kms.

Forecast of Demand, Capacity, Production and Shortage of Oil Filters

	1351 (1972/3)	1356 (1977/8)	1361 (1982/3)	1366 (1987/8)
Demand: New cars	42,300	90,000	150,000	210,000
vannettes, station wagons	13,400	21,400	32,000	45,000
buses & minibuses	3,800	5,600	6,800	9,000
trucks	4,200	9,300	16,000	28,000
tractors	6,000	8,000	10,500	13,500
tillers	2,300	2,700	3,100	3,800
Stationary diesel engines	1,200	5,000	7,800	10,800
Replacement including oil filters for other products*	8,800	16,000	28,800	35,900
Total demand	82,000	158,000	285,000	350,000
Capacity	-	100,000	200,000	300,000
Production	-	80,000	200,000	290,000
Shortage	82,000	78,000	85,000	70,000

* Replacement of complete oil filters only, replacement of filtering paper is not included. Oil filters for other products for example for machine tools, compressors etc.

There is no production of oil filters in Iran at present, but there is an intention to produce them in the future.

The demand is big enough for economical production and therefore it is advisable to start this production in the Fifth Five-year Plan and to extend the production in the Sixth and Seventh Five-year Plan (see above).

Description of Machinery, Equipment and Process

The housing of oil filter is mostly non-ferrous metal casting, filtering insert and gasket is made of special paper, other components and parts (bolts, washers etc.) are made of steel.

Housing is machined on turret lathes; bolts, nuts and washers on automatic lathes.

2. OIL PUMPS

Oil pump is supplying lubricating oil under pressure to lubricating system. There are used mostly gear type oil pumps; in some cases - for example Jeep with engine Hurricane F4 - are used rotor type ones. They are driven by cam shaft of engine and are mostly situated on the housing of the engine, i.e. they are interconnected with engine and therefore the producer of the engine is also producing oil pump.

The production of oil pumps for automotive as well as stationary engines started just recently in the factories for the production of automative as well as stationary engines.

Dorman Diesel Iran, Tabriz

The production of oil pumps for diesel engines produced in the factory started in three phases. In the first phase started the production of oil pump housing, in the second phase oil pump cover plate and in the third phase started the production of gears with shafts.

The shop for production of oil pumps is equipped with special machine tools. The capacity of this shop is adequate to cover all needs of oil pumps for new diesel engines produced in the plant as well as for repairs.

Iran Diesel Engine Motors Co., Tabriz

The production of complete oil pumps for all models of diesel engines produced in the factory started in 1351 (1972). The shop for production of oil pumps is equipped with modern, special machine tools, arranged in the operation line. The capacity of this line far exceeds the present demand.

Metallurgical and Engineering Plant in Tabriz

The factory will soon start the production of stationary diesel engines, machinery and equipment for their production is already installed. The production of oil pumps will start in the first phase.

Iran National Manufacturing Co., Teheran

The production of petrol engines for Peykan will start in 1353 (1974/5). Oil pumps will be produced already in the first stage.

Forecast of Demand, Capacity, Production and Shortage of Oil Pumps for Automobile and Stationary Engines

	1351 (1972/3)	1356 (1977/8)	1361 (1982/3)	1366 (1987/8)
Demand: New: cars	42,300	90,000	150,000	210,000
vannettes, station wagons	13,400	21,400	32,000	45,000
buses and minibuses	2,800	4,100	4,800	6,000
trucks	3,200	7,800	13,000	21,000
tractors	6,000	8,000	10,500	13,500
tillers	2,300	2,700	3,100	3,800
stationary diesel engines	1,200	5,000	7,800	10,800
Replacement including oil pumps for other products*	7,800	16,000	28,200	40,900
Total demand	78,000	155,000	250,000	350,000
Capacity	-	100,000	200,000	300,000
Production	-	80,000	200,000	300,000
Shortage	78,000	75,000	50,000	50,000

* Replacement of complete oil pumps only. Oil pumps for other products - for example for machine tools, compressors etc.

As all producers of petrol and diesel engines are producing or will soon start the production of oil pumps, it is not possible to produce them in a specialized unit.

3. OIL COOLERS

Oil coolers are cooling lubricating oil. They are used at big petrol and diesel engines only.

Dorman Diesel Iran, Tabriz

Production of oil coolers started in 1350 (1971/2). The capacity of production line is big enough for present as well as future demand.

Iran Diesel Engine Motors Co. Tabriz

Production of oil coolers started in 1351 (1972/3). The installed machinery and equipment has enough capacity for present as well as future demand.

Metallurgical and Engineering Plant in Tabriz

This factory will produce only small diesel engines which are without oil coolers.

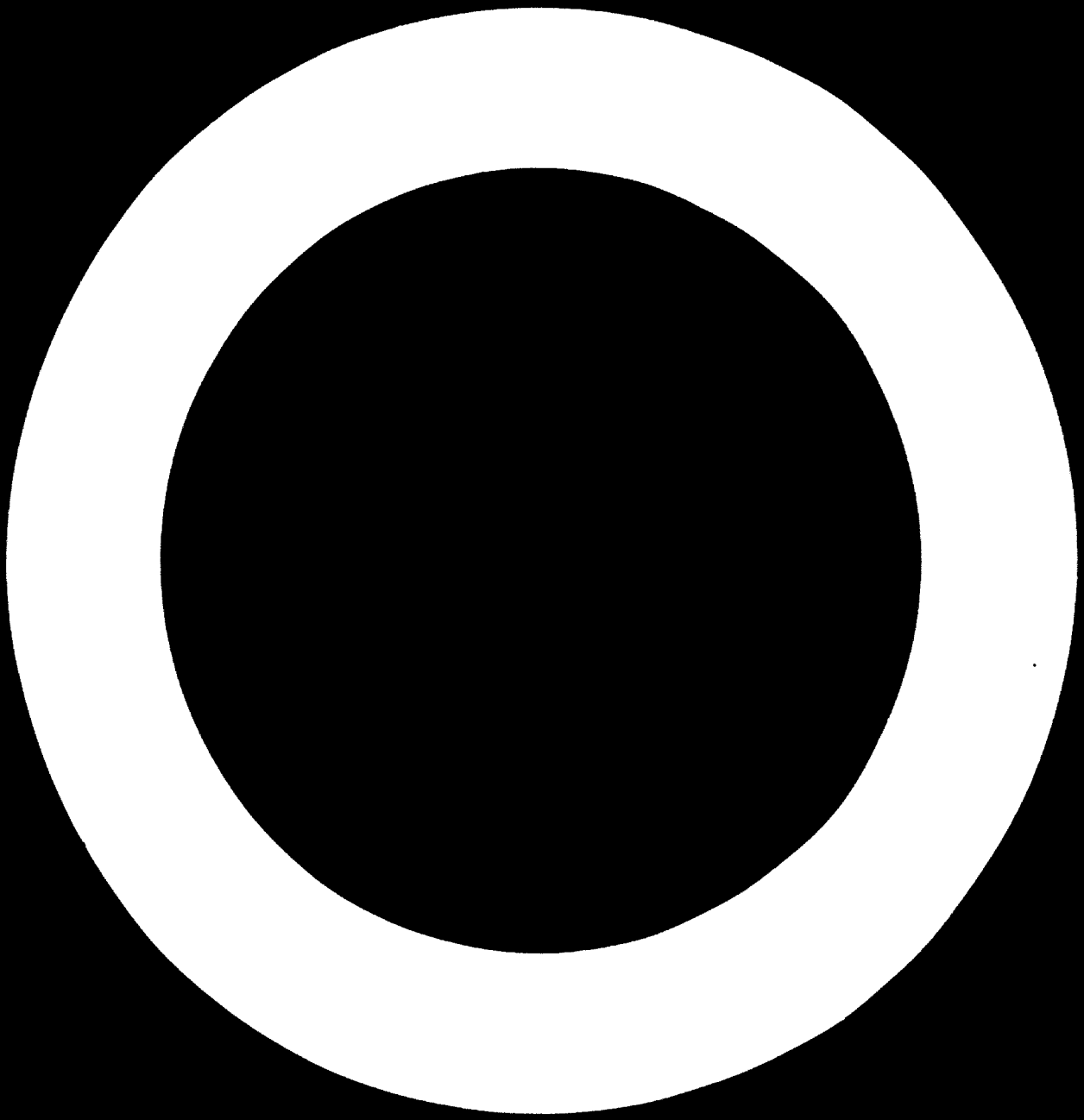
Tractor Manufacturing Co. Tabriz

Tractors Universal U650 and U651 are equipped with oil coolers. According to the project report oil coolers will be produced in the future in the plant. As machinery and equipment is not yet installed in the plant, it is possible to produce these coolers in small scale plant in Industrial Estate in Tabriz.

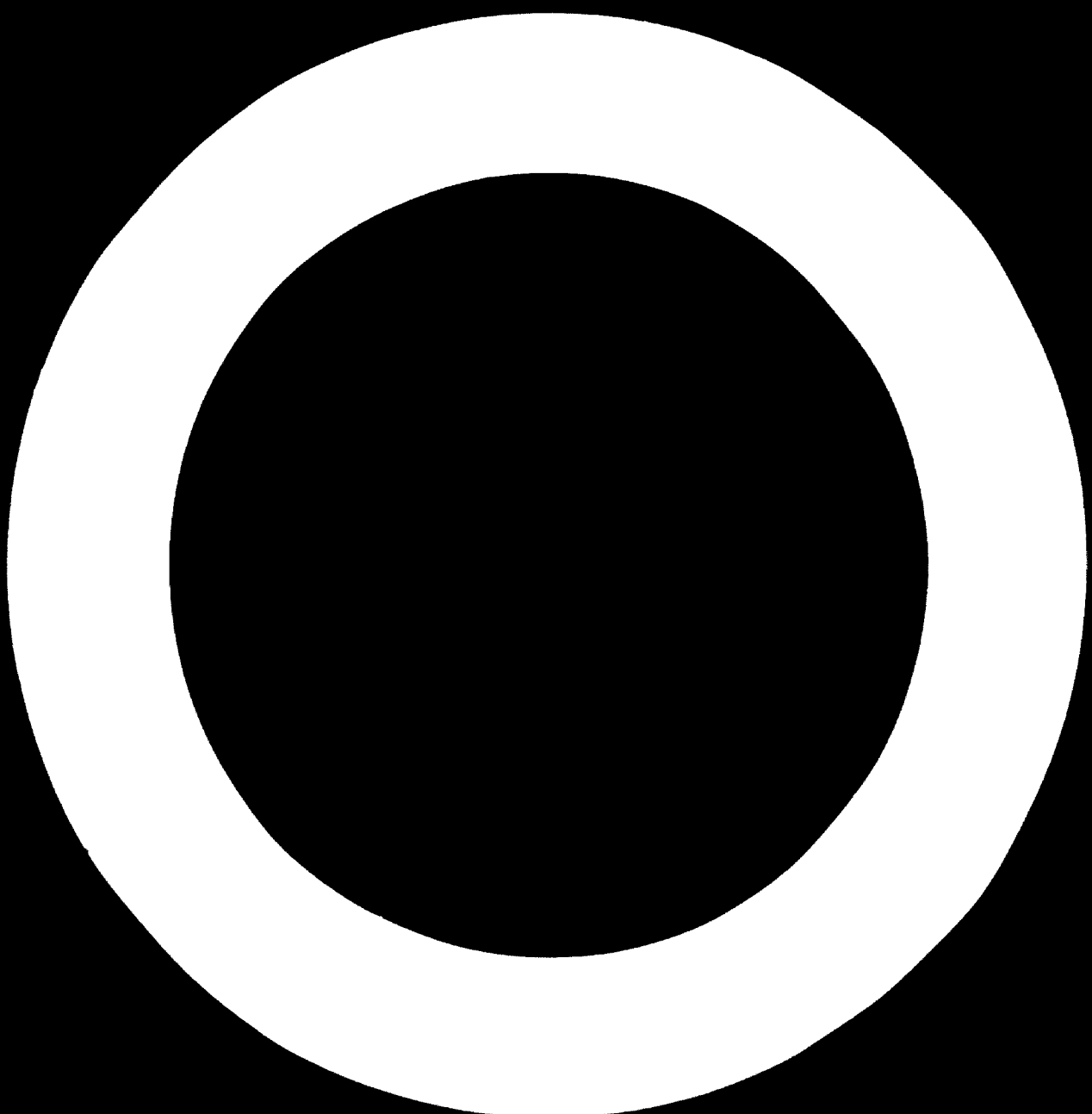
Forecast of Demand, Capacity, Production and Shortage of Oil Coolers

	1351 (1972/3)	1356 (1977/8)	1361 (1982/3)	1366 (1987/8)
Demand: New buses and minibuses	2, 800	4, 100	4, 800	6, 000
trucks	3, 200	7, 800	13, 000	21, 000
tractors	6, 000	8, 000	10, 500	13, 500
stationary diesel engines, replacement and other products	1, 000	2, 100	2, 700	3, 500
Total demand	13, 000	22, 000	31, 000	44, 000
Capacity	16, 000	25, 000	40, 000	50, 000
Production	5, 000	14, 000	31, 000	42, 000
Shortage	8, 000	8, 000	1, 000	2, 000

Except oil coolers for tractors there is no possibility to build specialised factory for oil coolers.



4. ELECTRICAL OUTFIT OF MOTOR VEHICLES



ELECTRICAL OUTFIT OF MOTOR VEHICLES

Modern motor vehicles are equipped with a complicated electrical outfit. In advanced countries there are specialized factories producing only components and parts of electrical outfit of motor vehicles.

Till now, there is no production of electrical outfit of motor vehicles in Iran (except wet batteries). It is advisable to start the production of some apparatuses in the Fifth Five-year Plan and to extend it in the Sixth and Seventh Five-year Plan. Also here it is advisable to produce electrical outfit for motor vehicles in specialized factories, but it is possible to produce in the same factory electrical equipment of the similar nature for other purposes to utilize to maximum extent installed machinery and equipment.

Electrical outfit of modern motor vehicles consists of these groups:

1. Sources of electric power
2. Starters
3. Ignition system
4. Lights and switches
5. Auxiliary electric equipment
6. Measuring gauges and signalling equipment
7. Wiring

1. SOURCES OF ELECTRIC POWER

Sources of electric power in modern motor vehicles are:

1. Wet batteries
2. Dynamos or alternators.

1.1 WET BATTERIES

See Electrical Engineering Industry.

1.2 DYNAMOS, ALTERNATORS, DYNAMOSTARTERS

Dynamo is a d.c. generator. According to the type (size) of vehicle, the voltage is 6 V, 12 V or 24 (the same as battery, starter etc.). The

capacity is from [illegible] W up to [illegible] 5000 W (buses, trucks, etc.).

Alternator is a a.c. generator. The voltage is again 6 V, 12 V or 24 V according to the size of vehicle. Also the capacity is the same as that of dynamo, i.e. [illegible] W up to 5000 W. Alternator is supplying a.c. current to the rectifier which rectifies it to d.c. current of the same voltage. Alternators have better characteristics mainly at low revolutions and therefore modern types of vehicles are using more frequently alternators. There is a tendency to replace dynamos by alternators.

Dynamostarter is special d.c. electric generator combined with starter. It is used mostly at motorcycles with big engine or high compression ratio. As from the point of view of production process, alternators, dynamos and dynamostarters are in the same group, the demand is calculated for the whole group and not for individual item. As already mentioned dynamos will be replaced in the future mostly by alternators.

Forecast of Demand, Capacity, Production and Shortage of Dynamos, Alternators and Dynamostarters

		1351 (1972/3)	1356 (1977/8)	1361 (1982/3)	1366 (1987/8)
Demand	New Cars	42,300	90,000	150,000	210,000
	Vannettes, station waggons	13,400	21,400	32,000	45,000
	Buses, minibuses	2,800	4,100	4,800	6,000
	Trucks	3,200	7,800	13,000	21,000
	Tractors	6,000	8,000	10,500	13,500
	Tillers	2,300	2,700	3,100	3,800
	Motorcycles	16,000	40,000	90,000	120,000
	Mopeds	18,000	45,000	80,000	110,000
Replacement and other vehicles		8,000	11,000	16,800	20,700
Total demand		110,000	230,000	400,000	550,000
Capacity		-	200,000	400,000	500,000
Production		-	120,000	320,000	480,000
Shortage		110,000	110,000	80,000	70,000

Replacement of dynamos, alternators and dynamostarters is low, as these generators are mostly repaired by replacement of worn-out components and parts.

There is no production of dynamos, alternators and dynamostarters in Iran at present. Industrial and Mining Development Bank of Iran studied the production of these generators and is planning to start production in the Fifth Five-Year Plan in the Vehicles Electrical Equipment Project.

Description of Machinery, Equipment and Process

The above given quantity is big enough for semi-automatic production with automatic, semi-automatic and single-purpose machine tools. The process is the same as at the production of fractional horse power motors, starters etc.

Dynamo sheets and other components and parts made of steel or plastic sheets are pressed in press shop, shaft as well as body and end shields are machined on special lines, consisting of automatic, semi-automatic and single-purpose machine tools. Winding is done in winding shop.

Assembly consists of assembly of stator and rotors insertion of coils and insulation and assembly of main groups.

2. STARTERS

Starter is a d. c. electric motor with pinion which meshes with starting gear of vehicle engine or stationary engine. When the engine is already in operation, the mesh is disconnected by shifting either of pinion only or pinion with armature. The voltage of starters is either 12 V (cars, small vannettes) or 24 V (trucks, buses, minibuses, tractors etc.). The power of smallest starter is approximately 0.5 HP, of the biggest approximately 8 HP. Dynamostarters which are used at motorcycles are given under heading "Dynamos".

The calculation of demand is based on new vehicles and stationary diesel engines (only smaller types are equipped with electric starter, big ones are started by compressed air), the replacement is minimal, as starters are mostly repaired.

Forecast of Demand, Capacity, Production and Shortage of Electric Starters

		1351 (1972/3)	1356 (1977/8)	1361 (1982/3)	1366 (1987/8)
Demand	New cars	42,300	90,000	150,000	210,000
	Vannettes, station wagons	13,400	21,400	32,000	45,000
	buses and minibuses	2,800	4,100	4,800	6,000
	trucks	3,200	7,800	13,000	21,000
	tractors	6,000	8,000	10,500	13,500
	stationary diesel engines	600	2,200	3,200	4,400
Replacement (all types)		1,700	2,500	4,500	6,100
Total demand		70,000	136,000	218,000	306,000
Capacity		-	150,000	150,000	400,000
Production		-	80,000	180,000	280,000
Shortage		70,000	56,000	38,000	26,000

There is no production of starters in Iran at present, but the demand in the future will be big enough for semi-automatic production. It is advisable to start the production of starters in the Fifth Five-year Plan and to develop it in the Sixth and Seventh Five-year Plan. The production of starters should be combined with production of other electrical equipment for vehicles, like dynamos, alternators, windscreen wipers etc.

Description of Machinery Equipment and Process

Machinery, equipment and process are the same as at the production of dynamos, alternators and dynamostarters.

Pinions are machined on automatic single spindle lathes, ground on centre grinding machine, then on gear cutting machines, heat treated and ground on gear grinding machine.

3. IGNITION SYSTEM

Ignition system of petrol engines consists of two circuits: primary (low voltage circuit) and secondary (high voltage circuit).

Primary (low voltage) circuit:

- battery fed by dynamo or alternator
- interruptor with capacitor
- ignition coil
- switch (common with starting switch)

Secondary (high voltage circuit):

- ignition coil (the same as in primary circuit)
- distributor - engines with more than one cylinder only common with interruptor
- spark plugs

Battery, dynamo and alternator - see Sources of Electric Power,
Switch - see Switches.

3.1 IGNITION COIL

Ignition coil is common for primary as well as secondary circuit. Primary (low voltage) winding is connecting battery with interruptor secondary winding (high voltage) is connecting battery with distributor and spark plugs.

Forecast of Demand, Capacity, Production and Shortage of Ignition Coils

	1351 (1972/3)	1356 (1977/8)	1361 (1982/3)	1366 (1987/8)
Demand: New cars	42,300	90,000	150,000	210,000
vannetes, station wagons	13,200	21,000	31,000	43,000
tillers	400	500	600	700
motorcycles	16,000	40,000	90,000	120,000
mopeds	18,000	45,000	80,000	110,000
Replacement and other vehicles	2,100	4,500	8,400	12,300
Total demand	92,000	201,000	360,000	496,000
Capacity	-	200,000	400,000	500,000
Production	-	80,000	300,000	440,000
Shortage	92,000	121,000	60,000	56,000

There is no production of ignition coils in Iran at present, but it is recommended to start this production in the Fifth Five-year Plan and to extend it in the Sixth and Seventh Five-year Plans.

Production of ignition coils should be connected with production of other ignition and electrical outfit, like distributors, solenoids, etc.

3.2 INTERRUPTORS WITH CAPACITORS

Interruptor with capacitor is always connected with other parts of ignition system: at mopeds, motorcycles and some cars with two-cylinder engine is connected with dynamostarter, at cars, vannettes, station wagons etc. with distributor, i.e. producers of dynamostarters or distributors are also producing interruptors. Capacitors are purchased from producers of capacitors - see Electrical Engineering Industry - Capacitors.

Forecast of Demand of Capacitors for Ignition System

	1351 (1972/3)	1356 (1977/8)	1361 (1982/3)	1366 (1987/8)
Demand: New Cars	42,200	90,000	150,000	210,000
vannettes, station wagons	13,200	21,000	31,000	43,000
tillers	400	500	600	700
mopeds	18,000	45,000	80,000	110,000
motorcycles	16,000	40,000	90,000	120,000
Replacement	2,100	4,500	8,400	12,300
Total demand	92,000	201,000	360,000	496,000

Production of capacitors - see Electrical Engineering Industry - Capacitors.

3.3 SPARK PLUGS

Spark plugs are used only at petrol engines for igniting vaporised petrol-air mixe in cylinder. Each cylinder of petrol engine has one spark plug.

Spark plug consists of two different types of components: a ceramic insulator made of aluminium silicates or alumines and metallic parts (bush, cable nut, bolt, medium and side electrode, sealing ring, compensating collar, cup) made of steel, nickel alloy steel, brass and copper.

There are different sizes of spark plugs - thread reach 10 till 18 mm with different thermal values from 95 up to 260.

Each spark plug should be changed after 15000 km of service, but in Iran spark plugs are changed after longer service- approximately after 25000 km.

Forecast of Demand, Capacity, Production and Shortage of Spark Plugs

	1351 (1972/3)	1356 (1977/8)	1361 (1982/3)	1366 (1967/8)
Demand: New cars	169,000	369,000	630,000	898,000
vannettes, station wagons	51,600	80,500	124,400	171,800
tillers	400	500	600	700
motorcycles	16,000	40,000	90,000	120,000
mopeds	18,000	45,000	80,000	110,000
Replacement - all types	1,885,000	3,285,000	5,375,000	7,700,000
Total demand	2,149,000	3,820,000	6,500,000	9,000,000
Capacity	-	2,200,000	5,000,000	10,000,000
Production	-	2,200,000	5,000,000	8,500,000
Shortage	2,140,000	1,620,000	1,500,000	500,000

Till now, there is no production of spark plugs in Iran, but soon the production will start in a new factory:

Sham-e Automobile Qazvin

This firm, collaborating with Bosh A.G. (West Germany) got the licence for production of spark plugs. In the first stage of construction (1353) the capacity will be 2,200,000 pcs/year in one-shift operation. There will be production only of metallic parts; ceramic insulators will

be imported. After 5 years should the capacity and production reach 5,000,000 pcs/year, at this time will start the production of ceramic insulators. After ten years (1968) the capacity and production will reach 7,000,000 pcs/year two-shift operation. In the Seventh Five-year Plan the capacity should be extended up to 10,000,000 pcs/year.

Description of Machinery, Equipment and Process

The turning shop is equipped with one- and six-spindle automatic lathes. In this shop are turned bushes, cable nuts, bolts and components of medium electrode.

Sealing rings, compensating collars and cups are pressed on eccentric presses. In the welding shop, bushes are welded with outside electrode and bolts are welded with medium electrode. Bushes and sealing rings, compensating collars and bolts of medium electrode are metal plated. All components and parts are assembled in mounting shop and then tested.

Ceramic insulators will be made of alumina with mineralizers and fluxing agents. After grinding, sieving , mixing and filter pressing the body is shaped on hydraulic presses, turned on special lathes, dryed and fired. After first firing the insulator is glazed and is fired for the second time in other tunnel kiln, then sorted and tested. More details see J. Semsch, "A project for the production of spark plugs including production of ceramic insulators in Iran with annual capacity of 3,000,000 pcs and 5,000,000 pcs in two-shift operation".

3.4 DISTRIBUTORS

Each petrol engine having more than one cylinder needs a distributor. It is an electric apparatus which is distributing electric energy from dynamo, alternator or battery to the respective spark plug in prescribed sequence and in the exact time.

Forecast of Demand, Capacity, Production and Shortage of Distributors

	1351 (1972/3)	1356 (1977/8)	1361 (1982/3)	1366 (1987/8)
Demand: New cars	42,300	90,000	150,000	210,000
vannettes, station wagons	13,200	21,000	31,000	43,000
Replacement and other vehicles	6,500	9,000	14,000	17,000
Total demand	62,000	120,000	195,000	270,000
Capacity	-	150,000	200,000	250,000
Production	-	90,000	150,000	240,000
Shortage	62,000	30,000	45,000	30,000

There is no production of distributors in Iran at present but Industrial and Mining Development Bank of Iran studied this item and included the production of distributors to the Vehicle Electrical Equipment Project which should be implemented in the Fifth Five-year Plan. Other items produced in this plant should be alternators, starters, ignition coils etc.

4. LIGHTS AND SWITCHES

4.1 LIGHTS

Most of bicycles and all motor vehicles are equipped with lights. It is anticipated, that approximately 70% of bicycles will be equipped with one head light and in the future with one tail light.

Mopeds and motorcycles have one head light, one tail light and one stop light, one or two controlling lights and some motorcycles are equipped with one fog light and two direction indicators.

Cars, vannettes and station wagons are equipped mostly with two head lights, two stop and two tail lights, four direction indicators, one interior light, one panel light, one engine and one luggage accommodation light and min. six controlling lights. Some cars, vannettes and station wagons have these additional lights: two head lights, two fog lights, four guard lights, two rear head lights and one interior light.

Trucks are equipped with two head lights, two stop and two tail lights, four up to eight guard lights, four direction indicators, one interior, one panel and one engine light, two rear head lights and min. eight controlling lights. Very often trucks have two fog lights, two additional head lights and one reflector for leading freights.

Buses and minibuses have mostly two head lights, two stop and two tail lights, four up to eight guard lights, four direction indicators, four up to eight interior lights, one panel, one engine and one up to four luggage accommodation lights and minimum eight controlling lights. Some buses and minibuses have two fog lights and two additional head lights.

Tractors have mostly two head lights, two stop and two tail lights, four direction indicators, one engine and one panel light and minimum four controlling lights. Very often tractors are equipped with one rear head and four guard lights.

Tillers are equipped with one up to two head lights and approximately four controlling lights.

Trailers and tractors and trucks are equipped with two stop and two tail lamps and two direction indicators.

Forecast of Demand, Capacity, Production and Shortage of Head Lights Fog Lights, Reflectors and Rear Head Lights

	1351 (1972/3)	1356 (1977/8)	1361 (1982/3)	1366 (1987/8)
Demand: New bicycles	10,000	130,000	210,000	250,000
mopeds	18,000	45,000	80,000	110,000
motorcycles	16,000	40,000	90,000	120,000
cars	120,000	350,000	720,000	1,050,000
Station wagons, vannettes	42,000	85,000	150,000	220,000
trucks	13,000	35,000	65,000	110,000
buses, minibuses	13,000	21,000	24,000	30,000
tractors	15,000	20,000	30,000	40,000
tillers	3,000	4,000	5,000	6,000
Replacement and other vehicles	14,000	30,000	56,000	84,000

Total demand	270, 000	760, 000	1, 430, 000	2, 020, 000
Capacity	-	800, 000	1, 200, 000	2, 000, 000
Production	-	350, 000	1, 080, 000	1, 800, 000
Shortage	270, 000	410, 000	350, 000	220, 000

There is no production of head lights, fog lights, reflectors and rear head lights in Iran at present. As the demand is big enough for economical mass production, it is advisable to start the production in the Fifth Five-year Plan and to develop it in the Sixth and Seventh Five-year Plans.

Forecast of Demand, Capacity, Production and Shortage of Other Lights, including Controlling Lights

	1351 (1972/3)	1356 (1977/8)	1361 (1982/3)	1366 (1987/8)
Demand: New bicycles	5, 000	100, 000	150, 000	250, 000
mopeds	48, 000	180, 000	320, 000	440, 000
motorcycles	64, 000	160, 000	400, 000	600, 000
cars	846, 000	1, 800, 000	3, 200, 000	4, 500, 000
station wagons, vannettes	268, 000	430, 000	650, 000	920, 000
trucks	80, 000	200, 000	340, 000	550, 000
buses, minibuses	78, 000	130, 000	150, 000	190, 000
trailers	16, 000	28, 000	48, 000	65, 000
tractors	65, 000	90, 000	120, 000	150, 000
tillers	9, 000	10, 000	12, 000	15, 000
Replacement and other products	77, 000	142, 000	230, 000	320, 000
Total demand	1, 700, 000	3, 270, 000	5, 650, 000	8, 000, 000
Capacity	-	2, 000, 000	4, 000, 000	8, 000, 000
Production	-	800, 000	3, 800, 000	7, 400, 000
Shortage	1, 709, 000	2, 470, 000	1, 850, 000	600, 000

Also other lights (stop, tail and guard lights, direction indicators, panel, engine and luggage accommodation lights and controlling lights) are not produced in Iran at present. The above given figures are showing that the total demand is big enough for mass production and therefore is advisable to start the production also in the Fifth Five-year Plan and to increase it in the Sixt and Seventh Five-year Plans.

Description of Machinery, Equipment and Process

From the technological point of view there are two types of lights:

1. Head lights, fog lights, reflectors, rear head lights etc. All these lights are equipped with parabolic reflector made of glass with reflecting surface either silver plated and polished or varnish coated and in vacuum aluminium plated. American reflector Sealed Beam is actually special incandescent lamp.

2. Other lights, i.e. stop lights, tail lights, dimension indicators, guard lights, controlling lights etc. are without parabolic reflector, i.e. their production is simpler.

Components and parts made of steel and non-ferrous metal sheets are pressed on mechanical presses, the others, made of steel and non-ferrous metal bars are turned on automatic lathes; plastics (covers etc.) are pressed on special presses. One of most important shops is surface plating shop. Components and parts made of glass-parabolic reflectors and light covers will be purchased outside the plant.

4.2 SWITCHES

All kinds of motor vehicles are equipped with switches for connecting and disconnecting electrical circuits of apparatuses, lights etc. Bicycles are equipped with one switch, which is mostly placed on head light, i.e. it is produced and supplied with head light.

The outstanding special motor vehicles switches are:

- Ignition and starter switch, sometimes connected with locking mechanismus of steering wheel.
- Head light dimmer switch for dimming head lights.
- Brake stop light switch-foot dipper switch, operated by foot brake pedal.
- Door pillar switch-operated by door etc.

Mopeds and motorcycles have one ignition (ignition and starter) switch, one brake stop light switch, one head-light dimmer switch and sometimes one or two other switches (direction indicators switch, fog light switch).

Cars, vannettes and station wagons are equipped with one ignition and starter switch, one headlight dimmer switch, one brake stop light switch, one panel light switch, one direction indicator switch, one warning light switch, one windscreen wiper switch and three up to nine other switches.

Trucks are equipped with one ignition and starter switch, one head light dimmer switch, one brake stop light switch, one direction indicator switch, one warning light switch, one windscreen wiper switch, one panel switch and four up to eight other switches.

Buses and minibuses have one ignition and starter switch, one head light dimmer switch, one brake stop light switch, one direction indicator switch, two interior light switches, one warning light switch, one windscreen wiper switch, one panel light switch and four up to eight other switches.

Tractors have one ignition and starter switch, one head light dimmer switch, one brake stop light switch, one direction indicators switch, one warning light switch, one panel light switch and four up to six other switches.

Tillers are equipped with one ignition (ignition and starter) switch, one headlight switch and three up to four other switches.

There are a number of special switches of similar kind as in automobile industry (for example automatic light switch in refrigerator, switches for radios, TV sets etc.), but it is not advisable to produce them in the same plant, as switches for motor vehicles are for the voltage up to 24 V, the above mentioned switches are for the voltage 220 V or 380 V. It is advisable to produce in the same plant switches for other products up to 50 V.

Forecast of Demand, Capacity, Production and Shortage of Switches for Motor Vehicles

	1351 (1972-3)	1356 (1977-8)	1361 (1982-3)	1366 (1987-8)
Demand: New mopeds	54,000	135,000	240,000	330,000
motorcycles	50,000	120,000	300,000	390,000
cars	600,000	1,350,000	2,400,000	3,570,000
vannettes, station wagons	185,000	320,000	480,000	720,000
trucks	40,000	80,000	180,000	315,000
buses, minibuses	40,000	65,000	75,000	105,000
tractors	60,000	95,000	135,000	175,000
tillers	11,000	15,000	20,000	25,000
Replacement and other products	40,000	90,000	170,000	270,000
Total demand	1,080,000	2,270,000	4,000,000	5,900,000
Capacity	-	1,000,000	3,000,000	6,000,000
Production	-	600,000	2,700,000	5,000,000
Shortage	1,080,000	1,670,000	1,300,000	900,000

There is no production of special switches for motor cars in Iran at present. It is recommended to start the production of these switches in the Fifth Five-year Plan, partly from imported components and parts and to increase it in the Sixth and Seventh Five-year Plan.

Description of Machinery, Equipment and Process

Production of switches for motor vehicles is a typical mass production. Most of components and parts are made of steel or non-ferrous metals sheets by pressing on high speed automatic or semi-automatic eccentric presses (up to 100 tons) or made of steel or non-ferrous metal bars by turning on automatic lathes. Very often these components are surface plated (silver-plated, chromium-plated, cadmium-plated etc.)

Some components and parts are made of plastics by pressing or injection pressing on automatic hydraulic presses and injection presses. Components and parts are assembled on conveyor assembly line by means of electric or pneumatic tools (screw-drivers, rivetting machines etc.)

5.1 HORNS

All vehicles, going on public roads must be equipped with horn (mostly electric) for sound signals. Electric horn consists of electro-magnet, membrane with electromagnet armature and interruptor with resistor. According to the voltage there are horns for 6 V, 12 V, 24 V, according to the tune there are one and two tune horns.

The demand of horns was calculated from number of new vehicles produced in Iran plus replacement.

Forecast of Demand, Capacity, Production and Gap of Electric Horns

	1351 (1972/3)	1356 (1977/8)	1361 (1982/3)	1366 (1987/8)
Demand: New Cars	42,300	90,000	150,000	210,000
vannettes, station wagons	13,400	21,400	32,000	45,000
buses and minibuses	2,800	4,100	4,800	6,000
trucks	3,200	7,800	13,000	21,000
tractors	6,000	8,000	10,500	13,500
tillers	2,300	2,700	3,100	3,800
motorcycles	16,000	40,000	90,000	120,000
mopeds	18,000	45,000	80,000	110,000
Replacement and other vehicles	3,000	6,000	11,600	16,700
Total demand	107,000	225,000	395,000	546,000
Capacity	-	250,000	400,000	500,000
Production	-	150,000	350,000	480,000
Shortage	107,000	75,000	45,000	66,000

There is no production of electric horns in Iran at present, but the demand in the near future will be big enough for semi-automatic production. It is advisable to produce electric horns in the Fifth Five-year Plan, but under the condition that this production will be combined with production of other electric outfit of vehicles.

5.2 WINDSCREEN WIPERS

Most of motor vehicles (except motorcycles, mopeds and some tractors) are equipped with windscreen wipers.

Windscreen wiper is a low voltage (12 V, 24 V) d.c. electric motor with wiper arm. Some motor vehicles are equipped with one electric motor and one wiper arm (for example tricycles, small vannettes, most of tractors), some with one motor and two wiper arms (most of cars, some trucks etc.) or two motors and two wiper arms (Jeeps, Land Rover, most of trucks, buses and minibuses).

The calculation of demand is based on new vehicles plus replacement. Replacement of d.c. motors is low, wiper arms are replaced more frequently and rubber sealing on wiper arm is replaced after approximately 2 - 3 years.

Forecast of Demand, Capacity, Production and Shortage of Windscreen Wipers

	1351 (1972/3)	1356 (1977/8)	1361 (1982/3)	1366 (1987/8)
Demand: New cars - wiper motors	44,000	94,000	155,000	220,000
wiper arms	84,600	180,000	300,000	420,000
vannettes, station wagons				
- wiper motors	15,000	24,000	35,000	48,000
- wiper arms	26,800	42,800	64,000	90,000
buses and minibuses				
- wiper motors	5,000	7,000	8,000	10,000
- wiper arms	5,600	8,200	9,600	12,000
trucks				
- wiper motors	5,000	13,000	22,000	36,000
- wiper arms	6,400	15,600	26,000	42,000
tractors				
- wiper motors	5,000	7,000	9,000	12,000
- wiper arms	5,000	7,000	9,000	12,000
Replacement				
- wiper motors	4,000	8,000	13,000	19,000
- wiper arms	31,600	56,400	91,600	124,000

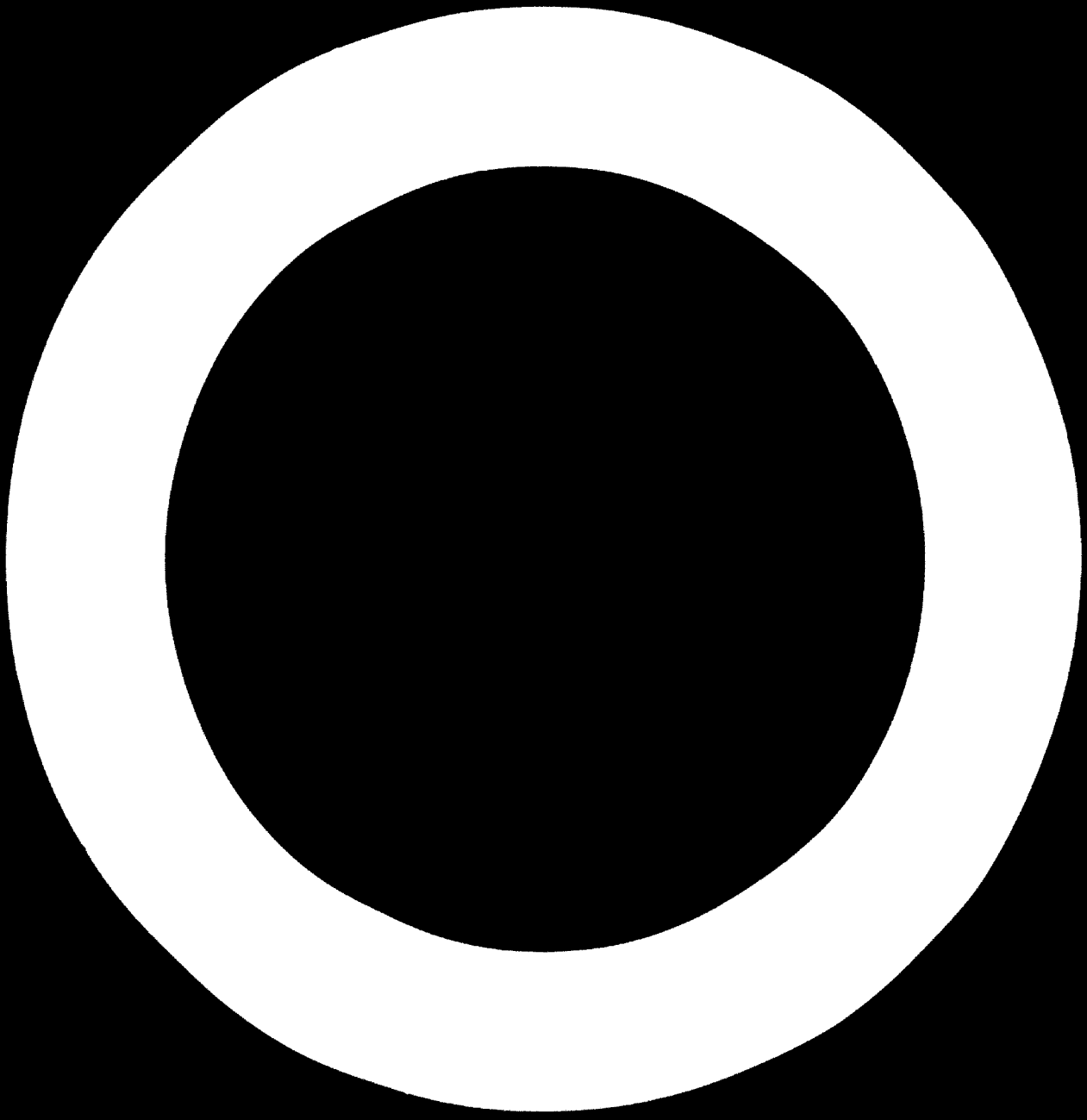
Total demand				
- wiper motors	78, 000	153, 000	243, 000	345, 000
- wiper arms	160, 000	310, 000	500, 000	700, 000
Capacity				
- wiper motors	-	200, 000	200, 000	300, 000
- wiper arms	-	400, 000	400, 000	600, 000
Production				
- wiper motors	-	100, 000	200, 000	300, 000
- wiper arms	-	200, 000	400, 000	600, 000
Shortage				
- wiper motors	78, 000	53, 000	42, 000	45, 000
- wiper arms	160, 000	110, 000	100, 000	100, 000

There is no production of windscreen wipers in Iran at present, but the forecasted demand after five years will be big enough for semi-automatic production. It is advisable to start the production of windscreen wipers in the Fifth Five-year Plan and to extend this production in the Sixth and Seventh Five-year Plans. The best solution will be to combine this production with other electrical equipment for automobile industry (starters, dynamos, horns etc.) or with production of fractional horse power motors (see Electric Motors).

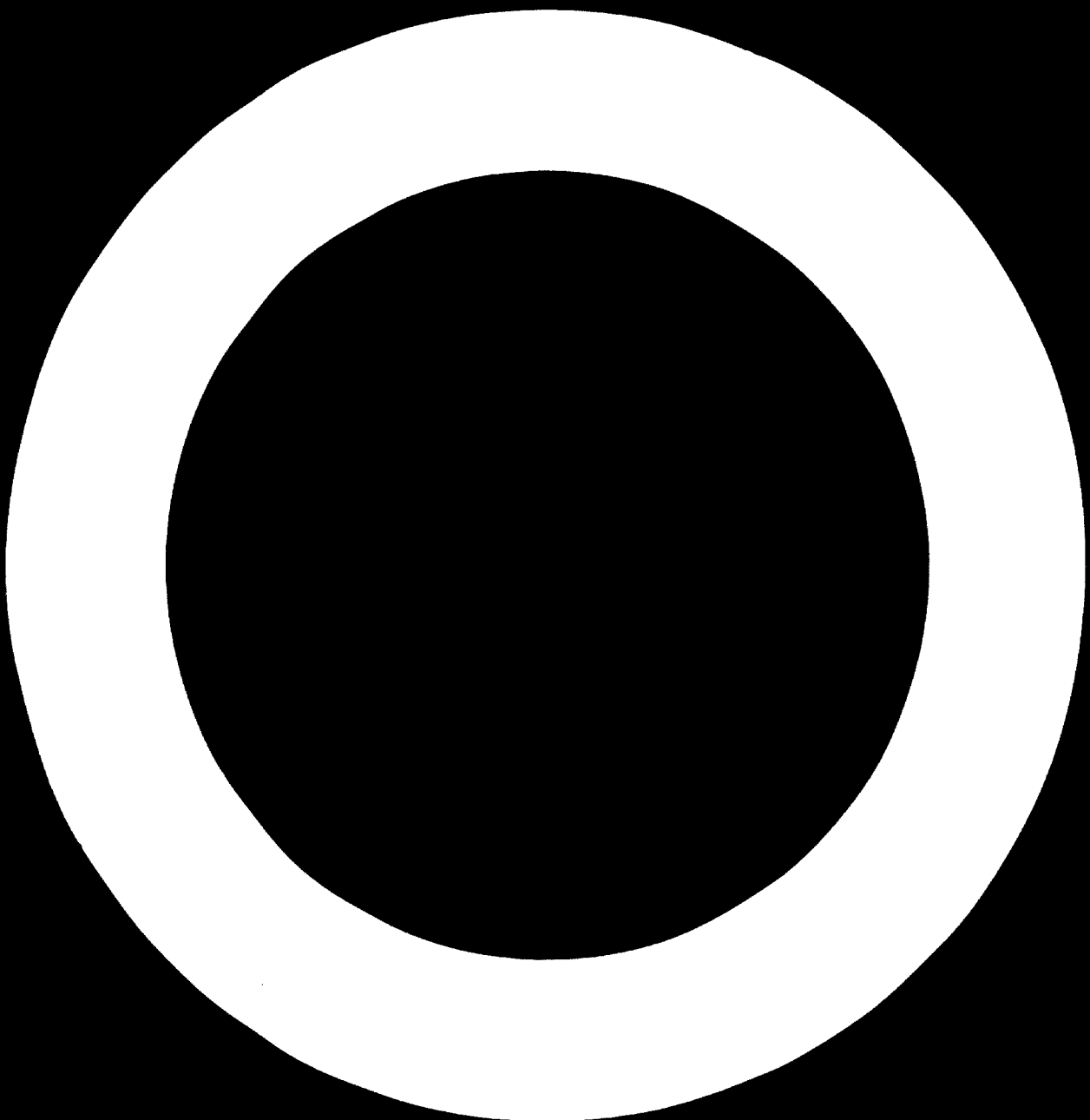
Description of Machinery, Equipment and Process

The machinery and equipment for the semi-automatic production of windscreen wiper motors is mostly the same as for the production of any d. c. fractional horse power electric motors - see for example Starters, Dynamos, etc.

Components and parts of wiper arms are pressed on eccentric presses and then chromium plated and assembled.



5. BRAKING SYSTEM



Each motor [illegible] one braking system [illegible] cycles, rollers or two braking systems [illegible] braking systems are used [illegible]

1 Brakes activated only by the force of the driver.

1.1 Mechanical brakes. Braking power is transmitted by mechanical means. This system is now mostly used at [illegible]

1.2 Hydraulic brakes. Braking power from brake pedal is transmitted by means of hydraulic master cylinder to all slave cylinders. The system consists of brake pedal connected with master cylinder, pipes to all braking drums, two up to four braking drums with slave cylinders. It is mostly used at cars, [illegible], station wagons, etc.

2. Brakes with servomotor.

2.1 Brakes with hydraulic servomotor i.e. hydraulic pump. The system consists of brake pedal connected with master cylinder, pump, pipes to all braking drums, two up to four braking drums with slave cylinders. It is used at bigger vannettes etc. There is a tendency to use hydraulic servomotors in the future also for bigger cars etc.

2.2 Brakes with pneumatic servomotors i.e. compressor. The system consists of brake pedal connected with master cylinder, compressor, pipes to braking drums, two up to four braking drums with slave cylinders. It is applied at trucks, buses, tractors, minibuses, etc.

Hydralic braking system (para 1.2, 2.1) is described in the chapter "Hydraulic System", pneumatic system (para 2.2) see the chapter "Pneumatic System".

BRAKES

Most of the brakes of modern motor vehicles are clam-shell brakes and disk brakes. There is a tendency to replace clam-shell brakes with disk brakes, as the latter are more effective than the former ones.

Clam-shell brake consists of brake drum and two brakes shoes with asbestos lining activated by one hydraulic or pneumatic slave cylinder and mechanisms of hand operated braking system.

Disk brake consists of disk, friction segments activated by hydraulic slave cylinder.

Forecast of Demand, Capacity, Production and Shortage of Brakes

	1351 (1972/3)	1356 (1977/8)	1361 (1982/3)	1366 (1987/8)
Demand: New cars	129,200	360,000	600,000	840,000
vans, pick-ups, station wagons	53,600	85,000	128,000	180,000
trucks	15,000	35,000	85,000	113,000
minibuses, buses	12,200	20,400	24,000	30,000
tractors	12,000	16,000	21,000	27,000
mopeds, motorcycles	34,000	85,000	170,000	330,000
Replacement and other vehicles	44,000	98,000	142,000	180,000
Total demand	200,000	700,000	1,150,000	1,700,000
Capacity	-	300,000	600,000	1,200,000
Production	-	120,000	550,000	1,050,000
Shortage	200,000	580,000	600,000	150,000

There is no production of brakes in Iran at present but there is the intention to produce them in the Fifth Five-year Plan from partly imported components and parts. The demand is big enough for economical production.

It is advisable to start the production of complete brakes of some cars (Peykan), trucks, buses and minibuses (Daimler Benz) and tractors (Universal U650) in the Fifth and Sixth Five-year Plans and to extend it in the Seventh Five-year Plan.

Description of Machinery, Equipment and Process

Brake drums, disks, brake shoes are made of grey iron castings or steel castings. Drums and discs are machined on heavy turret or capstan lathes with additional lifting device; other components and parts are machined on semi-automatic and automatic machines.

Hydraulic or pneumatic slave cylinders are purchased from specialised firm.

HYDRAULIC SYSTEMS OF MOTOR VEHICLES

Most of motor vehicles, i.e. cars, station wagons, vannettes, trucks, tractors, buses, minibuses are equipped with hydraulic system.

Hydraulic systems are used for different activities - for example for braking (cars, vannettes, station wagons), for clutch (cars, vannettes, station wagons, tractors, trucks, buses and minibuses), for stearing gear (buses, trucks and some tractors), for kipping equipment (some trucks and trailers), for door openers (some buses, minibuses), for additional equipment like mechanical shovels, lifting devices, cranes etc. (some tractors, trucks), etc.

Hydraulic system of cars, vannettes, station wagons, tractors and trucks consists of many elements. The most important are:

Pumps

Piston and gear pumps are used for supply of pressure liquid to other elements like hydraulic cylinders, hydraulic accumulators etc.

Gear pumps are supplying liquid by rotation of a pair of gears. They are mostly fitted with pressure regulator and are used up to pressure 180 atm. Axial clearance, i. e. leakage of fluid is automatically regu lated (brass face is pressed by helical springs to the pair of gears). Gear pumps are driven either directly by main shaft of engine or by means of reduction gears or V-belt. Gear pumps are very often used as hydraulic motors for servo-control, for hydraulic cylinders etc.

Gears of pump are made of hardened alloy steel, face plate is made of brass and housing is mostly made of aluminium casting.

Axial piston pumps are supplying liquid by stroke of one (or more) small pistons. They are mostly equipped with automatic pressure regulator and the maximum pressure is 250 atm. Axial piston pumps are used at hydraulic drive systems.

Hydraulic Cylinders

Piston in hydraulic cylinder is actioned by pressure fluid. There are different hydraulic cylinders:

a) hydraulic cylinders for breaking system - small cylinders with two pistons (slave cylinders) and one master cylinder.

b) hydraulic cylinder for clutch - small cylinder with one piston.

c) telescopic cylinders for kipping equipment - piston in one cylinder is shaped as cylinder for other piston etc.

Tank for liquid

Redundant liquid for hydraulic system is stored in small tank, made of plastics by cars or made of steel sheets by trucks etc.

Hydraulic Accumulators

Hydraulic accumulators are accumulating pressure liquid and damping shocks by nitrogen (or air) which is accumulated in the upper part of the accumulator.

Distributors

Distributors are apparatuses for distribution of pressure liquid to different hydraulic cylinders. There are

a) mechanical pressure distributors consisting of one up to five units,

b) electro-hydraulic distributors

c) electro-magnetic distributors.

All kinds of distributors are used for remote control of hydraulic cylinders (for example at kipping equipment, hydraulic lifting equipment etc.).

Dividers

Dividers are used for dividing the flow of liquid either to one or to the other hydraulic cylinder (for example at trucks with kipping equipment etc.)

Valves

There are different kinds of valves, installed in the hydraulic system:

a) control valves for control of flow of liquid

b) throttle valves for throttling the flow of liquid in one direction

c) back-pressure valves allowing the flow of liquid only in one direction

d) filling valves - for filling accumulators with nitrogen or air

e) by-pass valves etc. etc.

Forecast of Demand, Capacity, Production and Shortage of Pumps

	1351 (1972/3)	1356 (1977/8)	1361 (1982/3)	1366 (1987/8)
Demand: New cars	-	-	25,000	43,000
vannettes, station wagons	-	-	6,000	18,000
buses, minibuses	1,000	1,500	2,000	4,500
trucks	1,000	3,500	9,500	18,000
tractors	6,000	8,000	10,500	13,500
Replacement and other products	8,000	17,000	27,000	43,000
Total demand	16,000	30,000	55,000	140,000
Capacity	-	-	100,000	100,000
Production	-	-	30,000	100,000
Shortage	16,000	30,000	25,000	40,000

The demand will be big enough for economic production in the Sixth Five-year Plan.

Forecast of Demand, Capacity, Production and Shortage of Hydraulic Cylinders (all kinds)

	1351 (1972/3)	1356 (1977/8)	1361 (1982/3)	1366 (1987/8)
Demand: New cars	250,000	540,000	900,000	1,260,000
vannettes, station wagons	78,000	126,000	192,000	270,000
buses, minibuses	3,000	6,000	8,000	10,000
trucks	3,000	12,000	20,000	30,000
tractors	18,000	24,000	32,000	40,000
trailers	1,000	2,000	8,000	10,000
Replacement and other products	217,000	420,000	720,000	1,080,000
Total demand	570,000	1,130,000	1,880,000	2,700,000
Capacity	-	1,000,000	1,000,000	2,000,000
Production	-	400,000	1,000,000	2,000,000
Shortage	570,000	730,000	880,000	700,000

Also here the demand is over the threshold for economic production and therefore it is advisable to start the production in the Fifth Five-year Plan.

Forecast of Demand, Capacity, Production and Shortage of Hydraulic Valves (of all kinds)

	1351 (1972/3)	1356 (1977/8)	1361 (1982/3)	1366 (1987/8)
Total demand (approximately)	80,000	130,000	190,000	260,000
Capacity	-	120,000	240,000	240,000
Production	-	50,000	160,000	240,000
Shortage	80,000	80,000	30,000	20,000

Also in this case the demand is big enough for economical production.

It is advisable to produce hydraulic elements i.e. pumps, hydraulic cylinders, valves, hydraulic accumulators, distributors, dividers etc. for automobile industry as well as for other machines and equipment (machine tools, lifting devicee etc.) in one modern plant.

Plant should be built in the Fifth Five-year Plan and extended in the Sixth and Seventh Five-year Plans.

Description of Machinery, Equipment and Process

Hydraulic elements are made mostly of alloy steel castings and forgings, partly of non-ferrous castings and forgings, grey iron castings and alloy steels.

Hydraulic elements are high-precision products requiring precision machine tools and equipment as well as high skilled workers and technicians.

As hydraulic elements will be produced in big lots, it is possible to use automatic and semi-automatic machine tools, one-purpose machine tools or universal machine tools with jigs and fixtures.

It is presupposed that new plant will be built without own foundry and forge shop. Castings and forgings will be supplied from other plants in Iran.

PNEUMATIC SYSTEM OF MOTOR VEHICLES

Most trucks, tractors, buses, and minibuses are equipped with pneumatic braking system.

Pneumatic braking system consists of many elements, the outstanding ones are

1. Air compressor
2. Pneumatic accumulators
3. Braking valve
4. Pneumatic cylinders
5. Valves, taps, faucets etc.
6. Pressure equalizer and regulator
7. Tyre inflator and oil separator
8. Manometers (pressure gauge) - see Measuring Gauges.

1. AIR COMPRESSORS

Air compressors are used in trucks, tractors, buses and minibuses. They are supplying compressed air to the pneumatic braking system, i.e. pneumatic cylinders, tyre inflators, etc.

All tractors, lorries, buses and minibuses produced in Iran are equipped with air compressors - either one - cylinder (tractor Universal U 650, minibuses Benz etc.) or two-cylinder (lorries Leyland, Benz buses and lorries etc.)

Forecast of Demand, Capacity, Production and Shortage of Air Compressors

		1351 (1972/3)	1356 (1977/8)	1361 (1982/3)	1366 (1987/8)
Demand: New tractors	pcs	6,000	8,000	10,500	13,500
trucks	"	3,200	7,800	13,000	21,000
buses, minibuses	"	2,800	4,100	4,800	6,000
vannettes *	"	200	400	700	1,200
Replacement	"	400	700	1,000	1,300
Total demand	"	12,600	21,000	30,000	44,000
Capacity	"	-	20,000	30,000	50,000
Production	"	-	10,000	28,000	43,000
Shortage	"	12,600	11,000	2,000	1,000

* only big vannettes

There is no production of air compressors for trucks [illegible] at present. Production of air compressors was projected only [illegible] Plant in Tabriz, but till now there is no decision about this production.

It is advisable to start production of air compressors for [illegible] etc. either in the Metallurgical and Engineering Plant in Tabriz with production of stationary air compressors or better to produce them [illegible] specialized plant with production of small and medium range stationary and mobile compressors (up to four-cylinders, maximum diameter up to approximately 130 mm).

The production should start in the Fifth Five-year Plan (mostly from imported components) and to be extended in the Sixth and Seventh Five-year Plans. Some components and parts like pistons, valves etc. will be supplied by specialized plants.

Description of Machinery, Equipment and Process

Metallurgical and Engineering Plant in Tabriz is equipped with universal, semi-automatic and automatic machine tools, suitable for this production, but as already mentioned it is recommended to start the production in a new plant.

Most of components and parts are made of grey iron castings (frame, head, fly wheel etc.), some components are forged. The lots of same type of compressors are big enough for automatic and semi-automatic production i.e. the machining will be performed on automatic and turret lathes, single-purpose machines etc.

2. PNEUMATIC ACCUMULATORS

Compressed air from compressor is accumulated in one or two pneumatic accumulators.

Forecast of Demand, Production Capacity and Shortage of Pneumatic Accumulators

	1351 (1972/3)	1356 (1977/8)	1361 (1982/3)	1366 (1987/8)
Demand: New tractors	6,000	8,000	10,500	13,500
trucks	6,400	15,600	26,000	42,000
buses, minibuses	5,600	8,200	9,600	12,000
vannettes	200	400	700	1,200
Replacement	400	800	1,200	1,300
Total demand	18,600	33,000	48,000	70,000
Capacity	-	50,000	50,000	80,000
Production	-	20,000	44,000	68,000
Shortage	18,600	13,000	4,000	2,000

It is advisable to start the production of pneumatic accumulators in the Fifth Five-year Plan in existing plants for production of tractors, trucks, buses and minibuses and to extend it in the Sixth and Seventh Five-year Plans.

Description of Machinery, Equipment and Process

Pneumatic accumulators are made of cold rolled steel sheets by cold roll bending, pressing, stamping and welding. After welding pneumatic accumulators are pressure tested and painted.

3. BRAKING VALVES

Braking valve, activated by brake pedal is opening or closing the flow of compressed air from pneumatic accumulator to pneumatic cylinders.

Forecast of Demand, Capacity, Production and Shortage of Braking Valves

	1351 (1972/3)	1356 (1977/8)	1361 (1982/3)	1366 (1987/8)
Demand: New tractors	6,000	8,000	10,500	13,500
trucks	3,200	7,800	13,000	20,000
buses, minibuses	2,800	4,100	4,800	6,000
vannettes	200	400	700	1,200
Replacement	400	700	1,000	1,300
Total demand	12,600	21,000	30,000	44,000
Capacity	-	-	30,000	50,000
Production	-	-	28,000	43,000
Shortage	12,600	21,000	2,000	1,000

[illegible] needed in the Sixth Five-year Plan will be big enough for economical production and therefore it is advisable to start the production [illegible] extend it in the Seventh Five-year Plan in a specialized factory.

Description of Machinery, Equipment and Process

Components and parts are mostly made of castings, forgings and alloy steel bars. They are machined on automatic and semi-automatic [illegible] machine tools, eventually on single-purpose machine tools.

4. PNEUMATIC CYLINDERS

Each pneumatic braking system has two, four or more pneumatic slave cylinders, achieved by compressed air.

Forecast of Demand, Capacity, Production and Shortage of Pneumatic Cylinders

		1351 (1972/3)	1356 (1977/8)	1361 (1982/3)	1367 (1987/8)
Demand	New tractors	12,000	16,000	21,000	27,000
	trucks	12,800	31,200	72,000	84,000
	buses, minibuses	11,200	16,400	19,200	24,000
	vannettes	400	800	1,400	2,400
Replacement and other products (trailers)		2,600	5,600	9,400	12,600
Total demand		38,000	70,000	103,000	150,000
Capacity		-	-	100,000	100,000
Production		-	-	40,000	100,000
Shortage		38,000	70,000	63,000	50,000

The quantity needed in the Sixth Five-year Plan will be big enough for economical production and therefore it is advisable to start the production in the Sixth Five-year Plan and to extend it in the Seventh Five-year Plan.

Description of Machinery, Equipment and Process

Components and parts of pneumatic cylinders are made of forgings, castings and alloy steel bars and pipes. They are machined on single-purpose or universal automatic machine tools.

5. VALVES, TAPS, FAUCETS

Each pneumatic system of motor vehicles has two up to eight valves, taps, faucets etc, according to the type and size of vehicle.

Forecast of Demand, Production, Capacity and Shortage of Valves, Taps, Faucets, etc.

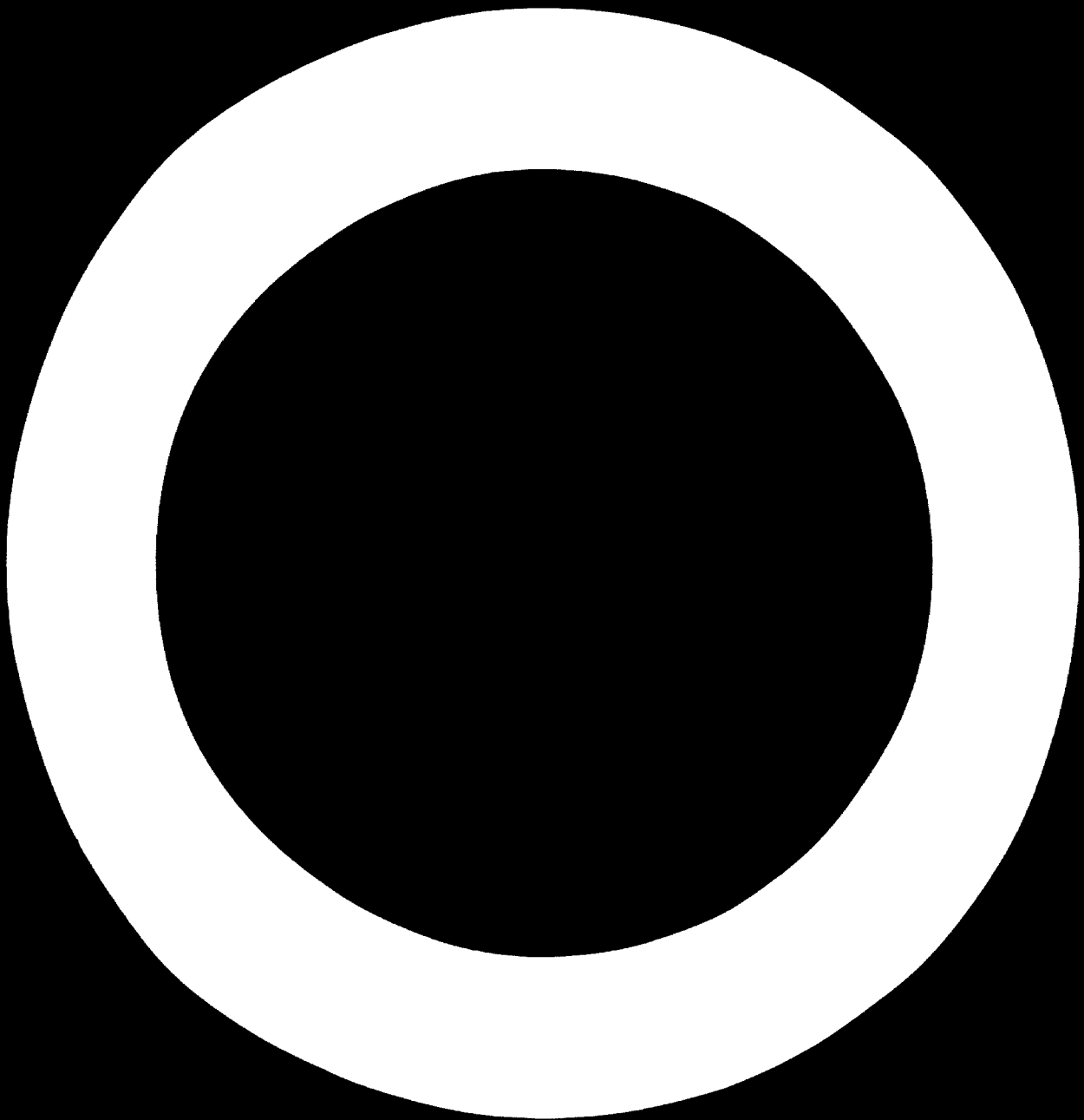
	1351 (1972/3)	1356 (1977/8)	1361 (1982/3)	1366 (1987/8)
Total demand (approximately)	63,000	105,000	150,000	220,000
Capacity	-	-	200,000	200,000
Production	-	-	80,000	180,000
Shortage	63,000	105,000	70,000	40,000

It is advisable to start the production of valves, taps and faucets for pneumatic systems of motor vehicles in the Sixth Five-year Plan in a specialized plant with production of pneumatic cylinders, braking valves tyre inflators, oil separators, pressure equalizers, regulators etc.

Description of Machinery, Equipment and Process

Valves, taps and faucets for pneumatic system of motor vehicles are made of grey iron and steel castings, forgings and alloy steel bars. They are machined on single-purpose or universal automatic machine tools.

6. MEASURING GAUGES



[illegible]

All [illegible] measuring gauges. The [illegible] therefore it is not easy [illegible]

In the future there [illegible] measuring gauges than now. This was taken into account [illegible] lation of demand.

There are the following kinds [illegible]

1. Speedometers and odometers
2. Fuel gauges
3. Water temperature indicators
4. Oil pressure gauges
5. Revolution meters
6. Voltmeters
7. Manometers

1. SPEEDOMETERS AND ODOMETERS

Speedometer is a most important apparatus of motor vehicle. It is giving the instantaneous velo[illegible] of the vehicle.

Speedometer is mostly combined with odometer, i.e. mileage recorder. Some luxury cars have two or three odometers (total mileage, mileage of last voyage etc.). Demand of speedometers with one or more adometers is given below as one set.

Forecast of Demand, Capacity, Production and Shortage of Speedometers and Odometers

			1351 (1972/3)	1356 (1977/8)	1361 (1982/3)	1366 (1987/8)
Demand :	**New cars**	sets	42,300	90,000	150,000	210,000
	vannettes and station wagons	"	13,400	21,400	32,000	45,000
	trucks	"	3,200	7,800	13,000	21,000

buses & minibuses	"	2,300	4,000	4,800	6
tractors	"	6,000	8,000	10,500	13
motorcycles	"	16,000	40,000	90,000	120
mopeds	"	18,000	45,000	80,000	110,000
Replacement and other products	"	4,300	8,700	16,700	24,
Total demand	"	106,000	225,000	395,000	650,
Capacity	"	-	-	300,000	600,
Production	"	-	-	260,000	600,
Shortage	"	106,000	225,000	135,000	50,000

There is no production of speedometers and odometers in Iran and it is anticipated that the production will not start in the Fifth Five-year Plan. It is advisable to start this production in the first half of the Sixth Five-year Plan mostly from imported components and to develop it in the Seventh Five-year Plan. Production of speedometers and odometers will be combined with other measuring gauges. Description of machinery, equipment and process - see below.

2. FUEL GAUGES

Fuel gauge is showing on the dial the quantity of fuel in the fuel tank. It is mostly combined with warning light signals. When the reserve of fuel is minimal, the lamp is giving light signals, first interrupted, then uninterrupted.

Forecast of Demand, Capacity, Production and Shortage of Fuel Gauges

	1351 (1972/3)	1356 (1977/8)	1361 (1982/3)	1366 (1987/8)
Demand: New cars	42,300	90,000	150,000	210,000
vannettes and station wagons	13,400	21,400	32,000	45,000
trucks	3,200	7,800	13,000	21,000
buses, minibuses	2,800	4,100	4,800	6,000
Replacement & other products	2,300	4,700	8,200	13,000

Total demand	64,000	128,000	202,000	[illegible]
Capacity	-	-	200,000	[illegible]
Production	-	-	100,000	280,000
Shortage	64,000	128,000	108,000	20,000

It is advisable to start the production of fuel gauges in the Sixth Five-year Plan mostly from imported components and to enlarge it in the Seventh Five-year Plan. Fuel gauges will be produced with other measuring gauges, like speedometers, odometers etc. in one plant.

3. WATER TEMPERATURE INDICATORS

Water cooled engines are equipped with water temperature indicators, measuring the temperature of cooling water. In some cases water temperature indicator is combined with warning signals. When the temperature of cooling water reaches maximum, the lamp is giving light signals.

Forecast of Demand, Capacity, Production and Shortage of Water Temperature Indicators

	1351 (1972/3)	1356 (1977/8)	1361 (1982/3)	1366 (1987/8)
Demand: New cars	39,600	83,200	140,000	196,000
vannettes, station wagons	11,000	17,200	27,000	38,000
buses, minibuses	2,800	4,100	4,800	6,000
trucks	3,200	7,800	13,000	21,000
tractors	6,000	8,000	10,500	13,500
stationary diesel engines	1,200	5,000	7,800	10,800
Replacement & other products	3,200	6,700	10,700	14,700
Total demand	61,000	132,000	214,000	300,000
Capacity	-	-	200,000	300,000
Production	-	-	130,000	280,000
Shortage	61,000	132,000	84,000	20,000

Also in this case it is advisable to start the production of water temperature indicators at the beginning of the Sixth Five-year Plan mostly from

[illegible] Plan. [illegible] spring gauges like speedometers [illegible] tion of machinery, [illegible]

4. OIL PRESSURE GAUGES

Oil pressure gauge is measuring instrument either showing on the dial the pressure of the lubricating oil in the engine, or giving warning light signals, when the pressure is too low. Some oil pressure gauges are showing pressure [illegible] as well as giving warning signals.

Forecast of Demand, Capacity, Production and Shortage of Oil Pressure Gauges

	1351 (1972/3)	1356 (1977/8)	1361 (1982/3)	1366 (1987/8)
Demand: New cars	42,300	90,000	150,000	210,000
vannettes, station wagons	13,400	21,500	32,000	45,000
buses & minibuses	2,800	4,[illegible]	4,800	6,000
trucks	3,200	7,[illegible]	13,000	21,000
tractors	6,000	8,500	10,500	13,500
tillers	2,300	2,700	3,100	3,800
stationary diesel engines	1,200	5,000	7,800	10,800
Replacement including gauges for other products	5,800	9,000	13,800	18,900
Total demand	77,000	148,000	235,000	329,000
Capacity	-	-	200,000	300,000
Production	-	-	120,000	280,000
Shortage	77,000	148,000	115,000	49,000

There is no production of oil pressure gauges in Iran at present and it is anticipated that the production will not start in the Fifth Five-year Plan. It is recommended to start this production in the Sixth Five-year Plan from imported components and parts and to develop it in the Seventh Five-year Plan with production of other measuring gauges like speedometers, odometers, fuel gauges, water temperature indicators etc.

Description of machinery, equipment and process - see below.

5. REVOLUTION METERS

Some luxury and sport cars, trucks, buses, minibuses and most of stationary diesel engines are equipped with revolution meter indicating the revolution of engine.

The demand of revolution meters will substantially grow in the future, as revolution meter is very useful apparatus, enabling optimal performance of the engine.

Forecast of Demand, Capacity, Production and Shortage of Revolution Meters

	1351 (1972/3)	1356 (1977/8)	1361 (1982/3)	1366 (1987/8)
Demand: New cars, vannettes, wagons	-	8,000	35,000	100,000
trucks, buses, minibuses	-	3,000	10,000	25,000
stationary diesel engines	1,200	4,000	6,000	10,000
Replacement including revolution meters for other products	200	1,000	1,000	2,000
Total demand	1,400	16,000	52,000	137,000
Capacity	-	-	-	150,000
Production	-	-	-	100,000
Shortage	1,400	16,000	52,000	37,000

There is no production of revolution meters in Iran at present and as the demand is too low, it is advisable to start this production in the Seventh Five-year Plan.

Description of machinery, equipment and process, see below.

6. VOLTMETERS

Voltmeter is an apparatus measuring voltage of charging current from dynamo to battery. All mopeds and motorcycles are now supplied without voltmeter and also most of cars, vannettes and station wagons are without voltmeter. There is a tendency to replace expensive voltmeter by cheap controlling lamp, which is giving warning light signals when the charging current is interrupted.

Forecast of Demand, Capacity, Production and Shortage of Voltmeters for Motor Vehicles

	1351 (1972/3)	1356 (1977/8)	1361 (1982/3)	1366 (1987/8)
Total demand	11,000	18,000	25,000	34,000
Capacity	-	-	30,000	30,000
Production	-	-	20,000	30,000
Shortage	11,000	18,000	5,000	4,000

It is advisable to start the production of voltmeters for motor vehicles in the Sixth Five-year Plan with production of voltmeters and ampermeters for electrical industry.

7. MANOMETERS

Motor vehicles with pneumatic braking system (buses, minibuses, trucks and tractors) are equipped with manometer (pressure gauge).

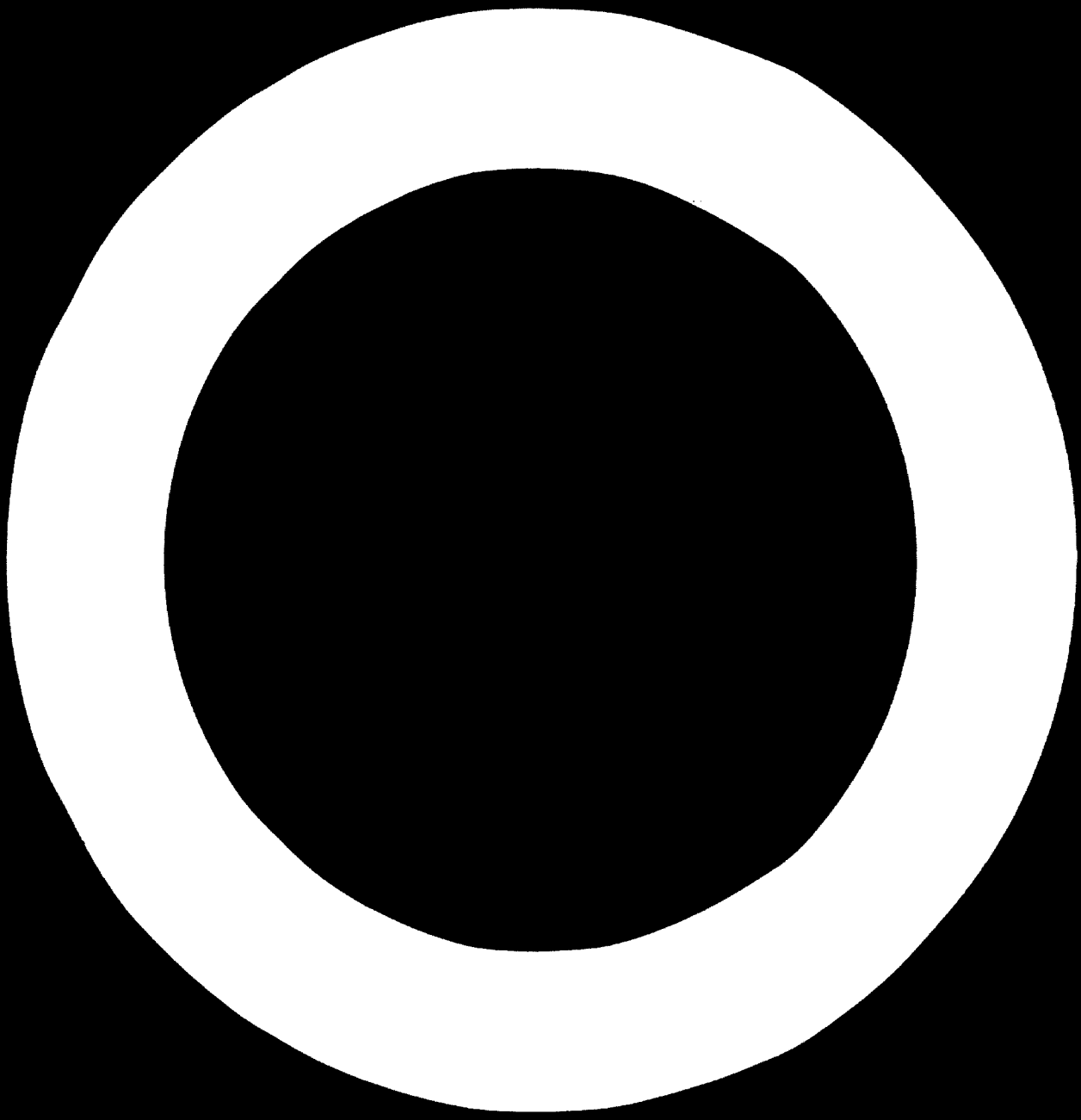
Forecast of Demand, Capacity, Production and Shortage of Manometers for Motor Vehicles

	1351 (1972/3)	1356 (1977/8)	1361 (1982/3)	1366 (1987/8)
Demand: New tractors	6,000	8,000	10,500	13,500
trucks	3,200	7,800	13,000	21,000
buses, minibuses	2,800	4,100	4,800	6,000
vannettes	200	400	700	1,200
Replacement	400	700	1,000	1,300
Total demand	12,600	21,000	30,000	44,000
Capacity	-	-	50,000	50,000
Production	-	-	20,000	44,000
Shortage	12,600	21,000	10,000	-

It is advisable to start production of manometers (pressure gauges) in the Sixth Five-year Plan with production of manometers for other industries.

In the above given forecast of demand are not included manometers (pressure gauges) used for checking of pressure in tyres.

7. OTHER COMPONENTS AND PARTS



CLUTCHES

Clutch in a vehicle of any type is a coupling by means of [illegible] rotating parts of engine and transmission system may be connected or disconnected. There are different clutches used in vehicles. According to the shape there are disc clutches and multiple-disc clutches, according the means used to actuate them there are mechanical, hydraulic, [illegible] magnetic and automatic clutches. The contact of two parts is spec[illegible] friction fabric to metal etc.

Till now, there is no production of clutches in Iran. The deman[illegible] of clutches is based on the calculation of clutches for new vehicles p[illegible] replacement of worn-out clutches.

Forecast of Demand, Capacity, Production and Shortage of Clutches

	1351 (1972/3)	1356 (1977/8)	1361 (1982/3)	1366 (1987/8)
Demand : New				
Cars	42,300	90,000	150,000	[illegible]
Vannettes, station wagons	13,400	[illegible]	32,000	[illegible]
Buses and minibuses	2,800	[illegible]	4,800	[illegible]
Trucks	3,200	[illegible]	13,000	[illegible]
Tractors	6,000	8,000	10,500	[illegible]
Tillers	2,300	2,700	3,100	[illegible]
Motorcycles	16,000	40,000	90,000	[illegible]
Mopeds	18,000	45,000	80,000	110,000
Replacement (all types)	3,000	6,000	9,600	430,000
Total demand	107,000	225,000	393,000	480,000
Capacity	-	250,000	300,000	400,000
Production	-	95,000	250,000	400,000
Shortage	107,000	130,000	143,000	80,000

In the replacement of clutches are included only replacements of the whole clutch (mostly at the accident); replacement of discs was calculated after approximately 60,000 km (see below).

Demand, Capacity, Production and Shortage of Disc Sets for Replacement

	1351 (1972-3)	1356 (1977-8)	1361 (1982-3)	1366 (1987-8)
Demand (all types)	210,000	440,000	1,180,000	1,380,000
Capacity	-	500,000	860,000	1,200,000
Production	-	250,000	750,000	1,000,000
Shortage	210,000	190,000	430,000	380,000

The demand of complete clutches as well as disc for replacement is over threshold of semi-automatic production and it is therefore recommended to start the production of both items in the Fifth Five-year Plan and to extend it in the Sixth and Seventh Five-Year Plans. It is further recommended to produce clutches including disc sets in new, specialized factory, which will supply its products to existing producers of cars, vannettes, buses, minibuses, trucks, tractors, tillers, mopeds and motorcycles.

Clutch lining is replaced in shorter intervals - see Code No. 3397 Brake and Clutch lining.

STEERING MECHANISM

There are different systems of steering mechanism:

1. Mechanical steering mechanism used at cars, vannettes, station wagons, some minibuses, small trucks and small tractors.

1.1 rack and pinion steering gear.

1.2 worm-type steering gear - 1.21 - worm-and-sector steering gear
1.22 - worm-and-wheel steering gear

2. steering mechanism with booster (hydraulic servomotor). Hydraulic servometer is facilitating the driving. There are the same systems like at mechanical steering gears i.e.

2.1 rack and pinion steering gear with booster

2.21 worm-and-sector steering gear with booster

2.22 worm-and-wheel steering gear with booster

Steering mechanism with booster is used at lorries, buses and tractors. In some countries it is compulsory at motor vehicles with permissible load over 5 tons, but there will be a tendency to use steering mechanism with booster also at small trucks, vannettes, station wagons and even at luxury cars.

Till now, there is no production of steering mechanism in Iran. However, demand justify future production in some plants.

Tractor Plant in Tabriz

In the detailed project report it was planned that this plant will produce complete mechanical steering mechanism. It is presupposed that the production of mechanical steering mechanism will start in the Sixth Five-year Plan and that the mechanical steering mechanism will be replaced in the Seventh Five-year Plan by steering mechanism with booster (hydraulic servomotor). Hydraulic elements will be purchased from specialized firm (see Hydraulic Systems for Motor Vehicles).

Iran National Manufacturing Co. Tehran

There is no intention to produce steering mechanism in the Fifth Five-year Plan. It is advisable to start the production of steering mechanism in the Sixth Five-year Plan not only for cars, but also for buses, minibuses, and trucks.

Forecast of Demand, Capacity, Production and Shortage of Steering Mechanism

	1351 (1972/3)	1356 (1977/8)	1361 (1982/3)	1366 (1987/8)
Demand: New cars	42,300	90,000	150,000	210,000
vannettes, station wagons	13,400	21,400	32,000	45,000
buses, minibuses	2,800	4,100	4,800	6,000
tractors	6,000	8,000	10,500	13,500

Trucks	6,200	7,800	13,900	2...
Replacement	300	700	1,150	1,...
Total demand	68,000	132,000	211,400	297,...
Capacity	-	-	150,000	300,...
Production	-	-	120,000	220,...
Shortage	68,000	132,000	91,300	67,...

only complete steering mechanism.

Description of Machinery, Equipment and Process

Steering mechanism consists of many components and parts made of different materials - grey iron castings, steel castings, steel forgings, steel bars, non-ferrous metals, standard parts (ball bearings, bolts, nuts, washers) etc.

In the case of steering mechanism with booster, complete booster i.e. pump with tank for liquid and hydraulic cylinder will be supplied from specialized firm (see Hydraulic Systems for Motor Vehicles).

Also standard components and parts like ball bearings, bright bolts, nuts and washers will be purchased from specialized firms.

Other components and parts will be produced in the factory. In the case of cars, these parts will be produced on automatic and single-purpose machine tools arranged in transfer line for automatic manufacture; components and parts for steering mechanism for tractors produced in Tractor Plant in Tabriz and for Daimler-Benz trucks, buses and minibuses will be produced on semi-automatic machine tools, partly on automatic machine tools.

DIFFERENTIALS

Differential is a transmission unit between gear box and driven wheels at cars, vannettes, station wagons, buses, minibuses and tractors. It automatically adjusts the difference of revolutions of driven wheels in a curve and displays turning moment to both wheels. The number of differentials depends on the number of driven wheels: Cars have mostly one

differential, vannettes and station wagons are equipped [illegible] differential (Peykan, Nissan, Citroen, Land Rover [illegible] entials (Jeep CJ-5, Gladiator), minibuses have mostly [illegible] (Daimler Benz 0 307, Fiat DM Lopeto etc.), buses mostly [illegible] ferentials (Daimler Benz 0302, Humbold Deutz 150[illegible] trucks are equipped partly with one (Daimler Benz LP608, [illegible] two differentials (Daimler Benz, Leyland etc.) and tractors [illegible] one differential.

Differential consists mostly of two pairs of bevel gears – [illegible] gears and two satellite gears (big trucks and buses have sometimes [illegible] satellite gears). Differentials are often combined with reduction gears.

Forecast of Demand, Capacity, Production and Shortage of Differentials

	1351 (1972/3)	1356 (1977/8)	1361 (1982/3)	1366 (1987/8)
Demand: New cars	42,300	90,000	150,000	210,000
vannettes, station wagons	15,000	25,000	37,000	52,000
buses, minibuses	3,700	5,800	6,800	8,500
trucks	5,000	7,000	22,000	35,000
tractors	6,000	8,000	10,500	13,500
Replacement and other vehicles	1,000	2,200	3,700	5,000
Total demand	73,000	143,000	230,000	324,000
Capacity	-	-	200,000	200,000
Production	-	-	110,000	200,000
Shortage	73,000	143,000	120,000	124,000

There is no production of differentials in Iran at present and production is not envisaged in the Fifth Five-year Plan.

It is advisable to start this production in the Sixth Five-year Plan (only for some types of cars, vannettes, buses, minibuses, trucks and tractors) partly from imported components and parts and to extend it in the Seventh Five-year Plan.

Description of Machinery, Equipment and Process

Main components and parts are casted housing and forged or casted bevel gears. Housing is machined on special machine tools, small lots are machined on radial or horizontal drilling machines with special jigs and fixtures. Bevel gears are turned on automatic multi spindle lathes and then gearing is machined on bevel gear generators and last operations are grinding and lapping of bevel gearing.

HEATING EQUIPMENT

Passenger cars, trucks, buses, minibuses, vannettes and station wagons are equipped with heating equipment.

In the heating equipment cold air is heated and supplied into the cabin by ventilator driven mostly by electric motor A.C. 12 V or 24 V. There are different kinds of heating equipment according to the heating medium.

In passenger cars with water cooled engine cold air is heated by hot water from cooling system; trucks, buses, minibuses etc. are mostly equipped with heating equipment where heating medium is petrol or crude oil.

Forecast of Demand, Capacity, Production and Shortage of Heating Equipment

		1971 (1973/3)	1976 (1977/8)	1981 (1983/3)	1986 (1987/8)
Demand: New cars	pcs	42,300	90,000	150,000	210,000
vannettes, station wagons	"	13,400	21,400	32,000	45,000
buses, minibuses	"	2,800	4,100	4,800	8,000
trucks	"	3,200	7,800	13,000	21,000
Total demand	"	61,700	123,300	199,800	282,000
Capacity	"	-	100,000	200,000	300,000
Production	"	-	50,000	199,800	282,000
Shortage	"	61,700	73,300	-	-

There is no production of heating equipment in Iran. The quantity needed is big enough for the economical production and therefore it is recommended to start the production in the Fifth Five-year Plan and to extend it in the future in a specialized factory.

Description of Machinery, Equipment and Process

Heating equipment is a complicated product made of high quality steel sheets. Mostly used operations are pressing and forming on mechanical presses of medium size and welding on spot welding machines etc. A.C. electric motor 12 V or 24 V will be supplied as subdelivery by other firm in Iran or from abroad.

WHEEL RIMS

Wheel rims are used in bicycles and all kinds of motor vehicles starting from mopeds and motorcycles up to trucks and buses.

All plants, producing bicycles, mopeds or motorcycles in Iran are or will be equipped with machinery and equipment for production of wheel rims.

Forecast of Demand, Capacity, Production and Shortage of Wheel Rims for Bicycles, Mopeds and Motorcycles

	1351 (1972/3)	1356 (1977/8)	1361 (1982/3)	1366 (1987/8)
Demand : New bicycles	30,000	360,000	580,000	700,000
mopeds	36,000	90,000	160,000	220,000
motorcycles	32,000	80,000	180,000	240,000
Replacement	7,000	20,000	30,000	50,000
Total demand	105,000	550,000	950,000	1,210,000
Capacity approximately	600,000	800,000	1,250,000	1,210,000
Production	105,000	550,000	950,000	1,210,000
Shortage	-	-	-	-

Description of Existing Machinery, Equipment and Process

Wheel rims for bicycles, mopeds and motorcycles are made of cold rolled steel strips. The strip is coming from the uncoiling reel to the straightening machine, then to circling machine with cutting-off device and to butt welding machine. Semi-products of wheel rims are surface treated, i.e. mostly electrolytic plated, painted by spraying etc.

At present, there is no production of wheel rims for passenger cars, vannettes, station wagons, buses, minibuses, trucks, tractors and trailers

Forecast of Demand, Capacity, Production and Shortage of Wheel Rims for Passenger Cars, Vannettes, Station Wagons, Buses, Minibuses, Trucks, Tractors and Trailers

		1351 (1972/3)	1356 (1977/8)	1361 (1982/3)	1366 (1987/8)
Demand	New cars	211,500	450,000	750,000	1,050,000
	vannettes, station wagons	67,000	107,000	160,000	225,000
	buses, minibuses	22,300	36,200	39,000	46,000
	trucks	32,000	78,000	130,000	210,000
	tractors	24,000	32,000	42,000	54,000
	Tillers	4,600	5,400	6,200	7,600
	Trailers	16,000	28,000	65,000	65,000
Replacement and other products*		7,600	13,400	24,800	32,400
Total demand		385,000	750,000	1,080,000	1,690,000
Capacity (two shift operation)		-	-	1,200,000	1,200,000
Production		-	-	820,000	1,200,000
Shortage		385,000	750,000	160,000	490,000

* mobile compressors, diesel generator sets etc.

The demand is big enough for one transfer line for fully automatic manufacture of cars, vannettes and station wagons wheel rims (eventually also other wheel rims).

Description of Machinery, Equipment and Process

Wheel rims for cars, vannettes, station wagons, buses, minibuses, trucks, tractors, trailers and tillers are made of hot rolled strips (coils).

Transfer line for fully automatic manufacture of passenger cars wheel rims consists of uncoiling reel, pre-straightening machine, strip straightening and cutting-off machine, feeding device, circling machine, butt welding machine, weld trimming machine, side trimming machine, cooling spray chamber, feeding device coning machine, 2 up to 3 profiling machines and expand sizing machine.

Semi-products are afterwards surface treated (mostly paint).

WHEEL DISCS

Wheel discs for passenger cars, vannettes, station wagons, buses, minibuses, trucks, tractors, tillers and trailers are pressed from hot rolled sheets up to maximum thickness 12 mm. There is no production of wheel discs in Iran at present.

Forecast of Demand, Capacity, Production and Shortage of Wheel Discs

	1351 (1972/3)	1356 (1977/8)	1361 (1982/3)	1366 (1987/8)
Demand : New cars	211,500	450,000	750,000	1,050,000
vannettes, station wagons	67,000	107,000	160,000	225,000
buses, minibuses	22,300	36,200	39,000	46,000
trucks	32,000	78,000	130,000	210,000
tractors	24,000	32,000	42,000	54,000
tillers	4,600	5,400	6,200	7,600
trailers	16,000	28,000	45,000	65,000
Replacement and other products*	7,600	13,400	24,800	32,400
Total demand	385,000	750,000	1,080,000	1,690,000
Capacity (two-shift operation)	-	-	1,200,000	1,200,000
Production	-	-	820,000	1,200,000
Shortage	385,000	750,000	260,000	490,000

* mobile compressors, diesel generator sets etc.

It is advisable to put into production one automatic forming line for pressing wheel discs for motor vehicles either at the end of the Fifth Five-year Plan or better at the beginning of the Sixth Five-year Plan (as the production of hot rolled sheets will start in the Sixth Five-year Plan). The capacity should be approximately 1, 200, 000 wheel discs in two-shift operation to cover full demand of wheel discs up to year 1366 (1987/8)

Description of Machinery, Equipment and Process

The manufacture of the wheel discs comprises the following operations:

1) Ths line for cutting the circular blanks for pressing the wheel discs from steel strips. The line comprises loading equipment, crank press, blanking attachment, blank unloader and scrap unloader.

2) Disc pressing line is designed for forming the wheel discs from the circular blank in 4 or 5 forming operations. The operations concerned are mainly the manufacture of wheel disc proper, punching of the bolt holes and centre hole, vent holss etc. and possibly drawing of the locks (losses) for the rim plate. A semi-produced bin is arranged in front of the first press, from whers the individual circular blanks are automatically transferred by means of the feede: jaws into the forming tools. At the end of the line, the complete pressing is discharged by means of roller conveyor, to be slacked into pallets. Wheel discs are then surface treated (mostly painted).

WHEEL COVERS

Wheel covers are used at passenger cars and partly at vanmettes, minibuses and station wagons.

Forecast of Demand, Capacity, Production and Shortage of Wheel Covers

	1351 (1972/3)	1356 (1977/8)	1361 (1982/3)	1366 (1987/8)
Demand; New cars	169,200	360,000	600,000	840,000
vannettes and station wagons	52,800	84,000	124,000	172,000
Replacement & other vehicles	4,000	8,000	16,000	23,000
Total demand	256,000	452,000	740,000	1,035,000
Capacity (in two shifts)	-	600,000	600,000	900,000
Production	-	380,000	600,000	900,000
Shortage	256,000	72,000	140,000	135,000

The demand is big enough to put into operation one automatic line in the Fifth Five-Year Plan.

Description of Machinery, Equipment and Process

Wheel covers are made of cold rolled strips (coils). Transfer line for fully automatic manufacture of wheel covers consists of uncoiling reel and hydraulic or mechanic presses for cold pressing (stamping) and shaping) or preferably of one multi-operation press where all operations are done one after another. Semi-products are degreased, electroplated and then polished.

DRIVER'S CABS

There is one specialised firm for production of driver's cab for agricultural and construction machinery and equipment.

Nosrat Factory - Tehran

This factory is producing 52 different models of drivers' cabs for agricultural and construction machinery and equipment, including cabs for overhead cranes. The capacity and production per year is not known, as the production started in 1350 (1971). The quality of production is good.

HYDRAULIC SHOCK ABSORBERS

Hydraulic shock absorbers are damping the oscilation of front and/or rear wheels. The number of hydraulic shock absorbers at one car, truck or bus differs from type to type. Some types of cars, trucks, buses and minibuses have only two hydraulic shock absorbers (Citroen 2CV, Aria, Shahin), some are equipped with 4 hydraulic shock absorbers (Jeep CJ5, Peykan, Mercedes Benz, Mack etc.)

Forecast of Demand, Capacity, Production and Shortage of Hydraulic Shock Absorbers

	1351 (1972/3)	1356 (1977/8)	1361 (1982/3)	1366 (1987/8)
Demand: New cars	150,000	330,000	540,000	760,000
vannettes, station wagons	46,000	75,000	112,000	162,000
buses and minibuses	10,000	15,000	17,000	22,000
trucks	12,000	30,000	52,000	84,000
Replacement	812,000	1,650,000	2,479,000	3,472,000
Total demand	1,030,000	2,110,000	3,200,000	4,500,000
Capacity	-	1,000,000	2,000,000	4,000,000
Production	-	400,000	2,000,000	4,000,000
Shortage	1,030,000	1,700,000	1,200,000	500,000

There is no production of hydraulic shock absorbers in Iran at present time, but the demand is big enough for economical production. It is advisable to start the production in the Fifth Five-year Plan and to extend it in the Sixth and Seventh Five-year Plans.

LEAF SPRINGS

There are three factories producing leaf springs in Iran at present; Zar Co. Tehran - production in year 1349 (1970/71) was 683 tons; Sherkate Sahami Tolidi Fanar Tehran - production in year 1349 (1970/71) was approximately 3,500 tons and Sherkate Sahami Aria va Shahin va Jeepe Iran - production of leaf springs for cars Aria, Shahin and Jeep in year 1349 (1970/71) was approximately 200 tons/year.

Forecast of Demand, Capacity, Production and Shortage of Wheel Covers

	1351 (1972/3)	1356 (1977/8)	1361 (1982/3)	1366 (1987/8)
Demand; New cars	169, 200	360, 000	600, 000	840, 000
vannettes and station wagons	52, 800	84, 000	124, 000	172, 000
Replacement & other vehicles	4, 000	8, 000	16, 000	23, 000
Total demand	256, 000	452, 000	740, 000	1, 035, 000
Capacity (in two shifts)	-	600, 000	600, 000	900, 000
Production	-	380, 000	600, 000	900, 000
Shortage	256, 000	72, 000	140, 000	135, 000

The demand is big enough to put into operation one automatic line in the Fifth Five-Year Plan.

Description of Machinery, Equipment and Process

Wheel covers are made of cold rolled strips (coils). Transfer line for fully automatic manufacture of wheel covers consists of uncoiling reel and hydraulic or mechanic presses for cold pressing (stamping) and shaping) or preferably of one multi-operation press where all operations are done one after another. Semi-products are degreased, electroplated and then polished.

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Hydraulic shock absorbers are damping the oscilation of front and/or rear wheels. The number of hydraulic shock absorbers at one car, truck or bus differs from type to type. Some types of cars, trucks, buses and minibuses have only two hydraulic shock absorbers (Citroen 2CV, Aria, Shahin), some are equipped with 4 hydraulic shock absorbers (Jeep CJ5, Peykan, Mercedes Benz, Mack etc.)

Forecast of Demand, Capacity, Production and Shortage of Hydraulic Shock Absorbers

	1351 (1972/3)	1356 (1977/8)	1361 (1982/3)	1366 (1987/8)
Demand: New cars	150,000	330,000	540,000	760,000
vannettes, station wagons	46,000	75,000	112,000	162,000
buses and minibuses	10,000	15,000	17,000	22,000
trucks	12,000	30,000	52,000	84,000
Replacement	812,000	1,650,000	2,479,000	3,472,000
Total demand	1,030,000	2,110,000	3,200,000	4,500,000
Capacity	-	1,000,000	2,000,000	4,000,000
Production	-	400,000	2,000,000	4,000,000
Shortage	1,030,000	1,700,000	1,200,000	500,000

There is no production of hydraulic shock absorbers in Iran at present time, but the demand is big enough for economical production. It is advisable to start the production in the Fifth Five-year Plan and to extend it in the Sixth and Seventh Five-year Plans.

LEAF SPRINGS

There are three factories producing leaf springs in Iran at present: Zar Co. Tehran - production in year 1349 (1970/71) was 683 tons; Sherkate Sahami Tolidi Fanar Tehran - production in year 1349 (1970/71) was approximately 3,500 tons and Sherkate Sahami Aria va Shahin va Jeepe Iran - production of leaf springs for cars Aria, Shahin and Jeep in year 1349 (1970/71) was approximately 200 tons/year.

Import of Leaf Springs in tons

Tariff No.		1345 (1966/7)	1346 (1967/8)	1347 (1968/9)	1348 (1969/70)	1349 (1970/71)	1350 (1971/2)
732A	Leaf Springs for vehicles tons	3,900	4,068	2,233	1,367	2,205	2,403

In the future the consumption of leaf springs will be growing with growth of production of cars, lorries etc. Only small quantity of leaf springs (for wagons and heaviest lorries) will be imported.

Forecast of Demand, Production and Shortage of Leaf Springs (in tons)

	1351 (1972/3)	1356 (1977/8)	1361 (1982/3)	1366 (1987/8)
Demand of leaf springs - tons	7,000	12,000	18,700	27,000
Production of leaf springs "	5,600	9,600	15,000	24,600
Shortage	1,400	2,400	2,300	2,400

Description of Existing Machinery & Equipment and Process

There is installed mostly modern machinery and equipment. Leaves are hot or cold pressed, heat treated and then semi-automatically or only mechanically assembled and tested. Existing capacity, utilized in two shifts will cover the demand of Iran for next years.

EXHAUST PIPES AND EXHAUST ACCUMULATORS

There is one firm producing on medium scale pipes and exhaust accumulators in Iran at present.

Iran Mafler Co. Tehran

The production started at the beginning of 1345 (1966). The planned capacity of the plant was 140 tons/year, but already in year 1346 (1967/8) the production of exhaust and exhaust accumulators far exceeded the planned capacity - the total production in Iran of exhaust pipes in 1346 (1967/8) was 140 tons/year and of exhaust accumulators was 125 tons.

In 1351 (1972/3) the Ministry of Economy issued licence for production of 100,000 sets of exhaust pipes and exhaust accumulators to the ARH company in Ghazvin. It is estimated that the production will start in 1354 (1975/6).

In future there will be no big expansion of this specialized industry, as the biggest producers of cars, trucks, vannettes, buses and minibuses, motorcycles and mopeds intend to produce these components and parts in their own factory.

Forecast of Demand, Production and Shortage of Exhaust Pipes and Exhaust Accumulators

	1351 (1972/3)	1356 (1977/8)	1361 (1982/3)	1366 (1987/8)
Demand: New cars	43,300	90,000	150,000	210,000
vannettes, station wagons	13,400	21,400	32,000	45,000
buses, minibuses	2,800	4,100	4,800	6,000
trucks	3,200	7,800	13,000	21,000
motorcycles	16,000	40,000	90,000	120,000
mopeds	18,000	45,000	80,000	110,800
tractors	6,000	8,000	12,000	14,000
tillers	2,320	2,700	3,100	3,800
Replacement	114,980	231,000	405,100	730,200
Total demand	230,000	450,000	790,000	1,460,000
Production	120,000	370,000	730,000	1,410,000
Shortage	110,000	80,000	60,000	50,000

It is estimated that only approximately 20% up to 25% of total production will be produced in specialized factory for production of exhaust pipes and exhaust accumulators.

DOOR AND LUGGAGE LOCKS AND HANDLES

There is a big demand of door and luggage boots locks and handles for cars, vannettes, station wagons, trucks, buses and minibuses.

Forecast Demand, Capacity, Production and Shortage of Locks & Handles

	1351 (1972/3)	1356 (1977/8)	1361 (1982/3)	1366 (1987/8)
Demand: New cars	197,000	375,000	600,000	870,000
vannettes, station wagons	28,800	50,000	78,000	105,000
trucks	7,600	15,600	28,000	45,000
buses, minibuses	12,600	19,800	27,000	34,000
Replacement	24,000	49,600	77,000	106,000
Total demand	270,000	510,000	810,000	1,160,000
Capacity	-	500,000	1,000,000	1,000,000
Production	-	200,000	750,000	1,000,000
Shortage	270,000	310,000	60,000	116,000

There is no production of door and luggage boots locks and handles in Iran at present. The demand is big enough for economical production of these components and parts.

It is recommended to start the production in the Fifth five-year Plan in existing factories, or better in a new, specialized plant. New plant will be able to produce also other parts of doors like mechanism for opening and closing windows, hinges, locking mechanismums for motor covers, etc. (demand see below). This production could be combined with production of locks and handles for houses etc.

Description of Machinery, Equipment and Process

Components and parts of door and luggage locks and handles are mostly made of cold rolled steel sheets or strips by pressing on mechanical presses; some components and parts are made of cold rolled bars, plastics and some parts are die casted or forged (handles).

After pressing (eventually machining) some components and parts are electroplated in well equipped electroplating shop and then all components are assembled by spot welding, riveting etc.

MECHANISM FOR OPENING AND CLOSING WINDOWS

There is no production of mechanism for opening and closing windows in Iran at present time.

Forecast Demand, Capacity, Production and Shortage of Mechanism for Opening and Closing Windows

	1351 (1972/3)	1356 (1977/8)	1361 (1982/3)	1366 (1987/8)
Demand; New cars	156,000	297,000	476,000	690,000
vannettes, station wagons	14,400	25,000	39,000	55,000
trucks	7,600	15,600	28,000	45,000
buses, minibuses	25,000	34,400	42,000	48,000
Replacement	12,000	23,000	30,000	52,000
Total demand	215,000	395,000	515,000	890,000
Capacity	-	400,000	800,000	800,000
Production	-	200,000	515,000	800,000
Shortage	215,000	195,000	-	90,000

It is advisable to start the production in the Fifth five-year Plan. It is possible to produce these components and parts in specialized small scale plant, or better in medium scale plant with production of door and luggage locks and handles, hinges and locking mechanismums for motor covers.

H I N G E S

Hinges at cars, vannettes, station wagons, trucks, buses and minibuses etc. are used not only at doors, but also at motor covers, luggage boots etc.

Forecast of Demand, Capacity, Production and Shortage of Hinges

	1351 (1972/3)	1356 (1977/8)	1361 (1982/3)	1366 (1987/8)
Demand New cars	470, 000	900, 000	1, 430, 000	2, 070, 000
vannettes, station wagons	68, 000	116, 000	182, 000	285, 000
trucks	30, 000	62, 000	110, 000	180, 000
buses, minibuses	42, 000	58, 000	70, 000	80, 000
Replacement and other products	20, 000	34, 000	58, 000	85, 000
Total demand	630, 000	1, 170, 000	1, 850, 000	2, 700, 000
Capacity	-	1, 000, 000	2, 000, 000	2, 600, 000
Production	-	500, 000	1, 700, 000	2, 600, 000
Shortage	630, 000	670, 000	150, 000	100, 000

The demand is over threshold of automatic production and therefore it is advisable to start the production in one of existing plants for production of cars etc. or better in a new plant.

It is possible to produce hinges for other products in the same plant - for example hinges for doors, windows, furniture etc. Production of hinges could be combined with production of door and luggage locks and handles, mechanism for opening and closing windows for cars etc.

Description of Machinery, Equipment and Process

Hinges are made of hot and cold rolled steel strips and hot rolled steel bars on automatic presses in a production line. Also assembly of hinges is mechanised.

TYRE PUMPS

Tyre pumps are used for inflating tyres of bicycles and motor vehicles. Bicycles, mopeds, motorcycles, cars, vannettes, station wagons and some minibuses, buses, trucks and tractors are equipped with hand operated tyre pump; the remaining minibuses, buses, trucks and tractors are using air compressors for inflating tyres instead of tyre pumps.

Import of Tyre Pumps According to the Foreign Trade Statistics of Iran

Tariff No.		1344 (1965/6)	1345 (1966/7)	1346 (1967/8)	1347 (1968/9)	1348 (1969/70)	1349 (1970/1)	
868-2	Tyre pumps	163637	123222	216977	182997	96952	176942	[illegible]

The calculation of demand of tyre pumps is made under the presupposition that approximately 80% of bicycles, mopeds and motorcycles and approximately 90% of cars, vannettes and station wagons will be equipped with hand operated tyre pumps. Trucks, buses, minibuses and tractors will be mostly without hand operated tyre pumps.

Forecast of Demand, Capacity, Production and Shortage of Tyre Pumps

	1351 (1972/3)	1356 (1977/8)	1361 (1982/3)	1366 (1987/8)
Demand: New bicycles	12,000	143,000	230,000	280,000
motorcycles	13,000	32,000	70,000	100,000
mopeds	14,000	36,000	65,000	95,000
cars	38,000	80,000	135,000	190,000
vannettes, staion wagons	12,000	19,000	30,000	40,000
Replacement: imported and other vehicles	131,000	50,000	40,000	35,000
Total demand	220,000	360,000	570,000	740,000
Capacity	-	300,000	500,000	800,000
Production	-	220,000	460,000	690,000
Shortage	220,000	140,000	110,000	50,000

Till now, there is no production of tyre pumps in Iran. It is advisable to start this production in the Fifth Five-year Plan either in one medium scale plant or two or three small scale plants and to extend it in the Sixth and Seventh Five-year Plans.

Description of Machinery, Equipment and Process:

Tyre pumps for bicycles, mopeds and motorcycles are made either of plastics or of thin cold rolled steel sheets; for cars and other vehicles they are made mostly of cold rolled steel sheets.

Components and parts made of plastics are either pressed on hydraulic presses or moulded on injection moulding presses for thermoplastic materials.

Components and parts made of thin cold rolled steel sheets are pressed on mechanical (eccentric) presses and then surface plated. Some components and parts (nuts etc.) are turned of brass bars on automatic lathes. Helical springs are made on special automatic machines for production of helical springs.

J A C K S

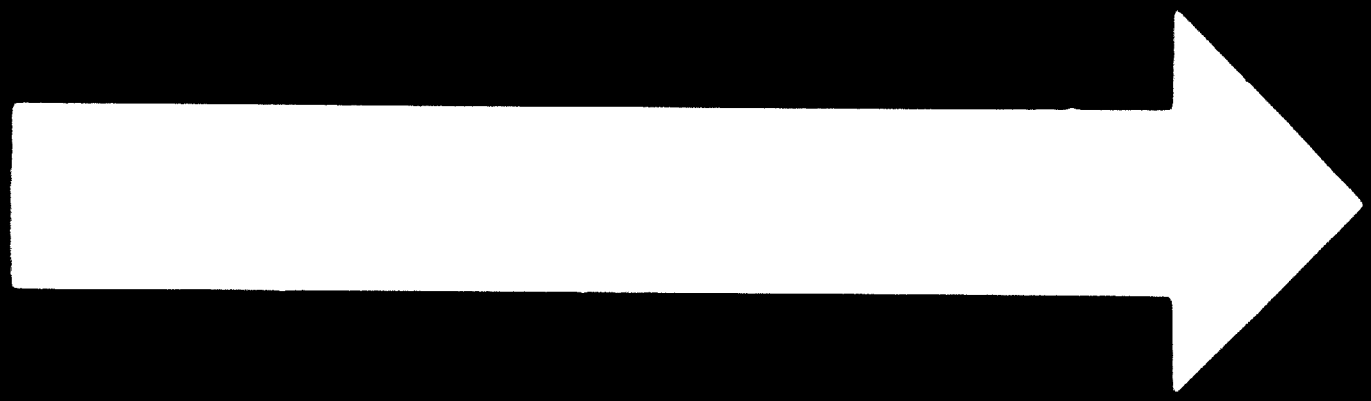
Cars, trucks, vannettes, station wagons, minibuses, buses and tractors are equipped with jack. Jack is a lifting equipment either mechanical (hand) or hydraulic for lifting and supporting car, truck etc. in the case the wheel with tyre should be changed etc.

Mechanical jacks of different designs and systems are used for cars, vannettes and station wagons; hydraulic jacks are mostly used for buses, trucks etc. Heavy jacks are also used in the industry for lifting loads, etc.

Imports of Jacks According to the Foreign Trade Statistics of Iran*

Tariff No.		1344 (1965/6)	1345 (1966/7)	1346 (1967/8)	1347 (1968/9)	1348 (1969/70)	1349 (1970/1)	1350 (1971/2)
833 B3	Hand jacks	10013	13537	13714	9727	30231	11504	17296
833 B6	Hydraulic jacks	6011	6889	3193	4935	3414	11292	27398
		16024	20426	16987	14712	33645	22796	44694

*Jacks imported with complete cars, trucks etc. are not included.



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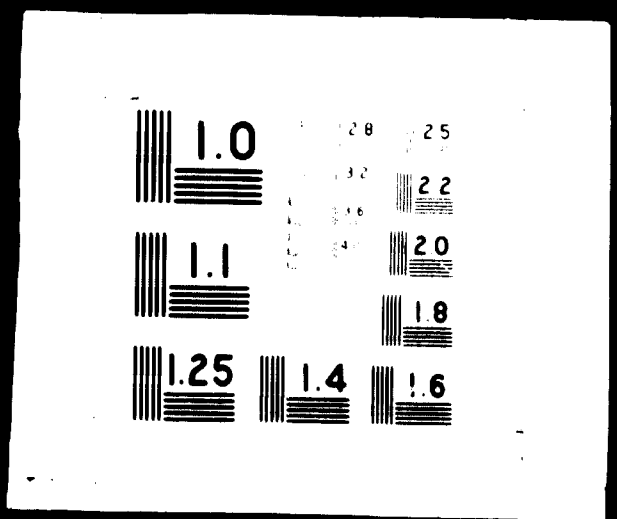

Forecast of Demand, Capacity, Production and Shortage of Jacks

	1351 (1972/3)	1356 (1977/8)	1361 (1982/3)	1366 (1987/8)
Demand: New cars	42300	90,000	150,000	210,000
vannettes, station wagons	13,400	21,400	32,000	45,000
buses, minibuses	2,800	4,100	4,800	6,000
trucks	3,200	7,800	13,000	21,000
tractors	6,000	8,000	10,500	13,500
Replacement jacks imported with motor vehicles and jacks for industry	8,300	13,700	21,700	24,500
Total demand	76,000	145,000	230,000	320,000
Capacity	-	100,000	200,000	300,000
Production	-	75,000	200,000	300,000
Shortage	76,000	70,000	30,000	20,000

There is no production of jacks in Iran at present, but there are some firms interested in this production.

It is advisable to start the production in the Fifth Five-year Plan mostly from local made components and parts and to extend it in the Sixth and Seventh Five-year Plans. Heavy jacks for industry could be produced in the same plant in the Sixth and Seventh Five-year Plans.

Description of Machinery, Equipment and Process:

Frames and levers for mechanical jacks for light loads are mostly made of steel sheets and bars by pressing on mechanical presses and then welded and machined; gears and screws are machined. Heavy mechanical jacks or hydraulic jacks are made of steel castings and all parts are machined.

Some mechanical or hydraulic jacks could be produced in small scale industry (castings, forgings and pressings will be supplied by other firms). The demand of jacks in Iran is big enough for medium scale plant equipped with semi-automatic and automatic machine tools.

SAFETY SEAT BELTS

Some passenger cars and vannettes are equipped with safety seat belts. Recently in Iran a law has been enacted which will make it compulsory to have seat belts for the two front seats as standard equipment in all passenger cars. This law will probably come into effect in the near future.

Forecast of Demand, Capacity, Production and Shortage of Safety Seat Belts

	1351 (1972/3)	1356 (1977/8)	1361 (1982/3)	1366 (1987/8)
Demand: New cars	10,000	180,000	300,000	420,000
replacement and other vehicles	2,000	20,000	30,000	40,000
Total demand	12,000	200,000	330,000	460,000
Capacity	-	300,000	400,000	500,000
Production	-	150,000	330,000	460,000
Shortage	12,000	50,000	-	-

At present there is no local manufacture of safety seat belts although Iran National Manufacturing Co. has recently obtained a license for their production. In the case the law which will make it compulsory to have safety seat belts will come into effect in the Fifth Five-year Plan, it would be advisable to start the production in the Fifth Five-year Plan and to extend it in the Sixth and Seventh Five-year Plans either in Iran National Manufacturing Co. or in a new, small scale plant.

Description of Machinery, Equipment and Process:

Steel sheets or strips are formed in dies on eccentric presses and then plated in electro-plating equipment; Webbing material, usually nylon is cut to suitable length. The buckle is assembled on eccentric presses by riveting and then is attached to the webbing material. Belts, nuts and washers are turned on automatic lathes.

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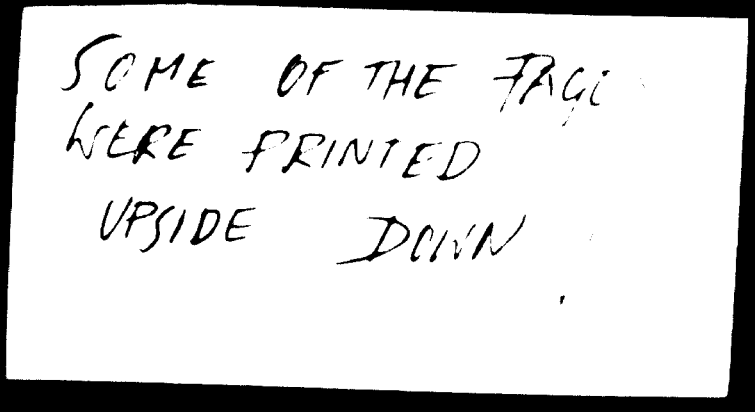
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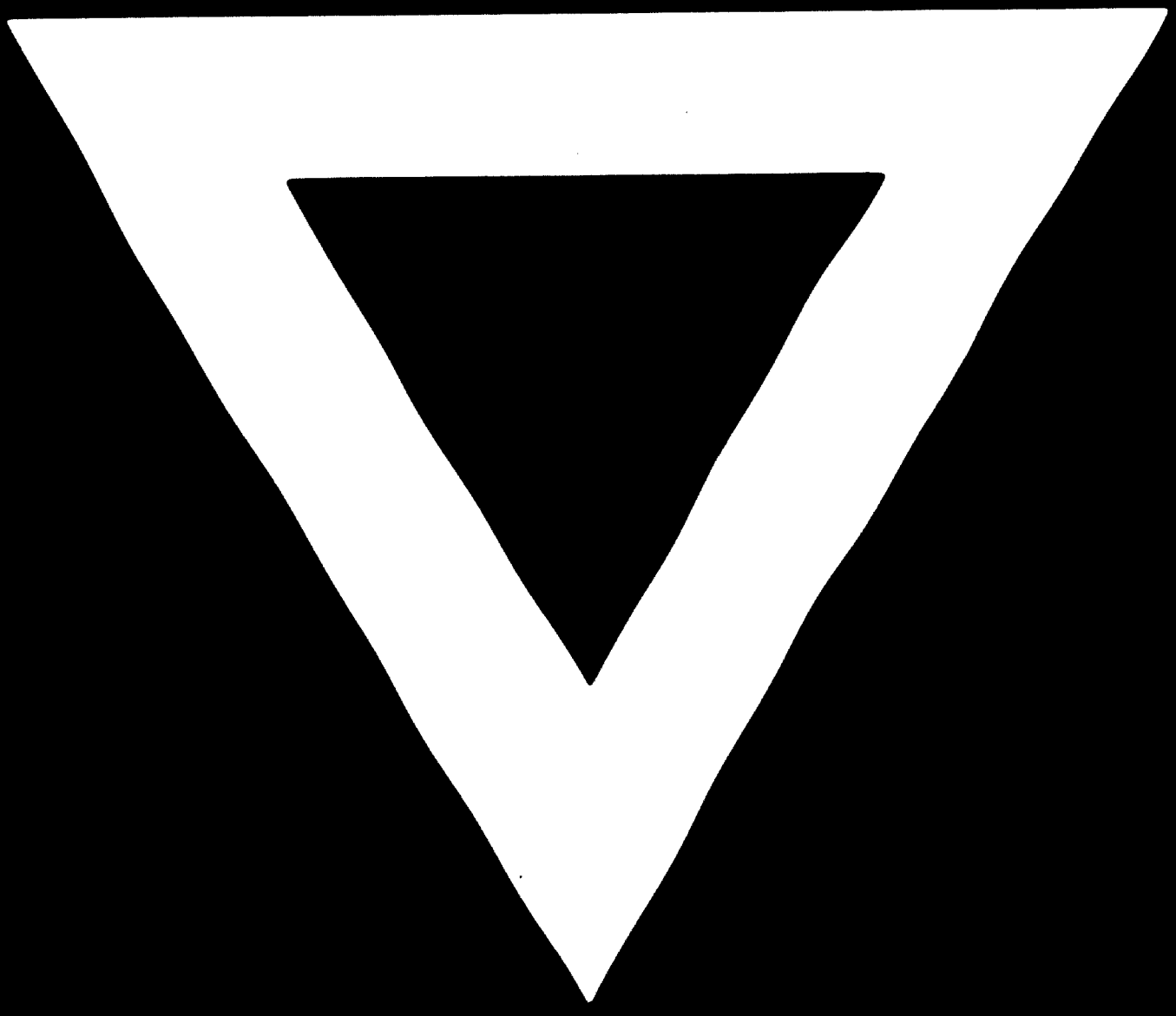

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