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**ECONOMIC AND SOCIAL COMMISSION FOR WESTERN ASIA**

مـلامـح اـسـاسـية عن  
مـشـروع تـصـنـيع زجـاج الـسـيارـات  
مـقـدمـة الـى  
مؤتمـر رجاـل الـاعـمال والمـسـتـثمـرين العـرب الـثـالث  
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الـكـويـت

17/02/86  
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Project Profiles

WINDSHIELD GLASS

Presented to

Third Arab Entrepreneurs Conference

28 - 30 April 1986

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## ملخص مؤشرات المشروع

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- اسم المشروع	: تصنيع زجاج السيارات
- الانتاج	: زجاج بكافة انواعه
- حجم السوق (منطقة الاسكوا)	: اكثر من مليون متر مربع سنويا
- الطاقة التصميمية للمشروع	: ٦٠٠.٠٠٠ متر مربع
- مساحة الارض المطلوبة	: ٩٧.٠٠٠ م <sup>٢</sup>
- كلفة المبانى	: ٣٢.١٥٠.٠٠٠ دولار
- كلفة المععدات	: ٤.٩٦٠.٠٠٠ دولار
- الاستثمارات الثابتة	: ٣٩.٠٥٠.٠٠٠ دولار
- عدد العمال	: ٥٣٠
- كلفة الانتاج	: ١٧.٩١٠.٠٠٠ دولار
- المبيعات المتوقعة	: ٢١.٠٠٠.٠٠٠ دولار
- الارباح المتوقعة	: ٣.٠٠٠.٠٠٠ دولار

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## Windshield Glass

### 1. Introduction

Wind shield glasses are normally manufactured in two different qualities, such as:

- Tempered Glass
- Laminated Glass

and both are manufactured in "flat" and "bent" forms.

The major demand in ESCWA region<sup>1)</sup> is for spare requirement- this depends on the type of vehicle and the glass.

The front glasses are replaced frequently, and to lesser extent rear glass. But seldom the window glasses are replaced.

The population of vehicles as projected for ESCWA region is shown as under.

<u>Class of vehicle</u>	<u>Population</u>	
	<u>1990</u>	<u>2000</u>
Passenger cars	6,000,000	8,000,000
Light commercial vehicles	1,600,000	2,300,000
Heavy commercial vehicles	400,000	500,000
Buses	130,000	186,000
Tractors	150,000	213,000
Total	8,280,000	11,199,000

Assuming the windshield glasses (front and rear only) are replaced once in the lifetime of a vehicle (8 - 10) years, then the total demand runs over one million square meters in 1990. This is based on the average requirement of 1.5 square meters per vehicle. This large demand justifies to establish more than one viable economic plant in the region.

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1) ESCWA region incorporates the member countries - Bahrain, Egypt, Iraq, Jordan, Kuwait, Lebanon, Oman, Qatar, Saudi Arabia, Syria, U.A.E., Yemen Arab Republic (YAR), Yemen People's Democratic Republic (PDRY), and PLO.

## 2. Plant Capacity

A Plant with the following capacities is proposed.

- 400,000 square meter of tempered glass
- 200,000 square meter of laminated glass

Both to be made in flat and bent forms. The plant to run 260 days a year in 2x8 hour shifts per day. Production to be continuous at tempered and laminated bent lines, while laminated glass line runs in 2x8 hour shifts.

## 3. Description of Product Characteristics

Tempered glass is a single layer usually 5-6mm thick, glass in which during the tempering process - heating into the transformation range and rapid cooling - the flexural strength is 6-8 times higher than the normal glass and it has a better heat shock resistance. While breaking, it disintegrates into very small parts.

Laminated safety glass consists of a hard plastic layer sealed under heat and pressure between two sheets of glass. The layer is of polyvinylbutyral /PVB / which adheres strongly and permanently to glass. Under impact, laminated glass cracks but remains integral. A cobweb pattern extends from the point to the interlayer.

## 4. Production Process

### 4.1 Tempered Glass Plant

#### 4.1.1 Flat windshield and flat side window glass shop

- Sheet glass preparing
- Cut to size and shape
- Grinding
- Drilling as required
- Washing
- Tempering heating and air-cooling
- Packing
- Storage
- Delivery

#### 4.1.2 Bent windshield and rear window glass shop

- Sheet glass preparing
- Cut to size and shape
- Grinding
- Drilling as required
- Washing
- Tempering heating, bending, air cooling
- Packing
- Storage
- Delivery

#### 4.2 Laminated Glass Plant

##### 4.2.1 Flat windshield and flat side window glass shop

- Sheet glass preparing
- Cutting
- Edge grinding
- Washing
- Powdering
- Cleaning
- Assembling, adding PVB
- Pre-laminating under pressure
- Autoclave
- Packing
- Storage
- Delivery

##### 4.2.2 Bent windshield rear window glass shop

- Sheet glass preparing
- Cutting
- Edge grinding
- Washing
- Powdering
- Bending
- Cleaning
- Assembling, adding PVB
- Pre-laminating vacuum treatment

- Autoclave
- Packing
- Storage
- Delivery

4.3 Auxiliary shops

- 4.3.1 Sheet glass preparing shop for Plants 4.1 and 4.2
- 4.3.2 Packing, storage and rack-making shop
- 4.3.3 Maintenance shop
- 4.3.4 Mould producing and maintenance shop
- 4.3.5 Forklift truck battery charging and filling station
- 4.3.6 Quality control laboratory

5. Factory Requirements

5.1	Land total:		97.000 m <sup>2</sup>	
5.2	Building:			
	- Plant 4.1 and 4.2 total		5.700 m <sup>2</sup>	
	- Shop 4.3.1 total		4.300 m <sup>2</sup>	
	storage:	2.500 m <sup>2</sup>		
	pre-cut:	1.800 m <sup>2</sup>		
	- Shop 4.3.2 total		15.100 m <sup>2</sup>	
	packing		800 m <sup>2</sup>	
	storage		3.600 m <sup>2</sup>	
	rack-making		4.200 m <sup>2</sup>	
	lumber-store		1.500 m <sup>2</sup>	could be open-air
	rack-store		5.000 m <sup>2</sup>	could be open-air
	- Shop 4.3.3 Maintenance		3.000 m <sup>2</sup>	
	- Shop 4.3.4 Mould shop		2.550 m <sup>2</sup>	
	- Shop 4.3.5 Forklift truck		1.000 m <sup>2</sup>	
	- Shop 4.3.6 Q.C. lab.		500 m <sup>2</sup>	
	Total		<u>32.150 m<sup>2</sup></u>	



5.3 Utility

	Electricity KW	Compressed air 6-8 bar m <sup>3</sup> /hr	Water 20°C m <sup>3</sup> /hr
Plant 4.1	2.200	100	150
Plant 4.2			
Shops 4.3	400	60	-
<b>Total</b>	<b>2.600</b>	<b>160</b>	<b>150</b>
Monthly requirement (based on 2x8 hr per day and 20 day per month operation)			
	832.000 kWh	51.200 m <sup>3</sup>	48.000 m <sup>3</sup>

5.4 Material per year

- Plant 4.1 and 4.2: Sheet glass 3mm	582.000 m <sup>2</sup>
Sheet glass 5-6 mm	684.000 m <sup>2</sup>
PVB film	260.000 m <sup>2</sup>
- Shops 4.3 : Paper, PS foam, rubber sheet	2.500 m <sup>3</sup>
lumber p.a. for approx. 50.000 racks	

5.5 Manpower:

	Plant 4.1	Plant 4.2	Shops 4.3	Total
- Skilled, unskilled etc	108	108	261	477
- Managers, Engineers	12	12	29	53
<b>Total</b>	<b>120</b>	<b>120</b>	<b>290</b>	<b>530</b>

6. Production Equipment

6.1 Equipment of tempered glass plant

1. Pantograph cutting machine	10 units
2. Edge grinding machine twin belt	2
3. Grinding machine with diamond wheels	3
4. Glass cutting machine	1
5. Glass drilling machine	2
6. Horizontal glass tempering oven	1

7. Bent glass tempering oven	1 unit
8. Pre-drilling machine for tong marks	1
9. Washing machine	2
6.2 <u>Equipment of laminated glass plant</u>	
<u>Production line for bended glasses</u>	
1. Preparing production line	
1.1 Pantograph cutting machine	2 unit
1.2 Break-out table	2
1.3 Edge grinding machine, twin belt	2
1.4 Glass washing machine	1
1.5 Powdering unit	1
2. Serial glass bending furnace	1
3. Individual glass bending furnace, for short series and for testing	1
4. Cleaning-assembling conveyor	
4.1 Cleaning station	1 unit
4.2 Assembling station	1
4.3 Lifting station	1
4.4 Conveyor	1
5. Vacuum conveyor	1
6. Autoclave and accessories	1
<u>Production line for flat glass products</u>	
7. Edge grinding machine twin belt	1
8. Glass washing machine	1
9. Pressing unit (autoclave according to point 6.)	1
<u>Unit for PVB-film treatment and storage</u>	
10. PVB-film storage room with air cooling	1
11. Mobile cooled PVB-film box	4
12. Climate room	1
6.3 <u>Equipment of Auxiliary shops</u>	
6.3.1 <u>Sheet Glass preparing Shop</u>	
- Crane 5 ton	1

- Diesel forklift truck 3 tonnes	2 units
- XY system cutting machine: max 250x350 cm sheet size, min 8x8 cm cutting size thickness 2-6 mm with accuracy -0.5 mm	2
- Pantograph system cutting machine: max glass sheets: 150x220 cm	5
max glass sheets: 100x150 cm	5
- Hand operated cutting table: with 200x250 cm sheet size	2
- Conveyor for the cutting machines	2 lines
- Electric forklift truck 2 ton	2 units
- Delivery rack 1,2 ton	200 "
- Hand-operated truck with hydraulic jack (2 ton)	10
- Cullet container 0.25 m3	50 pieces
- Glass rack built-in	100 metre

### 6.3.2 Packing, storage, rack-making shop

Strapping machines	
Staplers	
Hand tools	
Diesel, or electric fork lift 1-3 tonnes	6 units
Hand operated cart with hydraulic jack	8 "
Conveyor mobile	5
Mobile truck crane 5 tonnes	5
3 ton diesel side forklift truck	1
5 ton front forklift truck	2
Split band saw	1
Trimmer saw	2
Cut-off saw	1
Planer	2
Band saw	1
Pneumatic staple making machine	15
Wood dust separating cyclone	2
Bench for nailing	10
Sharpening machine	1
Bend saw welder	1

7.	<u>Cost of Project</u>		<u>US \$ Million</u>
	Land 97.000 m <sup>2</sup>		1.94
	Building 32.150 m <sup>2</sup>		32.15
	Equipment		4.96
	Total		<u>39.05</u>
8.	<u>Inputs</u>		
8.1	Utilities (Yearly)		<u>US \$ Million</u>
	Electricity		.5
	Compressed air		.122
	Water		.173
	Total		<u>.795</u>
8.2	Material (Yearly)		<u>US \$ Million</u>
	Sheet glass		3.9
	PVB film		1.0
	Lumber		.3
	Total		<u>5.2</u>
8.3	Manpower (Yearly)		<u>US \$ Million</u>
	Skilled, semi-skilled		6.869
	Managers, engineers		2.544
			<u>9.413</u>
9.	<u>Turnover</u>		20 US \$ Million
10.	<u>Operating Cost</u>		<u>US \$ Million</u>
	Utilities		.795
	Material		5.2
	Manpower		9.415
	Depreciation		2.000
	Others		.500
			<u>17.910</u>
11.	<u>Net profit</u>		2 US \$ Million