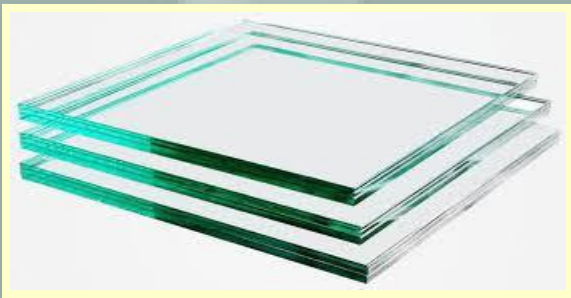


**Profitable Business Ideas &
Opportunities
in
Tempering and
Toughening of Flat Glass**

Introduction

Toughened or tempered glass is a type of safety glass processed by controlled thermal or chemical treatments to increase its strength compared with normal glass. Tempering creates balanced internal stresses when broken which cause the glass, to crumble into small granular chunks instead of splintering into jagged shards. The granular chunks are less likely to cause injury.

Glass is a naturally fragile material. To boost its functional properties and enhance its operational safety, it undergoes the process of tempering.



Tempering or toughening is a process where the glass is heated at high temperatures to make it stronger and more resistant to breakage. This process creates a balance in the product's internal stresses, so that when the glass is broken, it would crumble into tiny granular chunks instead of breaking into sharp, jagged pieces.

Because of its increased strength and safety, builders and architects utilize them in a multitude of demanding applications. This includes showers, vehicle windows, refrigerator trays, glass tables, diving masks, glassware, cookware, fireplace grates, bulletproof windows, architectural glass doors and virtually anywhere else that needs safe and strong glass.

Tempering is a term used in metallurgy, and defines the degree of hardness and strength imparted to a metal, as by quenching, heat treatment, or cold working. Glass is also 'hardened' the same way, i.e., heated to very high temperatures, then cooled quickly. (The melting point of glass is between 1400°C and 1600°C depending on its composition). This changes the structure of the glass. It has lower stress points and forms cube-like crystalline structures. Because of this, tempered glass shatters into cubes rather than into long, sharp shards so it is a lot safer to use.

After toughening, it becomes highly resistant to heat and shock. Tempered glass is four to five times more resistant to breakage than annealed glass.

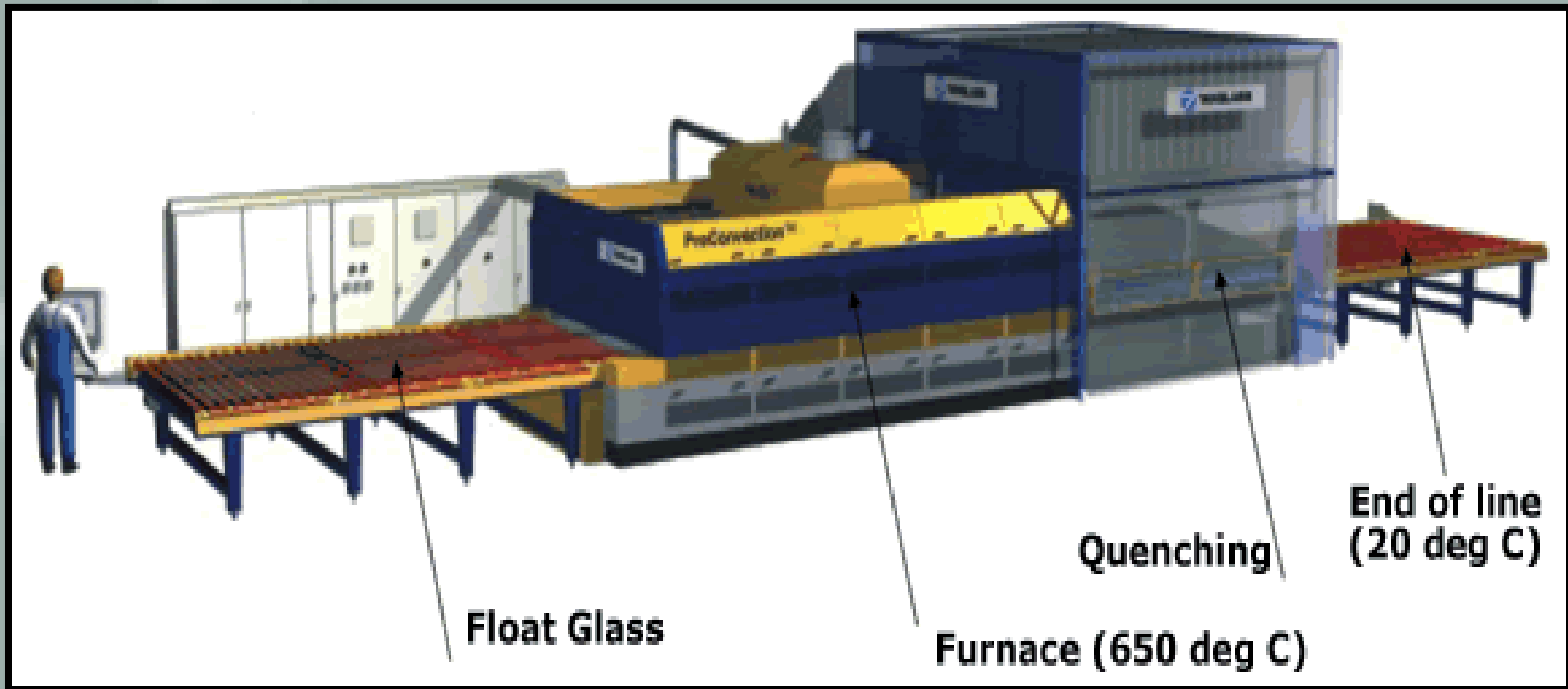
THE PROCESS OF TEMPERING GLASS

Tempered glass goes through a process similar to that of a tempered steel.

Stage 1: All toughened glass begins life as a float glass. Before it undergoes tempering, the glass is examined for imperfections. Bubbles, inclusions, and cracks may cause the float glass to break during toughening. So if any signs of such flaws are found, the glass can't be tempered.

Stage 2: Prior to toughening, it must first be cut to the desired shape as it won't be possible to cut or etch the finished product in its toughened state. Once cut, the edges are smoothed and any burrs produced during etching or cutting are removed.

Stage 3: To completely remove the grains of glass that were deposited during sanding, the float glass is thoroughly washed. This also ensures that dirt and any other tiny debris won't interfere with the tempering.

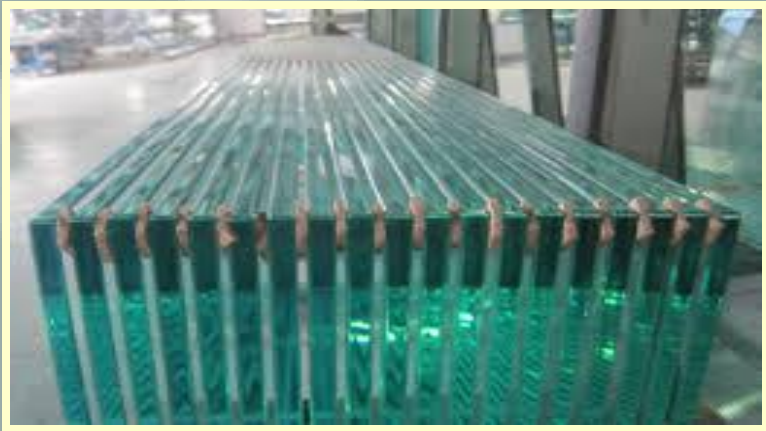


Stage 4: In the tempering process, the surface of the float glass is heated at over 600 degrees Celsius as it travels through a furnace. Some manufacturers heat the glass above its annealing point of approximately 720 degrees Celsius.

Stage 5: The scorching glass is then rapidly cooled through quenching by a high-pressure blast of air for a period of three to 10 seconds at various angles. As it cools and begins to shrink, tensile stresses temporarily build-up in the interior zone of the glass while its surface consequently develops surface stresses. These compressive stresses eventually enhance the strength of the glass, making it tougher to break.

A properly tempered glass should be able to withstand pressures of a minimum of 10,000 pounds per square inch (psi) and can be expected to break at about 24,000 psi.

Beyond the added tensile strength and safety, tempered glass has a greater resistance to thermal shock and thermal stresses. Essentially, it can withstand constant exposure to temperatures as high as 243 degrees Celsius.



Toughened glass has hundreds of applications. Used in automobiles, toughened glass windshields and windows reduces the occurrence of deadly cuts and bleeding in case of accidents because the glass breaks into small, cube-like pieces. Because of its structural strength, tempered glass is widely used in architectural applications.

Toughened glass acquires a degree of strength for excess of the strength of normal glass sheet or plate glass, which if broken shatters into small and comparatively harmless pieces. It is claimed that the resistance to mechanical shock of toughened plate glass is 4 to 5 times more than that of ordinary plate glass. A toughened glass has better resistance to the vibration, mechanical shock and abrasion.

Process of Manufacture:

The glass plate is heated to a temperature above its softening point and then subjected to rapid cooling. The glass is suddenly chilled and in this process contracts towards the core. It stretches until it has solidified and is no longer able to contract further at this stage the core is still soft. It contracts against restrained exercise by the solidified upper layer of the glass. This compression is responsible for the strength of the glass sheet, which is limited to about 20,000 lb/sq.inch. Thus it is highly stressed and the resultant force is able to nullify the external impact.

The intensity of the stresses depends on the rate of cooling, co-efficient of expansion, thermal conductivity of the glass, its specific heat, elasticity, and certain other physical properties.

Toughening Process:

The raw plate glass sheet which is free from waviness, distortion etc., is cut to required size and shape and then all the edges are ground and polished as per end use of the product. This is called edge 4 grinding and polishing and is very important for toughening because it will lead to breakages during process. No glass sheet can be toughened without edge grinding and polishing.



Washing and Drying:

After the edge grinding and polishing the glass sheets are washed manually or by machine and then dried. The glass sheets are fed into the furnace (Electrically operated). The sheets are kept in the furnace above its softening point, which varies according to the composition of glass. After attaining required temperature the glass sheets are removed out of the furnace and placed in the air blowing quenching boxes for 20 to 25 seconds. After quenching glass sheet is toughened. For bend glass toughening, the glass sheets passes through a set of dies (as per shape) after furnace and then to the quenching boxes.



Testing:

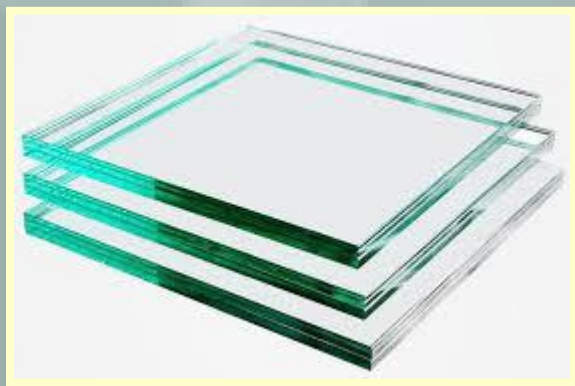
After toughening all the sheet glasses are passed through the polariscope inspection.

Tempered glass is also termed as toughened glass as it is believed to be four times stronger than normal glass. Tempered glass, when broken results into harmless granular pieces. In toughened or tempered glass, activities such as drilling, cutting, sandblasting, and machining are not possible.

Increasing government initiatives on infrastructure facilities accompanied with widening application outlook in construction sector will favor tempered glass market demand. Improving standard of living along with rising consumer spending on interior furniture designing owing to disposable income and rapid urbanization in India, China and Brazil will stimulate industry growth.

Rise in tempered glass market demand owing to high strength, safety, anti-breakage, and heat resistance properties coupled with its wide usage in public buildings including phone booths, bus terminals, canopies gymnasiums and sports arenas should stimulate market demand. Rising government regulatory support to favor infrastructure development towards residential and commercial buildings should stimulate the market growth.

Global Tempered Glass Market was valued at \$46 billion in 2016, and is projected to reach \$65 billion by 2023, registering a CAGR of 5.0% from 2017 to 2023.



Tempered glass also known as toughened glass, is known to be four times stronger than simple annealed glass. Tempered glass is produced by heating the silica mix up to 600°C and then rapidly cooling the molten silica. Tempered glass is widely used in automotive window panes, building windows, furniture, and interior activities of buildings.

Growth in use of tempered glass in automotive and construction industry drives the market. However, stringent government regulations in the automotive and construction industry restricts the market growth. Increase in construction activities in emerging economies such as India, Indonesia, Brazil, Argentina, and the Middle East offers growth opportunity for the tempered glass market.

Machinery Photographs



Force Convection Flat Glass Tempering Machine



Glass Polishing Machine



Automatic Glass Drilling Machine



Washing Machine

Project at a Glance

PROJECT AT A GLANCE

(` in lacs)

COST OF PROJECT				MEANS OF FINANCE			
Particulars	Existing	Proposed	Total	Particulars	Existing	Proposed	Total
Land & Site Development Exp.	0.00	100.00	100.00	Capital	0.00	191.80	191.80
Buildings	0.00	123.30	123.30	Share Premium	0.00	0.00	0.00
Plant & Machineries	0.00	337.04	337.04	Other Type Share Capital	0.00	0.00	0.00
Motor Vehicles	0.00	8.00	8.00	Reserves & Surplus	0.00	0.00	0.00
Office Automation Equipments	0.00	105.50	105.50	Cash Subsidy	0.00	0.00	0.00
Technical Knowhow Fees & Exp.	0.00	25.00	25.00	Internal Cash Accruals	0.00	0.00	0.00
Franchise & Other Deposits	0.00	0.00	0.00	Long/Medium Term Borrowings	0.00	575.40	575.40
Preliminary & Pre-operative Exp	0.00	3.00	3.00	Debentures / Bonds Unsecured	0.00	0.00	0.00
Provision for Contingencies	0.00	31.00	31.00	Loans/Deposits	0.00	0.00	0.00
Margin Money - Working Capital	0.00	34.36	34.36				
TOTAL	0.00	767.20	767.20	TOTAL	0.00	767.20	767.20

Project at a Glance

Year	Annualised		Book Value	Debt	Dividend	Retained Earnings		Payout	Probable Market Price	P/E Ratio	Yield Price/Book Value
	EPS	CEPS	Per Share		Per Share	Per Share		%		No.of Times	%
1-2	4.76	9.00	14.76	24.00	0.00	100.00	4.76	0.00	4.76	1.00	0.00
2-3	7.72	11.40	22.49	18.00	0.00	100.00	7.72	0.00	7.72	1.00	0.00
3-4	10.64	13.84	33.13	12.00	0.00	100.00	10.64	0.00	10.64	1.00	0.00
4-5	13.49	16.28	46.62	6.00	0.00	100.00	13.49	0.00	13.49	1.00	0.00
5-6	16.25	18.68	62.87	0.00	0.00	100.00	16.25	0.00	16.25	1.00	0.00

Project at a Glance

Year	D. S. C. R.			Debt / Equity - Deposits Debt	Equity as-Equity	Total Net Worth	Return on Net Worth	Profitability Ratio					Assets Turnover Ratio	Current Ratio
	Individual	Cumulative	Overall					GPM	PBT	PAT	Net Contribution	P/V Ratio		
	(Number of times)			(Number of times)		%	%	%	%	%	%			
Initial				3.00	3.00									
1-2	1.32	1.32		1.63	1.63	1.95		21.49%	11.90%	8.81%	717.60	69.21%	1.28	0.89
2-3	1.63	1.47		0.80	0.80	1.04		25.73%	18.31%	12.24%	836.04	69.12%	1.40	1.36
3-4	1.99	1.63	1.99	0.36	0.36	0.55		28.63%	22.86%	14.77%	955.45	69.12%	1.43	1.99
4-5	2.43	1.80		0.13	0.13	0.28		30.64%	26.13%	16.64%	1074.86	69.11%	1.38	2.74
5-6	2.97	1.99		0.00	0.00	0.12		32.02%	28.50%	18.03%	1194.27	69.11%	1.29	6.43

Project at a Glance

BEP

BEP - Maximum Utilisation Year	5
Cash BEP (% of Installed Capacity)	54.84%
Total BEP (% of Installed Capacity)	58.75%
IRR, PAYBACK and FACR	
Internal Rate of Return .. (In %age)	25.98%
Payback Period of the Project is (In Years)	2 Years 3 Months
Fixed Assets Coverage Ratio (No. of times)	4.025

Major Queries/Questions Answered in the Report?

- 1. What is Tempering and Toughening of Flat Glass industry ?**
- 2. How has the Tempering and Toughening of Flat Glass industry performed so far and how will it perform in the coming years ?**
- 3. What is the Project Feasibility of Tempering and Toughening of Flat Glass Plant ?**
- 4. What are the requirements of Working Capital for setting up Tempering and Toughening of Flat Glass ?**

- 5. What is the structure of the Tempering and Toughening of Flat Glass Business and who are the key/major players ?**
- 6. What is the total project cost for setting up Tempering and Toughening of Flat Glass Business?**
- 7. What are the operating costs for setting up Tempering and Toughening of Flat Glass Business ?**
- 8. What are the machinery and equipment requirements for setting up Tempering and Toughening of Flat Glass Business?**

- 9. Who are the Suppliers and Manufacturers of Plant & Machinery for Tempering and Toughening of Flat Glass plant ?**
- 10. What are the requirements of raw material for setting up Tempering and Toughening of Flat Glass Plant?**
- 11. Who are the Suppliers and Manufacturers of Raw materials for setting up Tempering and Toughening of Flat Glass Business?**
- 12. What is the Manufacturing Process of Toughened or tempered glass ?**

- 13. What is the total size of land required for setting up Tempering and Toughening of Flat Glass Industry?**
- 14. What will be the income and expenditures for Tempering and Toughening of Flat Glass ?**
- 15. What are the Projected Balance Sheets of Tempering and Toughening of Flat Glass ?**
- 16. What are the requirement of utilities and overheads for setting up Tempering and Toughening of Flat Glass Business?**
- 17. What is the Built up Area Requirement and cost for setting up Tempering and Toughening of Flat Glass Business?**

18. What are the Personnel (Manpower) Requirements for setting up Tempering and Toughening of Flat Glass Industry?

19. What are Statistics of Import & Export for Toughened or tempered glass ?

20. What is the time required to break-even of Tempering and Toughening of Flat Glass Business?

21. What is the Break-Even Analysis of Tempering and Toughening of Flat Glass Plant?

22. What are the Project financials of Tempering and Toughening of Flat Glass Business?

- 23. What are the Profitability Ratios of Tempering and Toughening of Flat Glass Business?**
- 24. What is the Sensitivity Analysis-Price/Volume of Tempering and Toughening of Flat Glass ?**
- 25. What are the Projected Pay-Back Period and IRR of Tempering and Toughening of Flat Glass?**
- 26. What is the Process Flow Sheet Diagram of Tempering and Toughening of Flat Glass ?**

27. What are the Market Opportunities for setting up Tempering and Toughening of Flat Glass Business?

28. What is the Market Study and Assessment for setting up Tempering and Toughening of Flat Glass ?

29. What is the Plant Layout for setting up Tempering and Toughening of Flat Glass ?

Table of Contents of the Project Report



1. PROJECT LOCATION

1.1. DISTRICT PROFILE & GEOTECHNICAL SITE CHARACTERIZATION

1.1.1. General

1.1.2. Map

1.1.3. Physical Characteristics

1.1.4. Climate

1.1.5. Transportation and Communications

1.1.6. Economy

2. INTRODUCTION

2.1. TEMPERED GLASS

2.2. TOUGHENED GLASS

3. COMPOSITION OF GLASS

4. DIFFERENCE BETWEEN TEMPERED GLASS AND TOUGHENED GLASS

5. PROPERTIES

6. OVERVIEW OF TEMPERED GLASS

7. USES AND APPLICATIONS

8. ADVANTAGES

9. MARKET SURVEY

10. EXPORT & IMPORT: ALL COUNTRIES

- 10.1. EXPORT: ALL COUNTRIES
- 10.2. IMPORT: ALL COUNTRIES

11. FINANCIALS & COMPARISON OF MAJOR INDIAN PLAYERS/COMPANIES

- 11.1. ABOUT FINANCIAL STATEMENTS OF CMIE DATABASE
- 11.2. PROFITS & APPROPRIATIONS
- 11.3. TOTAL LIABILITIES
- 11.4. TOTAL ASSETS
- 11.5. NET CASH FLOW FROM OPERATING ACTIVITIES
- 11.6. SECTION – I
 - 11.6.1. Name of Company with Contact Details
 - 11.6.2. Name of Director(S)
 - 11.6.3. Plant Capacity
 - 11.6.4. Location of Plant
 - 11.6.5. Name of Raw Material(S) Consumed with Quantity & Cost
- 11.7. SECTION – II
 - 11.7.1. Assets
 - 11.7.2. Cash Flow
 - 11.7.3. Cost as % Ge of Sales
 - 11.7.4. Growth in Assets & Liabilities
 - 11.7.5. Growth in Income & Expenditure

- 11.7.6. Income & Expenditure
- 11.7.7. Liabilities
- 11.7.8. Liquidity Ratios
- 11.7.9. Profitability Ratio
- 11.7.10. Profits
- 11.7.11. Return Ratios
- 11.7.12. Structure of Assets & Liabilities (%)
- 11.7.13. Working Capital & Turnover Ratios
- 11.7.14. Company Profile of Major Players

12.EXPORT & IMPORT STATISTICS DATA OF INDIA

13.PRESENT MANUFACTURERS

14.RAW MATERIALS

15.MANUFACTURING PROCESS

16.PROCESS FLOW DIAGRAM

17.MACHINERY DETAILS

18. BUYER'S LIST

- 18.1. CONTACT DETAILS OF BUYER'S
- 18.2. NAME OF DIRECTOR(S)
- 18.3. PLANT CAPACITY
- 18.4. LOCATION OF PLANT
- 18.5. COMPANY WISE CONSUMPTION DETAIL OF THE RAW MATERIALS

19.SUPPLIERS OF PLANT & MACHINERY

20.SUPPLIERS OF RAW MATERIAL

21. PHOTOGRAPHS/IMAGES FOR REFERENCE

- 21.1. MACHINERY PHOTOGRAPHS
- 21.2. RAW MATERIAL PHOTOGRAPHS
- 21.3. PRODUCT PHOTOGRAPHS

22.PLANT LAYOUT

23.QUOTATION OF PLANT, MACHINERY AND EQUIPMENTS FROM SUPPLIERS

Project Financials

• Project at a Glance	Annexure
• Assumptions for Profitability workings	1
• Plant Economics.....	2
• Production Schedule.....	3
• Land & Building.....	4
Factory Land & Building	
Site Development Expenses	

- **Plant & Machinery.....5**
 - Indigenous Machineries**
 - Other Machineries (Miscellaneous, Laboratory etc.)**

- **Other Fixed Assets.....6**
 - Furniture & Fixtures**
 - Pre-operative and Preliminary Expenses**
 - Technical Knowhow**
 - Provision of Contingencies**

- **Working Capital Requirement Per Month.....7**
 - Raw Material**
 - Packing Material**
 - Lab & ETP Chemical Cost**
 - Consumable Store**

- **Overheads Required Per Month and Per Annum.....8**
Utilities & Overheads (Power, Water and Fuel Expenses etc.)
Royalty and Other Charges
Selling and Distribution Expenses

- **Salary and Wages9**

- **Turnover Per Annum10**

- **Share Capital.....11**
Equity Capital
Preference Share Capital

- **Annexure 1 :: Cost of Project and Means of Finance**
- **Annexure 2 :: Profitability and Net Cash Accruals**
 - **Revenue/Income/Realisation**
 - **Expenses/Cost of Products/Services/Items**
 - **Gross Profit**
 - **Financial Charges**
 - **Total Cost of Sales**
 - **Net Profit After Taxes**
 - **Net Cash Accruals**

- **Annexure 3 :: Assessment of Working Capital requirements**

- **Current Assets**
- **Gross Working Capital**
- **Current Liabilities**
- **Net Working Capital**
- **Working Note for Calculation of Work-in-process**

- **Annexure 4 :: Sources and Disposition of Funds**

- **Annexure 5 :: Projected Balance Sheets**

- **ROI (Average of Fixed Assets)**
- **RONW (Average of Share Capital)**
- **ROI (Average of Total Assets)**

- **Annexure 6 :: Profitability Ratios**

- **D.S.C.R**
- **Earnings Per Share (EPS)**
- **Debt Equity Ratio**

• **Annexure 7 :: Break-Even Analysis**

- **Variable Cost & Expenses**
- **Semi-Variable/Semi-Fixed Expenses**
- **Profit Volume Ratio (PVR)**
- **Fixed Expenses / Cost**
- **B.E.P**

- **Annexure 8 to 11 :: Sensitivity Analysis-Price/Volume**

- **Resultant N.P.B.T**
- **Resultant D.S.C.R**
- **Resultant PV Ratio**
- **Resultant DER**
- **Resultant ROI**
- **Resultant BEP**

- **Annexure 12 :: Shareholding Pattern and Stake Status**

- **Equity Capital**
- **Preference Share Capital**

- **Annexure 13 :: Quantitative Details-Output/Sales/Stocks**

- **Determined Capacity P.A of Products/Services**
- **Achievable Efficiency/Yield % of Products/Services/Items**
- **Net Usable Load/Capacity of Products/Services/Items**
- **Expected Sales/ Revenue/ Income of Products/ Services/ Items**

- **Annexure 14** :: **Product wise Domestic Sales Realisation**
- **Annexure 15** :: **Total Raw Material Cost**
- **Annexure 16** :: **Raw Material Cost per unit**
- **Annexure 17** :: **Total Lab & ETP Chemical Cost**
- **Annexure 18** :: **Consumables, Store etc.**
- **Annexure 19** :: **Packing Material Cost**
- **Annexure 20** :: **Packing Material Cost Per Unit**

- **Annexure 21** :: **Employees Expenses**
- **Annexure 22** :: **Fuel Expenses**
- **Annexure 23** :: **Power/Electricity Expenses**
- **Annexure 24** :: **Royalty & Other Charges**
- **Annexure 25** :: **Repairs & Maintenance Expenses**
- **Annexure 26** :: **Other Manufacturing Expenses**
- **Annexure 27** :: **Administration Expenses**
- **Annexure 28** :: **Selling Expenses**

- **Annexure 29 :: Depreciation Charges – as per Books (Total)**
- **Annexure 30 :: Depreciation Charges – as per Books (P & M)**
- **Annexure 31 :: Depreciation Charges - as per IT Act WDV (Total)**
- **Annexure 32 :: Depreciation Charges - as per IT Act WDV (P & M)**
- **Annexure 33 :: Interest and Repayment - Term Loans**
- **Annexure 34 :: Tax on Profits**
- **Annexure 35 :: Projected Pay-Back Period and IRR**

Reasons for Buying our Report:

- **This report helps you to identify a profitable project for investing or diversifying into by throwing light to crucial areas like industry size, market potential of the product and reasons for investing in the product**
- **This report provides vital information on the product like it's characteristics and segmentation**
- **This report helps you market and place the product correctly by identifying the target customer group of the product**

- **This report helps you understand the viability of the project by disclosing details like machinery required, project costs and snapshot of other project financials**
- **The report provides a glimpse of government regulations applicable on the industry**
- **The report provides forecasts of key parameters which helps to anticipate the industry performance and make sound business decisions**

Our Approach:

- **Our research reports broadly cover Indian markets, present analysis, outlook and forecast for a period of five years.**
- **The market forecasts are developed on the basis of secondary research and are cross-validated through interactions with the industry players**
- **We use reliable sources of information and databases. And information from such sources is processed by us and included in the report**

Scope of the Report

The report titled “Market Survey cum Detailed Techno Economic Feasibility Report on Tempering and Toughening of Flat Glass.” provides an insight into Tempering and Toughening of Flat Glass market in India with focus on uses and applications, Manufacturing Process, Process Flow Sheets, Plant Layout and Project Financials of Tempering and Toughening of Flat Glass project. The report assesses the market sizing and growth of the Indian Tempering and Toughening of Flat Glass Industry. While expanding a current business or while venturing into new business, entrepreneurs are often faced with the dilemma of zeroing in on a suitable product/line. And before diversifying/venturing into any product, they wish to study the following aspects of the identified product:

- **Good Present/Future Demand**
- **Export-Import Market Potential**
- **Raw Material & Manpower Availability**
- **Project Costs and Payback Period**

We at NPCS, through our reliable expertise in the project consultancy and market research field, have demystified the situation by putting forward the emerging business opportunity in the Tempering and Toughening of Flat Glass sector in India along with its business prospects. Through this report we have identified Tempering and Toughening of Flat Glass project as a lucrative investment avenue.

Tags

Flat Glass Tempering, Glass Tempering, Tempered Flat Glass, Tempering and Bending of Glass, How is Tempered Glass Made? Glass Bending and Tempering, Toughened or Tempered Glass, Glass Industry, Tempered Glass, Toughened Glass, Tempering & Toughening of Flat Glass, Toughened, Tempered & Laminated Safety Glass, Flat Toughened Glass, Glass Toughening, Toughened Flat Glass Manufacture, Toughened Glass Plant, Toughening/Tempering Process of Glass, Flat Glass Industry, Glass Tempering Plant, Flat Glass Toughening, Glass Tempering Process, How to Temper Glass, Processed Glass, Project Profile on Toughened Glass, Tempered Glass Production, Flat Glass Manufacturing, Float Glass Production Process, How is Flat Glass Made? Float Glass Manufacturing Process, Float Glass Manufacturing Process Pdf, Manufacture of Flat Glass, Glass Manufacturing Process, Flat Glass Manufacturing Plant, Glass Industry, Flat Glass Manufacturing Opportunity, Flat Glass Manufacture, Flat Glass Manufacturing project ideas, Projects on Small Scale Industries, Small scale industries projects ideas, Flat Glass Manufacturing Based Small Scale Industries Projects, Project profile on small scale industries,

How to Flat Glass Manufacturing Industry in India, Flat Glass Manufacturing Projects, New project profile on Flat Glass Manufacturing industries, Project Report on Flat Glass Manufacturing Industry, Detailed Project Report on Flat Glass Manufacturing, Project Report on Flat Glass Tempering, Pre-Investment Feasibility Study on Flat Glass Tempering, Techno-Economic feasibility study on Flat Glass Toughening, Feasibility report on Flat Glass Toughening, Free Project Profile on Flat Glass Toughening, Project profile on Flat Glass Tempering Download free project profile on Flat Glass Tempering, Startup Project for Flat Glass Tempering, Project report for bank loan, Project report for bank finance, Project report format for bank loan in excel, Excel Format of Project Report and CMA Data, Project Report Bank Loan Excel, Tempered Glass (Toughened Glass), Glass Tempering and Toughening Process

**Niir Project Consultancy Services (NPCS)
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Our Market Survey cum Detailed Techno Economic Feasibility Report provides an insight of market in India. The report assesses the market sizing and growth of the Industry. While expanding a current business or while venturing into new business, entrepreneurs are often faced with the dilemma of zeroing in on a suitable product/line.



And before diversifying/venturing into any product, they wish to study the following aspects of the identified product:

- **Good Present/Future Demand**
- **Export-Import Market Potential**
- **Raw Material & Manpower Availability**
- **Project Costs and Payback Period**

The detailed project report covers all aspect of business, from analyzing the market, confirming availability of various necessities such as Manufacturing Plant, Detailed Project Report, Profile, Business Plan, Industry Trends, Market Research, Survey, Manufacturing Process, Machinery, Raw Materials, Feasibility Study, Investment Opportunities, Cost and Revenue, Plant Economics, Production Schedule,



Working Capital Requirement, uses and applications, Plant Layout, Project Financials, Process Flow Sheet, Cost of Project, Projected Balance Sheets, Profitability Ratios, Break Even Analysis. The DPR (Detailed Project Report) is formulated by highly accomplished and experienced consultants and the market research and analysis are supported by a panel of experts and digitalized data bank.

We at NPCS, through our reliable expertise in the project consultancy and market research field, have demystified the situation by putting forward the emerging business opportunity in India along with its business prospects.....[Read more](#)



Contact us

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Who are we?

- *One of the leading reliable names in industrial world for providing the most comprehensive technical consulting services*
- *We adopt a systematic approach to provide the strong fundamental support needed for the effective delivery of services to our Clients' in India & abroad*



We at NPCS want to grow with you by providing solutions scale to suit your new operations and help you reduce risk and give a high return on application investments. We have successfully achieved top-notch quality standards with a high level of customer appreciation resulting in long lasting relation and large amount of referral work through technological breakthrough and innovative concepts. A large number of our Indian, Overseas and NRI Clients have appreciated our expertise for excellence which speaks volumes about our commitment and dedication to every client's success.



We bring deep, functional expertise, but are known for our holistic perspective: we capture value across boundaries and between the silos of any organization. We have proven a multiplier effect from optimizing the sum of the parts, not just the individual pieces. We actively encourage a culture of innovation, which facilitates the development of new technologies and ensures a high quality product.



What do we offer?

- *Project Identification*
- *Detailed Project Reports/Pre-feasibility Reports*
- *Market Research Reports*
- *Business Plan*
- *Technology Books and Directory*
- *Industry Trend*
- *Databases on CD-ROM*
- *Laboratory Testing Services*
- *Turnkey Project Consultancy/Solutions*
- *Entrepreneur India (An Industrial Monthly Journal)*

How are we different ?

- *We have two decades long experience in project consultancy and market research field*
- *We empower our customers with the prerequisite know-how to take sound business decisions*
- *We help catalyze business growth by providing distinctive and profound market analysis*
- *We serve a wide array of customers , from individual entrepreneurs to Corporations and Foreign Investors*
- *We use authentic & reliable sources to ensure business precision*



Our Approach

Requirement collection

Thorough analysis of the project

Economic feasibility study of the Project

Market potential survey/research

Report Compilation

Contact us

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