Saint-Gobain Glass
ZAK WORLD OF FACADE
Sydney September 2019
A STRONG GLOBAL GROUP

One of the top
100
industrial groups in the world with around 1,000 manufacturing facilities

Created more than
350
years ago

Operating in
67
countries

More than
180,000
employees and 100+ nationalities represented

About
4,000
sales outlet

2018 sales
€41.8BN
AN AMBITION ENCOMPASSING TODAY’S AND TOMORROW’S CHALLENGES

Comfort
To answer today’s individual needs (high-performance solutions for thermal comfort, acoustics, indoor air quality, safety, accessibility, aesthetics)

Sustainability
To address tomorrow’s collective challenges (sustainable building, better mobility, resource efficiency, demographic growth, climate change)
A PASSION FOR MATERIALS

- Innovative and high-performance materials
- Materials for comfortable and sustainable buildings
- Expert employees
- Customer intimacy thanks to our distribution brands
3 700 researchers

8 cross-business R&D centers

1 product out of 4 sold by Saint-Gobain today didn't exist 5 years ago

Nearly 400 patents filed in 2018

About 100 development units

SGR Brasil
Capivari, Brazil

SGR Paris
Aubervilliers, France

SGR Provence
Cavaillon, France

SGR North America
Northboro, United States

SGR Compiègne
Thouroule, France

SGR Germany
Herzogenrath, Allemagne

SGR Shanghai
Shanghai, China

SGR India
Chennai, India

SGR France
Aubervilliers, France

SGR North America
Northboro, United States

SGR India
Chennai, India

SGR Shanghai
Shanghai, China

SGR Brasil
Capivari, Brazil
MEGATRENDS

DIGITALIZATION
That impacts the way we live, buy, communicate and work

URBANIZATION
5 billion people living in cities in 2030

GLOBAL ECONOMIC GROWTH
that favors the emergence of middle class in emerging countries but deepens inequalities

NEW MOBILITIES
Autonomous and electric vehicles

RESOURCE SCARCITY & RECYCLING
+50% Rising demand for raw materials by 2030

CLIMATE CHANGE
Buildings account for 40% of the global greenhouse gas emissions

That impacts the way we live, buy, communicate and work
Environmental targets (2010-2025)

- 50% of non-recovered waste, 0 long term
- 15% of energy consumption
- 20% CO₂ emissions
- 80% of waste water discharges in liquid form, 0 long term

Extraction of 9,025,000 tons of virgin materials avoided in 2018

Internal carbon price integrated into decision-making procedures on investments and R&D projects

Saint-Gobain appears for the first time on CDP’s Climate Change A List
On the environment and on people’s health & wellbeing

The BUILT ENVIRONMENT has a huge impact

- 33% of energy consumption
- 30% of greenhouse gas emissions
- 40% of raw material consumption
- 40% of solid waste streams (in developed countries)

As per WHO:
- 80% of time spent indoors by adults
- 90% of time spent indoors by children

*World Health Organization
for sustainable buildings

Our concept PROOF

COMFORT

feel
see
hear
breathe

SUSTAINABILITY

Energy & Carbon
Materials & Resources
Health & Safety
Water, Biodiversity & Local Value Creation

TODAY’S NEEDS

TOMORROW’S CHALLENGES

ASSESSMENT TOOLS

BREEAM® • HQE® • DGNB

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relating the design of working environments to our human senses

**Multi Comfort Focuses on Inhabitants**

- **feel**
  - Optimum temperature for a task & ambiance, lack of local discomforts

- **see**
  - Maximum of daylight & views outside, absence of glare

- **hear**
  - No unwanted sounds, task optimized room acoustics

- **breathe**
  - Constant supply of fresh air, free of any pollutants

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SAINT-GOBAIN
evaluating LIFE CYCLE IMPACT on ALL STAKEHOLDERS

Multi Comfort STRIVES FOR SUSTAINABILITY

Towards zero carbon, 

a circular economy, 

nurturing buildings. 

Towards water autonomy, net positive biodiversity and happy communities

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MAJOR TOPICS OF OUR GENERATION
# WATER

© Zak World of Façades Sydney Conference
# RESOURCES
# BIOPHILIA
# COMFORT
# LIFE CYCLE COSTING
Saint-Gobain’s approach to sustainability:
Our sustainability journey

2009
1st building

2011
1st building

2011
1st building

2012
Training of the sales force (500 pers)

2012
1st pilot on windows recycling

2015
Internal carbon price

2016
New Saint-Gobain brand

2016
Complete sustainability approach

2017
1st Saint-Gobain pilot on sustainable scorecard
OUR MISSION IS TO CREATE GREAT LIVING PLACES AND IMPROVE DAILY LIFE, WHILE PRESERVING THE FUTURE OF ALL.

This commitment is driven by our Glass Forever program, with the help of all our stakeholders: employees, customers, partners, suppliers....

From small seeds to big rivers, our vision is to grow our business and to differentiate, while improving our environmental footprint and increasing our contribution to people’s wellbeing.
Invent sustainable habitat/mobility

Encourage employees’ growth

Limit our environmental impact

Take action across the supply chain

Support local community development

Glass Forever company values & culture

*(Principles of conduct & actions)*
OUR SUSTAINABILITY JOURNEY: CREATE SUSTAINABLE VALUE FOR ALL

2025 OBJECTIVES

**INVENT SUSTAINABLE HABITAT & MOBILITY**
- Build a glass circular economy
  - 50% of our glass is made of cullet
- Invent sustainable solutions
  - 100% of our solutions have been assessed with regard to their sustainability

**ENCourage EMPLOYEE GROWTH**
- Make work safer
  - 50% occupational accidents
- Increase gender balance
  - 25% of women in management
- Develop employee engagement
  - 80% in the employee NPS (satisfaction survey)

**LIMIT OUR ENVIRONMENTAL IMPACT**
- Fight climate change
  - -20% CO₂ emissions
- Preserve natural resources
  - -80% water discharge
- Use renewable energy
  - 100% renewable energy for non-industrial electricity uses

**TAKE ACTION ACROSS THE SUPPLY CHAIN**
- Make the supply chain more efficient
  - -20% CO₂ emissions / T
- Help our suppliers be more sustainable
  - 100% of high-impact suppliers assessed on their sustainability practices (by 2021)

**SUPPORT LOCAL COMMUNITY DEVELOPMENT**
- Create local value
  - X2 projects submitted to the Foundation

GLASS FOREVER IS BASED ON SAINT-GOBAIN'S PRINCIPLES OF CONDUCT AND ACTION
Measure and minimize the environmental impacts of materials

Our contribution

• We are the first glassmakers to have made EPD’s
  ✓ Specific (and not generic) EPD
  ✓ EPD verified by an external third party

• To date, 18 EPD’s covering 50 glass configurations

Documentation available

Download EPD’s on

• Calumen (expert version)
• On the Internet for short versions http://epd.glassolutions.eu/
Responsible sourcing - Use of recycled raw material

**Cullet source**

<table>
<thead>
<tr>
<th></th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>20%</td>
</tr>
<tr>
<td>B</td>
<td>7%</td>
</tr>
<tr>
<td>C</td>
<td>&lt;1%</td>
</tr>
</tbody>
</table>
RECYCLED CONTENT

DECLARATION

We declare that the percentage of cullet included in the composition of Flat Glass products, manufactured by Saint-Gobain and for building applications is the following:

<table>
<thead>
<tr>
<th>Internal cullet</th>
<th>20 %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-consumer cullet</td>
<td>7 %</td>
</tr>
<tr>
<td>Post-consumer cullet</td>
<td>&lt;1 %</td>
</tr>
</tbody>
</table>

Following ISO 14021:1999, the recycled content is 7% by weight:

Recycled content (ISO 14021:1999) = post-consumer content + pre-consumer content

Following LEED v4 “Building product disclosure and optimization - sourcing of raw materials” criteria, the recycled content is 3.5% by weight:

Recycled content (LEED v4) = post-consumer content + ½ pre-consumer content

Using one ton of cullet,

- Saves 1.2 tons of raw material, including 850 kg of sand;
- Reduces Greenhouse gas emissions (CO₂) by approximately 300 kg.

November 10th 2016
SAINT-GOBAIN BUILDING GLASS EUROPE
Our contribution

- All SGG floats are ISO 14 001 and our SAMIN quarries too.
- Saint-Gobain has a responsible purchasing policy, with supplier audits on social and environmental subjects.
- The Group’s sustainability report details all these items.
- Saint-Gobain works on recovering end-of-life windows.

Documentation available

- ISO 14 001 accreditations for floats
- The Group’s responsible purchasing policy
- The Group’s sustainability report
Saint-Gobain Glass India

The Evolution...

- 2000: Float line 1 Inaugurated, First Exports
- 2001: Mirror Plant inaugurated
- 2002: Float Line 2 Commissioned, Sekurit Tempered
- 2005: Full Integration of Jhagadia Plant
- 2006: ACGP - Start of Operations
- 2011: Bhiwadi Float Commission
- 2012: Sekurit Laminated, Bhiwadi
- 2013: Fire-Safety Glass Line Start-up
- 2014: Advanced Laminated Glass Processing
- 2015: Coater II, Sriperumbudur
- 2016: Float V, Sriperumbudur
- 2017: ACGP II
- 2018:
Saint-Gobain Glass India
Chennai’s World Glass Complex
A Regional Manufacturing Hub for Value Added Products
Overall Manufacturing Capabilities

**Clear and tinted glass**
- 90 million sq. m / annum

**Coated glass**
- >14 million sq. m / annum

**Technology**
- Manufactured by the state-of-the-art magnetron sputtering process, which requires special surface condition of base glass
- Exclusive Dehumidified Warehouse (DWH) guaranteeing the preservation of the surface quality and ensuring no corrosion of the substrate

**Process Capabilities**
- Tempering: 675,000 m²/year
- Lamination: 120,000 m²/year
- Double glazing: 220,000 m²/year
SAINT GOBAIN GLASS SOLUTIONS
A CLEAR TREND TOWARDS HIGH & EXTREME SELECTIVE PERFORMANCE

SAINT GOBAIN GLASS SOLUTIONS
A CLEAR TREND TOWARDS HIGH & EXTREME SELECTIVE PERFORMANCE
SGG PLANITHERM® UN/ UNII

Low-E glass with advanced thermal insulation properties

SGG PLANITHERM® UN & Planitherm UN II are advanced performance low-E coatings, further extending the SGG PLANITHERM family.

**BENEFITS**

- **Daylight comfort**
- **Energy saving**
- **Summer comfort**
- **Winter comfort**

<table>
<thead>
<tr>
<th></th>
<th>Vlt</th>
<th>Shgc</th>
<th>Ug</th>
<th>Rext</th>
<th>Rint</th>
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<tr>
<td>UN serie</td>
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<td>1.6</td>
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SGG COOL-LITE SKN SERIES

A SNAPSHOT OF OUR PRODUCT OFFERINGS- NFRC

SGG COOL LITE SKN
State-of-the-art solar control and thermal insulation glass - double silvered Low-E glass, with spectral selectivity (light-heat ratio).

<table>
<thead>
<tr>
<th>Model</th>
<th>Vlt</th>
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<th>Ug</th>
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<th>Rint</th>
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<tbody>
<tr>
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<tr>
<td>SKN 176II</td>
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<td>0.34</td>
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<tr>
<td>SKN 165II</td>
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<td>1.6</td>
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<td>17</td>
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<tr>
<td>SKN 154II</td>
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<td>24</td>
</tr>
<tr>
<td>SKN 146II</td>
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<td>12</td>
<td>11</td>
</tr>
<tr>
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<td>20</td>
<td>12</td>
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<tr>
<td>SKN 133II</td>
<td>30</td>
<td>0.18</td>
<td>1.6</td>
<td>12</td>
<td>12</td>
</tr>
</tbody>
</table>

*6 skn /12/6 mm
A SNAPSHOT OF OUR PRODUCT OFFERINGS - NFRC

**SGG XTREME**
Advanced solar control thermal insulation glass (Low-E) that reflects long wave heat radiation and provides high thermal insulation.

<table>
<thead>
<tr>
<th>Description</th>
<th>Vlt</th>
<th>Shgc</th>
<th>Ug</th>
<th>Rext</th>
<th>Rint</th>
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</thead>
<tbody>
<tr>
<td>XT 70/33</td>
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<td>1.6</td>
<td>11</td>
<td>13</td>
</tr>
<tr>
<td>XT 60/28</td>
<td>60</td>
<td>0.25</td>
<td>1.6</td>
<td>14</td>
<td>17</td>
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<tr>
<td>XT 50/22</td>
<td>47</td>
<td>0.2</td>
<td>1.6</td>
<td>16</td>
<td>18</td>
</tr>
</tbody>
</table>

*6 skn /12/6 mm

**BENEFITS**
- Daylight comfort
- Energy saving
- Environment
- Safety
- Summer comfort
- Winter comfort
UV CURED POLYMER COATING FOR OUTSTANDING MECHANICAL PROPERTIES

Glass out of the magnetron coater:
Optics and quality check

Roller coating:
100% UV acrylate coating
No solvent

UV curing:
High power fluorescent curing
Low energy

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WHAT IS EASY-PRO?

ADDED VALUE FOR STORAGE AND PROCESSING

EASYPRO protects

Coating → Transport → Tempering → IGU → Facade

& storage Processing

- MECHANICAL AND CHEMICAL PROTECTION OF THE GLASS
- FROM THE EXIT OF THE COATER TO THE EXIT OF THE TEMPERING FURNACE
  ✓ No edge sealing tape - Shorter time to unpack glass blocks
  ✓ No cover sheet required
  ✓ Mechanical resistance during pre-processing
  ✓ Shorter tempering cycle – better productivity
  ✓ Burns off during tempering – zero waste
  ✓ Better flatness
  ✓ 1 year shelf life
Saint-Gobain Glass India Services

© Zak World of Façades Sydney Conference
A Comparative study between energy performances of various glass options for the project

Helps choose the right glass with quicker payback period and higher energy efficiency

Structural safety calculation for various special fixing conditions such as
1) Spider fixing
2) Two sided
3) Glass floors
4) Canopies
5) Skylights
6) Balustrades

Acoustic recommendations based on project conditions

Recommendation for the most economical configuration to achieve the project requirements from a extensive simulated database of 15000 combinations.
Project Design Support

Daylighting Simulations
Simulations for various light transmissions in glass for daylighting levels and glare calculations.
Helps choose the right light transmission in glass and to avoid excessive glare in buildings.

Facade Renderings
Realistic project facade rendering with the chosen glass options.
Helps choose the glass with best match to the desired aesthetics.

Environmental Commitment
Third party certified environmental product declaration for all our products.
Specific brochures developed highlighting the contribution of glass for each green building rating system.
27% average recycled content used during glass production.
What is “physico-realistic” rendering?

An image calculated with the physical properties of the glass,

A rendering of the real glass.

**PHYSICO-REALISTIC RENDERING**

Spectral color calculation allows very small variations in glass tint, and integrate exact physical data from real glass.

= SCIENCE

**TRADITIONAL RENDERING**

RGB color calculation helps in beautification of a 3d model. It does not accept a material data.

= ART

Duo Tower, by Jean Nouvel
GlassPro Live by Saint-Gobain

A service in Three steps

Two pre-designed scenes, one custom-made …

all with glass compositions fitting your needs

STEP 1
GLASS KUBUS

Test products in a simple scene and avoid any representation issue

STEP 2
URBAN SCENE

Test products on a large area

STEP 3
REAL BUILDING

Test products on your building
Some alternative facade solutions to consider
SGG PATTERN PRODUCTS
Project: 70 CASTLEREAGH STREET

- SGG SKN 154II Vision IGUs
- 6mm SGG MASTER-SHINE SPANDRELS
- 13.52mm SGG MASTER-SHINE FINS
INTRODUCING SAGEGLASS HARMONY™
The world’s most elegant dynamic glass

• Glare control without shading devices
• Intelligent daylight management
• Maintain view and connection to the outdoors
• Help achieve green labels
• Automatic and manual control

SageGlass Benefits Plus:
• Precise solar control
• Excellent interior color rendering

All the Benefits of SageGlass and SageGlass LightZone® Plus:
• Elegant visual experience with gradual in-pane tint transitions
• Enhanced biophilic design

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NEW HARMONY STATES
Most hours of operation will typically utilize Harmony states (application dependent)

PLUS ORIGINAL UNIFORM STATES
For hours where uniform tinting is required for occupant comfort
SAGEGLASS® AUTOMATION
Dynamic to local conditions and needs

Prioritized Goals
Glare, Daylight, Energy

Basic automation accounting for building location, orientation, exterior obstructions, interior layout, time of day and predictable sun path

Local Weather Changes
(e.g. cloud cover, extreme hot/cold)

Building Automation Overrides
(e.g. HVAC / lighting optimization)

Dynamic Processing

Manual Overrides

Dynamic Control

IoT Interactions
(e.g. meeting scheduled)

Note: In addition to above, core system or critical software updates free (and very rare, <= 1 per year); future features/functionality subject to fee
ENHANCE THE BEAUTY OF YOUR DESIGN
SageGlass® delivers delight inside and out

Unique coating process within glass results in a more clean, uniform and vibrant finish
SAGEGLASS® IGU
Our composition enables the greatest flexibility on the market for customisation

Benefits
1) Custom outboard
2) SGP laminate for extra protection
OVERLENGTH
A NEW APPROACH IN STRUCTURAL GLAZING
WHAT DO WE OFFER?

PRODUCT

3.210 x 18.000mm

- **Basic Glass** from Cologne-Porz
  - sgg PLANICLEAR/sgg DIAMANT
  - 8, 10, 12 and 15mm

- **Coated Glass** from Torgau
  - sgg PLANITHERM® XN II and CNE II
  - sgg COOL-LITE® SKIN I and XTREME II
  - 8, 10 and 12mm
Thank you for your attention and please consider Saint-Gobain Glass as your sustainable glass partner for your next project.