

2004 Survey of US Architects on the Subject of Switchable Glazings

For more information, please contact:

Gregory M. Sottile, Ph.D.

Director of Market Development
Research Frontiers Incorporated

Sottile@SmartGlass.com

www.SmartGlass.com

Research Methodology

◆ Design: Exploratory/Qualitative

◆ Attitudes of US architects:

- SIC 8712 (architectural services)
- Random selection
- Study period: Jan/Feb 2004
- In-depth telephone interviewing (n=16)
- Blend of open- and closed-ended questions

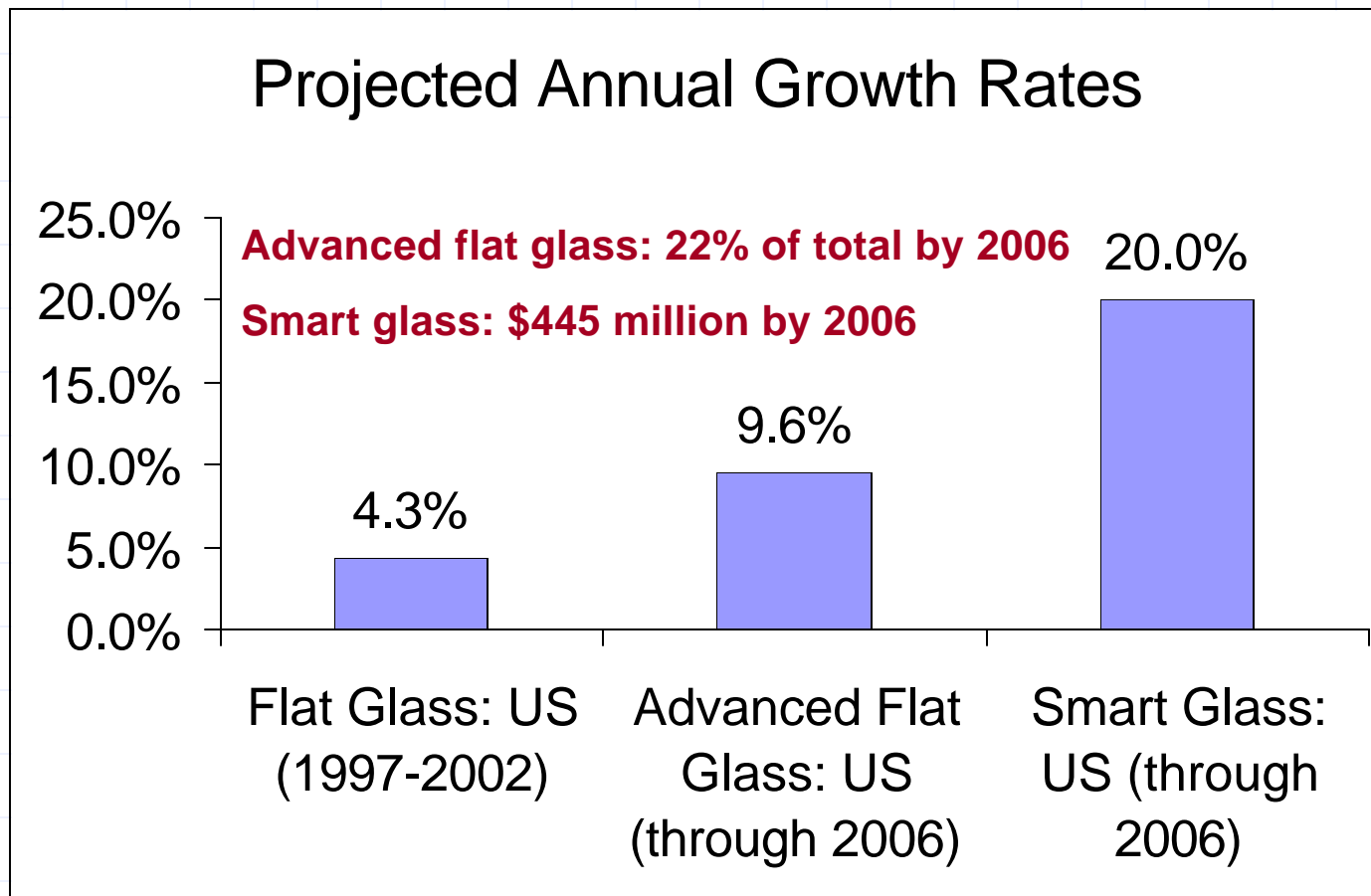
Sample Characteristics

Measure	Population	Sample
Firm size, employees (median)	18.0	16.5
Firm size, revenue (median)	\$1,930,000	\$1,860,000
% of firms serving only US clients	NA	87.5%
% of firms offering res./comm. services	NA	56.3%/93.4%

Switchable Glazings (SG)

- ◆ A “smart” material
- ◆ Uses electrical voltage or current to manage light passing through glass or plastic
- ◆ Examples of application markets:
 - windows
 - interior partitions
 - mirrors, sunvisors
 - skylights, sunroofs
 - displays, signage
 - eyewear

Smart Glass: Forecast of Demand



Sources: U.S. Census Bureau; The Freedonia Group (Cleveland, OH)

Driving Forces

Large-Scale
Product
Introductions

Rising Demand
for Windows and
Doors

Interest in Quality-
of-life Enabling
Technologies

- Increased promotional expenditures; Growing sales volumes should support investments in distribution infrastructure
- Worldwide: 5.7% CAGR through 2007
- US: 2001 - 52.3% of households have a PC (3X the 1990 rate)
- US: 2003 - home automation controls market totals \$1.5 bil; 20.4% CAGR through 2008

Sources: The Freedonia Group (Cleveland, OH); J. Swanson; J.N. Sheth & B. Mittal; US Energy Information Administration; Wireless News.

Driving Forces (cont.)

Positive Impact
of Daylighting

Pressure to
Increase Energy
Efficiency

- Factors that improve worker productivity
 - 1.) Quality of lighting
 - 2.) High levels of daylighting
 - 3.) Increased individual control over workplace environment
- US: 1990 to 2002 – 1.8%/2.3% CAGR in residential/commercial energy consumption
- Worldwide commercial energy consumption to increase 58% by 2028

Sources: L.K. Monroe; US Energy Information Administration; C.Landry.

Attitudes of US Architects

Use of Glass
vs. 5 Years Ago

- Majority: same amount or more
- Determining factors
 - 1.) Consumer desire for more glass
 - 2.) Improvements in glazing materials
 - 3.) Building/energy code requirements

Satisfaction with
Existing Light
Management
Products/Systems

- Residential focus: highly satisfied (but still very interested in SG)
- Commercial focus: moderately satisfied (with costs and building/energy codes influencing integration into projects)

Attitudes of US Architects (cont.)

Awareness and Usage of SG

- Approximately 75% are aware
- 2000: 71.7% awareness among decision makers at US window manufacturers*
- Among US Architects
 - Low awareness of specific types of switchables (EC, LC, SPD)
 - Limited specification activity due to:
 - + Lack of product knowledge
 - + Perception of high prices
 - + Limited installation history

* Source: G.M. Sottile

Attitudes of US Architects (cont.)

Current
Interest in
SG

- Moderate to high
- Reasons
 - More aesthetic/functional design flexibility
 - Viewed as a substitute or complement to existing light-management products/systems
 - Added utility for areas that are difficult to shade and/or hard to clean

SG
Product
Attributes

- Most important
 - Light control without loss of one's view
 - Protection against heat gain
 - Product warranties

Attitudes of US Architects (cont.)

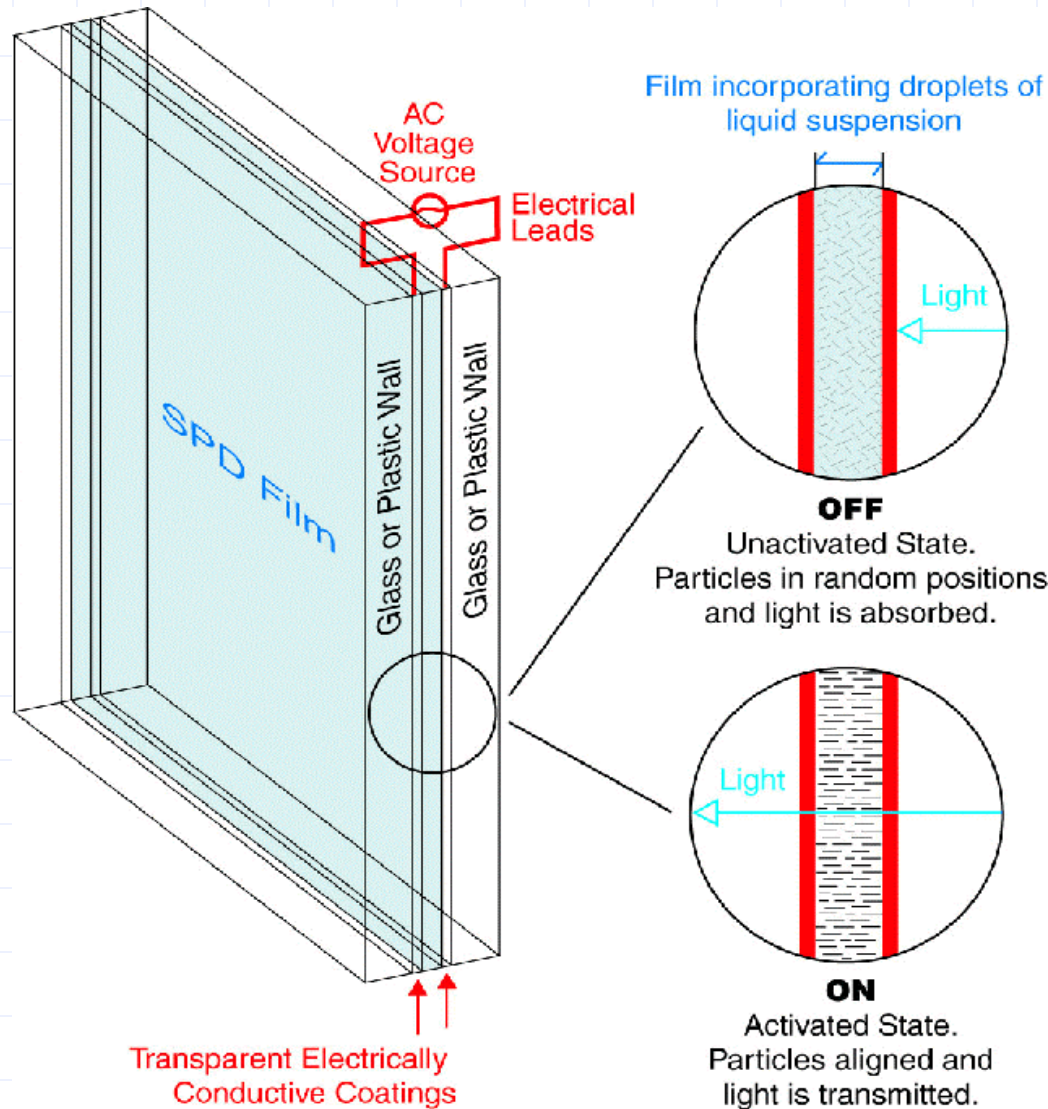
Variances in
Importance of
SG Attributes

SG Expected
Market
Penetration

Current
Needs for SG

- Residential focus
 - Instant switching speed
 - Noise attenuation
- Commercial focus
 - Ability to block all light and eliminate need for window coverings
- US, 2009 median: 13.5%
 - All windows, doors and skylights installed or retrofitted during the year
 - Assumes “reasonable” costs for materials
- Exterior windows, interior partitions, skylights, retail storefronts

SPD Light Control Technology



Conclusions

- ◆ Smart glass demand expected to grow rapidly
- ◆ Various driving forces support demand
- ◆ US architects
 - Awareness of SG moderately high; current usage low
 - Interest in SG moderate to high
 - Key attributes: light control, warranties, heat gain, switching speed (res.), light blockage (comm.)
 - Expected SG market penetration in 2009: 13.5%
- ◆ SPD technology
 - Performance characteristics make it appropriate for many types of projects/applications