Dr. Wang's Presentation in International Convention and Tradeshow of Energy Harvesting Europe 2014 in Berlin

New Applications of 3G Switchable Film Face Huge Markets

Scienstry, Inc.

Go Outdoor with Scienstry 3G Switchable Film

About This Presentation

- Review known technologies in liquid crystal (LC) smart glass field
- Challenges for outdoor applications
- What’s new for 3G Switchable Film / Glass
- New products, new applications and new markets

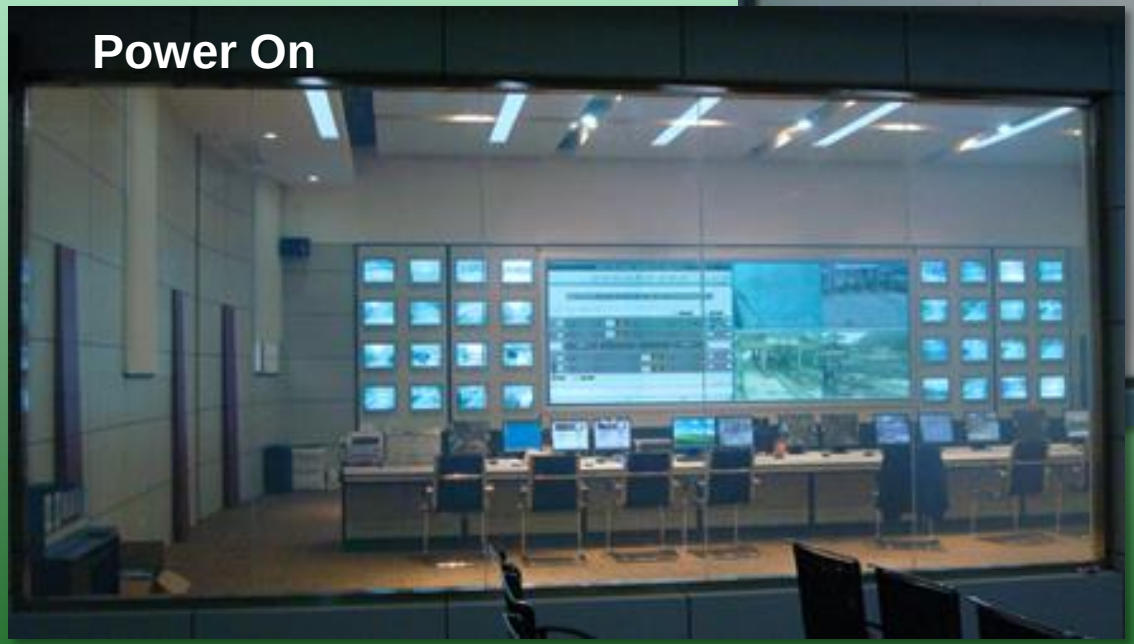
About Scienstry

- Founded in 1992; President Dr. Jenson Wang
- Leading supplier for liquid crystal (LC) smart film in indoor application
- Major supplier for outdoor applications of LC smart film
- Independent patent protected/pending technologies and products for
  - **3G Switchable Film, NPD-LCD**
  - **Super UV Stable and Low Voltage Driving LC Smart Film**
  - **Casting Laminated Switchable Glass**
  - **Switchable Projection Window**
  - **Switchable Projection Glass,**
  - **New projections technology under high ambient light**
  - **Underwater projection**

  All of the newly developed technologies are suitable for outdoor applications

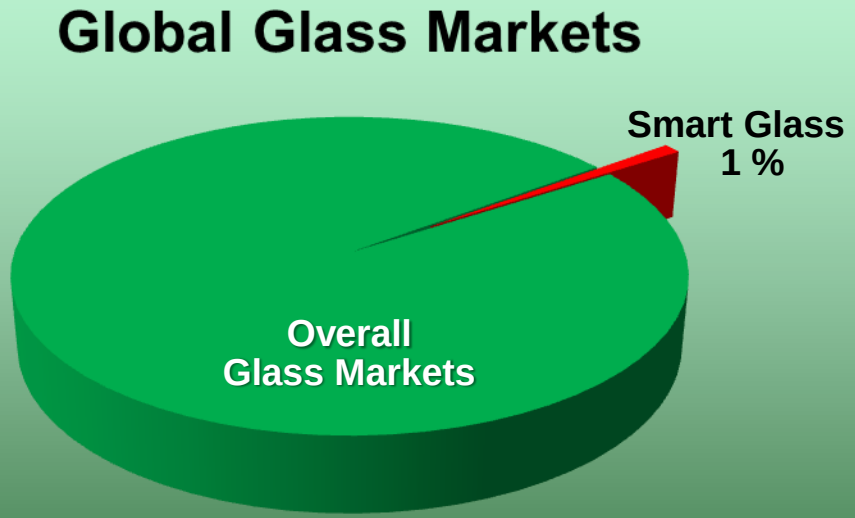
Traditional applications

for conference room indoor at air-conditioned room



Not for windows facing outside

Market Share of Smart Glass



Why does LC smart glass industry have such a small market share? Because older generations can only be used indoor at room temperature for over 30 years, but not for windows facing outside

Properties of a material determine applications which determine markets

What do we need for outdoor applications?

- Wide temperature range
- High stability for moisture
- High stability for UV
- Long lifetime

Scienstry's

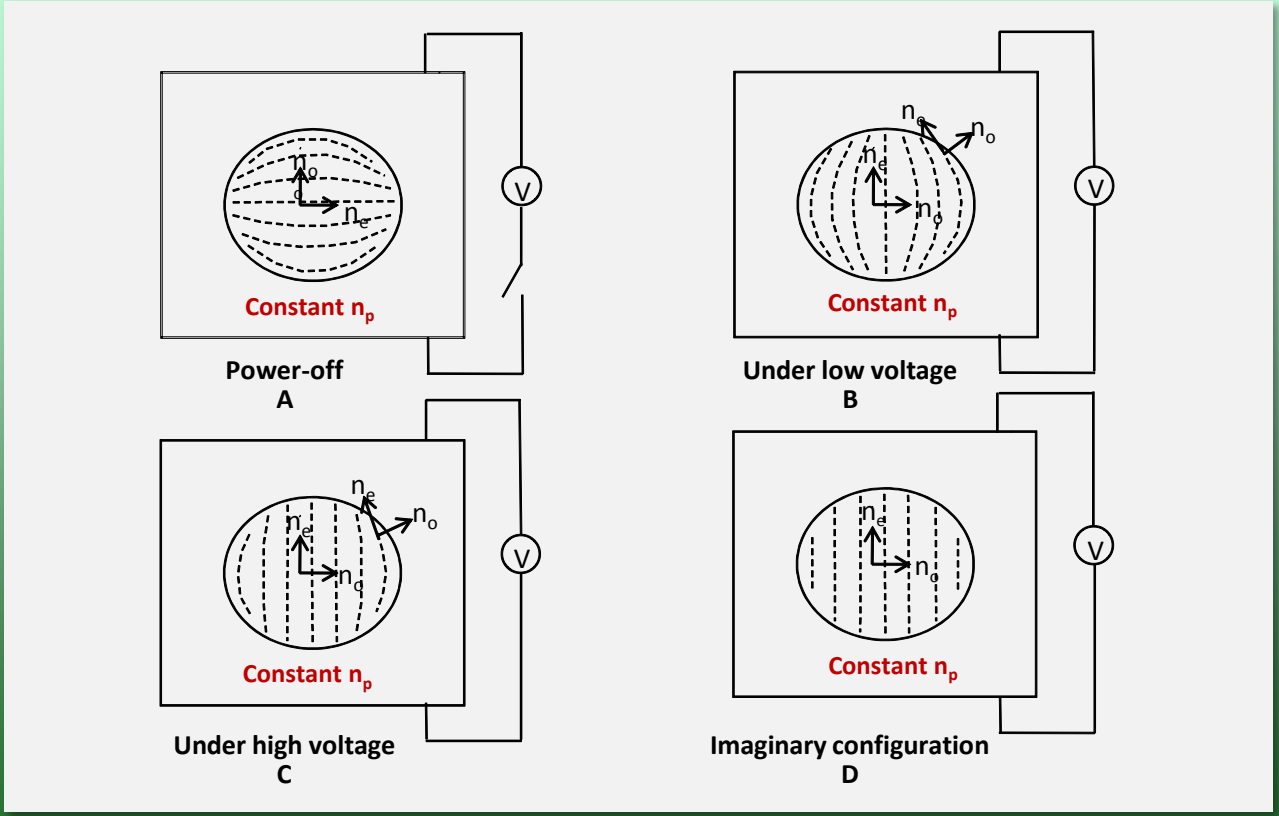
High Standards to meet outdoor applications

- Best optical properties (best opacity and best clarity together)
- Low driving voltage
- High Stability for UV, moisture and heat
- All weather applications from -30 °C to 80 °C for indoor and outdoor
- Both front and rear projections
- Super diffusion
- Great energy saving
- Longest lifetime

It is time to use 3G Switchable Film/Glass for many outdoor applications

Industries classify a generation by independent patent which is first patent defining a technology and structure. One independent patent may be followed by hundreds of dependent/improvement patents. There is no 4th or 5th generation yet in this industry.

Relationship between LC transparency and voltage

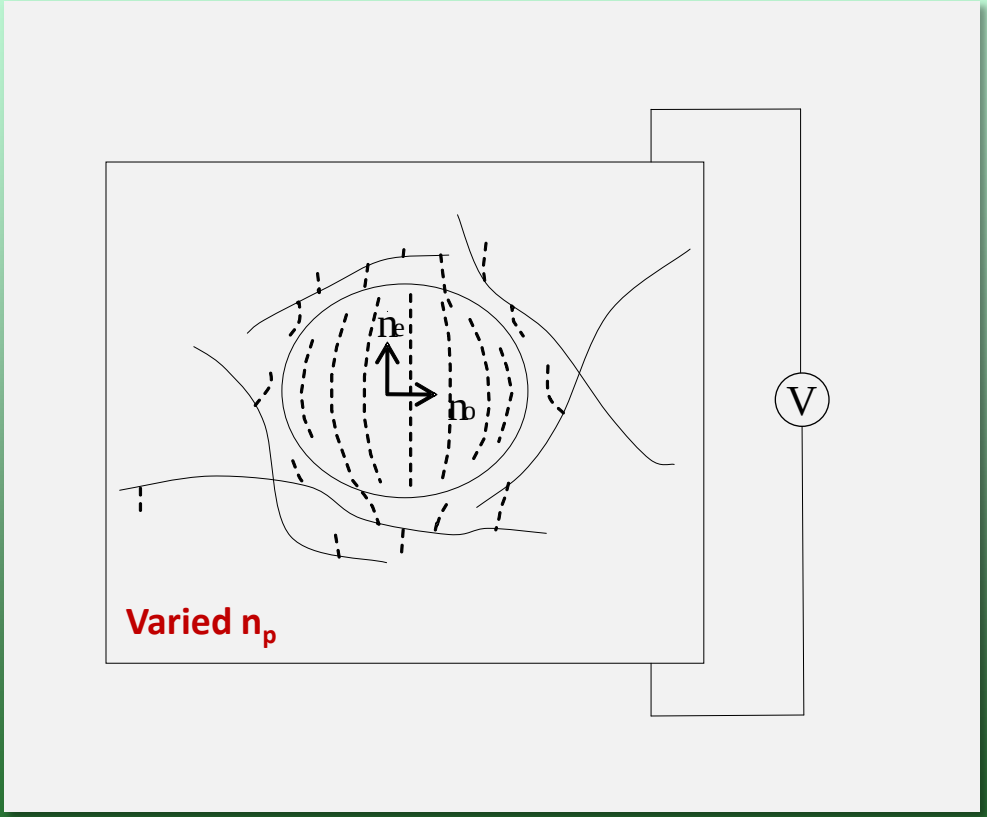


Is it possible to get good transparency by matching n_o and n_p with a low driving voltage in old systems?

No
We Cannot!

Best Transparency and Low Voltage Driving

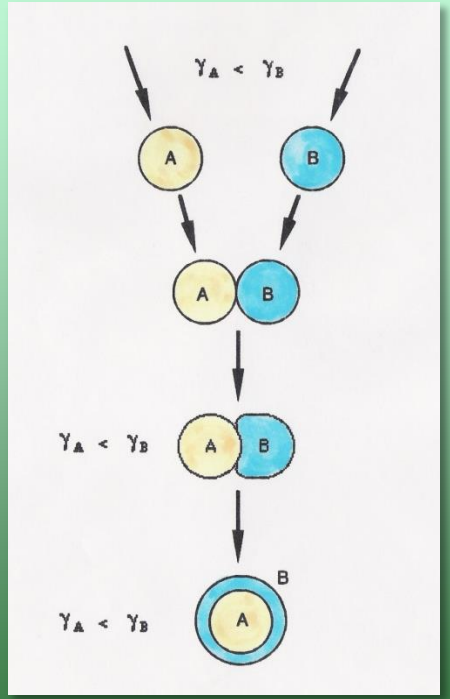
can be obtained by controlling inner surface and size of droplet in 3G system



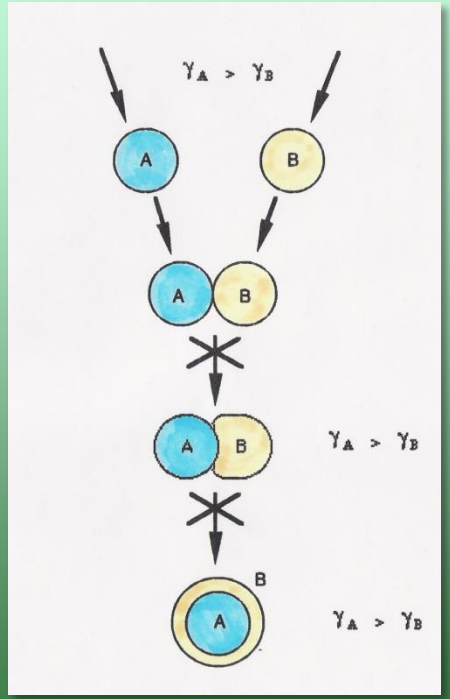
In 3G Film, LC align with polymer branches to form highly similar boundary interface to "automatically" achieve matching. This OPENS a door to freely design and change main body of polymer matrix for many great outdoor features

Friedel-Creagh-Kmetz, FCK Rule

requirement for forming a droplet



Formation of Encapsulated LC Droplet

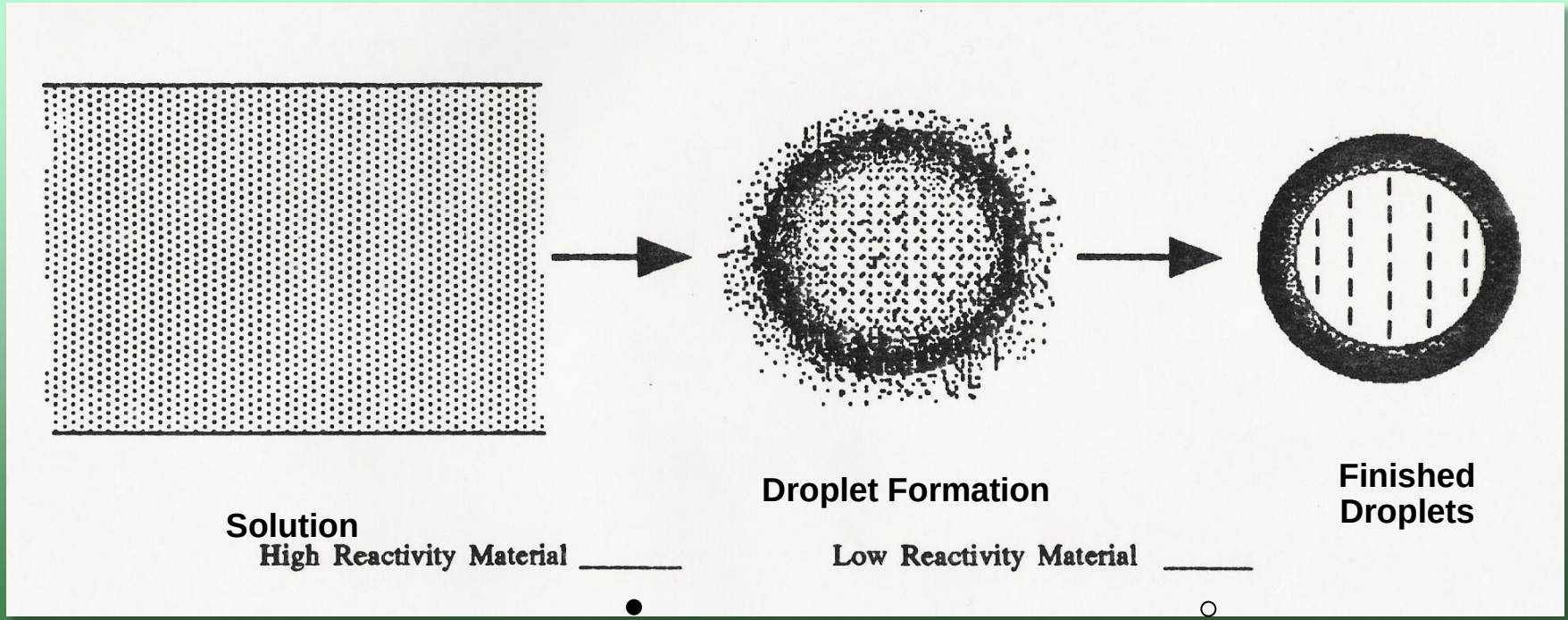


Encapsulated LC droplet can't be formed under this condition

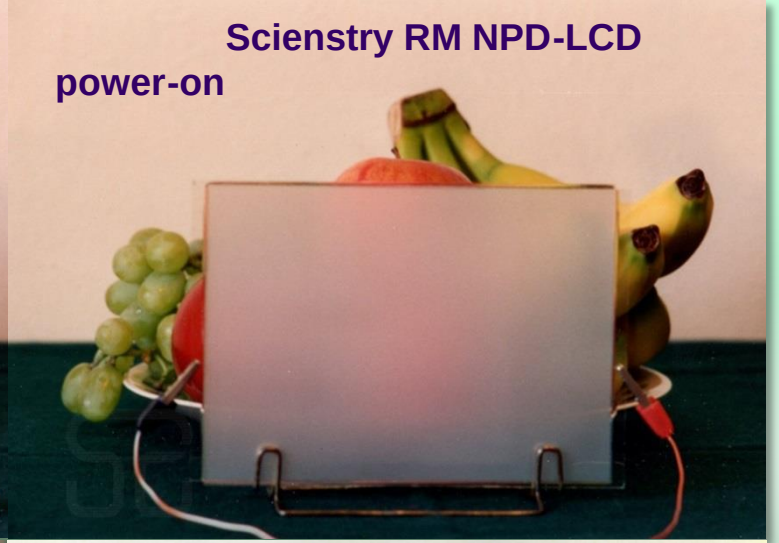
FCK Rule tells us:
It is easy to form positive mode of droplets with polymer resin with high surface energy

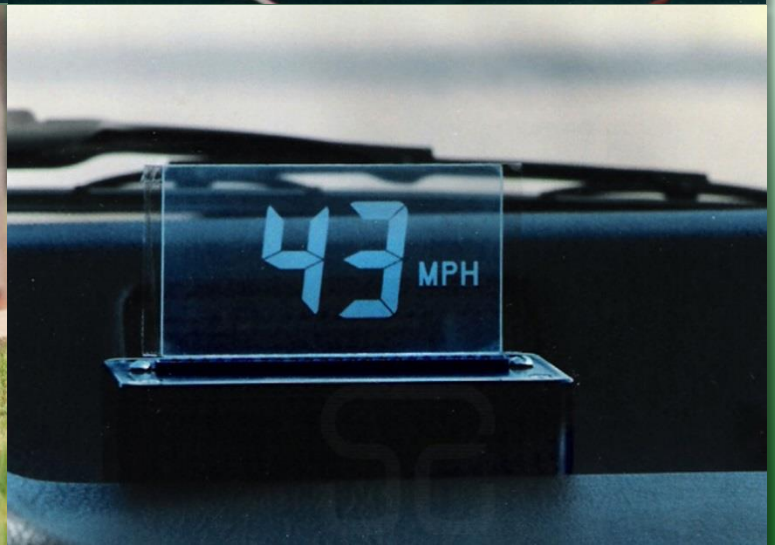
It is impossible to directly form the negative/reverse mode of droplets with polymer resin with lower surface energy

Process of Phase Separation for NPD-LCD



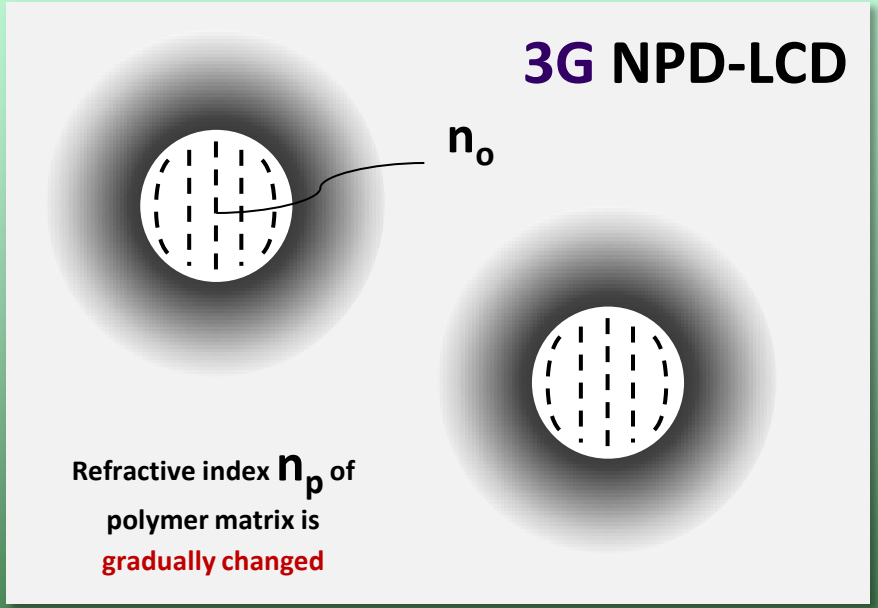
Scienstry did not break FCK rule, but obtain inhibited reverse mode droplets by using different reactivities of monomers. 3G technology may directly form reverse mode microdroplet display

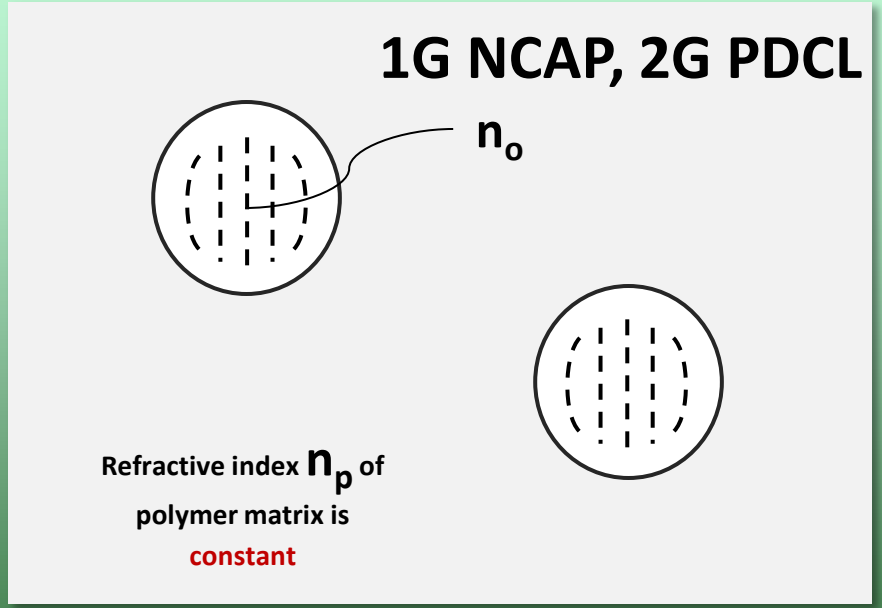




Reverse Mode NPD-LCD

A major difference of 3G Switchable Film from old generations is its gradually changed polymer matrix





A non-linear polymer matrix in 3G system may have an automatic matching function and freely change main body of polymer matrix. This technology opens a door to all kinds of improvements without a need to hold one formulation for many years. That is why 3G Film may keep improving.

3G Switchable Film has three major advantages

- Easy to match refractive indexes to get better transparency and lower driving voltage
- Non-linear system allows to use perfect chemical ratio Therefore, chemical stability is greatly improved
- Non-linear system is an **open system** which allows to add any new component into the system without interfering optical requirements, so that many new features can be easily achieved

3G Switchable Film (positive mode, power off)

3G Switchable Film (positive mode, power on)

Majors Differences in Three Generations of LC Smart Films

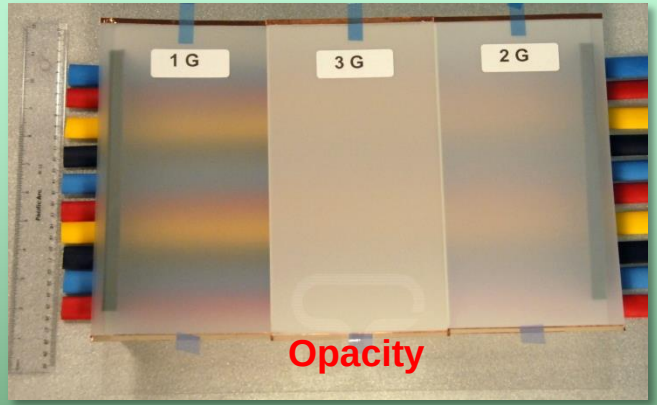
Feature	1G, NCAP	2G, PDLC	3G, NPD-LCD
Independent Patent	US Patent 4435047	US Patent 4688900	US Patent 5270843
Droplet Formation	Emulsion	Phase separation	Phase Separation
Process	Mechanical Emulsion	Thermal Curing or UV Curing	Thermal Curing
Polymer Matrix	Linear	Linear	Non-linear
Applications	Indoor	Indoor	Indoor and Outdoor
Projection Capability	None	Rear (narrowly)	Front and Rear
Manufacturers	UMU	All others	Scienstry

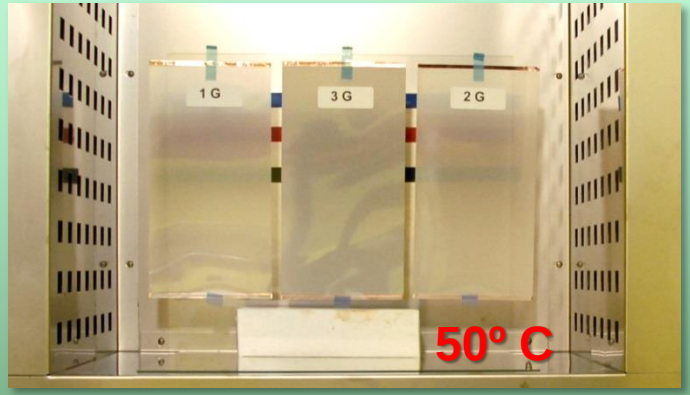
Simple Ways To Evaluate LC Smart Films

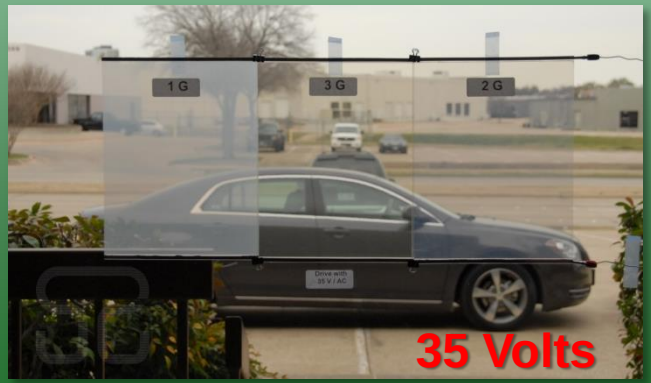
	Method	Time
UV Stability	**Sun Test** without any protection	**1 Week**
Durability / Life Time	**Underwater Driving** With 55 V AC	**1 Day**
Thermo Stability	**Heat Gun Test**	**1 Minute**
Projection Capability	**Laser Test** Looking for Wang Ring	**1 Second**

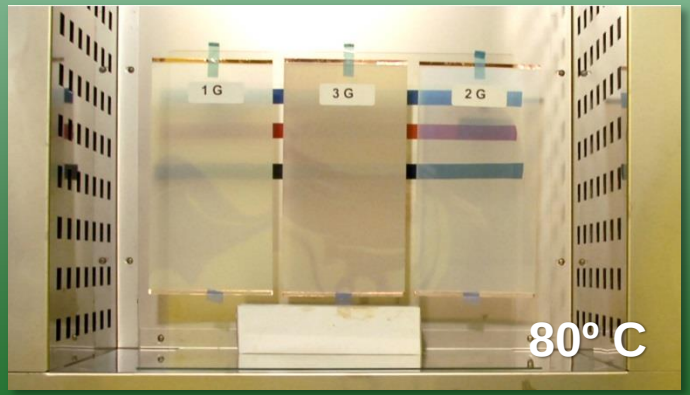
Comparative Study (1)

for opacity, driving voltage and operational temperature









Newsletter 1

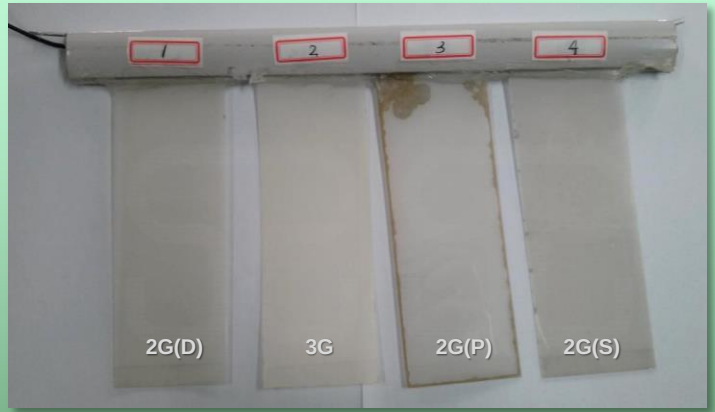
Newsletter 2

Testing 1

Tasting 2

Comparative Study (2)

thermal property and durability (underwater driving with 55V AC)



Newsletter

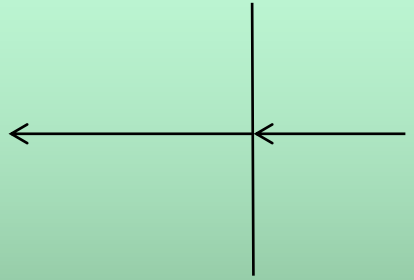
YouTube 1

YouTube 2

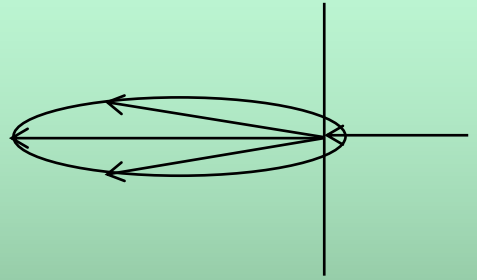
VIDEO: 1:40

Levels of Scattering and Energy Saving

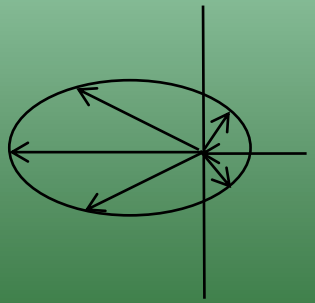
Little study on scattering in past, because of very weak back scattering of 1G/2G films



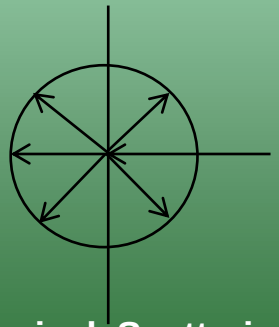
Transparent



1G, No Capability for Projection

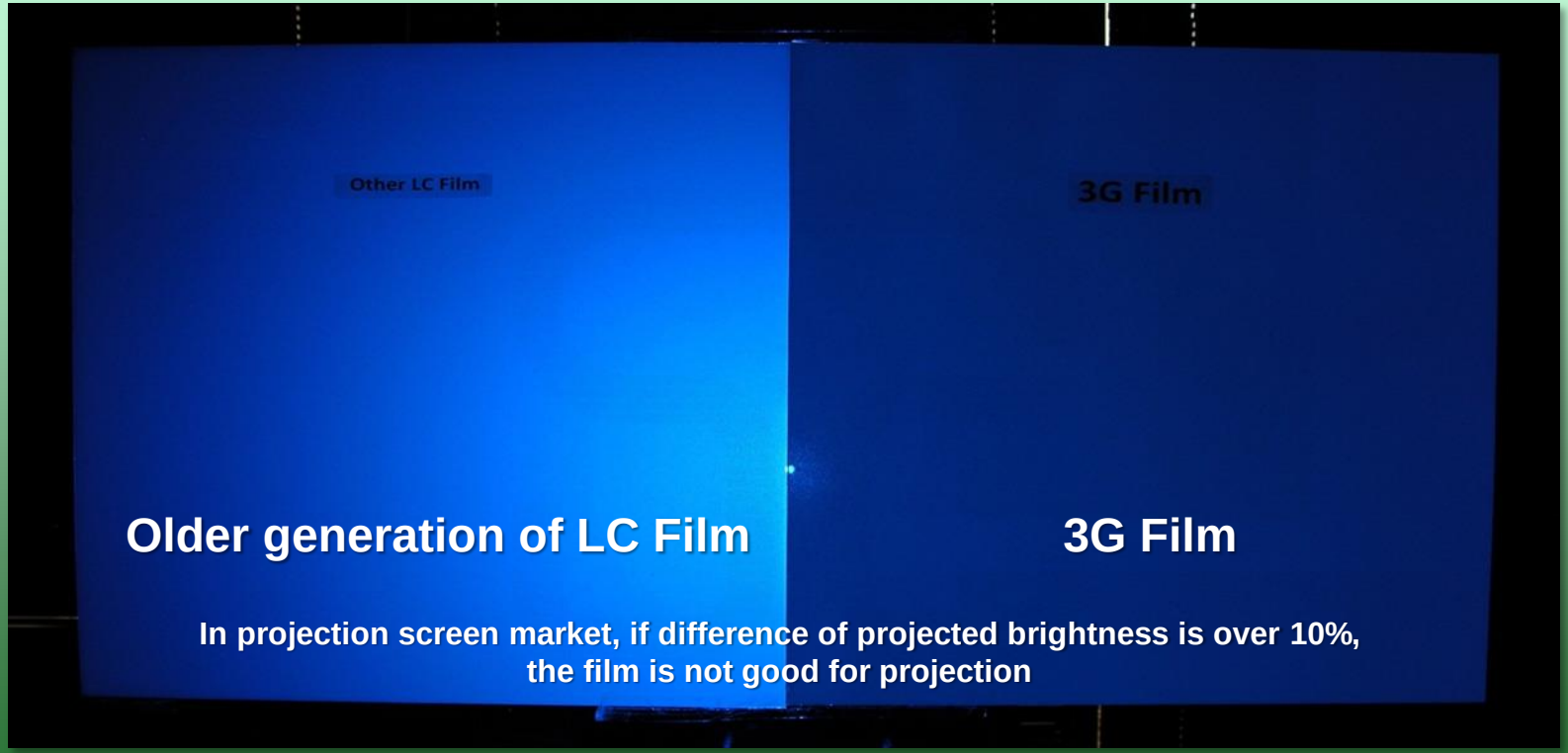


2G, Oval Scattering
Rear Projection Only



3G, Spherical Scattering
Both Front and Rear Projection
& Save Energy by back scattering of IR

Comparative Study (3)
Level of Diffusion (super diffusion of 3G Film)



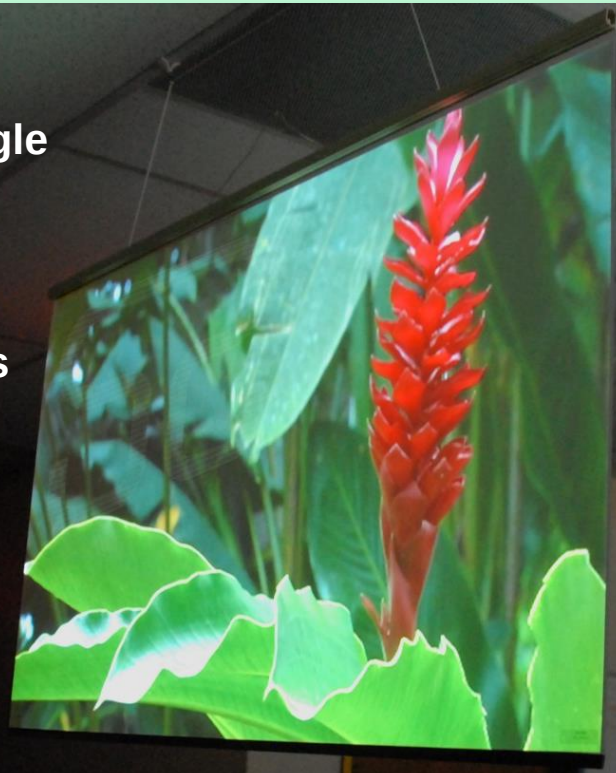
Super Uniformity for Projection

Capability and Quality unique feature of 3G Film

360º Viewing Angle

Both Sides View

Same Brightness
In any viewing angle



VIDEO: 34s

YouTube 1

YouTube 2 HD

Newsletter

Announcement:

NPD-500 series of 3G Switchable Film

- **Super UV stability**
- First time for LC smart film specially designed and tested for outdoor applications
- Available in June, 2014 in size 1.5m x 4.2m

Tough testing

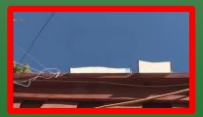
Weather Tested

Summer

Winter

3G Switchable film has been successfully tested in outdoor conditions for two years without any protection

VIDEO: 11s

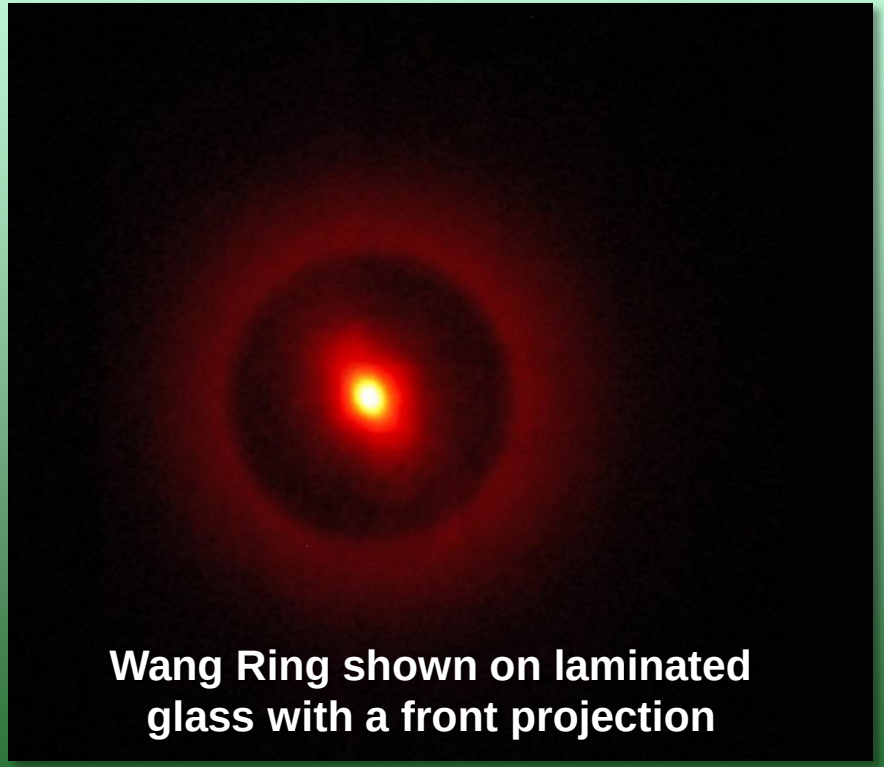


New Product and New Application

Switchable Projection Glass

- A long lasting problem: laminated smart glass cannot be used for front projection. No one reveals a reason
- A reason can be explained with a simple laser testing
- A solution is found, therefore, new generation of smart glass, Switchable Projection Glass, is invented
- Switchable Projection Glass has both functions for privacy and projection

Revealed reason of causing blurry on laminated LC Smart Glass

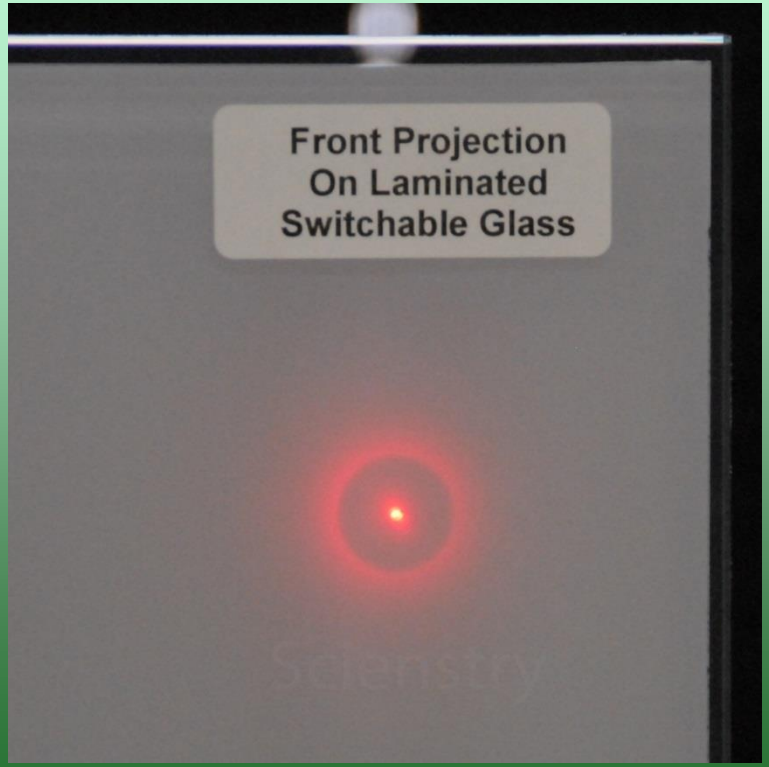


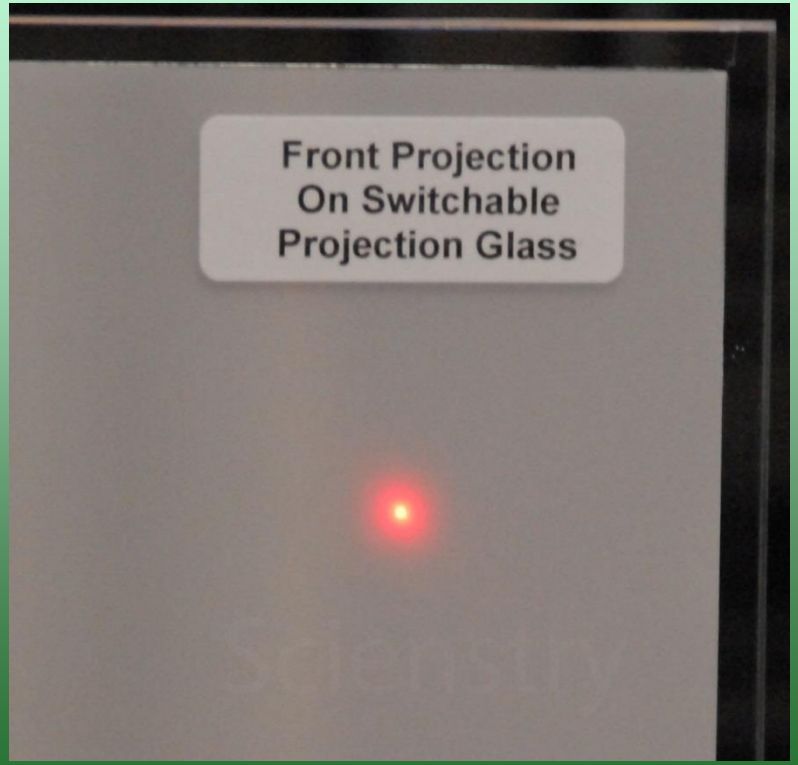
Wang Ring shown on laminated glass with a front projection

Wang Ring is characterized by a sharp inner edge. Wang Ring may service as a disproof seal. A projection panel cannot have a good quality of images if a Wang Ring is shown up by a laser pointer. Wang Ring also provides much other optical Information about projection panel.

Comparison Laser Images on Different Glass Panels

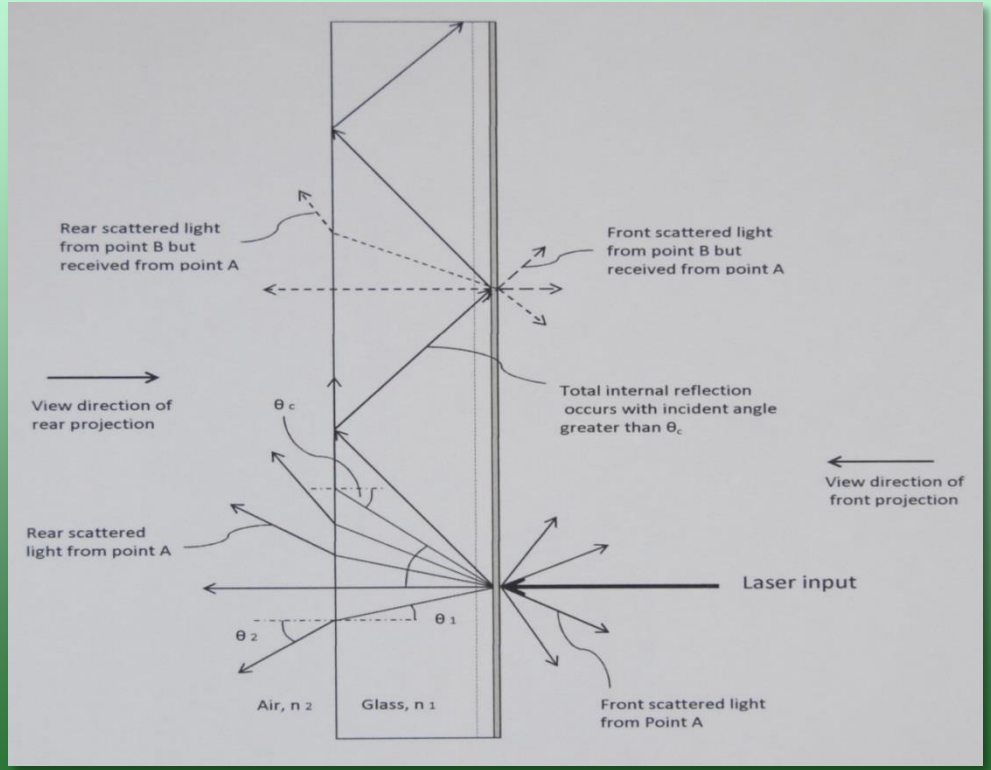
Generated Wang Ring becomes noise signal and produce blurry on projection





Optical Mechanism

of generating blurry image on laminated smart glass



Lights	Light Energy (%)
Total input energy at point A	100
Front scattered light at point A	50
Light entering into glass from point A	50
Total internal reflection energy from point A	38
Noise distributed in front side as first ring	19
Noise distributed in rear side as first ring	5

Comparison on Clarity for Front Projection between

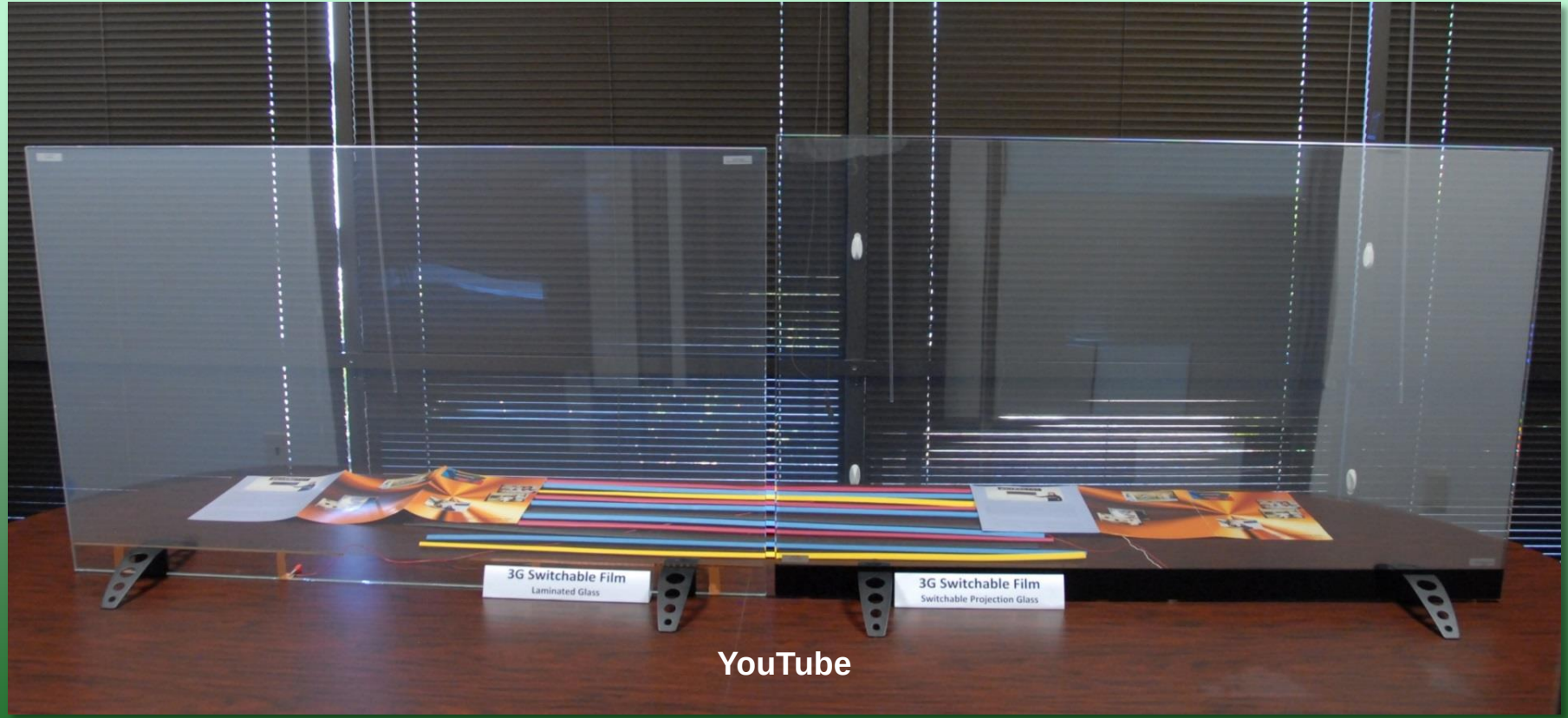
Laminated Smart Glass (left) **and Switchable Projection Glass** (right)

A single picture image projected on different switchable glass panels

Newsletter

YouTube

Comparison on Clarity between laminated Smart Glass (left) and **Switchable Projection Glass** (right)



New Product and New Application

Switchable Projection Window

20% cost in comparison to large LCD TV

Newsletter

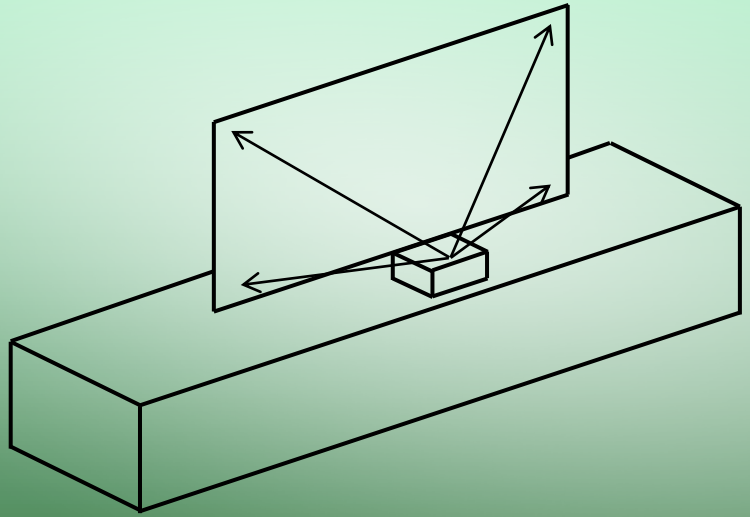
YouTube 1

YouTube 2

VIDEO: 25s

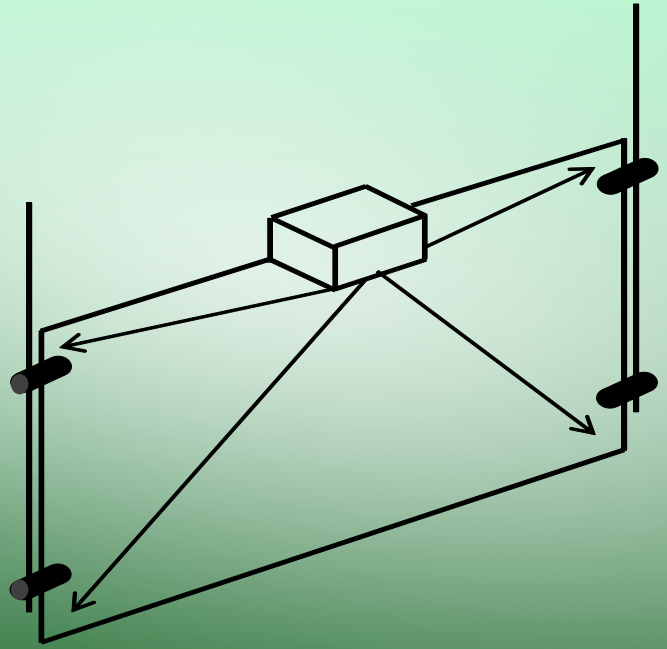
New Product and New Application

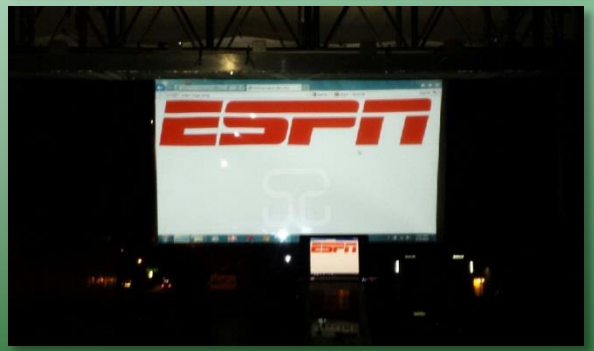
Switchable Projection Sales Counter



A newly design sales counter or tradeshow cabinet equipped with 70” – 100” Switchable Projection Glass. 360º view capable of attracting customers from a significant distance and delivering information about merchandise to the consumer at a retail location.

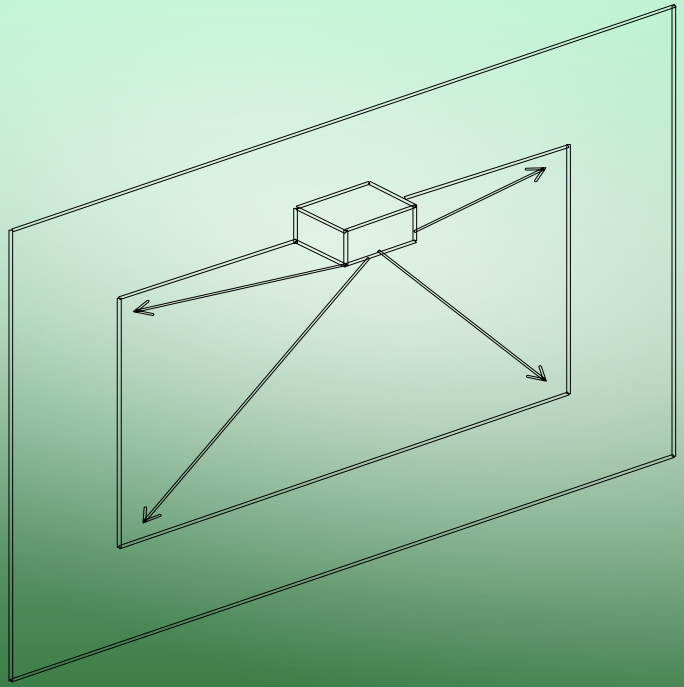
Switchable Projection Panel for double sided view with ceiling mounting mechanism





100” ceiling mounted Switchable Projection Panel has a strong attraction in a store

Switchable Projection Panel on a wall



Application in Mall

Newsletter 1

Newsletter 2

YouTube 1

YouTube 2

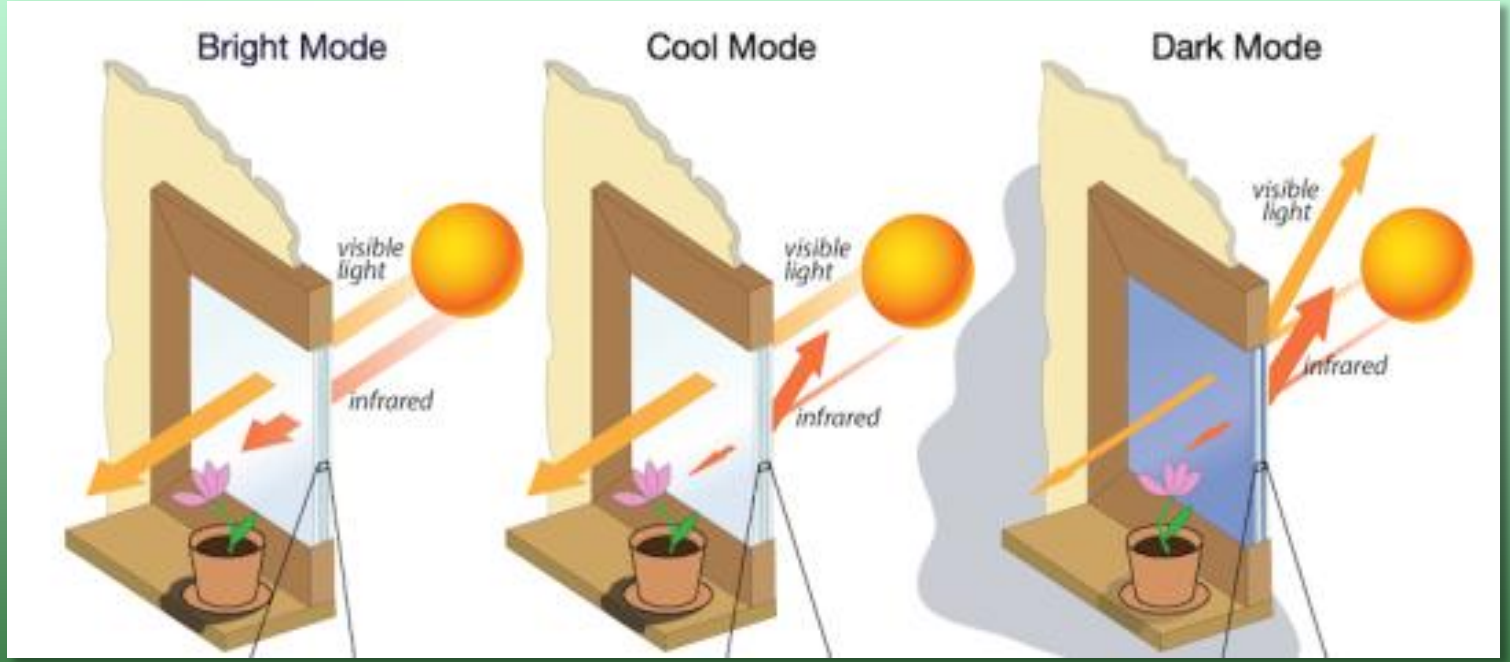
YouTube 3

YouTube 4

The wall may be glass wall or non-transparent wall. The SPP is double sided viewable
3G Switchable Film may be installed on existing glass with tape or DayLightCure glue

Controllable Multi-Functional Window

It has a great energy saving capability in both summer and winter and allows a full spectrum of natural visible lights to enter buildings. It is good for plant growing and human living. (more patented structures for building)



Higher Voltage

Very Low Voltage

Power Off

Newsletter

YouTube

New Product and New Manufacturing

Casting Laminated Switchable Glass

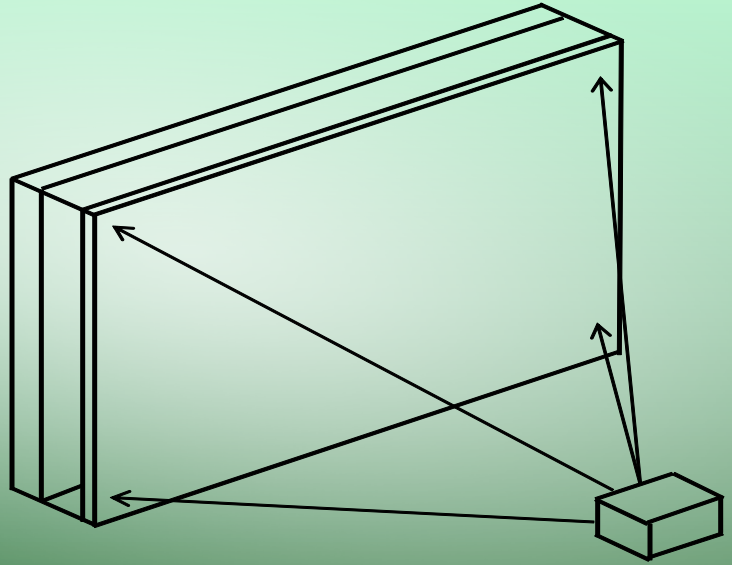
10 -20% Cost in comparison with old interlayer lamination process. Anyone may make any size of CLSG in any place without any heavy equipment. May make regular laminated glass, hurricane and bulletproof glass too.

VIDEO: 48s

Newsletter YouTube

New Product and New Application

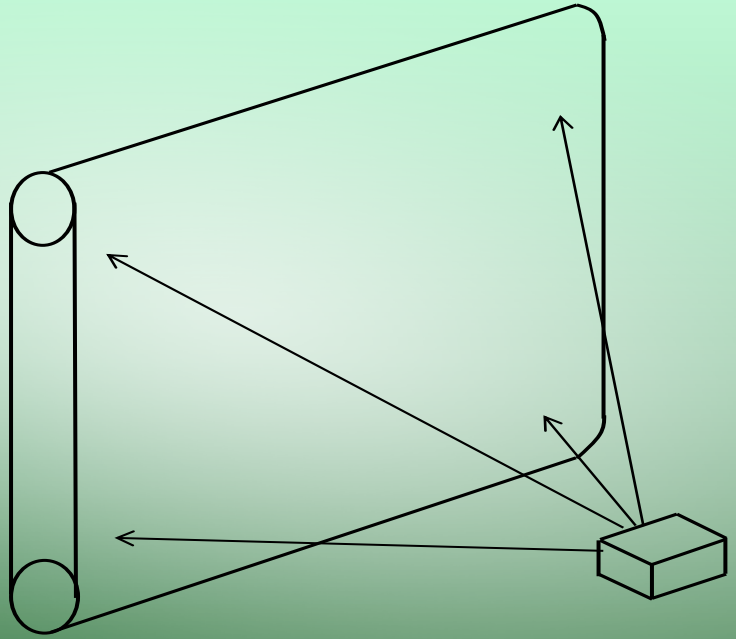
Switchable Billboard（1）



In daytime, the billboard may show a printed image. In evening, the billboard may show dynamic video images. It has only 5% of LED cost. With a laser projector, it is able to have daylight projection and has 10% cost and 5% energy consumption in comparison with LED

New Product and New Application

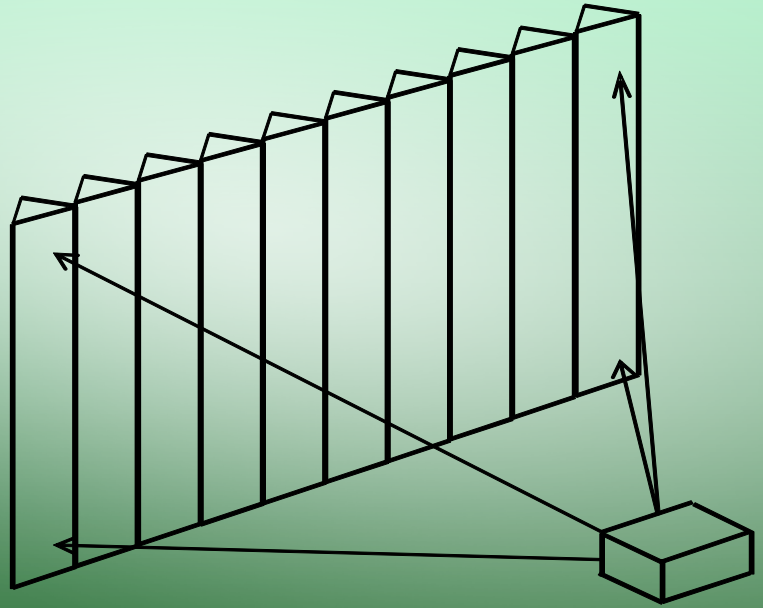
Switchable Billboard (2)



This design of switchable advertising panel may show printed images in one side and show dynamic video images on other side. The advertising panel may be used in both indoor and outdoor with a very low cost

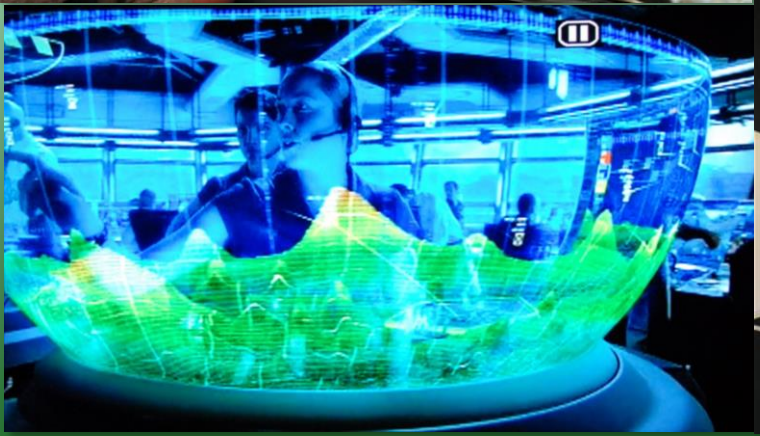
New Product and New Application

Switchable Billboard（3）



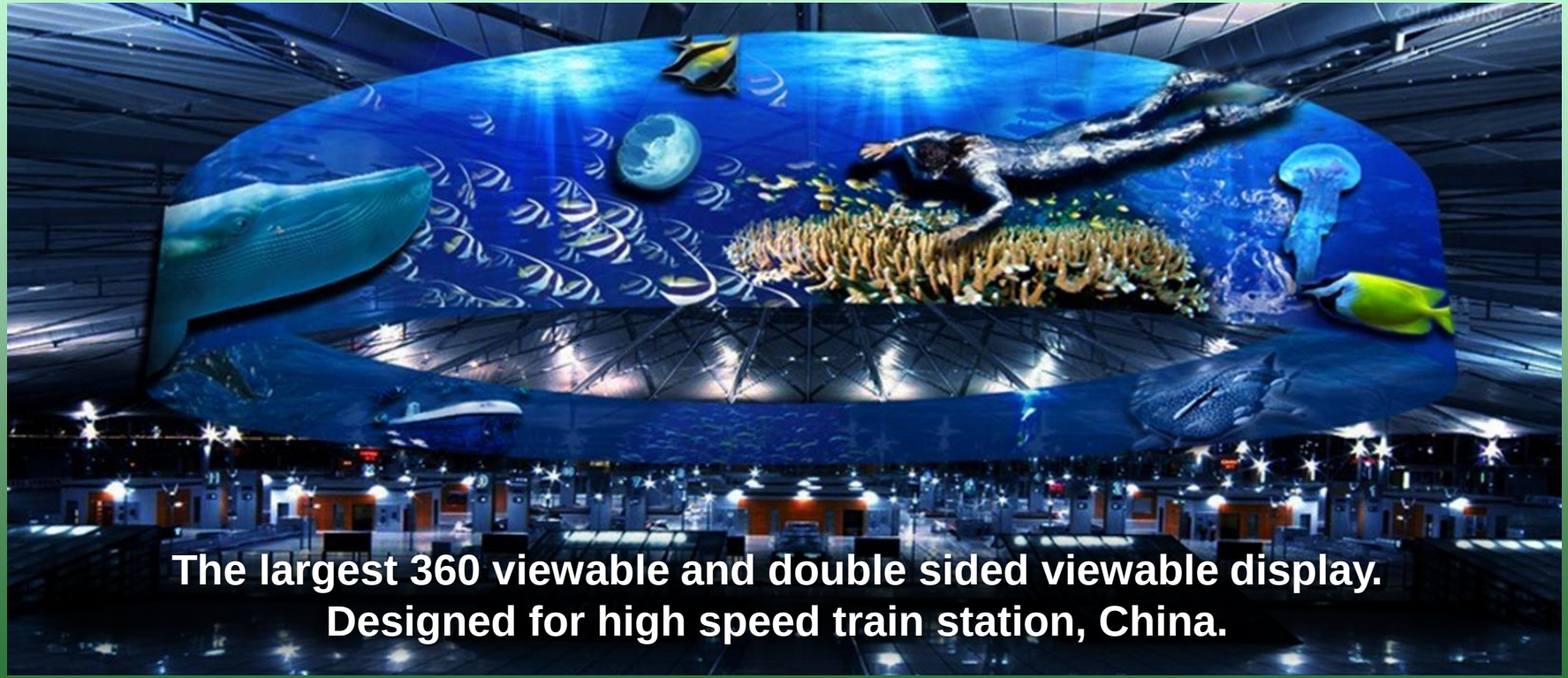
Projection triangular prism changeable billboard may show printed images in daytime and show dynamic projected images at evening times

Applications in TV

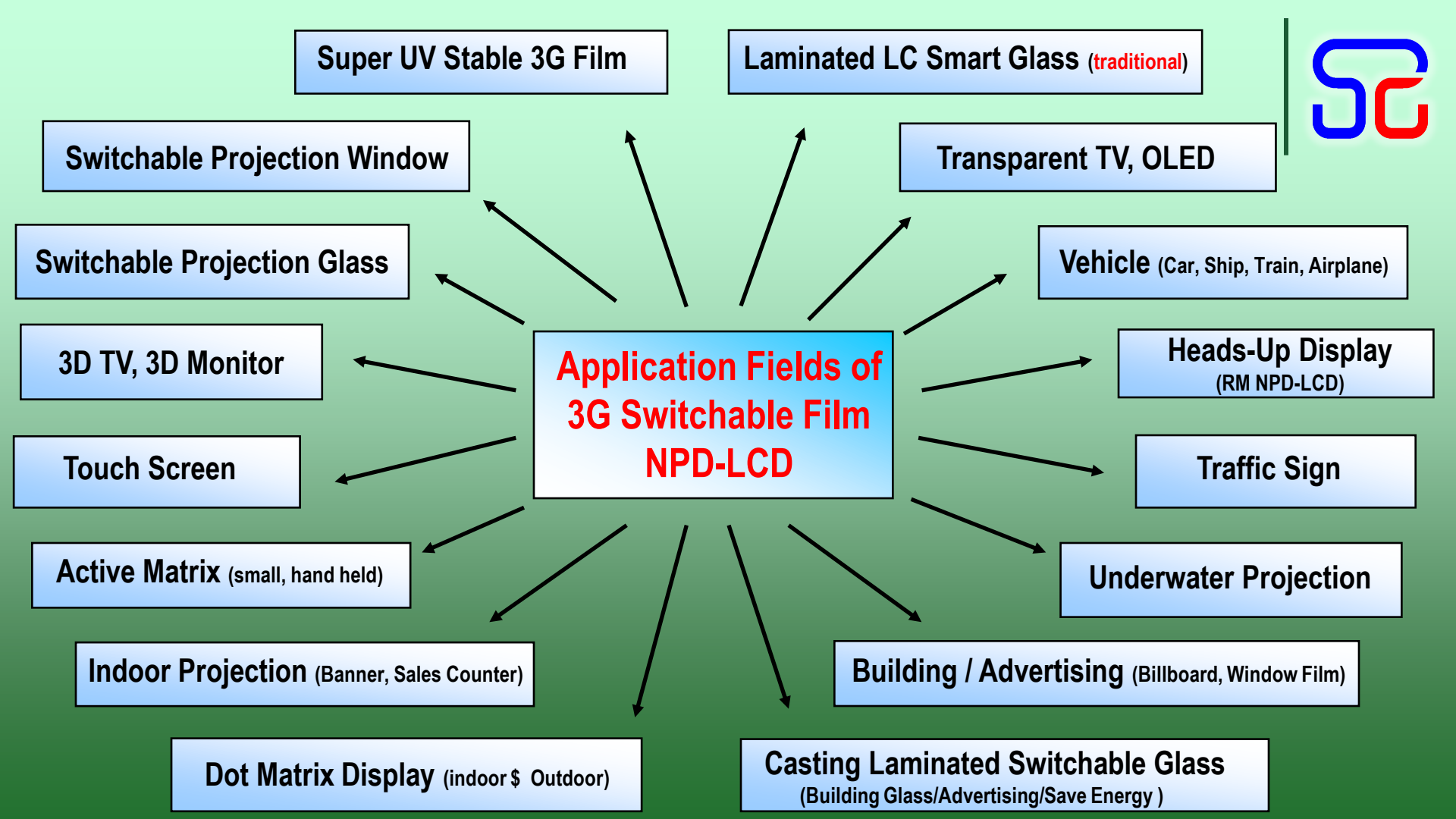


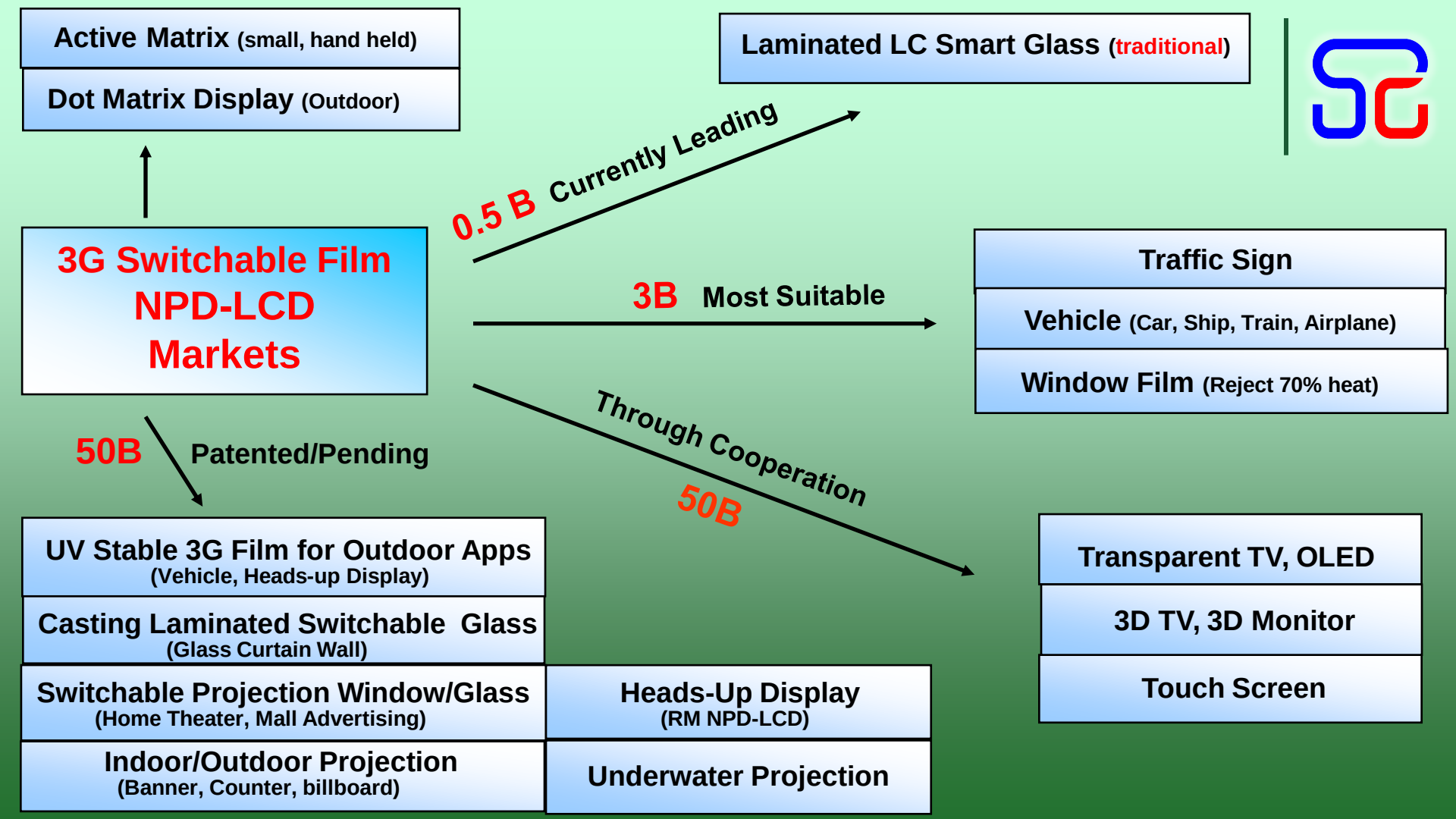
Left pictures are transparent TV and right normal TV. Both normal mode and reverse mode of 3G Switchable Film may be used In transparent TV, OLED TV, 3D TV and 3D monitor.

Circle-Vision 360 Degree Display



Building Advertising


Super UV Stable 3G Film
Laminated LC Smart Glass (traditional)
Switchable Projection Window
Transparent TV, OLED
Switchable Projection Glass
Vehicle (Car, Ship, Train, Airplane)
3D TV, 3D Monitor
Application Fields of 3G Switchable Film NPD-LCD
Heads-Up Display (RM NPD-LCD)
Touch Screen
Traffic Sign
Active Matrix (small, hand held)
Underwater Projection
Indoor Projection (Banner, Sales Counter)
Building / Advertising (Billboard, Window Film)
Dot Matrix Display (indoor $ Outdoor)
Casting Laminated Switchable Glass (Building Glass/Advertising/Save Energy)


Active Matrix (small, hand held)
Dot Matrix Display (Outdoor)
Laminated LC Smart Glass (traditional)
0.5 B Currently Leading
3G Switchable Film NPD-LCD Markets
3B Most Suitable
Traffic Sign
Vehicle (Car, Ship, Train, Airplane)
Window Film (Reject 70% heat)
50B Patented/Pending
Through Cooperation
50B
UV Stable 3G Film for Outdoor Apps (Vehicle, Heads-up Display)
Casting Laminated Switchable Glass (Glass Curtain Wall)
Switchable Projection Window/Glass (Home Theater, Mall Advertising)
Indoor/Outdoor Projection (Banner, Counter, billboard)
Heads-Up Display (RM NPD-LCD)
Underwater Projection
Transparent TV, OLED
3D TV, 3D Monitor
Touch Screen

Projects

- 24 major airports in China
- 2010 World Expo in Shanghai, China
- Luxury cruise ship Swift 141 is entirely covered with 3G Switchable film/glass
- Building advertising
- Automobile, ship, train and airplane applications
- Traditional indoor applications through worldwide glass manufacturers

YouTube 1

YouTube 2

Beijing Capital International Airport
Show cases built in 24 major Chinese airports

Power Off

Power On

2010 World Expo in Shanghai, China
GOLD MEDAL WINNING PROJECT

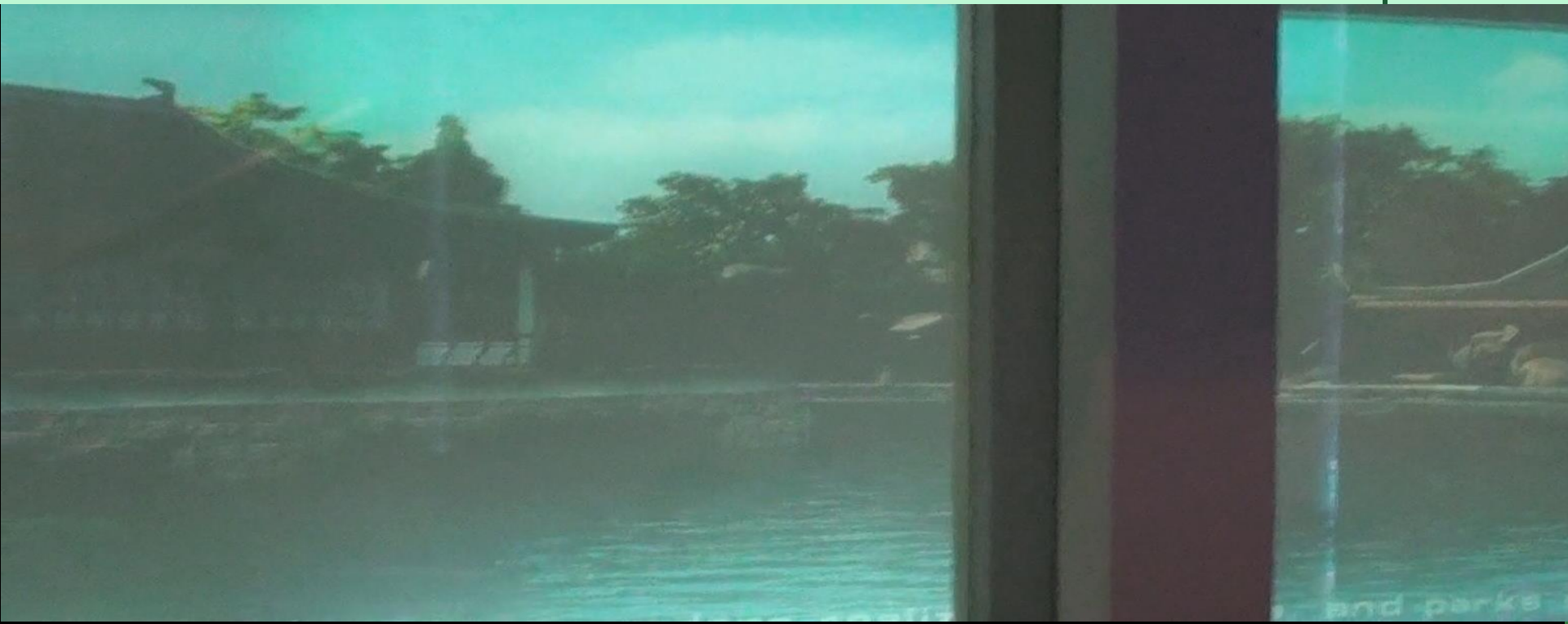
Switchable Projection Glass Wall

Cruise Ship Swift 141

Abu Dhabi, United Arab Emirates

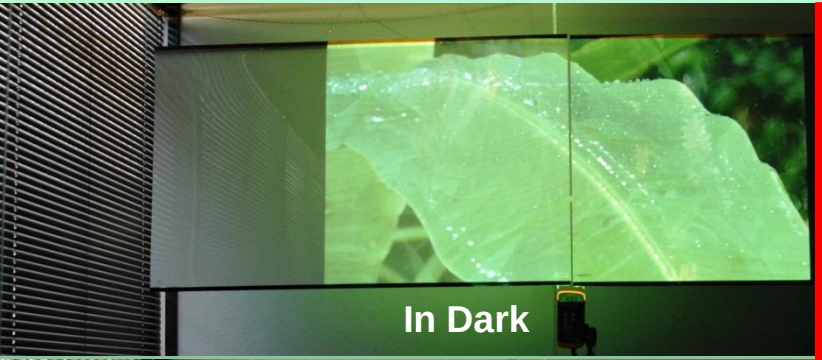
This is world first cruise ship entirely covered with hundreds of bent 3G switchable glass from outside to inside and also is world largest single project using LC smart glass. It has zero defect after 3 years of operation.

Projection on Street



YouTube 1 YouTube 2

High Contrast under Bright Ambient Light

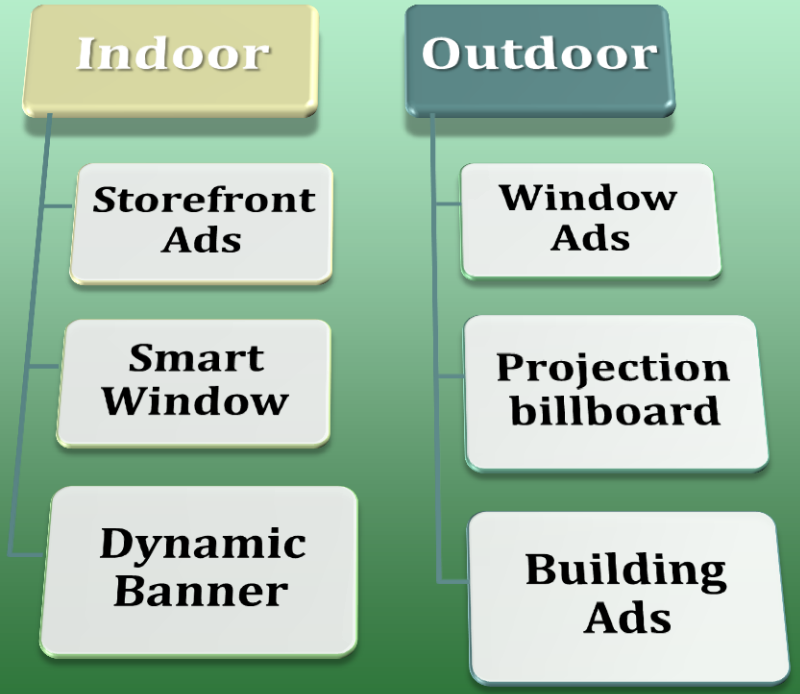


Video
Light and Contrast

YouTube

Projection Advertising

Laser projectors make outdoor projection possible and easy with 5-10% cost and 3-5% energy consumption of LED



NPD-LCD Outdoor Application

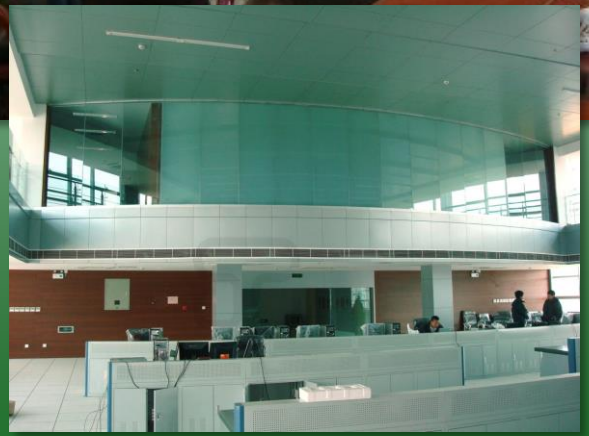
Multiplexing driving outdoor display without backlighting

Production (1)

Most production line equipment is also designed and made by Scienstry

Production (2)

Projects (1)



Projects (2)

Underwater Projection

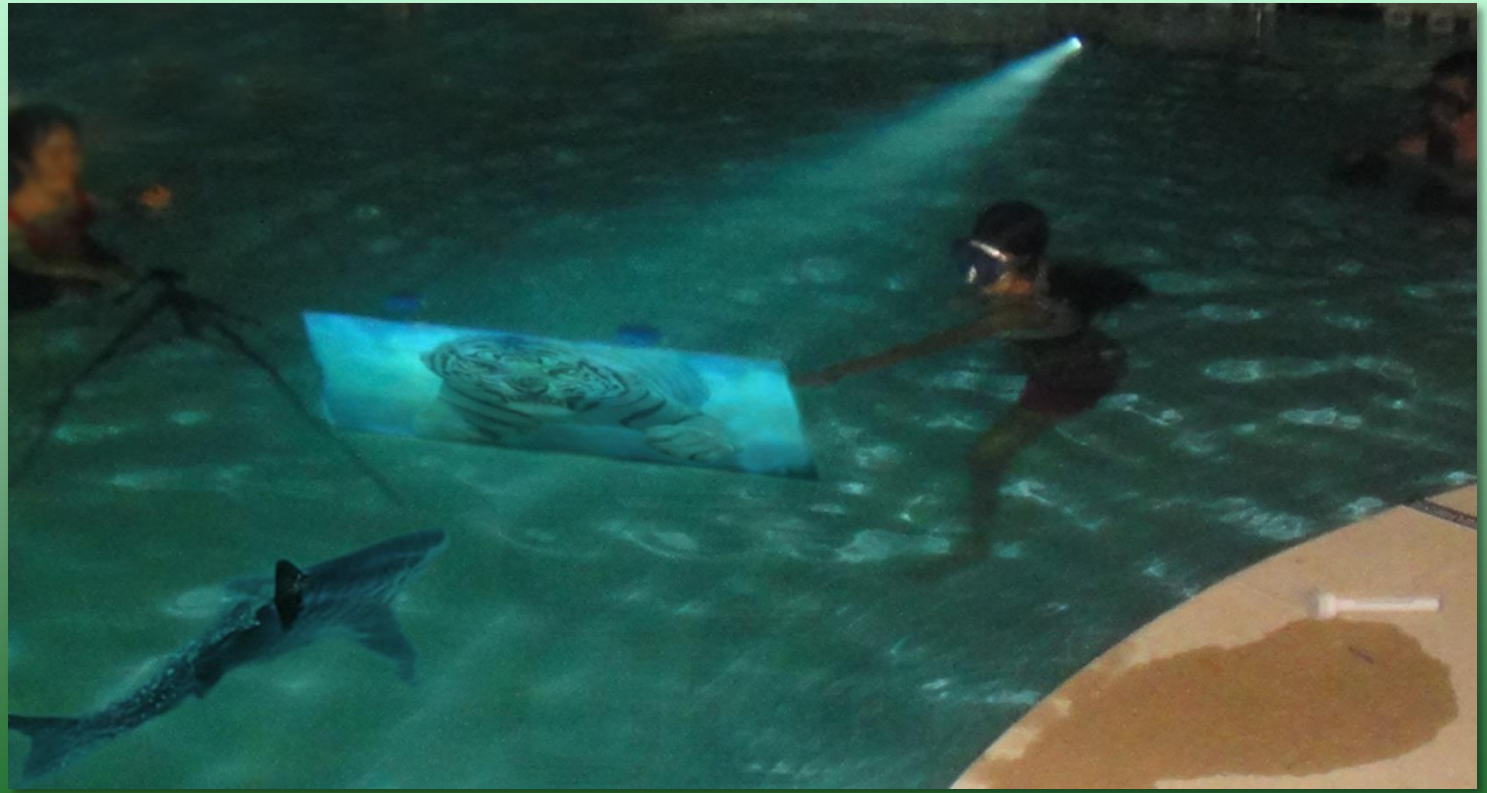
- This is first underwater projection
- When image taking devices like underwater camera and underwater camcorder are more and more popular. There is need for image delivery device underwater projector, but underwater projector is not invented yet
- Underwater projection may have many new applications, like Underwater Theater to experience fish feeling or Automatic Fishing Machine by displaying baits and more than 20 other new applications

YouTube 1

YouTube 2

Underwater Projection / Underwater Movie

Today's Show… Shark vs. Tiger!



Automatic Fishing Machine

Underwater Movie Theater

Underwater Zoo

See 20 Applications In next page

Scienstry, Inc.
1110 E. Collins Blvd. STE 120
Richardson, TX 75081
Tel: (972) 690-5880
Fax: (972) 690-5888

Applications of Underwater Projection

1. Underwater projection may be used to attract underwater creatures. The screen/panel may be used to display bait such as shrimps on an NPD-LCD projection film/panel in a lake or ocean at night. Use of "Automatic Fishing Machine" may allow fishing in dark with nets around the machine and regularly collect fishes. In these ways, farmers or environmental protectors can also catch and remove or otherwise control unwanted species by displaying their favor foods or prey to attract the species. This kind of "fish attractor" may concentrate fishes in lake and ocean and increase production. Projected images on an NPD-LCD film/panel, is viewable from both sides and thus can attract fish from all directions. The projected surfaces, such as NPD-LCD display, can also be many other shapes including curved, cylindrical, or spherical.

2. Underwater projection may be used to drive out or repel underwater creatures. For example, lake farmers may create a relative safe zone for baby fishes or for a hatching area by displaying on the projection screen predators to drive out adult fish which may eat the baby fishes or eggs. Thus, production yields may be increased. Further the apparatus 100 may be used for repelling sharks for beach safety by displaying a shark repellant such as ejected squid ink, killer whales, or sparks.

3. "Underwater Theater" or underwater movie uses may include allowing a user to experience visual and sound effects from a fish environment or moving terrestrial landscapes into an ocean environment. Underwater movie provides a special chance to watch movie and simulate a fish world. Now, people not only can imagine a fish world but also can experience it

4. Decorating or other ambiance uses include a wall-sized water/fish tank in a room, hotel or convention center with still features or moving features such as live fish or air bubbles. A back wall of the tank may be an NPD-LCD projection film. An ocean movie, an underwater activity or any other kind of underwater simulation can be projected on the back wall. Such a device can offer the impression of a much greater and deeper underwater space and provide more information or depth to a very limited actual space. Such uses may have significant decorating and attracting function.

5. Educational uses may include displaying how to protect oceans in coral reef area or showing background information of exhibits in an "Underwater Museum".

6. Business uses may include displaying information about underwater creatures in an "Underwater Zoo", where sea creatures are in underwater cages like zoo in land. Visitors with diving suit may know a lot of knowledge with great experience and enjoyment.

7. Advertising uses may include showing how an NPD-LCD underwater projection film/panel works; advertising for a product by showing an actual potential leaking weakness with adverse consequences; showing the power of a glue to fix leaks.

8. Fitness and exercise uses may include showing demonstrations for underwater yoga or other workout or showing a video or television program for an underwater treadmill user.

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9. Training uses may include training for synchronized swimming or running.

10. Uses for guiding underwater operations may include repairing or assembling an underwater oil well.

11. Underwater therapy uses may include displaying instructions or demonstration videos for an underwater exercise.

12. Entertainment uses may include presenting a birthday cake and candles at an underwater party or showing images of a bride and groom for use in an underwater marriage ceremony.

13. Gaming uses may include stepping on projected images or laser shooting projected sea animals or other targets.

14. Camouflage uses may include underwater projection panels that can be used to hide a submarine by showing surrounding images such as coral reef or sea-plant to increase difficulty to be identified from sky, so that the submarine is safer when in shoal water.

15. Filmmaking uses may include making a filming studio by using a water tank for close-up shots while using a NPD-LCD projection screen/film installed on one or more walls of the tank for projecting images used in a longshot. Many underwater movie scenes can be made with a combination of true underwater scenes and simulated backgrounds on the projection screen.

16. Photography uses include showing land animals in an underwater environment or generating an art effect with underwater lighting to view a statue. Suitable uses may also include photography background including displays of various backgrounds for photography for travelers wearing a diving suit.

17. Research uses include studying fluid dynamics by directly showing fluid images and data; studying underwater images and sound effects; and studying responses or relationships of sea creatures with their prey or predators. Underwater projection provides new method to study and communicate with underwater creatures.

18. Underwater display uses for swimming pools may include underwater TV for viewing during a swimming workout while wearing a snorkel in a still or running water pool. Further underwater display uses include showing a score or position for a race or enhancing the aesthetic conditions of a user during a swimming workout or while wearing a snorkel in a simulated ocean environment like a simulation of flying.

19. Aquarium display uses include putting an NPD-LCD film on a side of an aquarium for watching projected TV when the film is in opaque state and for allowing the fishes to be seen when not watching TV and the NPD-LCD film is in clear state.

20. "Underwater Park" uses may include many underwater projection displays showing all kind of scenes, paintings, decorating, maps, simulations, games, and allow visitors to play. Such treatments may reduce cost while increasing possibility for fun.

Newsletter

Thanks!

www.scienstry.us
info@scienstry.us

Let Me Out!

Indoor is boring…
Outdoor is BEAUTIFUL!