

## CONTROL OPERATION DETAILS



### DETAILED EXPLANATION OF THE FACADE AND OF THE CONTROL/OPERATION SYSTEM

The project is based on GreenPix, a carbon-neutral media wall for the Xicui Entertainment Complex in Beijing. Featuring one of the largest color LED display worldwide and the first photovoltaic system integrated into a glass curtain wall in China, GreenPix transformed the building envelop into a self-sufficient organic system.

New York-based architect Simone Giostra pushes this technology in his site-specific installation, improving the energy efficiency of the previous system, while increasing the resolution of the digital display and effectively achieving a transparent media wall.

SolPix allows daylight into the building while controlling its exposure to direct sunlight, reducing heat gain and transforming excessive solar radiation into energy for the media wall. When applied to building exteriors, the sun-shading elements provide unobstructed outside views from the building interior, while lending a contemporary texture to the building exterior. The horizontal or vertical panels can be mounted at a preferred angle or can be rotated in order to maximize exposure to direct sunlight.

#### CONTROL/OPERATION TYPE

<b>Intrinsic (auto reactive)</b>	<input checked="" type="checkbox"/>
Extrinsic (requires external control)	<input type="checkbox"/>
Electromagnetic	<input type="checkbox"/>
Other (specify)	<input type="checkbox"/>

#### SYSTEM RESPONSE TIME

Seconds	<input type="checkbox"/>
<b>Minutes</b>	<input checked="" type="checkbox"/>
Hours	<input type="checkbox"/>
Days	<input type="checkbox"/>
Seasons	<input type="checkbox"/>
Years	<input type="checkbox"/>
Other (specify)	<input type="checkbox"/>

#### SYSTEM DEGREE OF ADAPTIVITY:

<b>On/Off</b>	<input checked="" type="checkbox"/>
Gradual	<input type="checkbox"/>
Other (specify)	<input type="checkbox"/>

#### DEGREE OF SPATIAL ADAPTATION

Nanometers	<input type="checkbox"/>
Micrometers	<input type="checkbox"/>
Millimeters	<input type="checkbox"/>
Centimeters	<input type="checkbox"/>
Meters	<input type="checkbox"/>
Other (specify)	<input type="checkbox"/>

#### LEVEL OF AF VISIBILITY

01 Not visible (heat storage, phase change materials)	<input type="checkbox"/>
<b>02 Visible, no surface change (smart glazing)</b>	<input checked="" type="checkbox"/>
03 Visible, surface change (lamellas, rollers, blinds)	<input type="checkbox"/>
04 Visible, size or shape change (shutters, flaps, dynamic facade elements)	<input type="checkbox"/>
05 Visible, location or orientation change	<input type="checkbox"/>

## ECONOMICAL ASPECTS

### IS THE SYSTEM ECONOMICALLY VIABLE?

Yes	<input type="checkbox"/>
<b>No</b>	<input checked="" type="checkbox"/>
Other (specify)	<input type="checkbox"/>

### ESTIMATE THE COST OF THE CASE-STUDY

Low (traditional, residential, simple prefabricated, etc)	<input type="checkbox"/>
Medium (curtain walls, ventilated facades, etc)	<input type="checkbox"/>
High (double skin facades, high tech, etc)	<input type="checkbox"/>
<b>Information not available</b>	<input checked="" type="checkbox"/>

### SYSTEM MAINTENANCE FREQUENCY

Daily	<input type="checkbox"/>
Weekly	<input type="checkbox"/>
Monthly	<input type="checkbox"/>
<b>Yearly</b>	<input checked="" type="checkbox"/>
Information not available	<input type="checkbox"/>

Cost/m2	-
Yearly cost of maintenance	-



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#### Reference

Text description provided by the architects: Simone Giostra & Partners

<https://inhabitat.com/giant-solpix-led-wall-is-a-photovoltaic-solar-shield/> (Accessed July 22, 2018)

<https://www.designboom.com/design/simone-giostra-partners-architects-solpix/> (Accessed July 22, 2018)

<https://www.fastcompany.com/1644131/solpix-giant-led-display-doubles-solar-shield> (Accessed July 22, 2018)

#### Reference to picture

© Simone Giostra & Partners

#### Author of the sheet info

Rosa Romano  
Florence University, Department of Architecture

Mark Alston  
Faculty of Engineering - Architecture and Built Environment, The University of Nottingham

Enrico Sergio Mazzucchelli  
Politecnico di Milano



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3. Interactive Experience
4. System components as applied to a building curtain wall

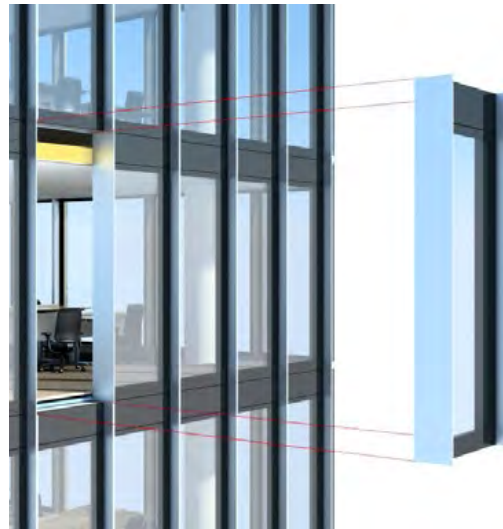
**InDeWaG, BAYREUTH (DE), 2015**  
**Prof. Dr. Dieter Brüggemann**

The research project InDeWaG (Industrial Development of Fluid Flow Glazing Systems) has been funded for three and a half years by the European Union within the framework of the program HORIZON 2020.

The project will be ended in March, 2019.

The focus of this project is an insulating glazing unit filled up with a water-glycol fluid circulating within one of the Insulating Glass Units (IGU) cavities. The glass units will be developed for both, the usage within façades and as interior separation walls. They are conceived to serve for both heating and cooling.

The aim is to combine these units with other technologies in HVAC systems, such as photovoltaic and high-efficiency heat exchangers leading to minimized total energy consumptions of buildings without restrictions of daylight autonomy.



MATERIAL



COMPONENT



FACADE

**FLUID FLOW GLAZING SYSTEMS; INSULATING GLAZING; DAYLIGHT**

**BUILDING INFORMATION:**

Building floor area	-	Climate Type	All type of climate
Building use	-	Orientation of the facade	All orientation
Building status	-	Other	-

**DETAILED DESCRIPTION OF THE CASE STUDY SYSTEM**

**TECHNOLOGY READINESS LEVEL**

01. Basic principles observed and reported/ Idea	<input type="checkbox"/>
02. Technology concept formulated/Design Proposal	<input type="checkbox"/>
03. Technology validated in lab	<input type="checkbox"/>
<b>04. Prototype demonstration</b>	<input checked="" type="checkbox"/>
05. Commercial product/Existing building	<input type="checkbox"/>

**FUNCTION / GOAL / PURPOSE**

<b>Thermal comfort</b>	<input checked="" type="checkbox"/>
<b>Visual comfort</b>	<input checked="" type="checkbox"/>
Acoustic comfort	<input type="checkbox"/>
<b>Energy management (harvesting, storing, supply)</b>	<input checked="" type="checkbox"/>
Mass transfer control (e.g. condensation control)	<input type="checkbox"/>
<b>Indoor air quality</b>	<input checked="" type="checkbox"/>
Appearance (aesthetic quality)	<input type="checkbox"/>
Structure performance	<input type="checkbox"/>
<b>Energy generation</b>	<input checked="" type="checkbox"/>
Personal users' control	<input type="checkbox"/>
Other (durability, accessibility, use of natural resources, etc):	<input type="checkbox"/>

**TYPE OF COMPONENT SYSTEM**

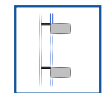
External skin	<input type="checkbox"/>
<b>Curtain wall (stick)</b>	<input checked="" type="checkbox"/>
Window frame	<input type="checkbox"/>
Insulated glass unit	<input type="checkbox"/>
Building services unit	<input type="checkbox"/>
<b>Energy harvesting device</b>	<input checked="" type="checkbox"/>
Air circulation device	<input type="checkbox"/>
Natural ventilation device	<input type="checkbox"/>
Solar tube	<input type="checkbox"/>
Switchable Glazing	<input type="checkbox"/>
Other:	<input type="checkbox"/>

**TECHNOLOGICAL FEATURES**

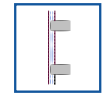
<b>High-performance innovative materials and systems for absorbing and storing solar energy</b>	<input checked="" type="checkbox"/>
Devices for managing natural ventilation in combination with mechanical ventilation systems	<input type="checkbox"/>
Mobile screens for controlling solar radiation	<input type="checkbox"/>
Technological solutions designed to increase and/or control comfort inside the building	<input type="checkbox"/>
Building automation systems for the management of plants and elements of the building skin	<input type="checkbox"/>



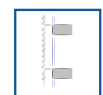
CW



ATF



SG



MFM



BF

**CS\_05**

TYPE OF MATERIAL	
Liquid crystals	<input type="checkbox"/>
Phase Change Materials	<input type="checkbox"/>
Polymers	<input type="checkbox"/>
Alloys	<input type="checkbox"/>
Ceramics	<input type="checkbox"/>
Wood	<input type="checkbox"/>
Salthydrates	<input type="checkbox"/>
Other (specify): Fluidglass	<input checked="" type="checkbox"/>

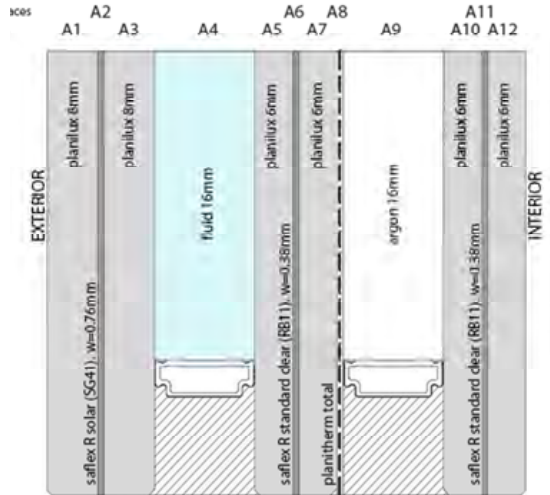
TYPE OF SWITCHABLE GLAZING	
Electro-chromic (EC)	<input type="checkbox"/>
Liquid crystal, SPD	<input type="checkbox"/>
Photo-volta-chromic	<input type="checkbox"/>
Independently tunable NIR-VIS EC	<input type="checkbox"/>
Thermo- tropic / chromic	<input type="checkbox"/>
Photo-chromic	<input type="checkbox"/>
Fluidglass	<input checked="" type="checkbox"/>
Other (specify):	<input type="checkbox"/>

TYPE OF SHADING DEVICE	
Screens / roller shades	<input type="checkbox"/>
Blinds with slat angle control	<input type="checkbox"/>
Bi-directional transmission control	<input type="checkbox"/>
Insulating shutters	<input type="checkbox"/>
Shading with dual-axis tracking	<input type="checkbox"/>
Other (specify):	<input type="checkbox"/>

MATERIAL EFFECT HOW DOES THE MATERIAL ADAPT?	
Shape Memory Material	<input type="checkbox"/>
Bi-material effect	<input type="checkbox"/>
Electroactive material	<input type="checkbox"/>
Superabsorbent material	<input type="checkbox"/>
Phase Change	<input type="checkbox"/>
Other (specify):	<input type="checkbox"/>

TYPE OF TRIGGER (INPUT)	
Mechanical (e.g. wind load)	<input type="checkbox"/>
Thermal (e.g. outdoor air temperature)	<input type="checkbox"/>
Electromagnetic (e.g. solar radiation)	<input type="checkbox"/>
Optical (e.g. daylight level, glare)	<input type="checkbox"/>
Air quality (humidity, CO2 concentration, etc)	<input type="checkbox"/>
Building heating/cooling load	<input type="checkbox"/>
Occupant's presence	<input type="checkbox"/>
Other (specify)	<input type="checkbox"/>

TYPE OF ACTUATOR (OUTPUT)	
Mechanical	<input type="checkbox"/>
Pneumatical	<input type="checkbox"/>
Electromagnetic	<input type="checkbox"/>
Thermal	<input type="checkbox"/>
Chemical	<input type="checkbox"/>
Other (specify):	<input type="checkbox"/>



1. An example of WFG (Water Flow Glazing) layers
2. Prototype WFG (Water Flow Glazing) BAU 2017 Munich - ETEM Stand
3. Bulgarian Pavilion with WFG Modules designed by Architektonika (source: <http://www.architektonika.com>)