New Development in Solar-thermal Facade

Neue Entwicklungen bei solarthermischen Fassaden

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Projects

- ACT Facade  exhaust air facade with inner layer textile
- TABSOLAR  UHPC opaque facade cladding, flexible geometry
- Arkol  heat-pipe solar thermal collector integrated facade
  STSC : opaque facade, flexible length, flexible orientation
  STVB : transparent facade, operatable sunshading
- Energetic Panel  Photovoltaik-Solar Collector integrated facade
ACT Facade
Active Cavity Transition Facade
ACT Facade
Festo Automation Center, Esslingen, DE

© Festo AG
ACT Facade

Typical façade system for highrise building

Double Skin Facade

Closed Cavity Facade

Box Type Window
ACT Facade
Basic Function
ACT Facade
Festo Automation Center – Exhaust Air Facade

Parallel-opening Window with activated Electrochromic Glass
ACT Facade
Fixed glazing
Airflow in the cavity absorbs long-wave heat radiation

Supply Air outlet

40°C
26°C

Anti-glare Roller Blind
- Absorb solar radiation
- Create air exhaust corridor

Manual Operating
Parallel-opening window with inactivated Electrochromic Glass
Inactivated ACT Facade with manual operating blind

Exhausted Heated Air to the Heating/Cooling System
ACT Facade
Measuring / testing: Comparison of twin rooms

- Room 2 OG2_R2
- Room 3 OG2_R2

Bar chart:
- Room temperature [°C]
- Cooling load [%]

-25%

Legend:
- With internal sun-shading as ACT Facade / exhaust air facade
- With internal glare protection blind (without air exhaust)
ACT Facade
Measuring / testing at Fraunhofer IBP
ACT Facade
Design Variation
ACT Facade
Festo Automation Center
DGNB Platin (Deutsche Gesellschaft für Nachhaltiges Bauen)
ACT Facade
Facade mockups comparison

double skin facade
closed cavity facade
box type windows
drained air facade
ACT Facade
Finished and on-going projects by Priedemann
Energieaktive Fassaden

TABSOLAR
Is there a channel structure which allows a uniform flow distribution on a given area and simultaneously a low pressure drop?
Adiantum leaf (maidenhair fern)
https://www.uniprot.org/taxonomy/32168

https://medizzy.com/feed/1448848
TABSOLAR
FracTherm® algorithm

Calculate and flexible through geometry and parameter variation
TABSOLAR
FracTherm®: Hydraulic and Thermal simulation

Volume flow distribution
Pressure distribution
Collector efficiency factor F’
Temperature distribution

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TABSOLAR
FracTherm®: Fluid flow experiment

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TABSOLAR
Original concept

- UHPC solar absorber
- spectrally selective coating
- UHPC cooling/heating element
- FracTherm® canal
- Thermal insulation
- Glass
TABSOLAR II

Solar absorber and other thermal active building components made of ultra-high-performance concrete (UHPC)

Solarabsorber und andere thermisch aktive Bauteile aus Ultrahochleistungsbeton (UHPC)
TABSOLAR

BAU 2017, Munich: TABSOLAR product family
TABSOLAR
First big panel production : September 2017
TABSOLAR

Demonstration Building

- TABSOLAR_Premium / Economy (735x1475mm) 8 Elements
- TABSOLAR_Premium / Economy / Design (735x1475mm) 24-32 Elements
- UHPC panel (735x657,5mm) 8-16 Elements
- Special geometries 6 Elements

Energieaktive Fassaden | Wien

13 Dec 2018
TABSOLAR
Demonstration Building

- TABSOLAR Premium / Economy / Design
- UHPC panel
- Special geometries

Glasfassade

Nord

3000mm

3700mm (740x5)

2960mm (740x4)

Süd

3000mm

3700mm (740x5)
TABSOLAR
Topics during development

- Production of bigger size panel
- Improvement of hydraulic connection
- Improvement of façade installation methods
- BAU 2019
ARKOL
Solar Thermal Collector with Heat-pipe Technology
Heat-Pipe
Commercial available - copper

https://www.gamersnexus.net/guides/981-how-cpu-coolers-work
ARKOL - Solar Thermal Strip Collector
Arkol : Strip Collector
Original concept : BAU 2017, Munich

ArKol
Strip Collector : Architectural design diversity
Streifenkollektor : Architektonische Gestaltungsvielfalt
Arkol : Strip Collector
Original concept

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Arkol: Strip Collector
Variation
Arkol: Strip Collector
Actual Concept: Mockup: Glasstec 2018, Düsseldorf
Arkol : Strip Collector
Actual Concept : Mockup : Glasstec 2018, Düsseldorf
Arkol : Strip Collector
ARKOL – Solar Thermal Venetian Blind
Arkol: Solar Thermal Venetian Blind
Original concept: BAU 2017, Munich

Arkol
Solar Thermal Venetian Blind: Energy efficiency and transparency

Solarthermische Jalousie: Energieeffizienz und Transparenz
Arkol : Solar Thermal Venetian Blind
Mechanism Concept
Arkol : Solar Thermal Venetian Blind

Position in Facade

- Maximize collected solar energy
- Building with high demand of heating with big transparent facade area (hotel/resort/hospital/high-rise)
- Double skin facade allows STVB to be operated in strong wind, protect the system from dust or human contact, and increase the efficiency of the collector though accumulated heat inside the cavity.
Arkol: Solar Thermal Venetian Blind

Alternative concept: increase user comfort

- Minimize solar heat gain
- Maximize thermal comfort
- Decreased temperature of inner glazing
- Example: office high-rise building with solar dehumidification
Arkol: Solar Thermal Venetian Blind
Facade Integration
Arkol : Solar Thermal Venetian Blind
Actual Appearance : Closed Cavity Façade / Double Skin Facade

- Innenscheiben: Inner glass
- Anpressmechanismus: Pressing Mechanism
- Jalousiemotor: Venetian Blind Motor
- Lamellen: Absorberblech
- Lamellae: Absorber sheet
- Außenscheiben: Outer Glass
- Sammelkanal: Collecting Dust

Doppelfassade
Double Skin Facade / Closed Cavity Facade
Arkol: Solar Thermal Venetian Blind Laboratory Test Sample

© Fraunhofer ISE
Arkol : Solar Thermal Venetian Blind
Façade Variations
Arkol: Solar Thermal Venetian Blind

Slat variations
Arkol : Solar Thermal Venetian Blind
Glasstec 2018, Düsseldorf
ARKOL
BAU 2019, Munich
• ACT Facade
• TABSOLAR
• ARKOL
Energetic Panel
Energetic Panel
Position on facade

Solar thermal Capilar matt

Summer
Night time cooling through radiation exchange
365 days per year

Adaptive U-Value
365 days per year

Solar warm water production
30-80°C surface temperature

Winter
Low-temperature heating
25-35°C surface temperature

Winter
Energy source for heat pumps instead of geothermal energy
10-25°C surface temperature

365 days per year
Optimized efficiency through backside cooling

Quelle: metallbau-woelz.de

365 Tage im Jahr
356 Tage im Jahr
Adaptive U- Wert

Power generation PV-Module

365 Tage im Jahr
Winter
Solare... Kühlung
Optimierter Wirkungsgrad
Quelle: metallbau-woelz.de

365 Tage im Jahr
356 Tage im Jahr
Adaptive U-Wert

Solar thermal Capilar matt

Power generation PV-Module

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www.facade-lab.com www.priedemann.de

64
Energetic Panel
Test Façade : TU Dresden