

Solar Thermal Collector in Façades

Nowadays architecture tends to be mainly made of high-rise buildings. The façades are becoming the greatest surface of a building that is exposed to solar radiation, but the increasing use of glass creates an overheating problem in building. The challenge is to take the solar energy that strikes the façade and transform it into thermal energy to activate air heating and cooling processes to reach room comfort, while the use of fossil energy is diminished. Here is presented a proposal of a shading system that inhibits overheating from direct radiation and additionally works as a solar thermal collector.

What is the best configuration of a venetian blind in order to face the sun, expose the maximum possible surface and resist high temperatures while it collects as much solar thermal energy as possible for active heating and cooling purposes, and still fulfill the function of sun shading device?

Cities that were analyzed

City	Type of solar tracking		
	South Façade	North Façade	East/West Façade
Caracas	Fixed	Fixed	Hourly
Singapore	Fixed	Fixed	Hourly
Mexico City	Fixed	Fixed	Hourly
Shanghai	Any tracking	Not Relevant	Hourly
New York City	Hourly	Not Relevant	Hourly
Amsterdam	Hourly	Not Relevant	Hourly
Helsinki	Hourly	Not Relevant	Hourly

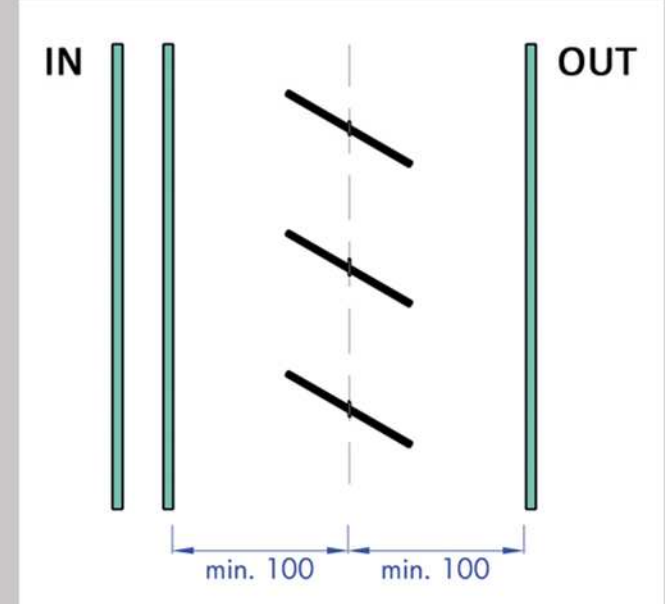
Working Principle

Slats are heated up by solar radiation. Heat is transferred to the manifold at both ends through a heat pipe. Antefreeze runs through the manifold and collects the heat. Warm antefreeze is then carried to heating and cooling devices.

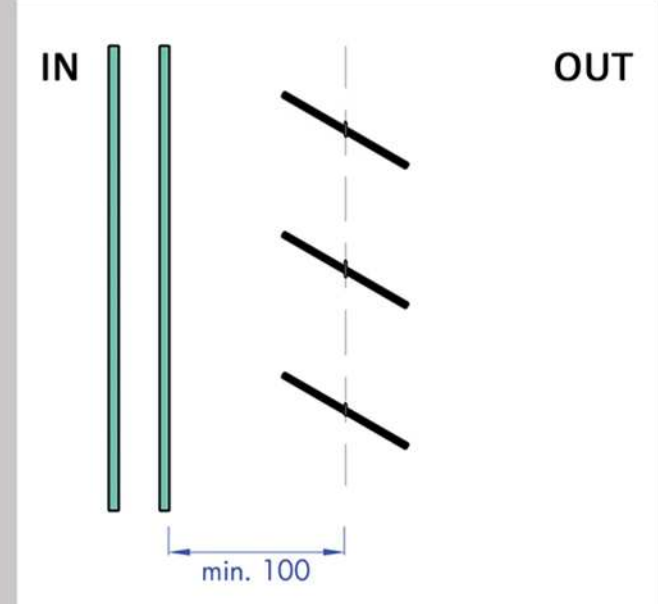
Frequency of adjustment for solar tracking

- Hourly angle adjustment
- Daily angle adjustment
- Monthly angle adjustment
- Fixed angle (no tracking)

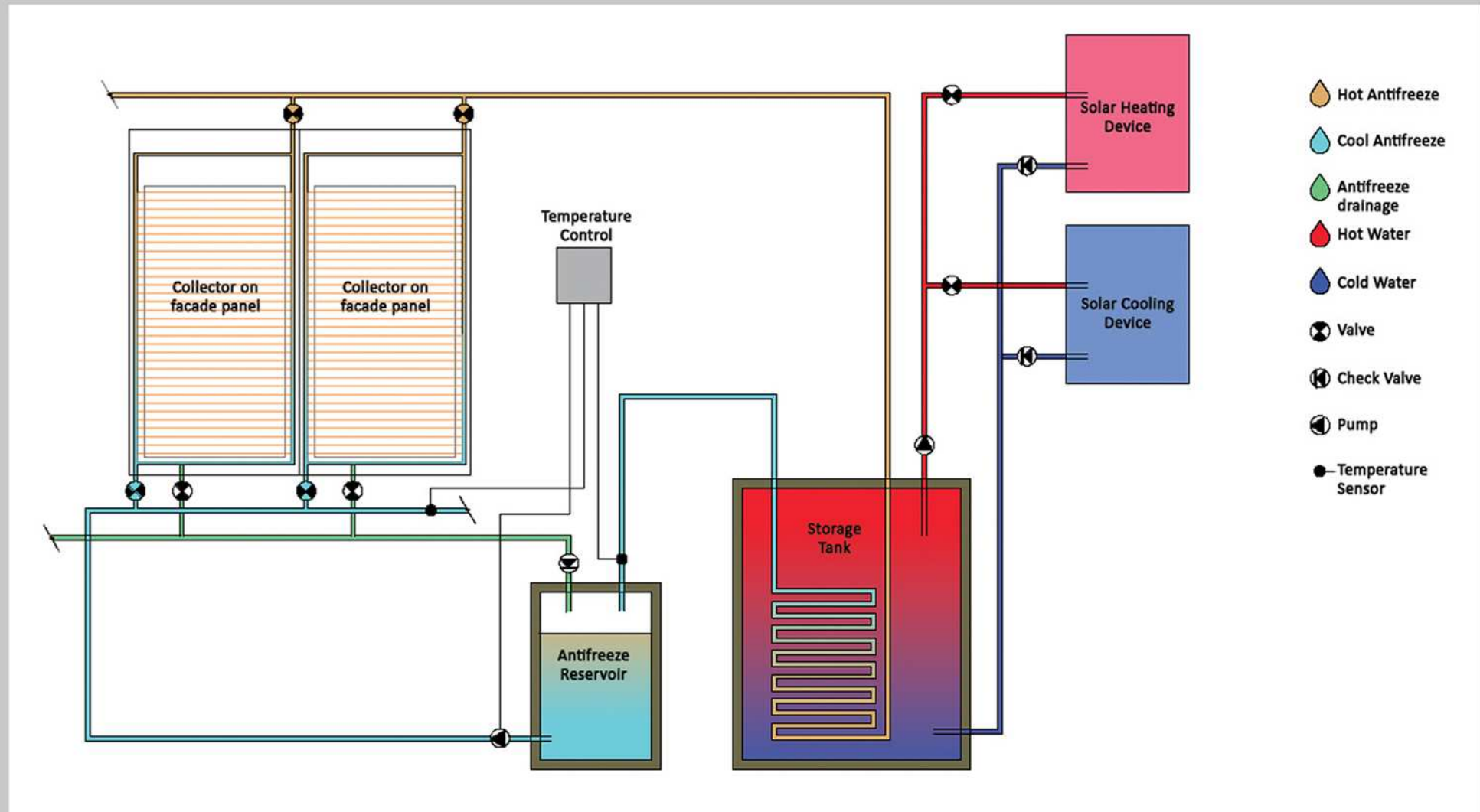
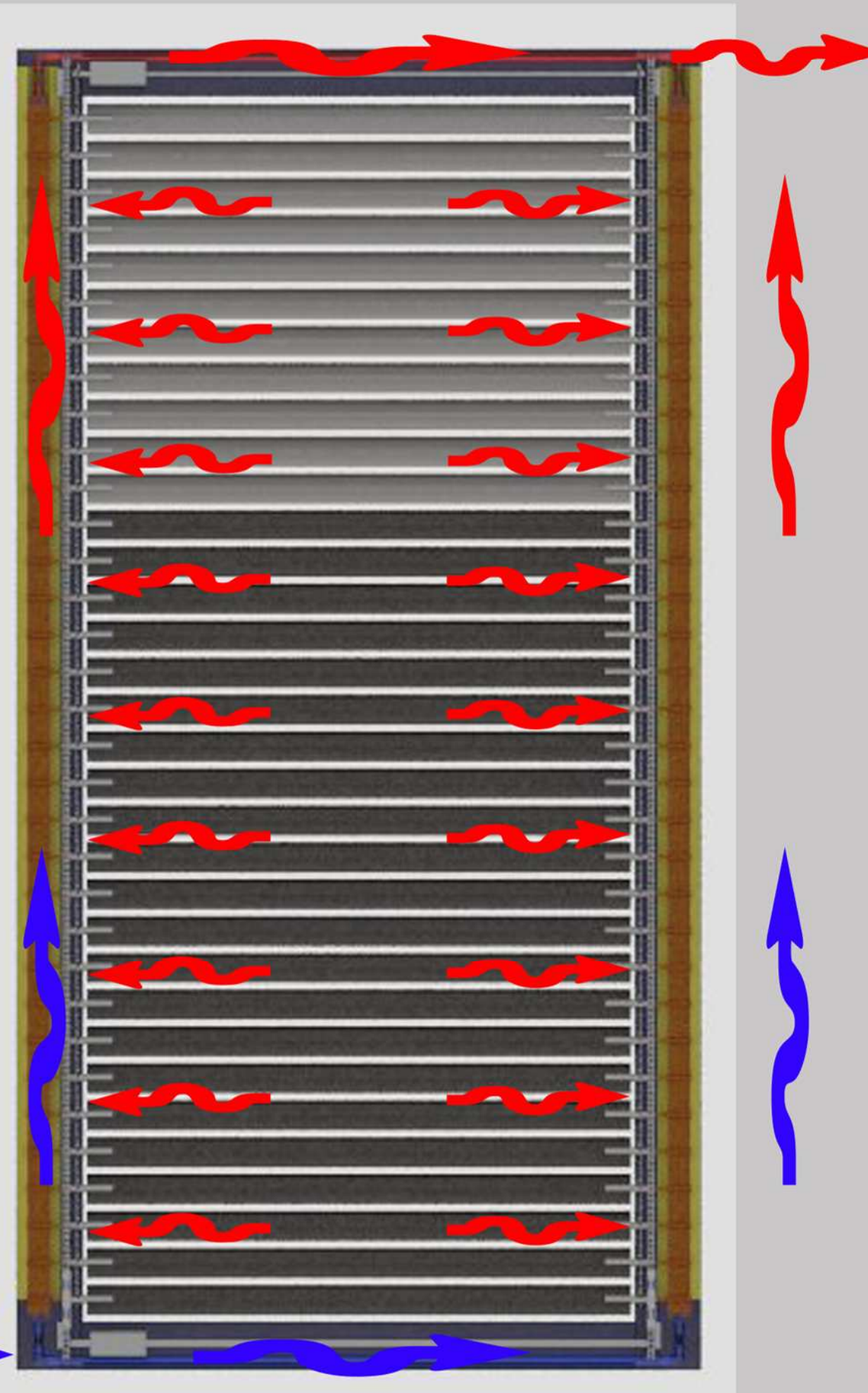
Location of solar collector in the façade



Venetian blind collector in cavity



External Venetian blind collector (in front of facade)

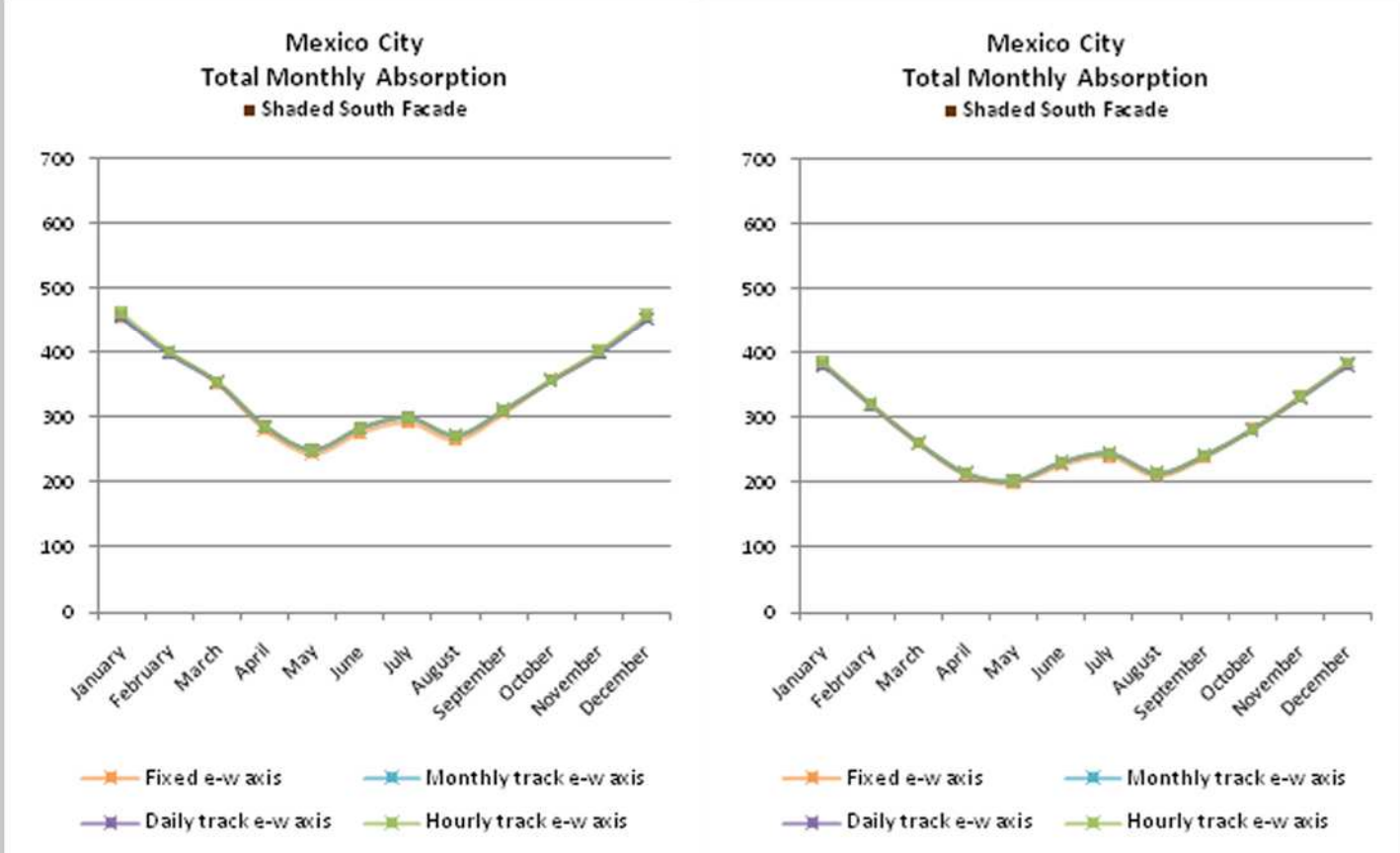


Overview of overall system



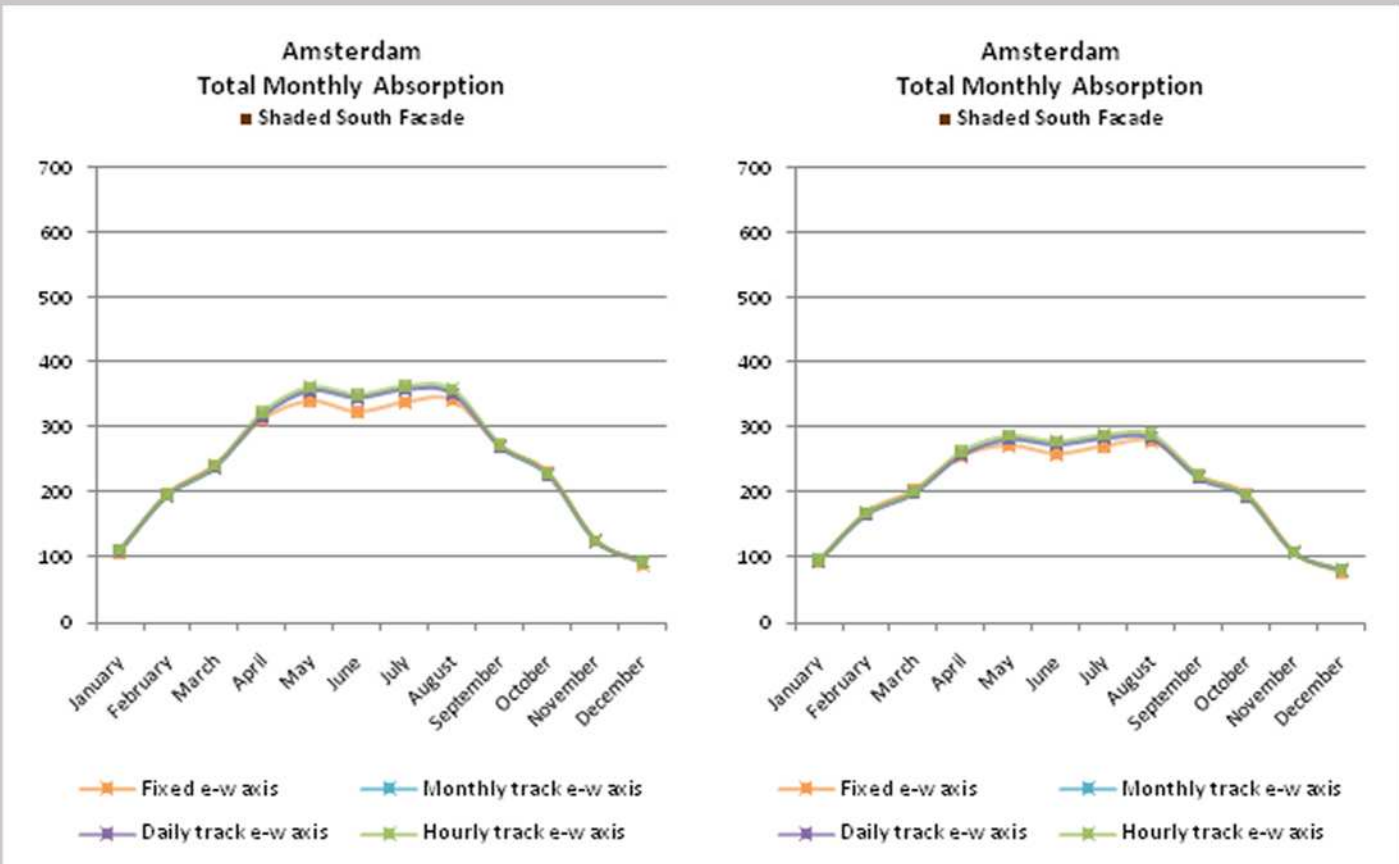
Mexico Exterior blind

Interior blind



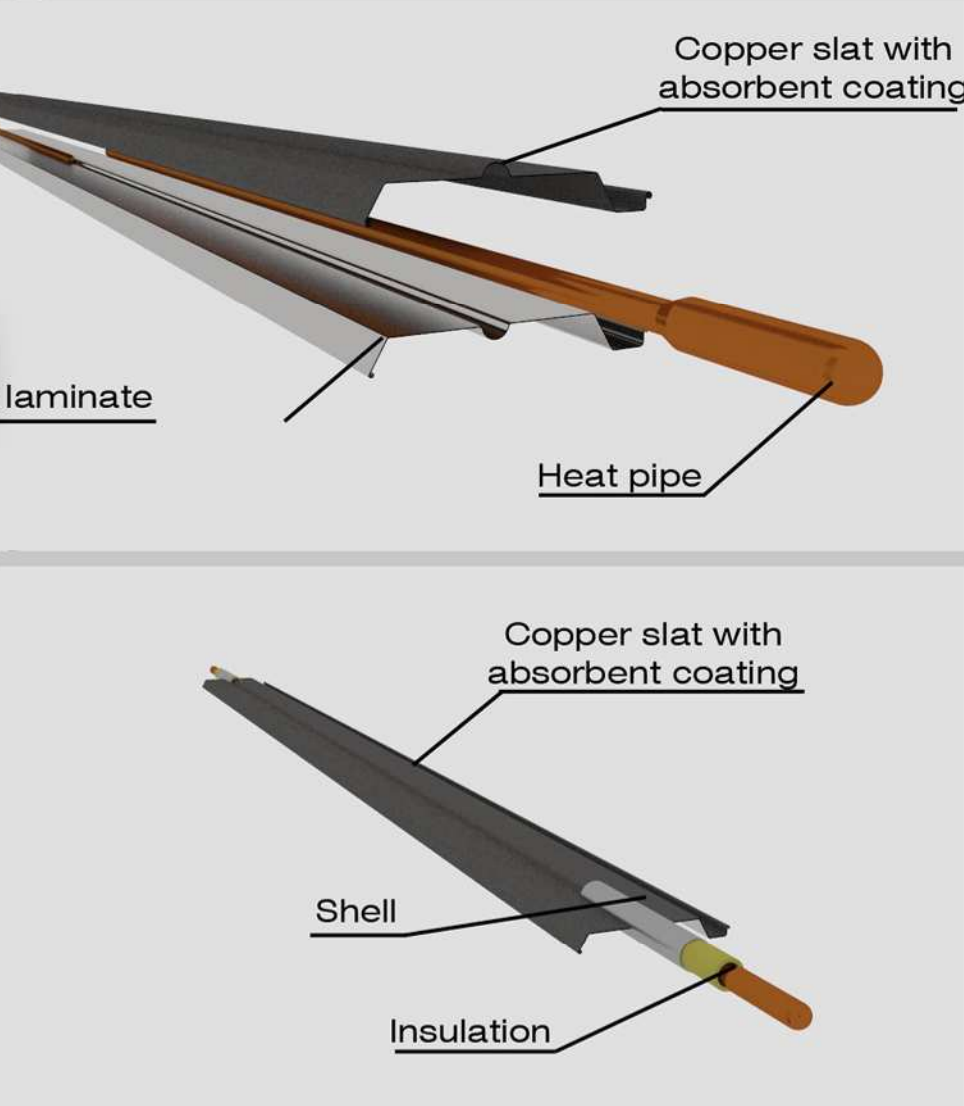
Amsterdam Exterior blind

Interior blind



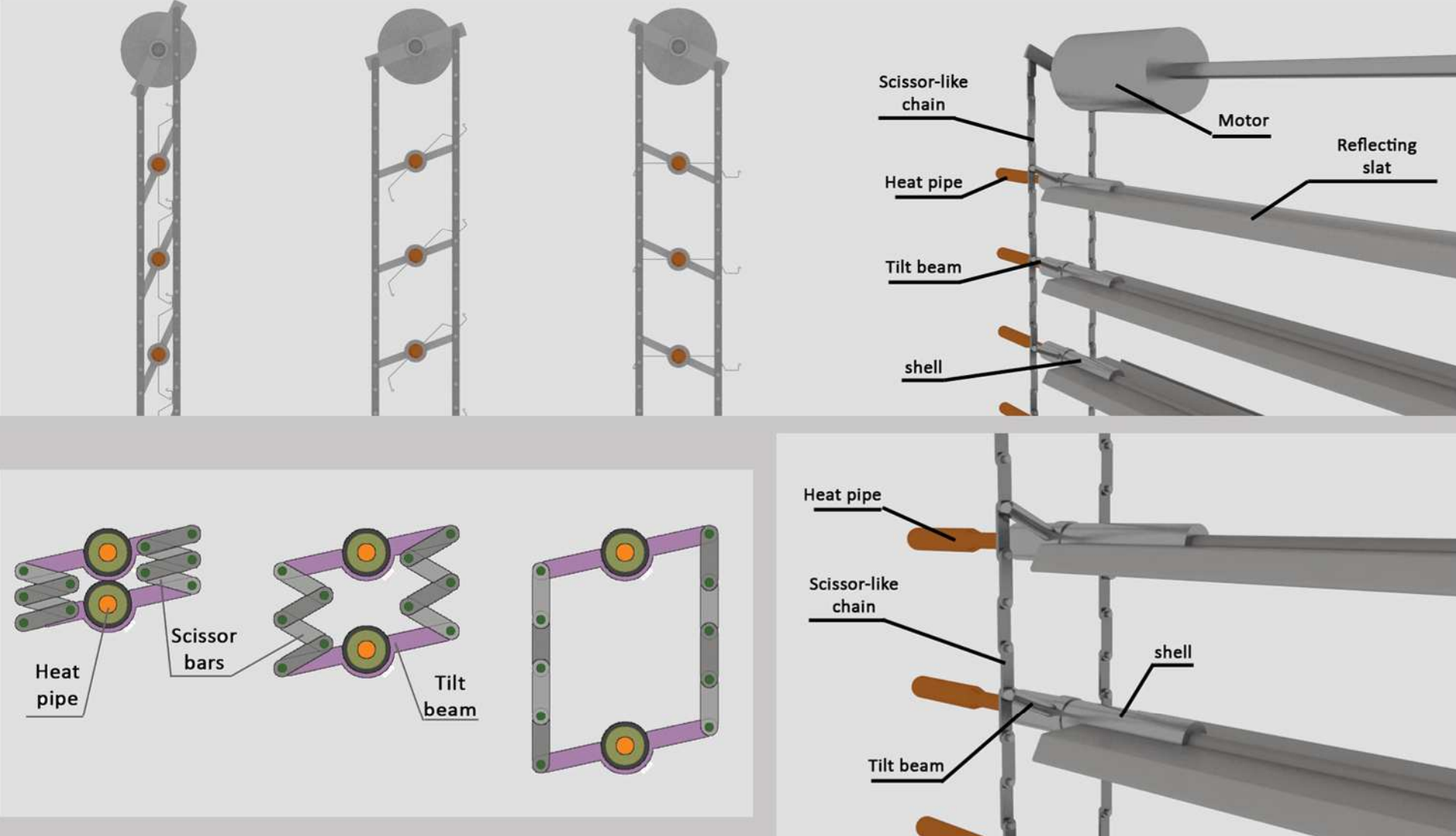
Components and mechanism

Absorbent slat



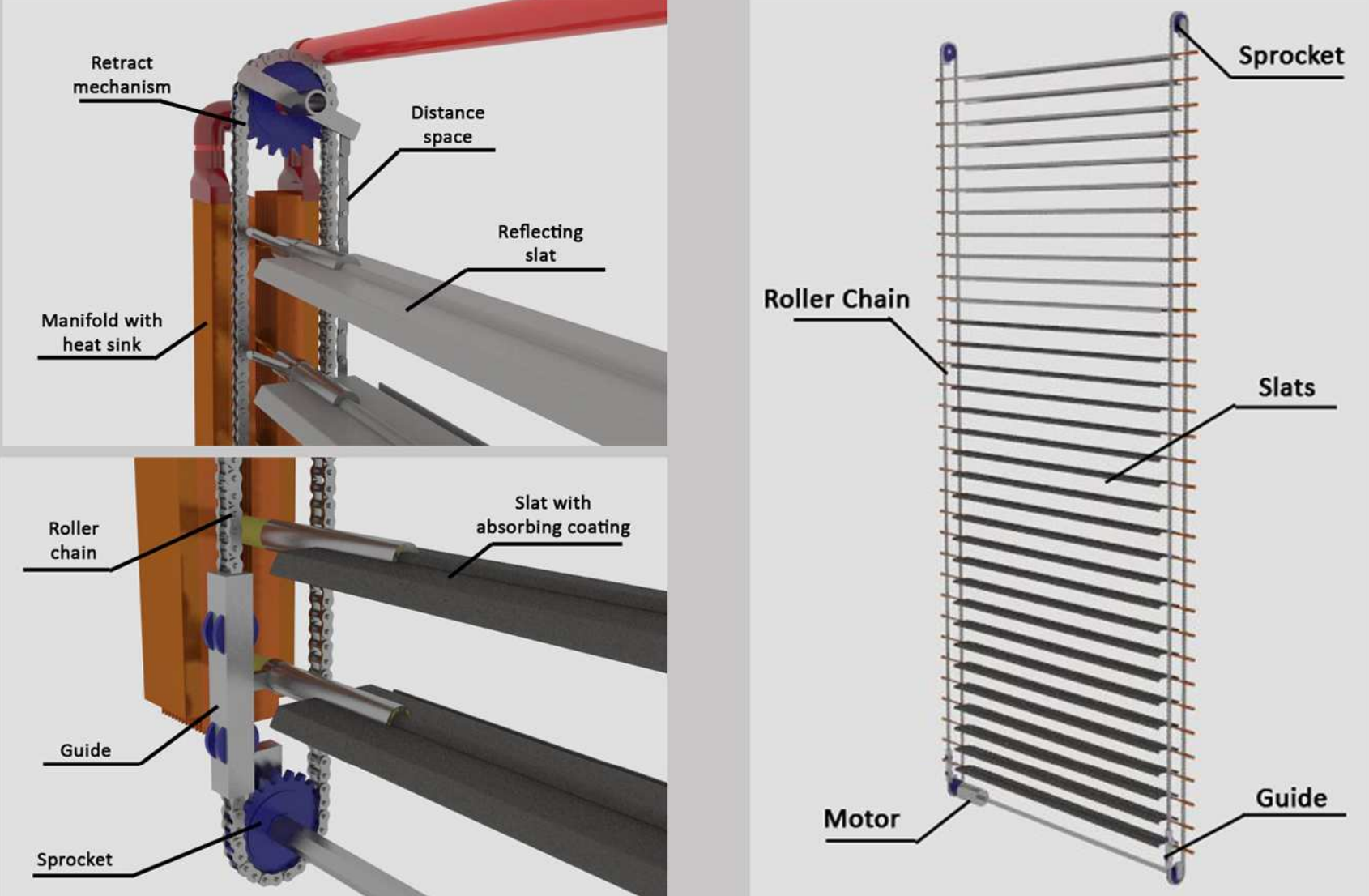
Heat collection is done by means of a copper slat coated with a absorbent screen. Heat is then transferred through the central copper heat pipe to the antifreeze manifold to be collected.

Tilt mechanism



The tilting is done by means of a steering bar located in the top frame. This bar tilts and transmits the movement to the slats through two scissor-like chains which are attached to a tilt beam connected with each slat. When the blind retracts, the scissor-like chain folds and gets packed at the top of the frame.

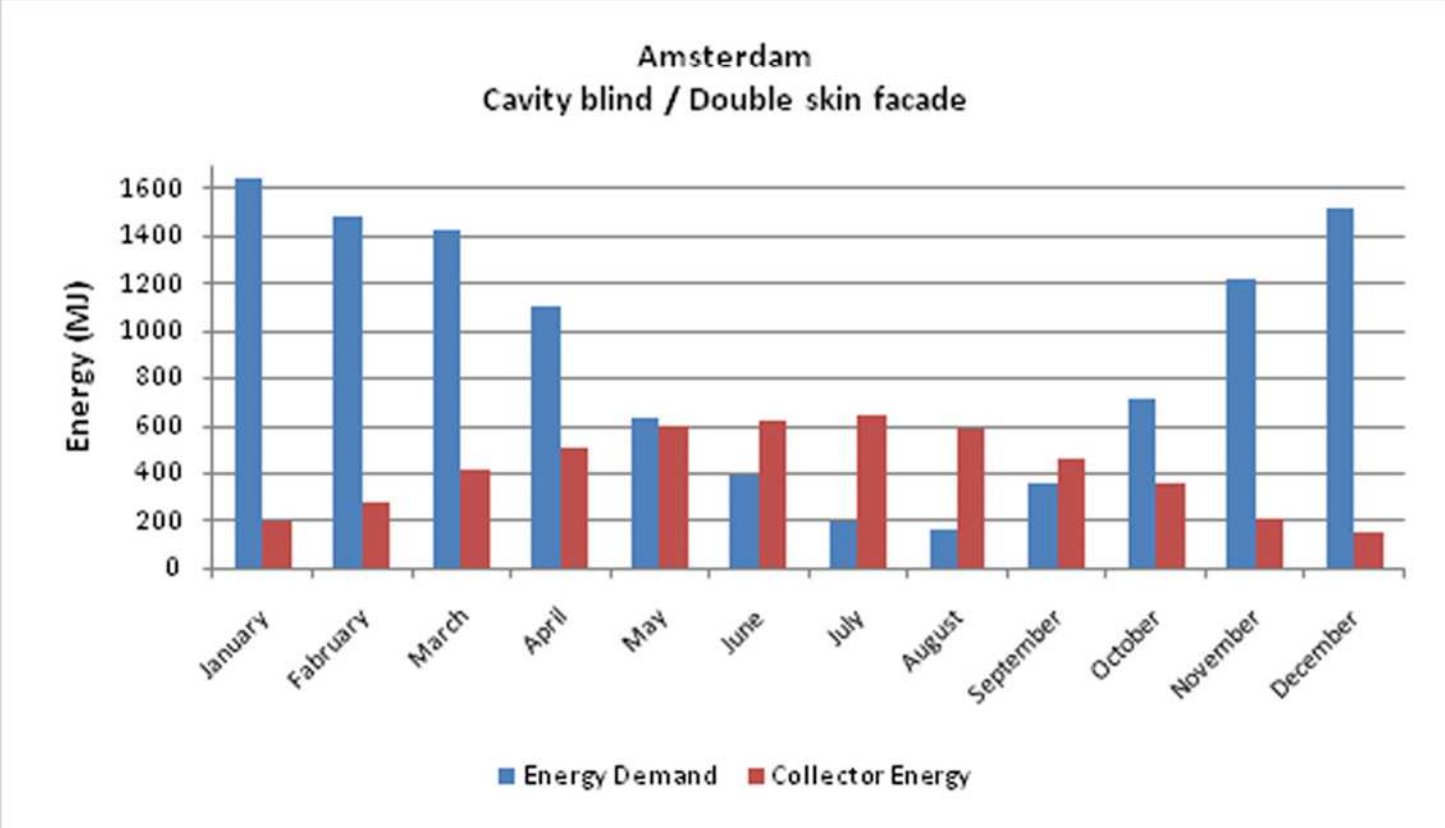
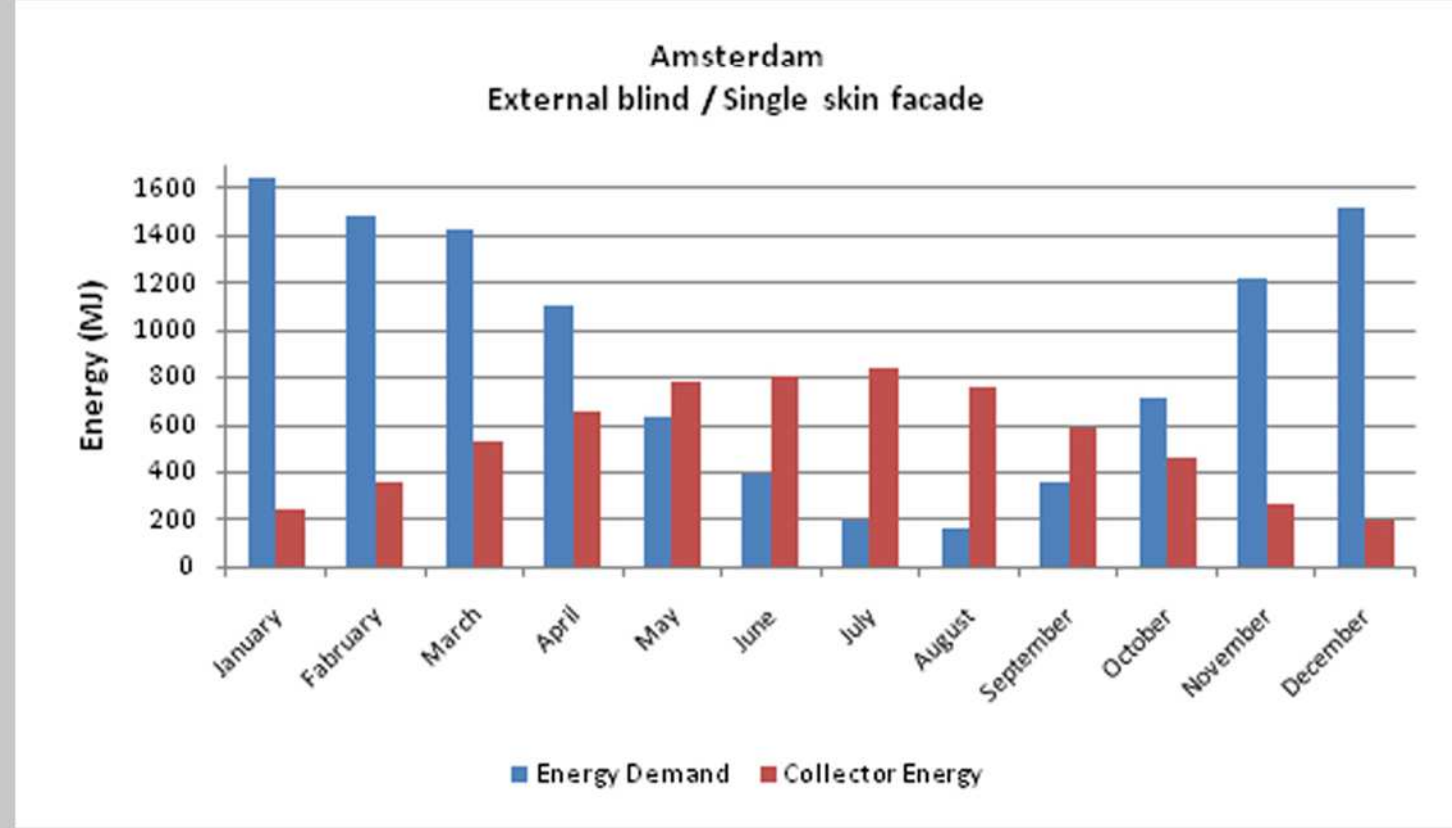
Retract mechanism



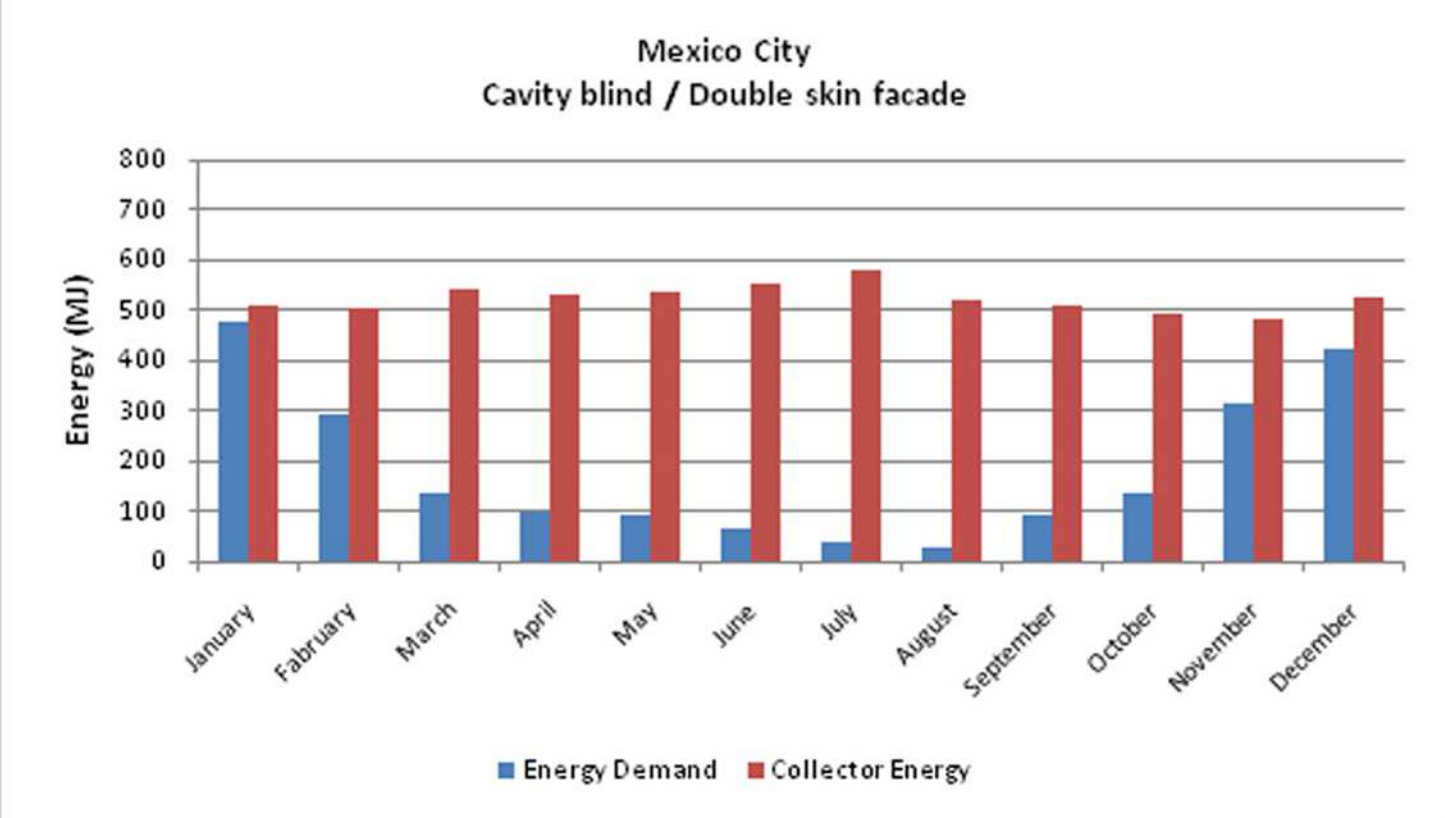
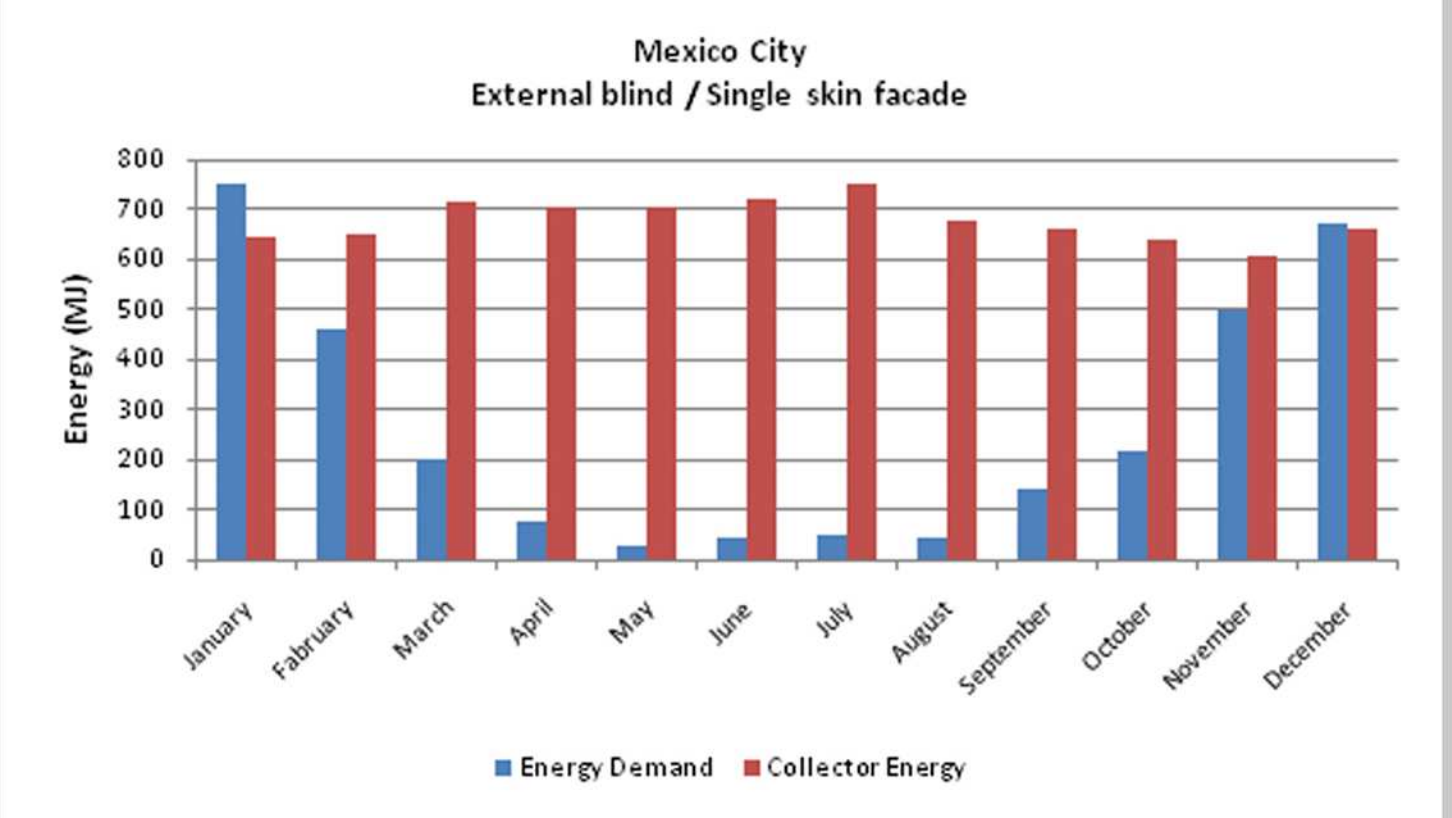
Retraction of the blind is done with a roller chain that rotates around two sprockets. At the bottom, the chain has a guide that is attached to the bottom slat. When the chain pulls the guide up, the slat goes up as well, dragging the rest of the slats up.

Study Cases

Amsterdam Hourly solar tracking blind



Mexico Fixed - angle blind



Integrated Mechanism

