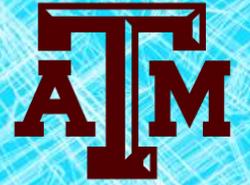
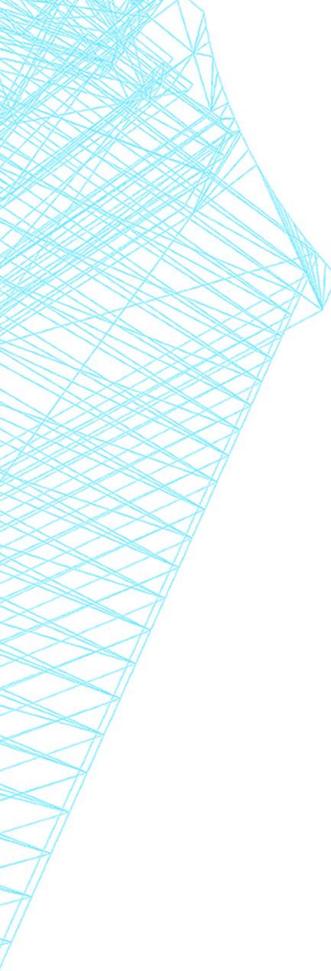


# **Characteristics of Glazing Layers of Double-Skin Facades and Energy Consumption**

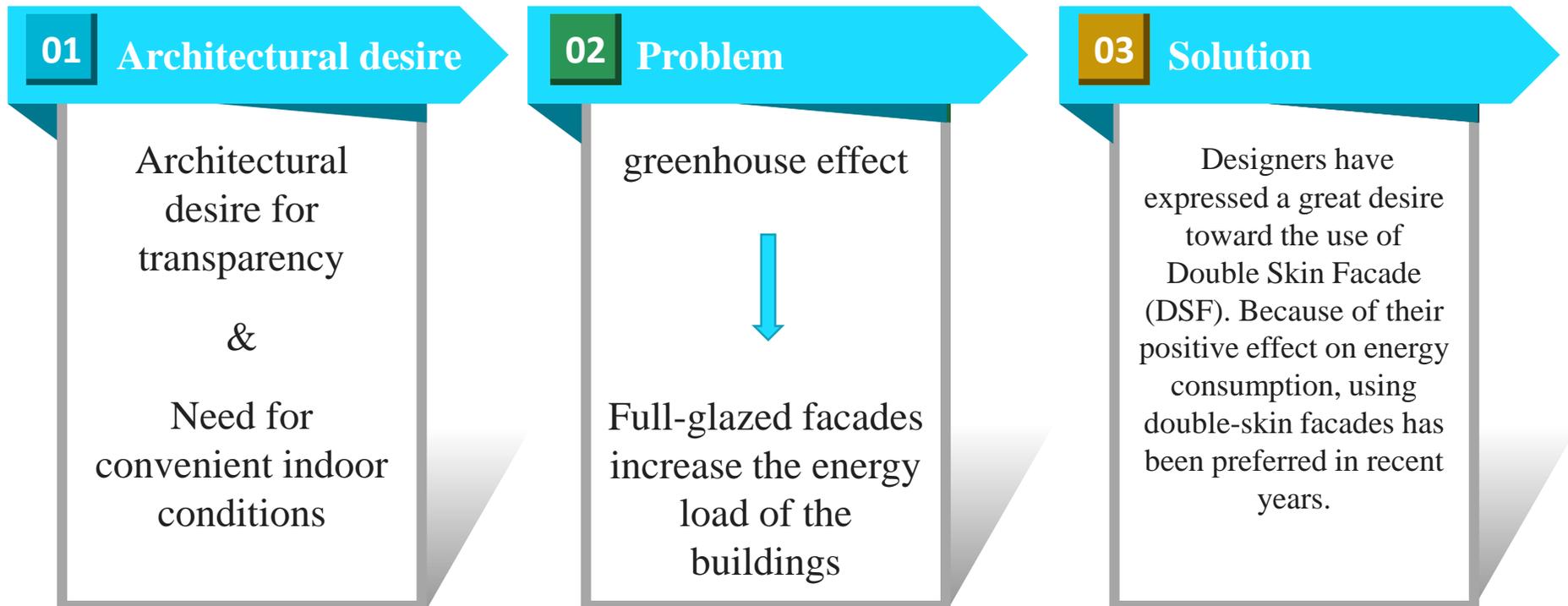
**Mohammadmehdi Danesh**



**TEXAS A&M**  
UNIVERSITY.

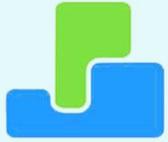


## Research Process



# Research Methodology

Software

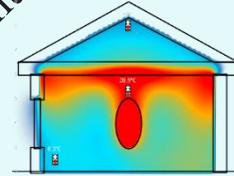


DesignBuilder

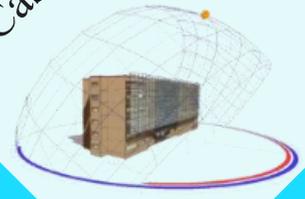
Validation



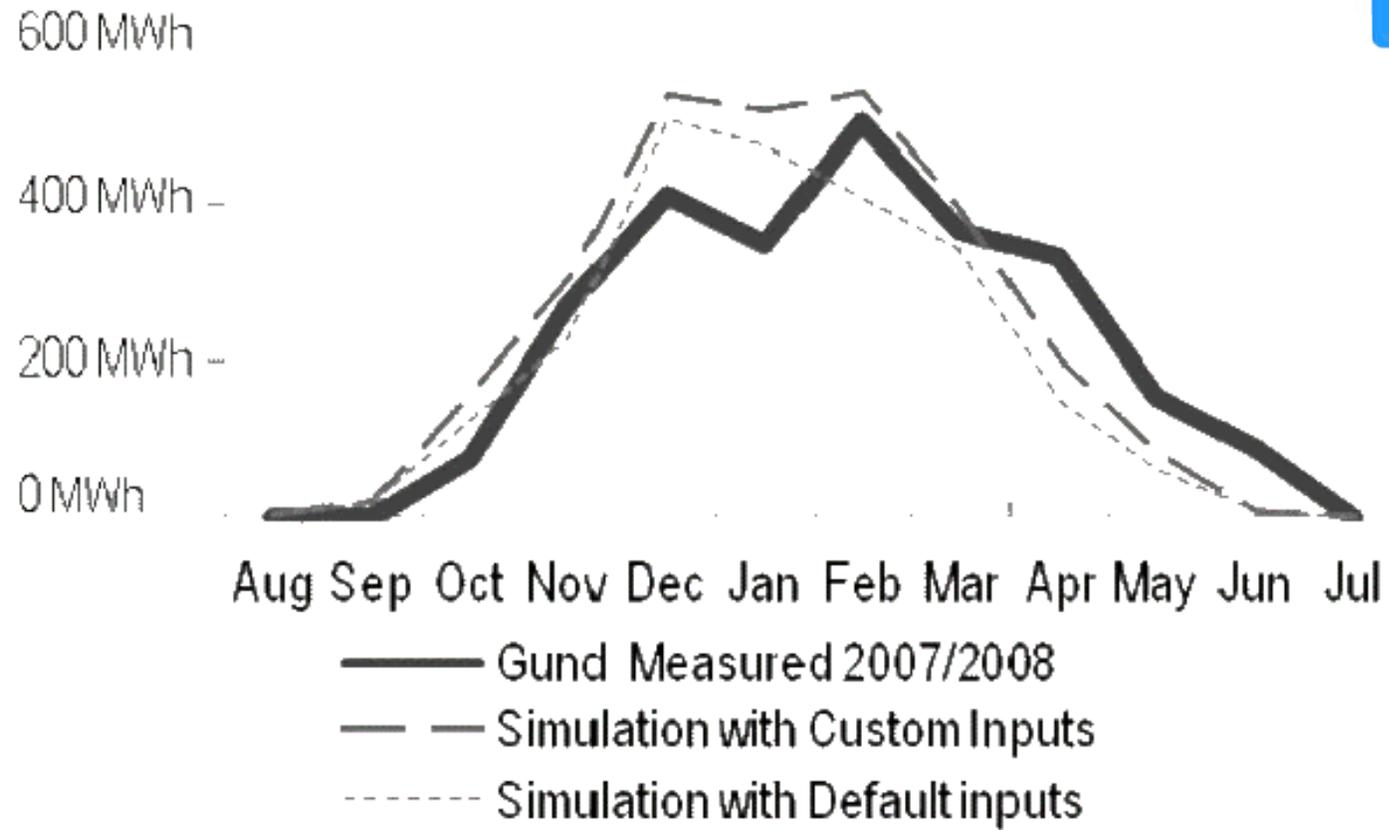
Simulation



Case study



## Validation



## Simulation process

With regard to double skin facades and considering the glazing type of the inner and outer skins, there are 6 independent variables for the thermal simulation which is performed

As a result, there will be different energy transfer rates into the building that contain dependent variables

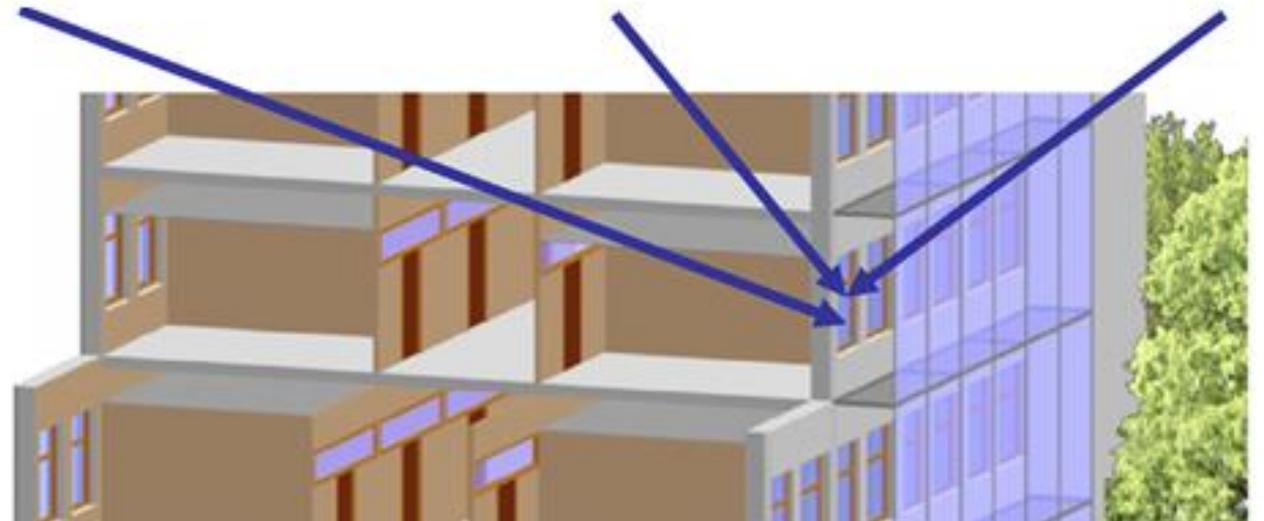
Single Glazing



Double Glazing



Triple Glazing

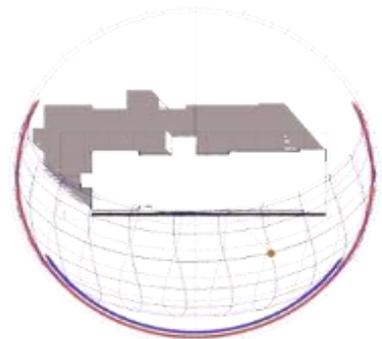
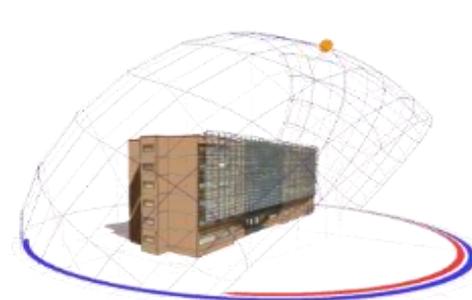
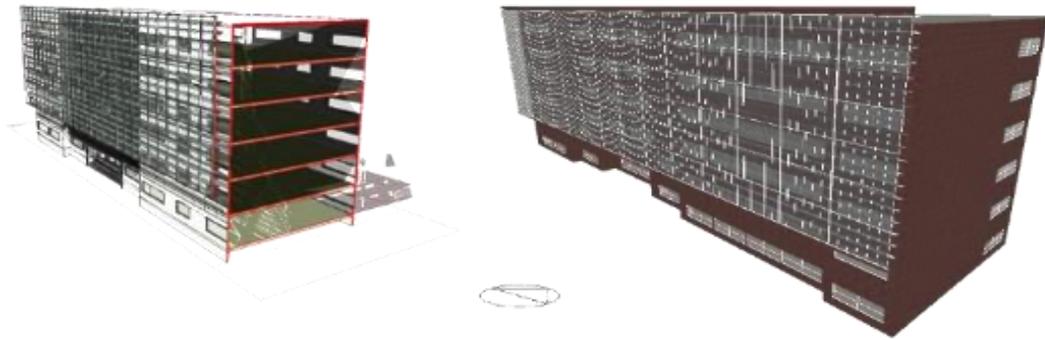


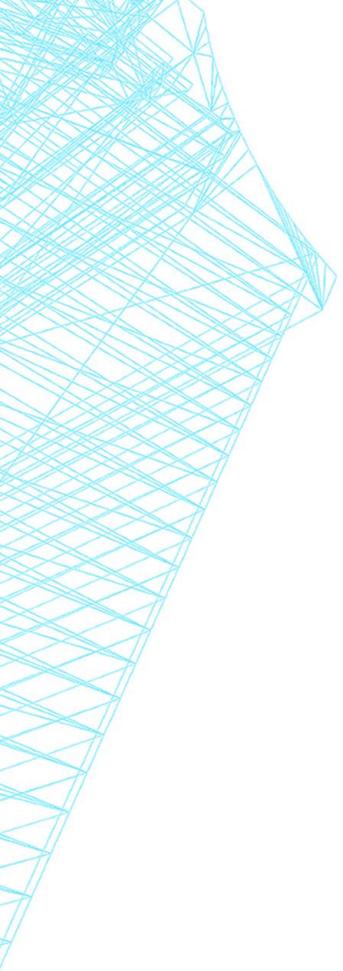
## Case Study Building

The studied building is situated in Tehran

The case study is the building of Science in the main campus of IUST, constructed in 2009

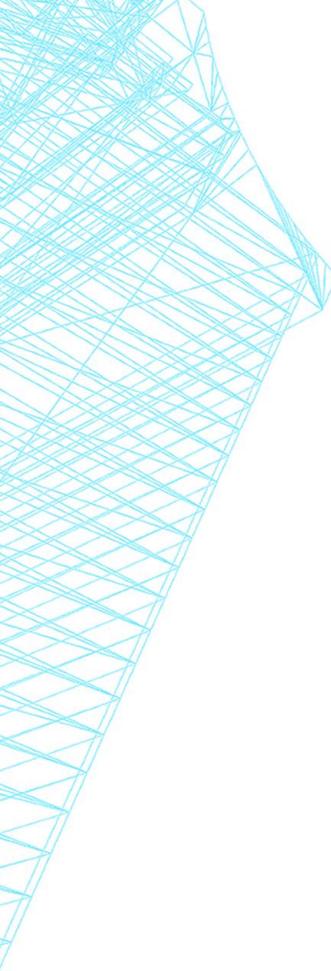
Having 11535 m<sup>2</sup> total floor area, the building consists of 5 floors on ground level that is 73 m long and 22 m wide





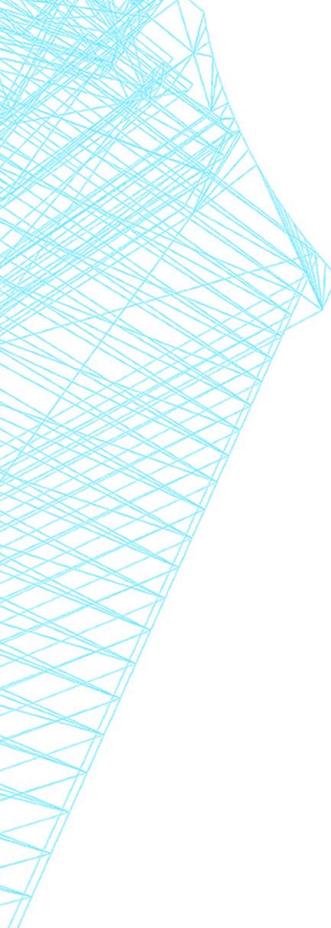
## Glazing type properties

Glazing type	SHGC	solar transmittance	U-Value (W/m <sup>2</sup> °K)
Single clear-glazing 3.2 mm glass	0.84	0.82	7.24
Double clear-glazing 3.2 mm glass, 6.4 mm air	0.74	0.68	4.93
Triple clear-glazing 3.2 mm glass, 6.4 mm air	0.59	0.52	4.11



## Thermal behavior Analysis by Changes in Number of Inner Layers of DSF

Title	Results		
	Single-glazing	Double-glazing	Triple-glazing
Mean energy required for cooling kWh/m <sup>2</sup>	54.13	53.30	51.71
Mean energy required for heating kWh/m <sup>2</sup>	234.1	226.3	218.9
Mean solar energy transmission kWh/m <sup>2</sup>	582.3	572.8	553.6



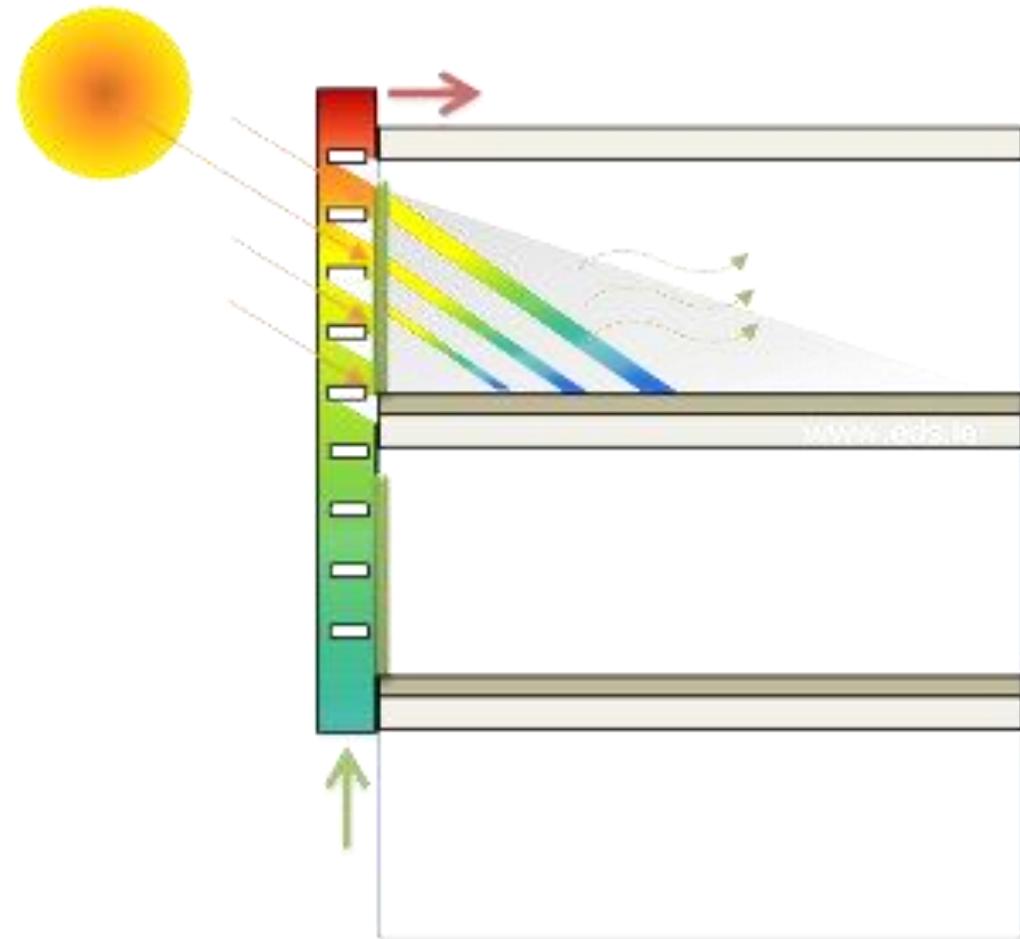
## Thermal behavior Analysis by Changes in Number of Outer Layers of DSF

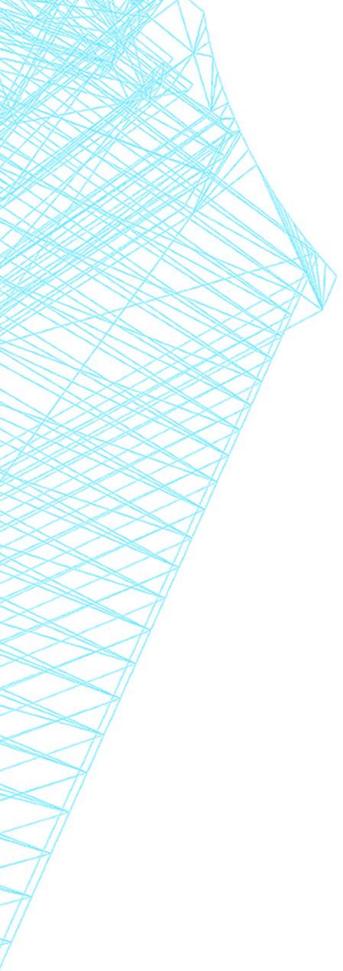
Title	Results		
	Single-glazing	Double-glazing	Triple-glazing
Mean energy required for cooling kWh/m <sup>2</sup>	54.13	54.17	54.11
Mean energy required for heating kWh/m <sup>2</sup>	234.2	235.9	238.2
Mean solar energy transmission kWh/m <sup>2</sup>	528.3	478.5	274.8

## Thermal behavior Analysis by Changes in Number of Inner and Outer Layers of DSF

Glazing type	SHGC	Double skin facade (DSF)					
		Inner layer			Outer layer		
		Cooling load	Heating load	solar transmission	Cooling load	Heating load	solar transmission
Single clear-glazing 3.2 mm glass	0.84	54.13	234.1	582.3	54.13	234.2	528.3
Double clear-glazing 3.2 mm glass, 6.4 mm air	0.74	53.30	226.3	572.8	54.17	235.9	478.5
Triple clear-glazing 3.2 mm glass, 6.4 mm air	0.59	51.71	218.9	553.6	54.11	238.2	274.8

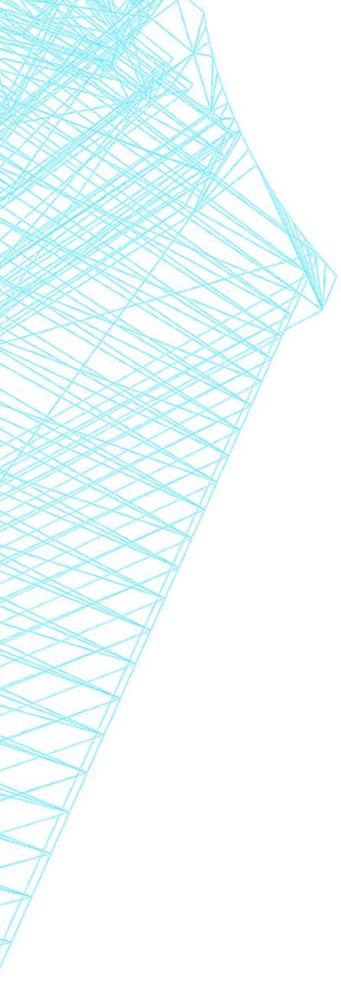
## Thermosiphon effect in DSF



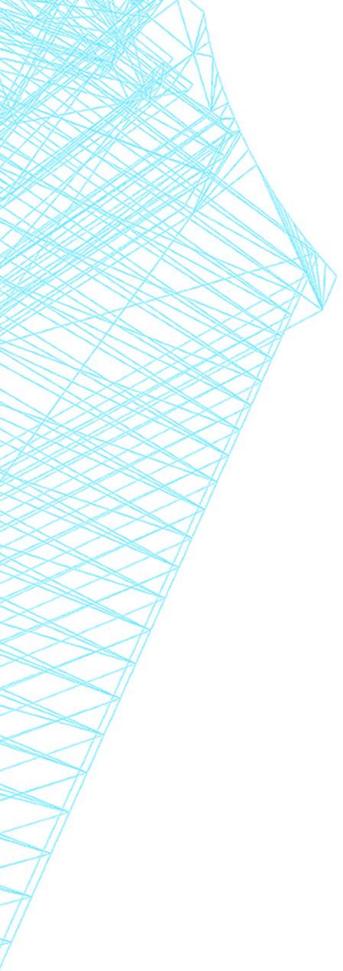


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**Thank you**