CASE STUDY – YIN HWA SHOES LASTS FACTORY

GENERAL INFORMATION

- Site area : 11,200 m^2
- GFA : 5,907 m^2
- Project type : Industrial
- Floors : 2
- Location : Lot M, Loc An – Binh Son Industrial Park, Long An Commune, Long Thanh District, Dong Nai Province, Vietnam
- Owner : Yin Hwa Shoes Lasts Viet Nam

CONTENTS

I. INTRODUCTION

The idea of this project is to construct a sustainable and eco-friendly building in Vietnam manufacturing industry, in accordance with standards of LEED (Leadership in Energy and Environmental Design) Green Building Rating System. There have been many conscious efforts toward "going green" in factory such as Yin Hwa Shoes Lasts Factory (LEED Silver certified), Yin Hwa Shoes Lasts Factory also set the target toward sustainability through achieving the LEED certification.

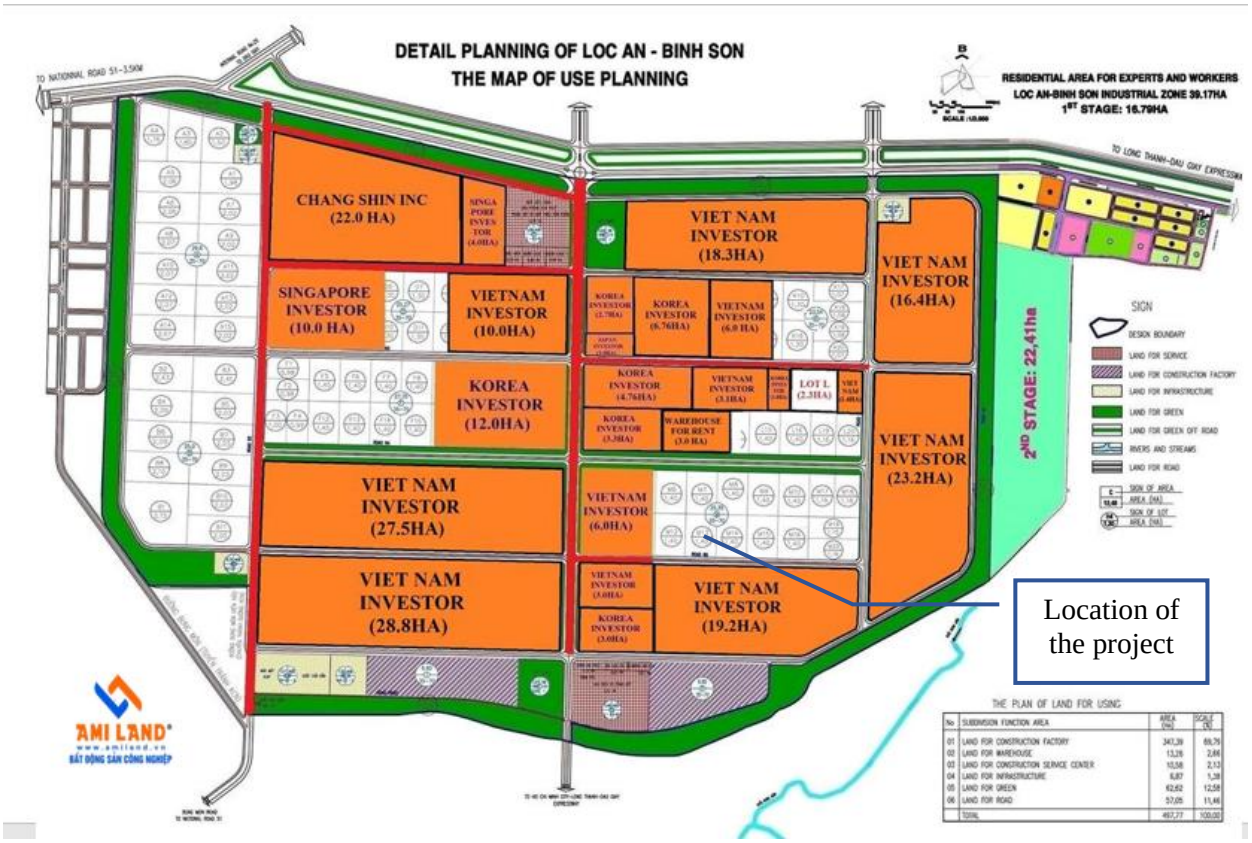

Figure 1. Yin Hwa Shoes Lasts Factory is located in Loc An – Binh Son Industrial Park, Dong Nai Province

Being recognized by U.S. Green Building Council (USGBC) that the project has met all requirements of international environmental design standards, the factory will not only have positive impacts on the environment but also result in significant reduction of operation costs. Lighting and air quality, vegetation, relaxation areas, cleanliness, functionality and thermal comfort together will contribute to the effective operation of the factory.

Key Highlights

- Water-efficient systems that reduce potable water demand
- High-quality facility components that reduce chemicals and contaminants in office area

- High efficiency (high COP) VRV systems and Heat Reclaim Ventilation units that reduce the operation energy cost
- High-efficiency lighting system with the use of 100% of LED lights.

In this case study, other highlighted features which make the factory a LEED-certified building are also introduced in details.

II. TRANSPORTATION

To minimize the environmental harms associated with parking facilities and reduce pollution by promoting alternatives to conventionally fueled automobiles, the project encourages everyone to use carpool vehicles. In details, among 6 car parking spaces provided, the project provides 2 preferred parking space for carpool vehicles and 2 preferred parking space for green vehicle that are closest to the entrance.

Figure 2. Illustrating pictures of carpool and green vehicle parking space

III. SUSTAINABLE FEATURES

1. Heat Island Reduction

The parking of this Project use roofing materials with a solar reflectance index (SRI) valued 93. (Dong A Sheet, off-white color), green roof for parking, concrete roof and grass brick This installation helps to reduce heat islands to minimize impacts on microclimates and human and wildlife habitats.

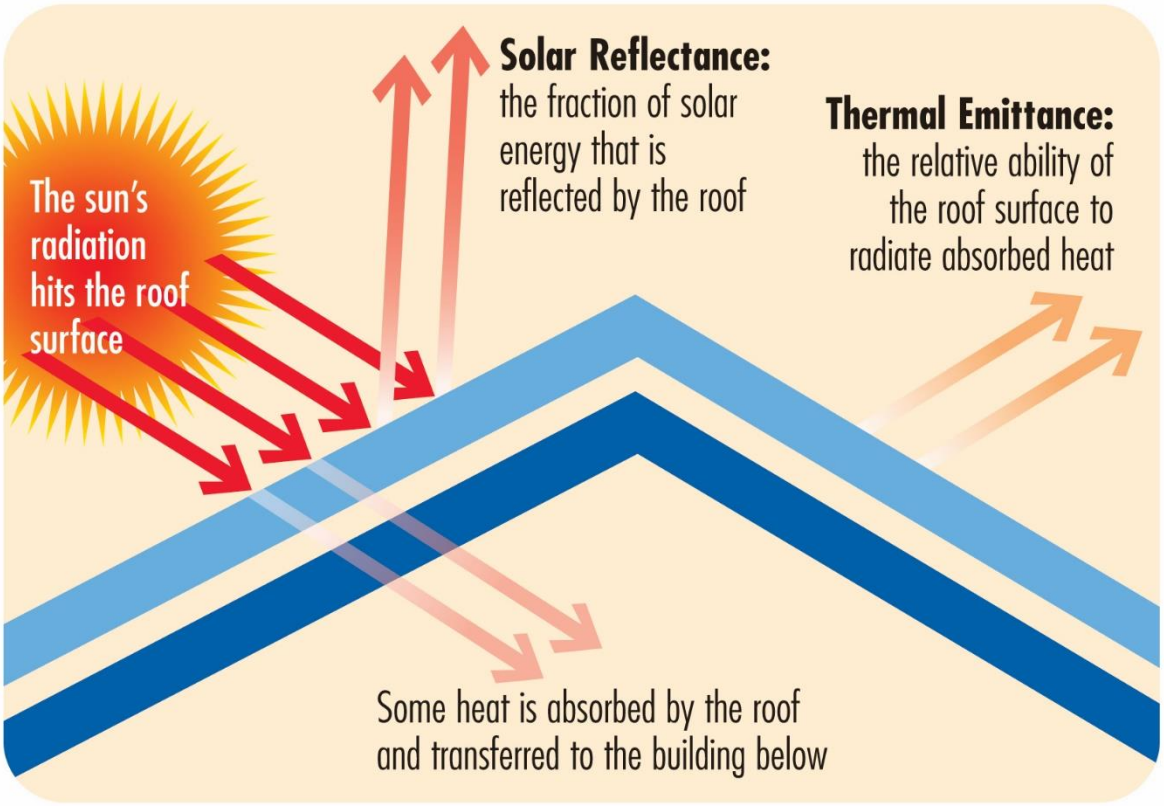

Figure 3. Solar Reflectance

2. Waste Management

To reduce the amount of waste generated by either building occupants or guests, as well as encourage everyone to classify waste, the project reserves an area for the central waste storage. This central waste storage includes separate areas for different types of waste such as recyclable waste, domestic waste, factory waste and hazardous waste.

Figure 4. Waste management

IV. WATER EFFICIENCY

1. Indoor Water Use

The project aims to reduce indoor water consumption through using water-efficient fixtures such as low flowrate water closets, urinals, and lavatory faucets. Besides, lavatory faucets are equipped with LEED-compliant pressure compensating aerators to reduce water flowrate. The result achieved is 52.84 % reduction compared to LEED baseline for indoor water use.

No	Item	Sample picture	Product code	Specification
1	Water closet			Dual Flush 2.5 - 3.5 LPF
2	Urinal			0.5 LPF
3	Lavatory Faucet			1.32 LPM

2. Outdoor Water Use

Selecting native and climate-adapted plants whose water demand is not high helps saving irrigation water (72 % water reduction compared to LEED baseline) although the project does not have to use

potable water for irrigation. In details, 100% of irrigation demand is covered by treated water from sewage treatment plant. Treated wastewater is considered to be qualified and meets the requirements to be used for watering plants according to local code. In specific, the STP tank volume is 96 m3, and the capacity of sewage treatment plant is 31 m3/day for irrigation while irrigation demand is only 0.51 m3/day. The project uses manual irrigation for easy maintenance during use.

3. Water Metering

The project aims to manage water use and track water consumption by installing permanent water meters for all water subsystems. A system of 04 water meters have been installed to measure water consumption from two water systems and subsystems:

Install permanent water meters for

- 01 main water meter: connect to Municipal water supply system from Industrial Park.
- 01 water meter for indoor plumbing fixtures and fittings: connect to Input-water pipe of sanitary fixture Supply System of Factory.
- 01 water meter for indoor plumbing fixtures and fittings: connect to Input-water pipe of sanitary fixture Supply System of Office.
- 01 water meter for irrigation: connect to Input-water pipe for irrigation system.

Sub-meters will be periodically read and inspected for monitoring purposes concerning water consumptions and potential damages.

V. ENERGY

1. Building Envelope

Roof assemblies include concrete deck, insulation layer, and two layers of plaster. The total thermal transmittance (U-value) of roof assemblies is 1.17 W/m^2K. External walls including a layer of concrete brick and two layers of plaster have a total thermal transmittance (U-value) of 0.96 W/m^2K. Indoor comfort conditions are ensured for all areas within the building, including common spaces, working areas, and office area.

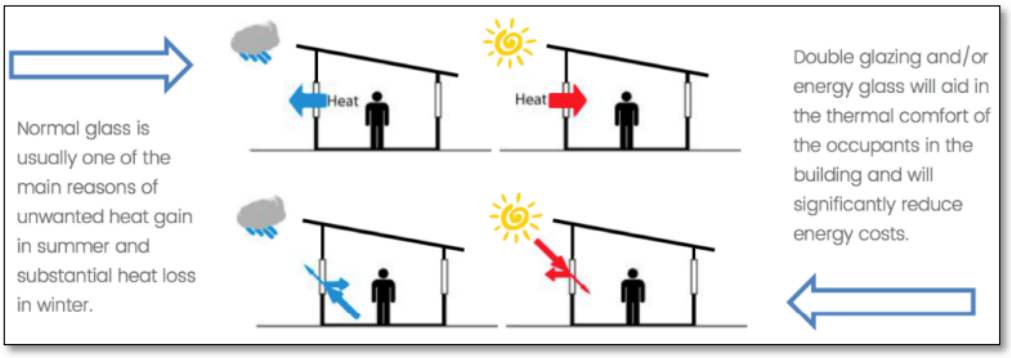

Figure 5. Difference between single-glazed windows and double-glazed windows

The system of external double-glazed windows with low-e coating, low U-value, and good light transmittance (LT) value works effectively to limit solar radiation, energy loss but increase daylighting harvesting. In other words, the glazing system limits the amount of heat and UV-rays transmitted through glass, but still allows light to easily pass through the window. This contributes to the reduction of interior artificial lighting and cooling demand.

2. Lighting

Lighting system of the building uses only LED lights for energy efficiency and savings. Common areas within the building are equipped with occupancy sensors and timers to effectively control lighting in parking areas, stairs, common toilets, storages, corridors.

LIGHTING FIXTURES SCHEDULE					
Type of lighting	Brand	Model	Technical information	Quantity	Image
LED TUBE T5 40W	DUHAL	SDLD840	- Power: 40W - Lumens: 4200lm - Efficiency: 105lm/W	423	
LED BATTEN 2X20W	DUHAL	LTF218	- Power: 2X18W - Lumens: 4400lm - Efficiency: 110lm/W	14	
LED BATTEN T5 2X36W	DUHAL	LSI128	- Power: 72W - Lumens: 7200lm - Efficiency: 100lm/W	34	

LED BATTEN T5 2X20W	DUHAL	LSI128	- Power: 40W - Lumens: 4400lm - Efficiency: 110lm/W	10	
LED 600X600 4X9W	DUHAL	TDA409	- Power: 36W - Lumens: 4000lm - Efficiency: 111lm/W	6	
LED PANEL 12W	DUHAL	SDGT512	- Power: 12W- Lumens: 1300lm- Efficiency: 108lm/W	20	
LED PANEL 40W	DUHAL	DGA804M	- Power: 40W - Lumens: 4800lm - Efficiency: 120lm/W	56	
LED DOWNLIGHT 12W	DUHAL	SDGT512	- Power: 12W - Lumens: 1300lm - Efficiency: 108lm/W	159	
LED LINEAR LIGHT 18W	DUHAL	DTD0183	- Power: 18W - Lumens: 1800lm - Efficiency: 100lm/W	76	
LED LINEAR LIGHT 36W	DUHAL	DTD0363	- Power: 36W - Lumens: 3600lm - Efficiency: 100lm/W	16	
LED SOLAR STREET LIGHT 100W	DUHAL	DHL1001	- Power: 100W - Lumens: 3200lm - Efficiency: 32lm/W	15	

LED POLE 18W	DUHAL	DVA805	- Power: 18W - Lumens: 1600lm - Efficiency: 89lm/W	18	
LED FLOOD LIGHT 100W	DUHAL	KDJD1001	- Power: 100W- Lumens: 1100lm- Efficiency: 110lm/W	28	
LED SPOTLIGHT OUTDOOR	DUHAL	ABY218	- Power: 5W - Lumens: 500lm - Efficiency: 100lm/W	42	

3. HVAC

To optimize energy performance of the building as well as reduce environmental and economic harms associated with excessive energy use, the project uses Heat Reclaim Ventilation units and VRV (variable refrigerant volume) system which consists of outdoor units (placed on the roofs) and indoor units for cooling indoor working areas.

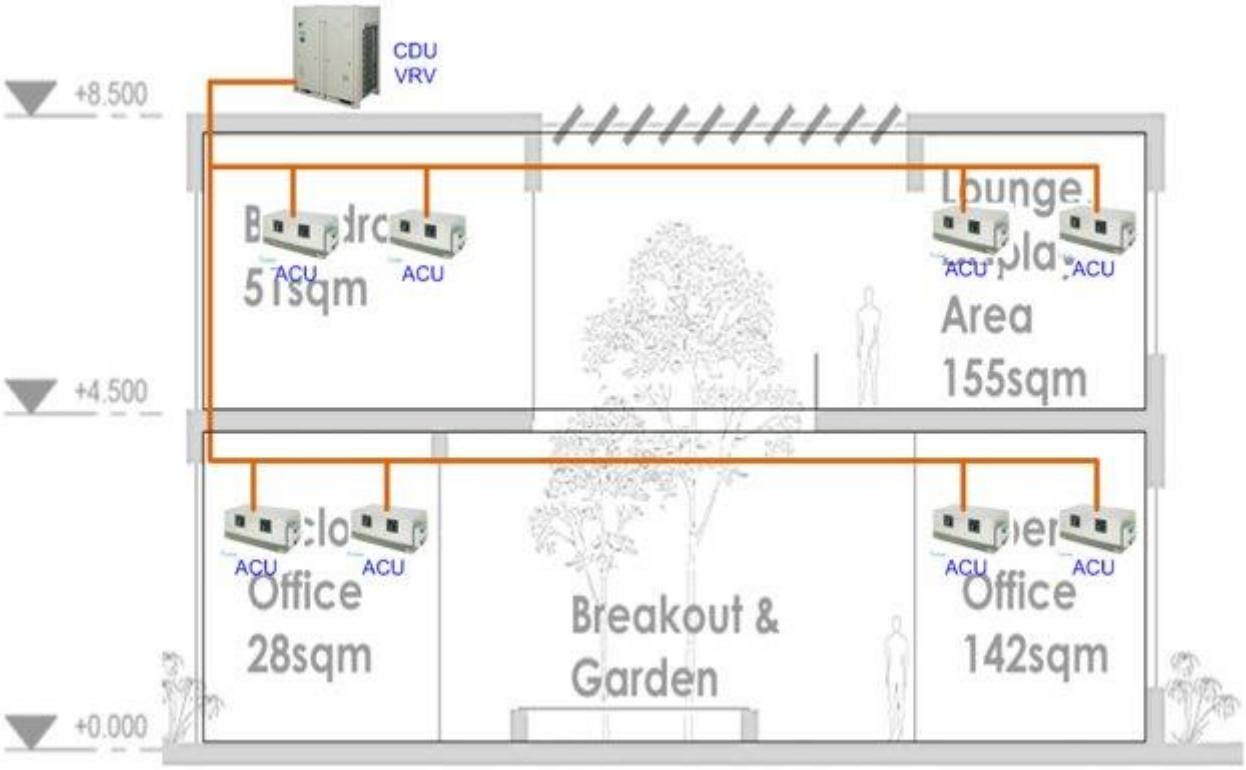

Figure 6. Schematic layout of a VRV system

Indoor air quality performance of the building is ensured to contribute to the comfort and well-being of occupants. Indoor air quality of working areas is controlled by Room Air Conditioner units by thermostat. All toilets at all floors are ventilated by exhaust fans.

VI. INDOOR ENVIRONMENTAL QUALITY

1. Daylighting

To connect the building occupants with the outdoors, the project provides daylighting for 91.8% of regularly occupied spaces. Shading manual blinds are installed on the façades to reduce glare for regularly occupied spaces.

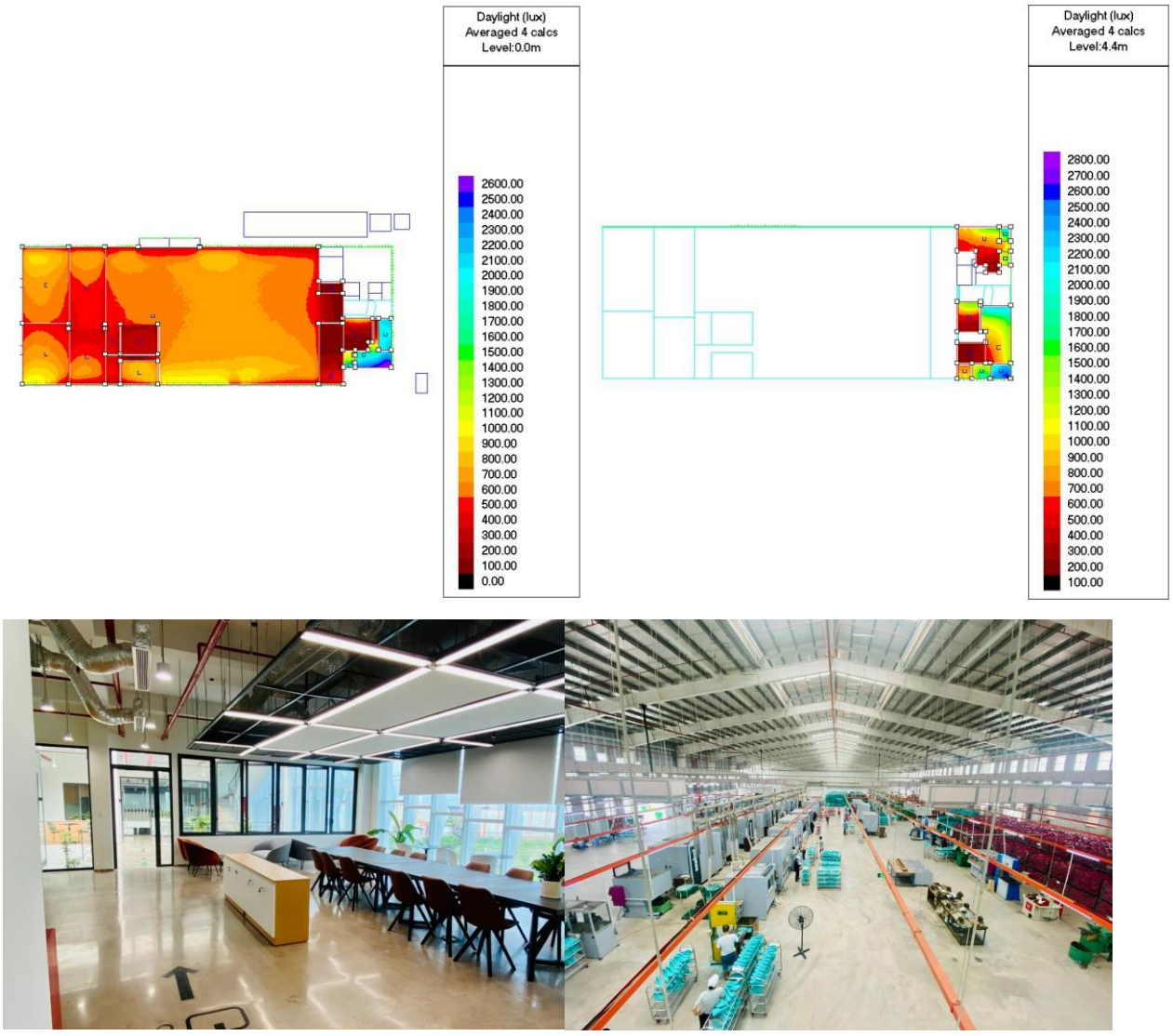

Figure 7. Daylighting in working area

The efficient daylighting design helps reduce the use of electrical lighting while quality view design

ensures the direct line of sight (via glazing) to outdoor natural environment such as flora, sky, movements, etc.

2. Thermal Comfort

Meeting the requirements of ASHRAE Standard 55-2017 for thermal comfort conditions for human occupancy, thermal comfort controls are provided for 100% of individual occupant spaces and 100% of shared multi-occupant spaces. The thermal comfort zone of natural ventilated area is determined using the adaptive comfort model, which accounts for outdoor climate as well changes in occupants' expectations, clothing adjustments and use of controls, such as ceiling fans.

Internal conditions of Office spaces are:

- Operative temperature: 24
- Air speed: 0.1 m/s
- Relative humidity: 65 %

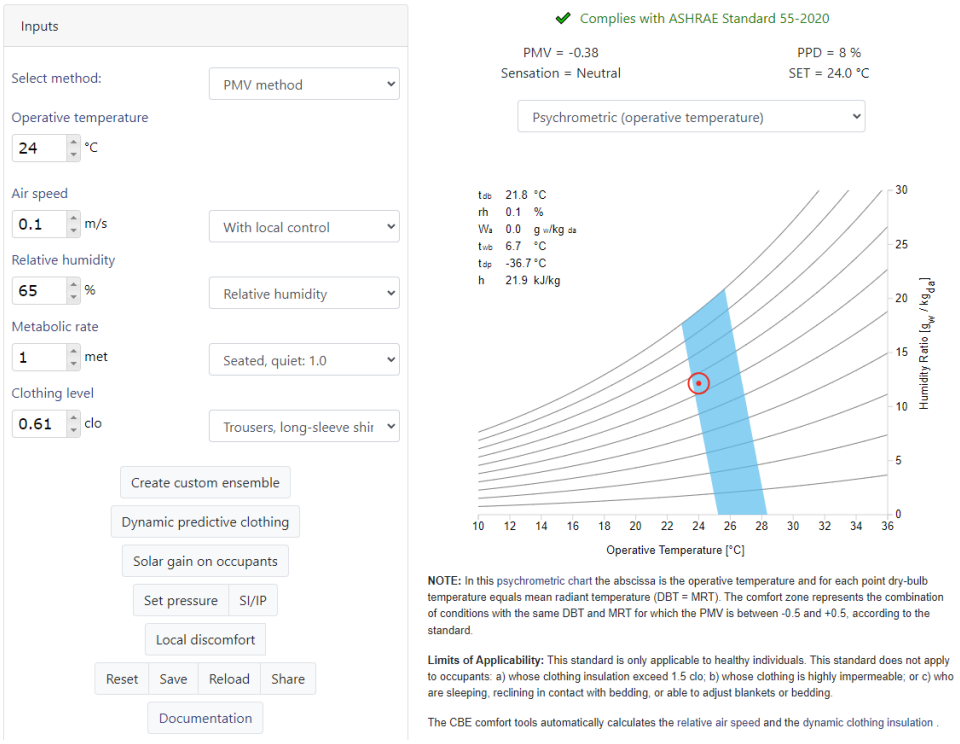

Figure 8. Thermal comfort simulation results

The Factory space, which using natural ventilation stratergies, is determined compliance using the adaptive method, described in ASHRAE 55–2010, Section 5.3, Optional Method for Determining Acceptable Thermal Conditions in Naturally Conditioned Spaces. Weather characteristics such as:

average temperature, windrose including wind speed, wind direction, etc. are collected from TMY weather data file. CFD simulations including: local wind profile taking into account the topography and adjacent structures, the efficiency of openings on the facade system, and temperature and velocity analysis models of indoor spaces during operation of the factory were performed.

Below is a calculation of thermal comfort analyzed in April - the month with the highest average temperature, where the operative temperature and average air speed are extracted from the CFD analysis results.

Figure 9. Thermal comfort simulation results