National Taipei University of Technology
Research Center of Energy Conservation (RCEC) for New Generation of Residential, Commercial, and Industrial Sectors, Dept of Energy and Refrigerating Air-Conditioning Eng:
Chair Professor, Shih-Cheng Hu

- **Education: PhD, Department of Architectural Engineering, Liverpool University**
- **Expertise: Clean Room Design, Indoor Air Quality Control, Air Conditioning System Design, Semiconductor Optoelectronics and Factory Systems, Fluid Mechanics, Heat Transfer**
- **RCEC Principal Research: Clean room and high-tech factory facilities technology**
- **RCEC Research Goals: 1. Use heat recovery technology, optimization of operating parameters and automatic adjustment of energy-saving modes to improve the energy efficiency of clean room air conditioning systems. 2. The preheating energy consumption of the air conditioning system is reduced by more than 10%.**

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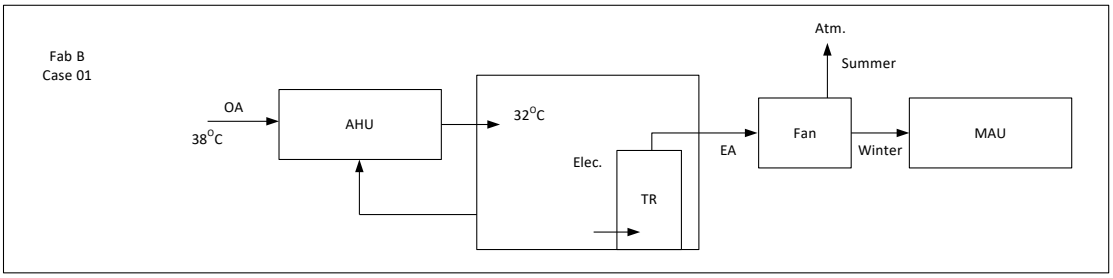


Can save 13.8% of energy consumption of heating system

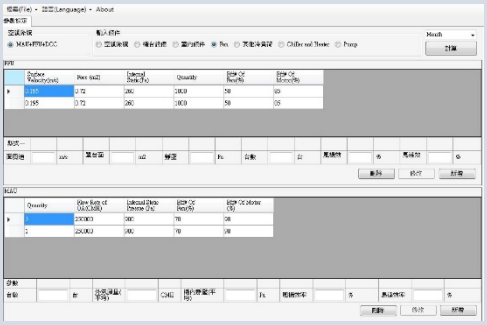
Research on energy saving of the heating system of the outdoor air conditioning box by recycling the waste heat of the electric power machine room

Energy consumption analysis and energy saving research of high-tech factories

Air Cond. System

Process Tool

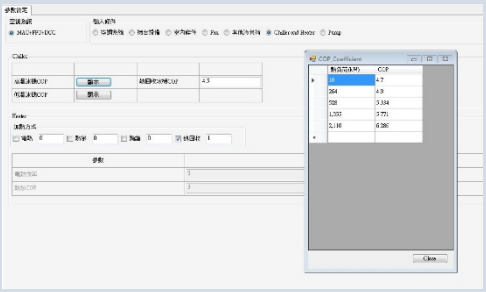
Fans



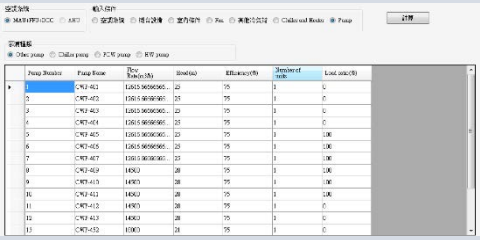
Operating Condition

Cooling Loads

Chiller System



Pumps

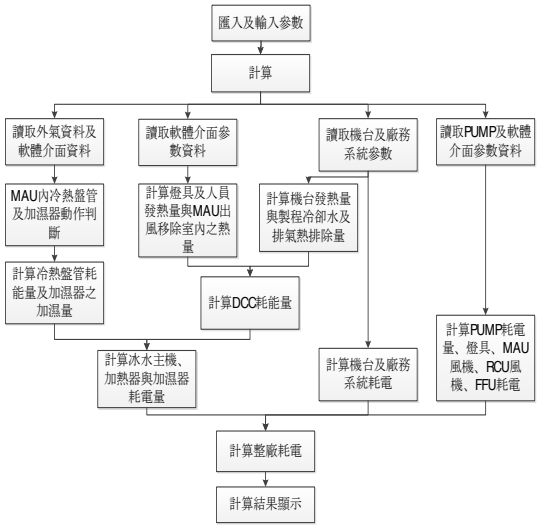


Energy Conversion Factor

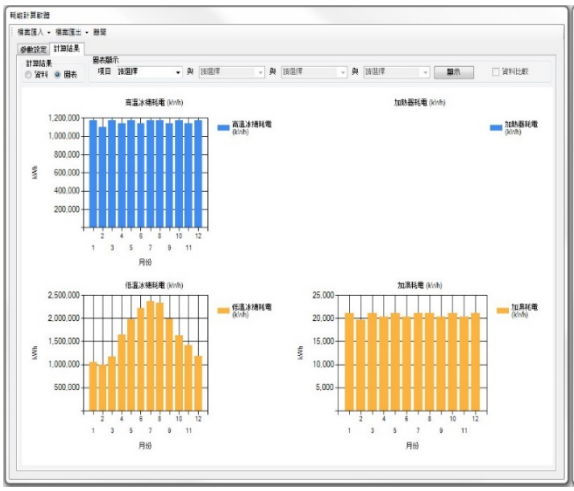
Item	ECF value	Unit	Operating conditions
Low Temperature Chiller	**0.1932**	(kW/kW)	Used in cooling coils of MAU
High Temperature Chiller	**0.1597**	(kW/kW)	Used in cooling coils of Dry Coils and PCW
high temperature heater	**0.0313**	(kW/kW)	Used for preheating and reheating coil in MAU
Compressed dry air	**0.1181**	(kWh/m^3)	Supply pressure: 6.5 kg/cm^2 (about 6.5*10^5 Pa)
FFU	**0.1361**	(kW/kW)	Class 10 Flow rate: 10,784,534 m^3/h
	0.1704	(kW/kW)	Class 100 Flow rate: 9,108,418 m^3/h
	0.1399	(kW/kW)	Class 1,000 Flow rate: 4,629,442 m^3/h
	0.0097	(kW/kW)	Class 10,000 Flow rate: 238,049 m^3/h
Make-up air	**0.0127**	(kWh/m^3)	Flow rate: 1,256,053 m^3/h
PCW	**0.9440**	(kWh/m^3)	Water cooled by refrigeration process. Supply Pressure: 5 kg/cm^2 (about 5*10^5 Pa)
General exhaust air	**0.0010**	(kWh/m^3)	Flow rate: 455,640 m^3/h
Alkaline exhaust air	**0.0007**	(kWh/m^3)	Flow rate: 208,070 m^3/h
Acid exhaust air	**0.0010**	(kWh/m^3)	Flow rate: 150,505 m^3/h
Flammability exhaust air	**0.0022**	(kWh/m^3)	Flow rate: 72,226 m^3/h
Solvent exhaust air	**0.0022**	(kWh/m^3)	Flow rate: 118,854 m^3/h

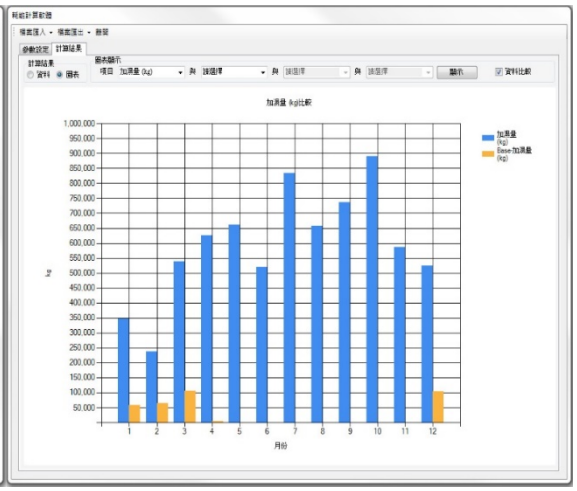
Data Input

Energy consumption analysis and energy saving research of high-tech factories



Energy Consumption Cal.





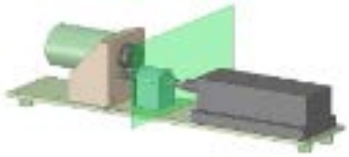
Analysis of energy saving effectiveness

Total solution on micro contamination for wafer AMHS

Wafer transportation system

Wafer box (FOUP) with gas purge diffusers

Laminar Air Curtain (LAC)



Airflow and Particle visualization system for large area application (L-PIV)

Wafer environment monitoring sensor system (wafer sense)

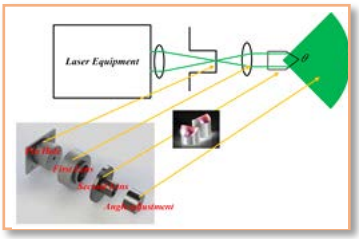
Full-Scale Fiber & Chemical Filter Test Rigs

Fiber Filter Test Rig

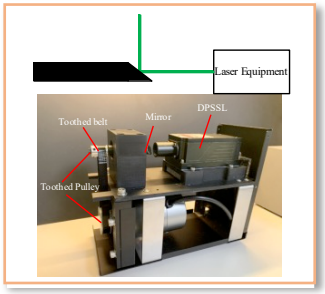
Loading Capacity testing system for EPA/ULPA

Full Scale Chemical Filter Test Rig.

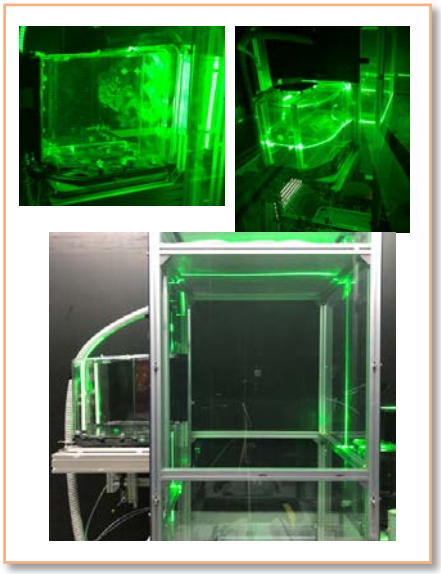
Large Scale Particle Image Velocimetry (L-PIV)



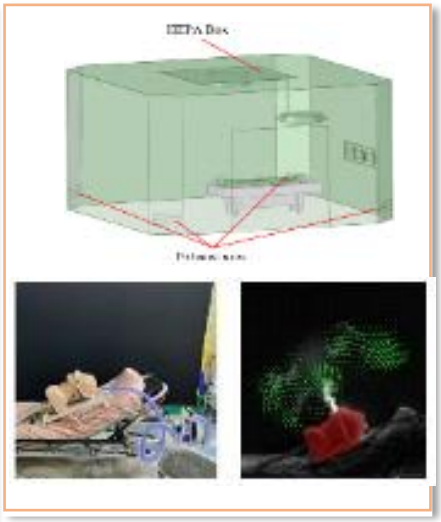
Gaussian Laser Beam



L-PIV system



Flow Visualization on FOUP by L-PIV



Flow Visualization on hospital operation theater and lung intubation by L-PIV