



**United
Technologies**

Building & Industrial Systems

智能低碳楼宇解决方案

翟超勤 博士

2014. 10. 23

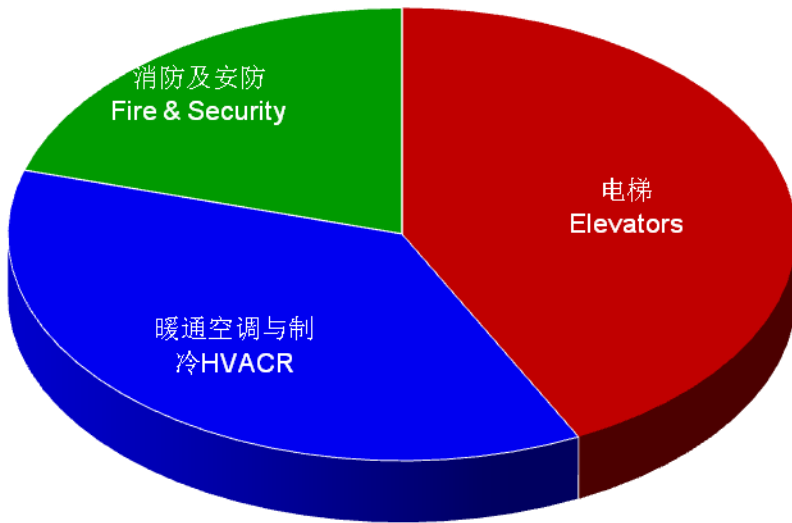
联合技术公司

高科技商业建筑及航空航天系统

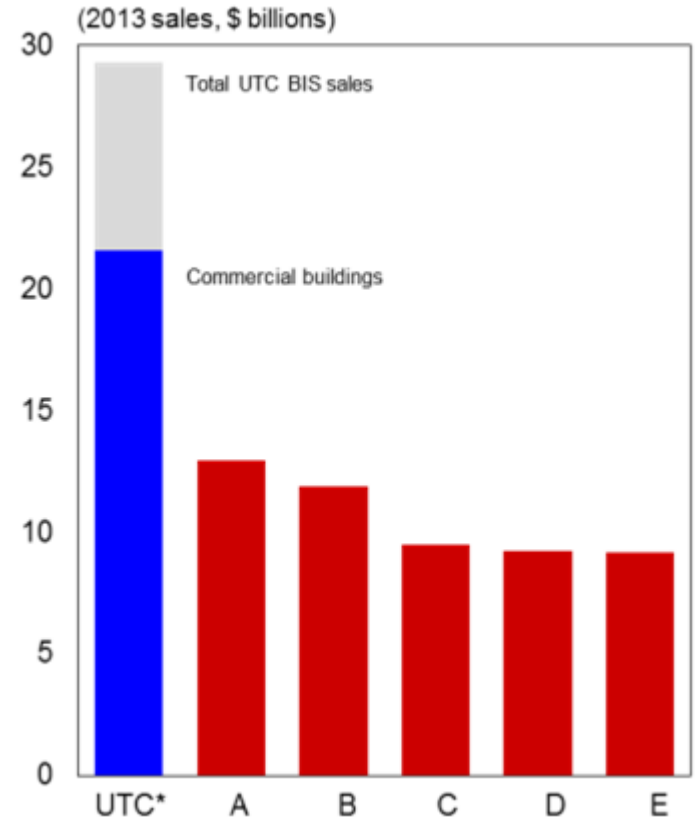


联合技术公司

建筑及工业系统



UTC Fire & Security
A United Technologies Company



建筑及工业系统BIS

广泛的产品及服务

电梯/扶梯



垂直电梯



扶梯

空调/冷冻



家用空调



商用空调



商业冷冻

消防/灭火



消防报警



消防早期检测报警



气体和细水雾灭火

安防系统



门禁系统



视频监控



防侵入系统

控制/安装/服务



电梯



空调冷冻



消防



安防

建筑及工业系统BIS

创新的传承

1818

Jeremiah Chubb patented the first detector lock



1853

Elisha Graves Otis founded the Otis Elevator Company and sold the first elevator



1881

Robert Edwards patented the first electric alarm bell



1902

Willis Carrier developed and later patented the first modern air conditioning system



1917

Walter Kidde Company founded. Later produced the first integrated smoke detection and carbon dioxide extinguishing system



建筑及工业系统BIS

行业各领域的领导者

Otis

天津117金融中心
将会安装57台奥的斯高效节能的
Gen2®-MRL 电梯，回收能源后并
网再用。该建筑建成后将会是
中国第一高楼。



Carrier



上海国金中心
采用了开利空调的设备和先进冷站
控制系统，实现每年节电25%，每
年节省金额达到1000万元人民币。
该先进冷站控制系统具有自学习、
自适应及预测负荷等功能。

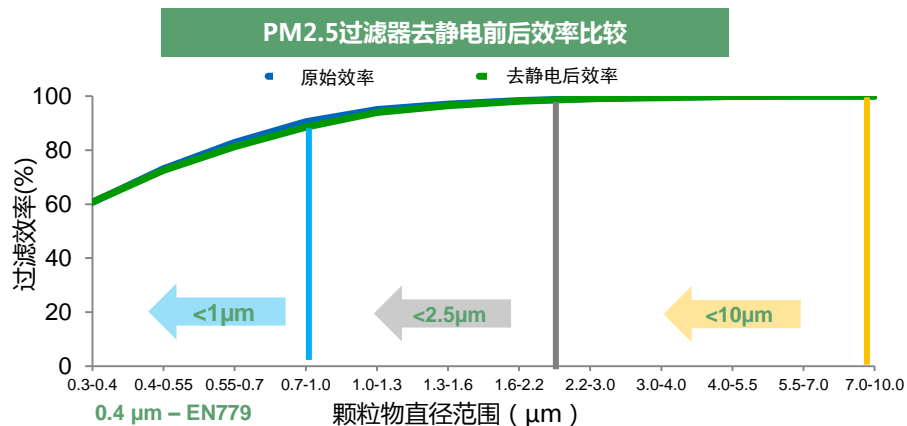
EMSI

北京中国尊
通过与EMSI的合作实现了18%
的节能量 (和 ASHRAE标准比
较)。手段是建筑围挡、幕墙
优化、节能设计咨询和支持等
服务。



建筑节能

节能产品



GEN2



复合钢带 Belt



主机 Machine



再生能源变频器 ReGen



LED节能 LED

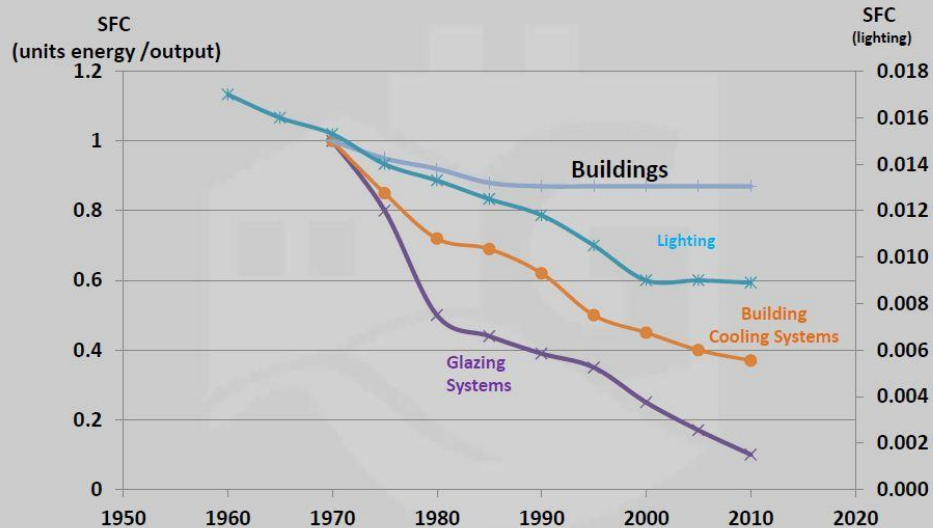
建筑能效提升

系统能效是关键

Building System Energy Efficiency Improvements

Lagging Building Components

建筑整体能效的提升滞后于单项建筑部件性能的进步



Building Sector Accounts for :
40% of Total U.S. Prime Energy Expended
70% of all U.S. Electric Energy Use

1. 系统解决方案
2. 集成化设计
3. 系统综合调试

3/22/2011

© GPIC for Energy-Efficient Buildings

Slide 9

系统集成

先科方案中心



垂直市场
解决方案



Hotel



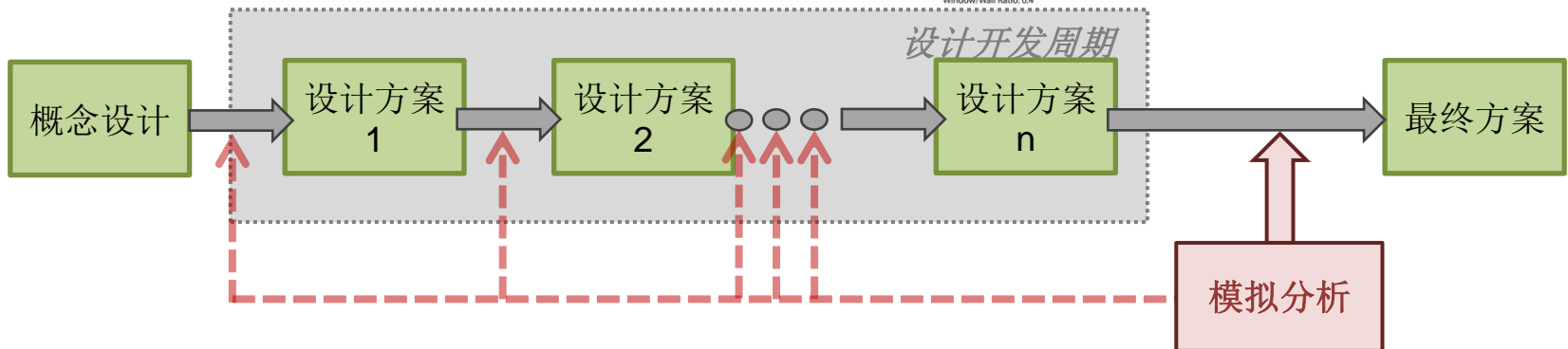
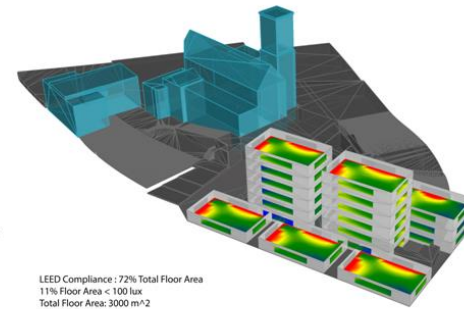
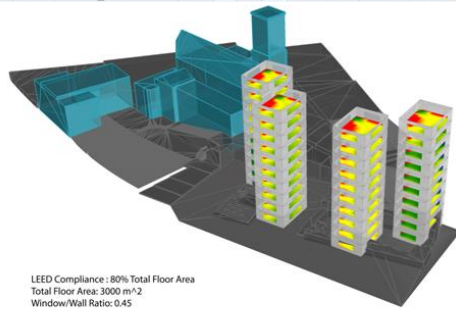
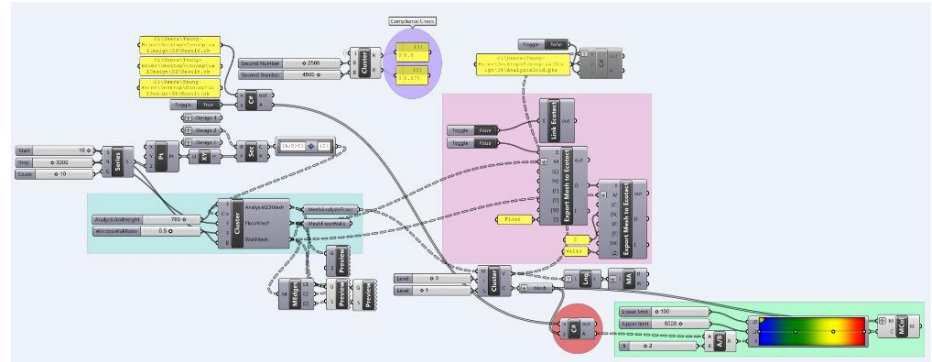
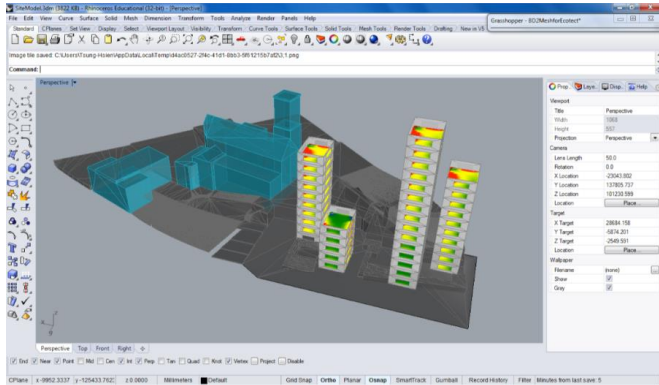
Data Center

定制化
系统解
决方案



集成化设计

EMSI



智能建筑，智慧城市

转变城市发展模式

智能建筑，智慧城市： 转变城市发展模式

第 9 届重庆市市长年度会议
国际经济顾问委员会
2014年9月21日

联合技术公司建筑及工业系统

Smart Buildings, Smart City: Transforming the Urban Growth Model

9th Annual Chongqing Mayor's International Economic Advisory Council
September 21, 2014

Prepared by United Technologies Building & Industrial Systems

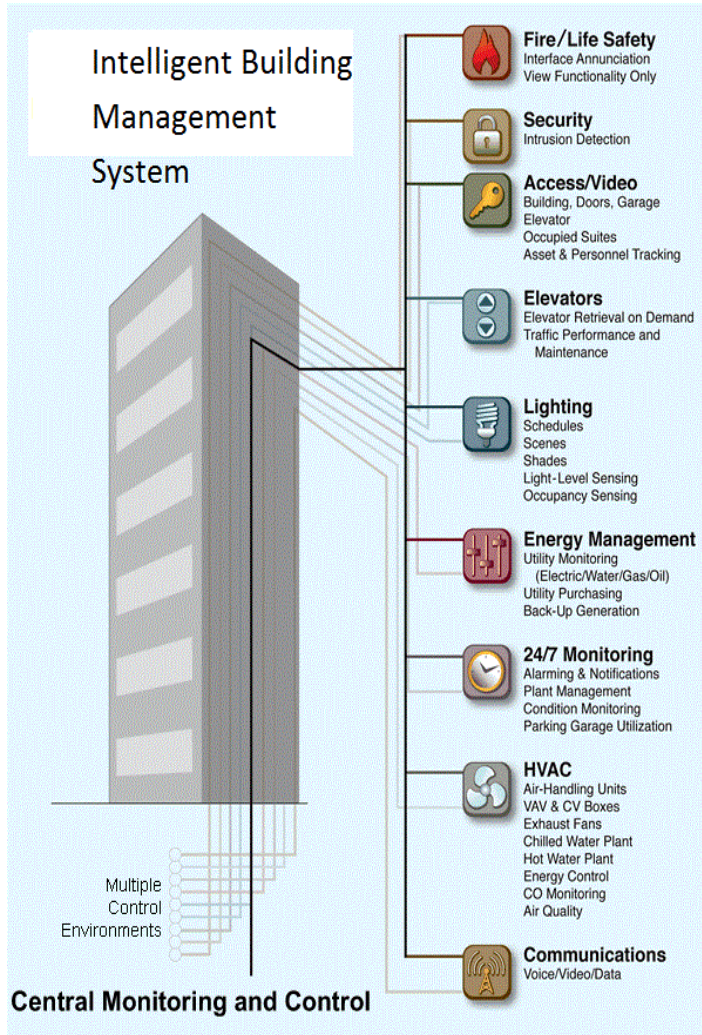
IBMS智能楼宇管理系统

系统集成

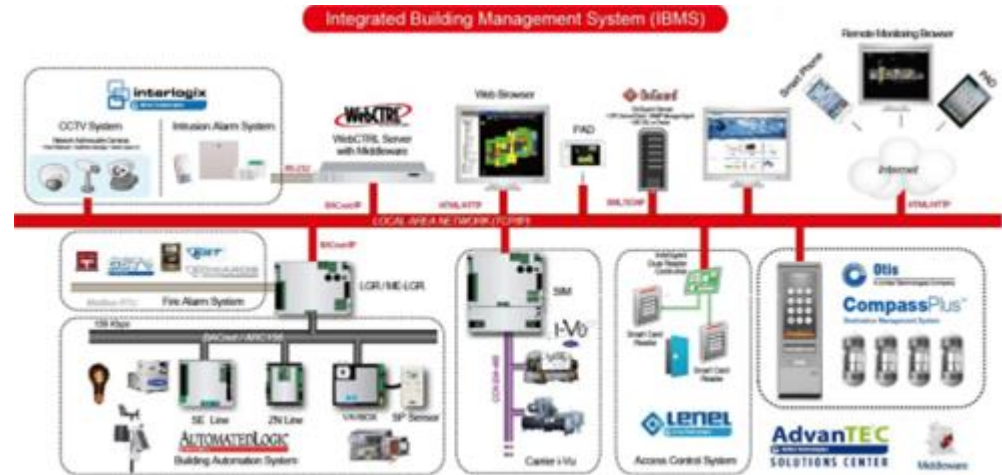


IBMS智能楼宇管理系统

优化建筑运行



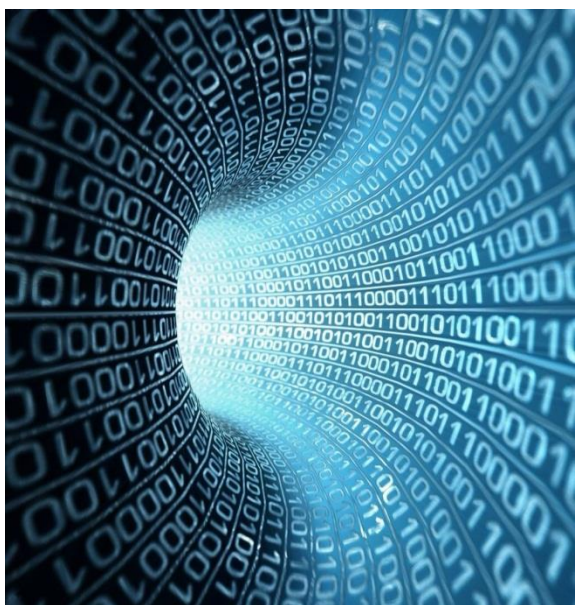
Energy Efficiency 能源效率
Operational Efficiency 运营效率
Customer Experience 客户体验



IBMS智能楼宇管理系统

智能信息系统

数据？



不同子系统产生的海量
数据

或

信息？



易于理解或决策的系
统信息

IBMS智能楼宇管理系统

智能建筑

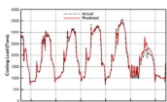
能耗最佳化 – 监控摄像、暖通空调、电力、网络
Energy optimization - video, HVAC, power, internet



天气
Weather



监控摄像
Video



历史数据
History

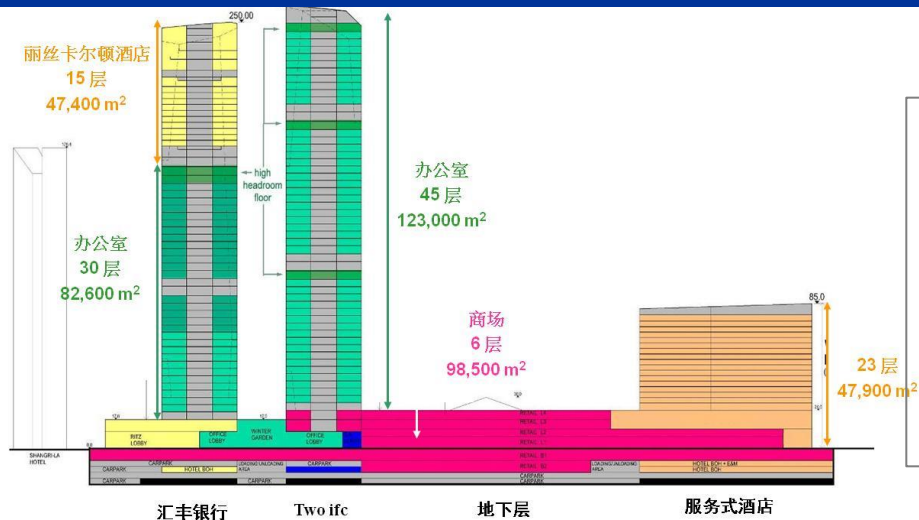
以入住率为依据的负载量预测及最佳化
Occupancy based load prediction and optimization

强化电梯轿厢管理 – 监控摄像 + 电梯
Smart Elevator Management- video + elevators

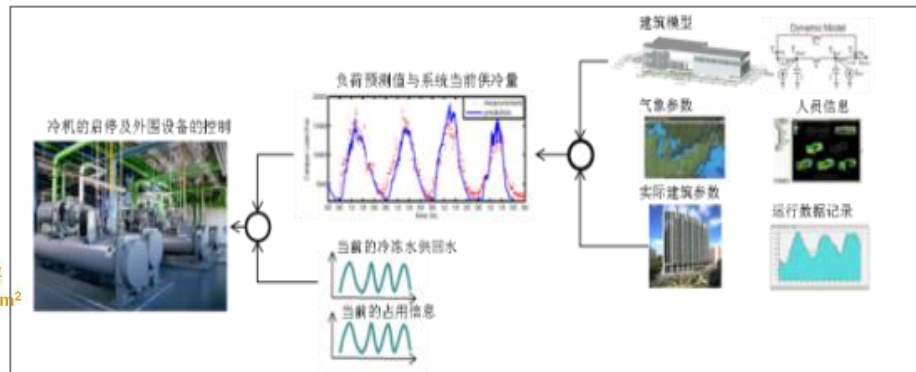


智能低碳

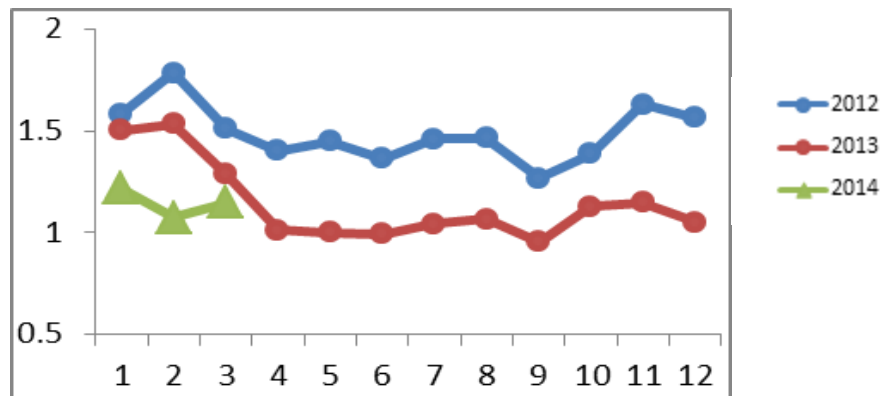
制冷站优化控制



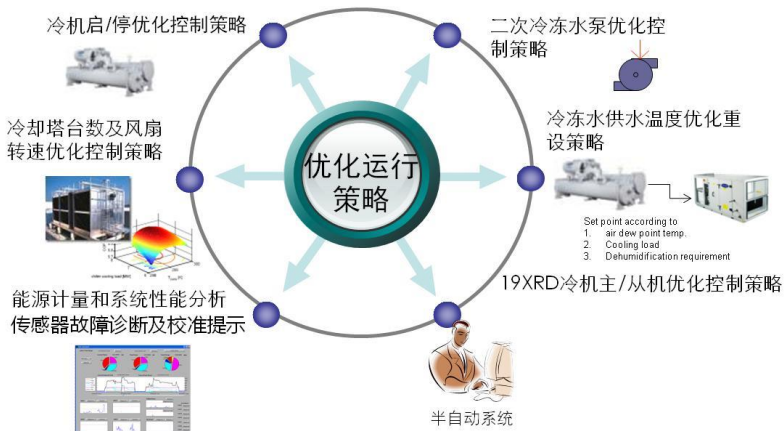
基于负荷预测的冷站优化控制



冷站系统运行效率 (kW/RT, 实测值)

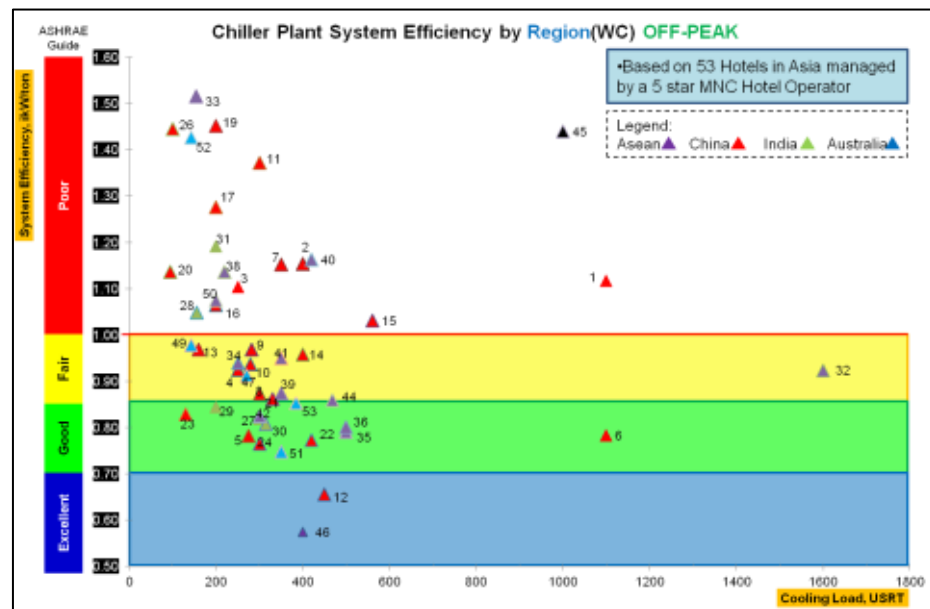
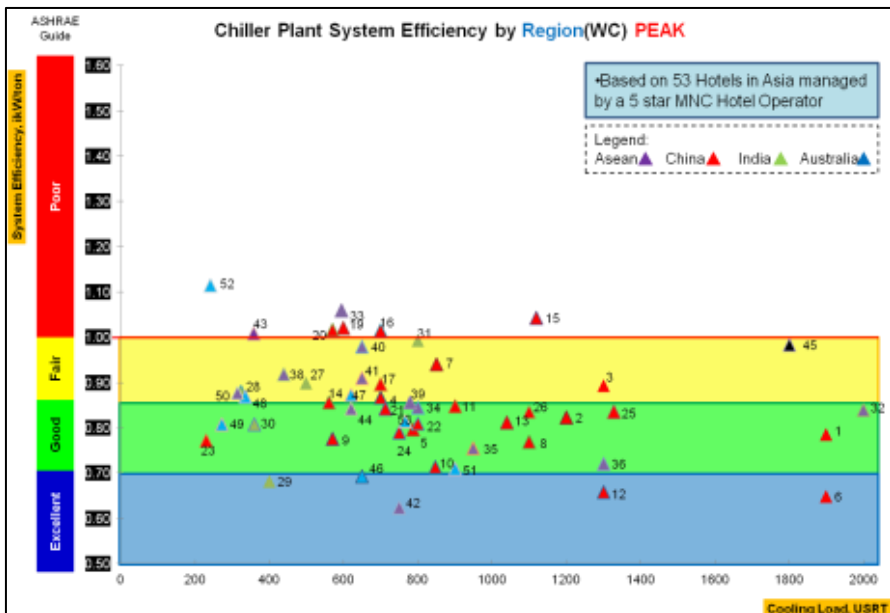


2013年节约1000万RMB

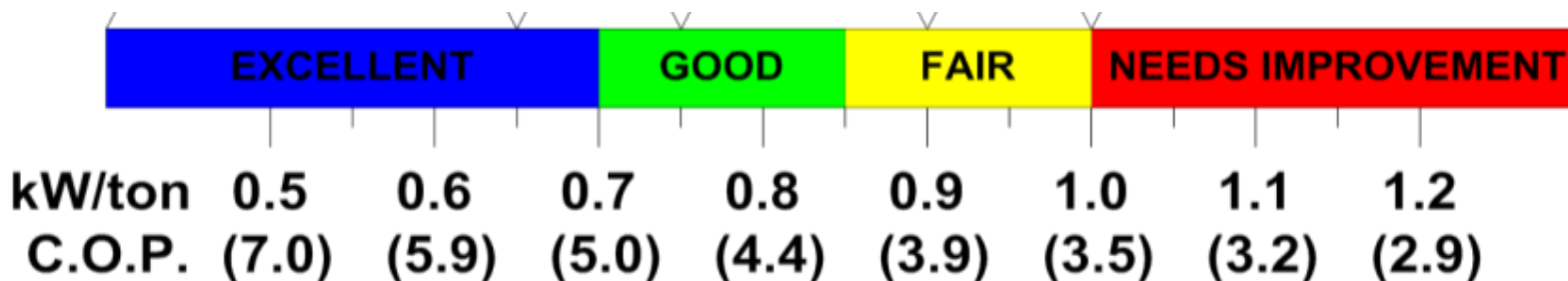


制冷站优化控制系统

制冷站效率调研

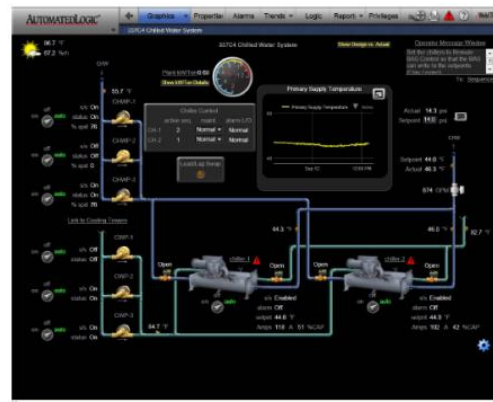
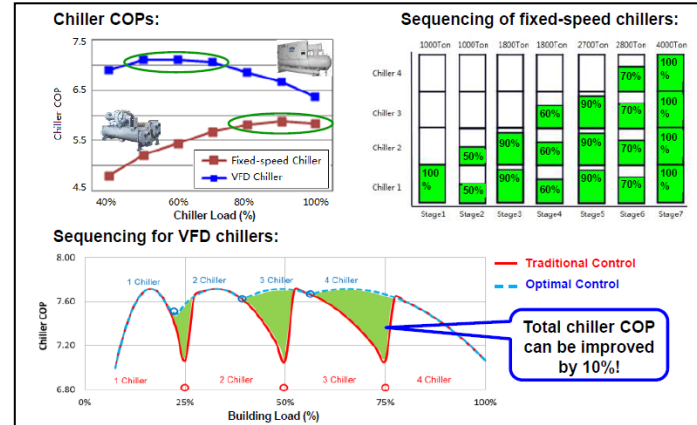
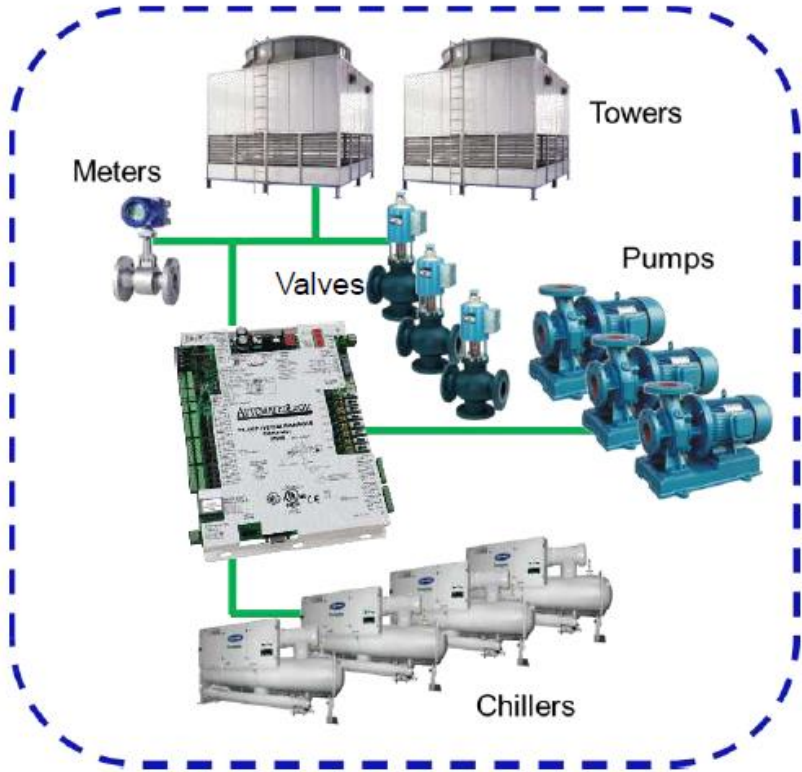


Legend: ▲ Asean ▲ China ▲ India ▲ Australasia



制冷站优化控制系统


开利PSM



制冷站优化控制系统

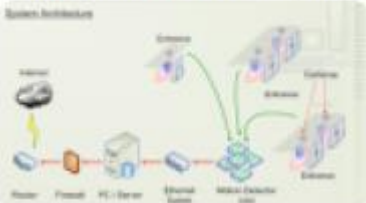
视频分析应用

Weather Station




Pyranometer (Solar irradiation)

Measurement of Occupancy Rate

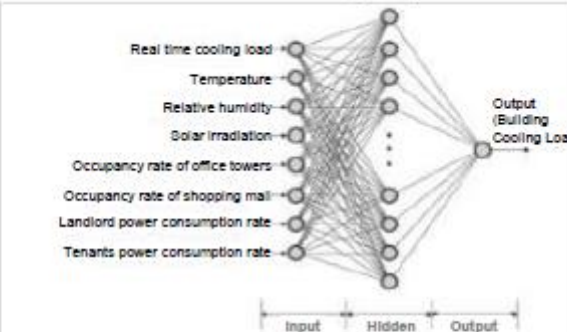


People Counting System at Shopping Mall



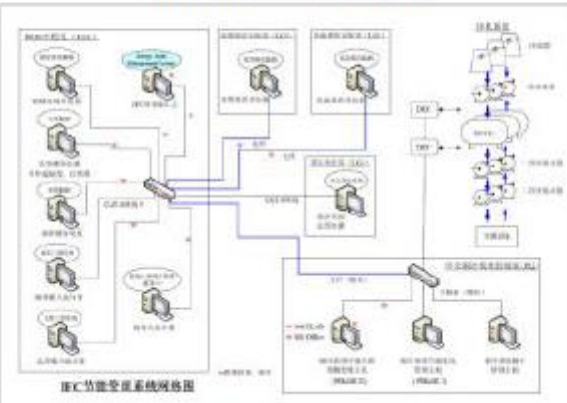
Turnstiles at Office Lift Lobbies

Artificial Neural Network (ANN) Model*



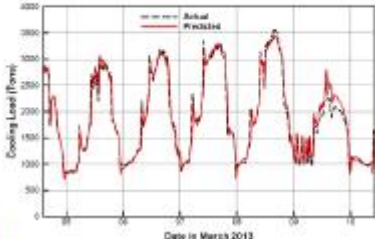
* ANN core model by City University of Hong Kong

Network Configuration



IFC 智慧楼宇系统网络图


Ahead Prediction of Cooling Load



Test results:
Error within 5% for working days

↓

Chiller Plant Control Optimization

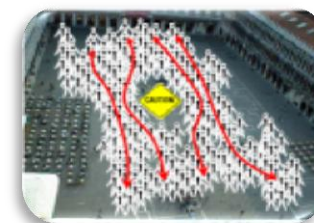
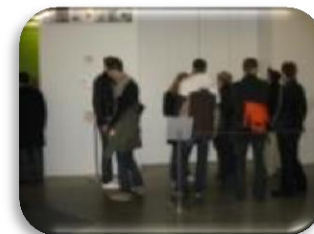
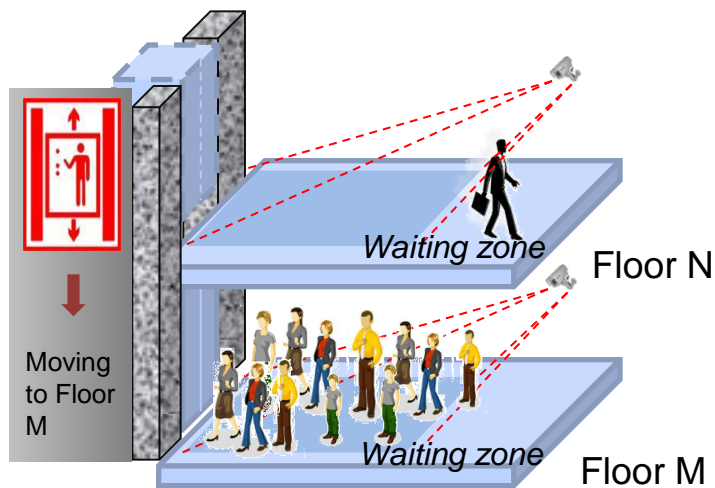


智能体验

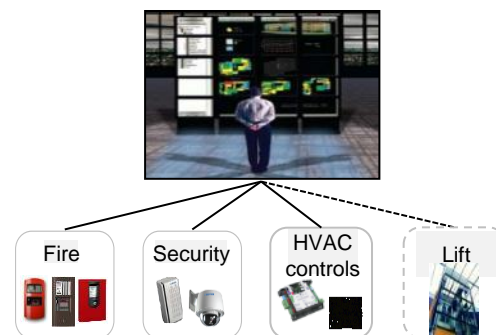
优化用户体验，提升运营效率



广交会Westin酒店

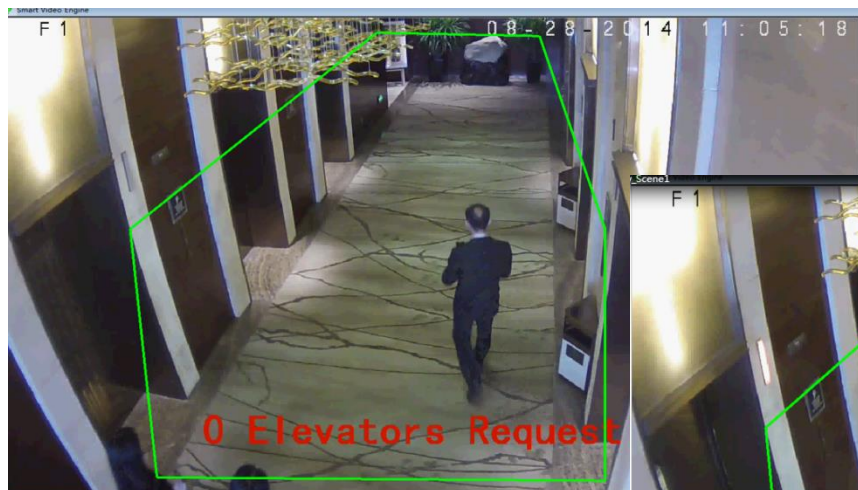


香港iSQUARE



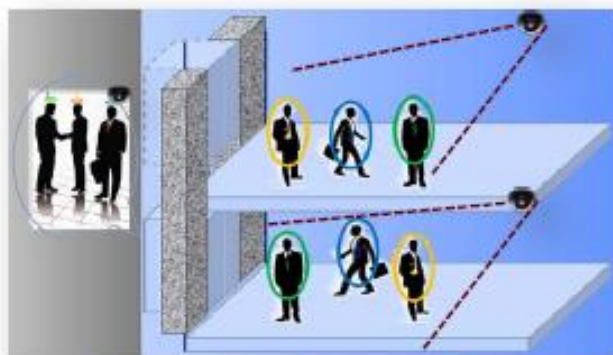
智能体验

优化用户体验，提升物业价值



智能体验

优化用户体验，提升物业价值



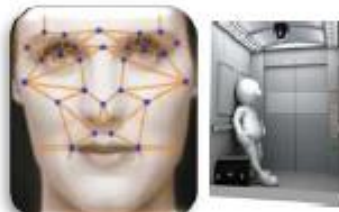
Video Analytics Solutions



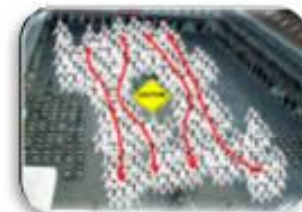
In-car
Occupancy Estimation
(Sensor Fusion w/ Load Sensor)



People Counting/
Crowd Sensing



VIP
Face Recognition



Daily Flow Pattern
Estimation and Prediction



Sensor Fusion/Replacement
(Door reversal/speed)



Special Boarding Detection



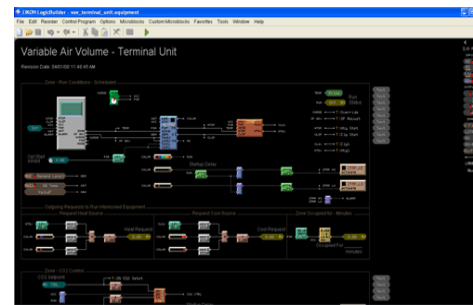
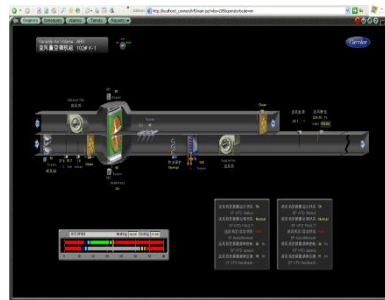
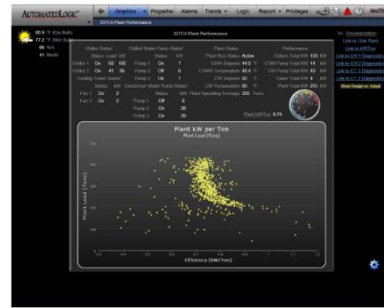
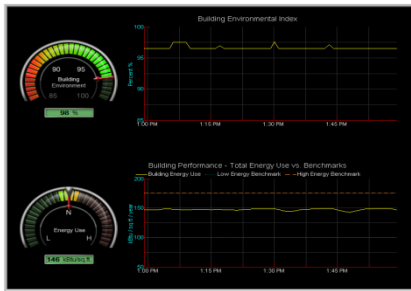
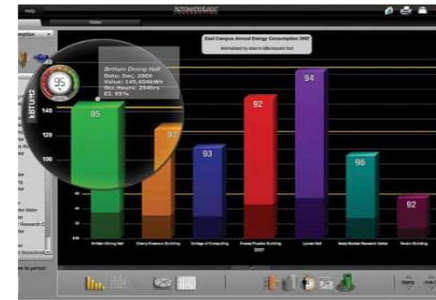
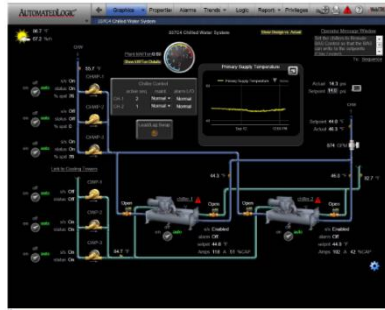
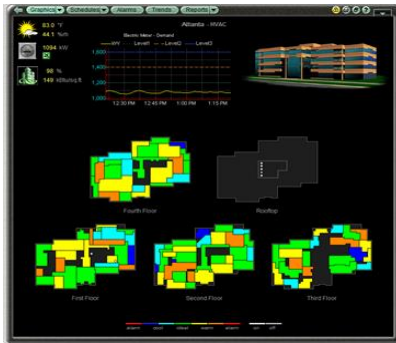
Trapped Passenger Detection



In-car
Violence/Vandalism Detection

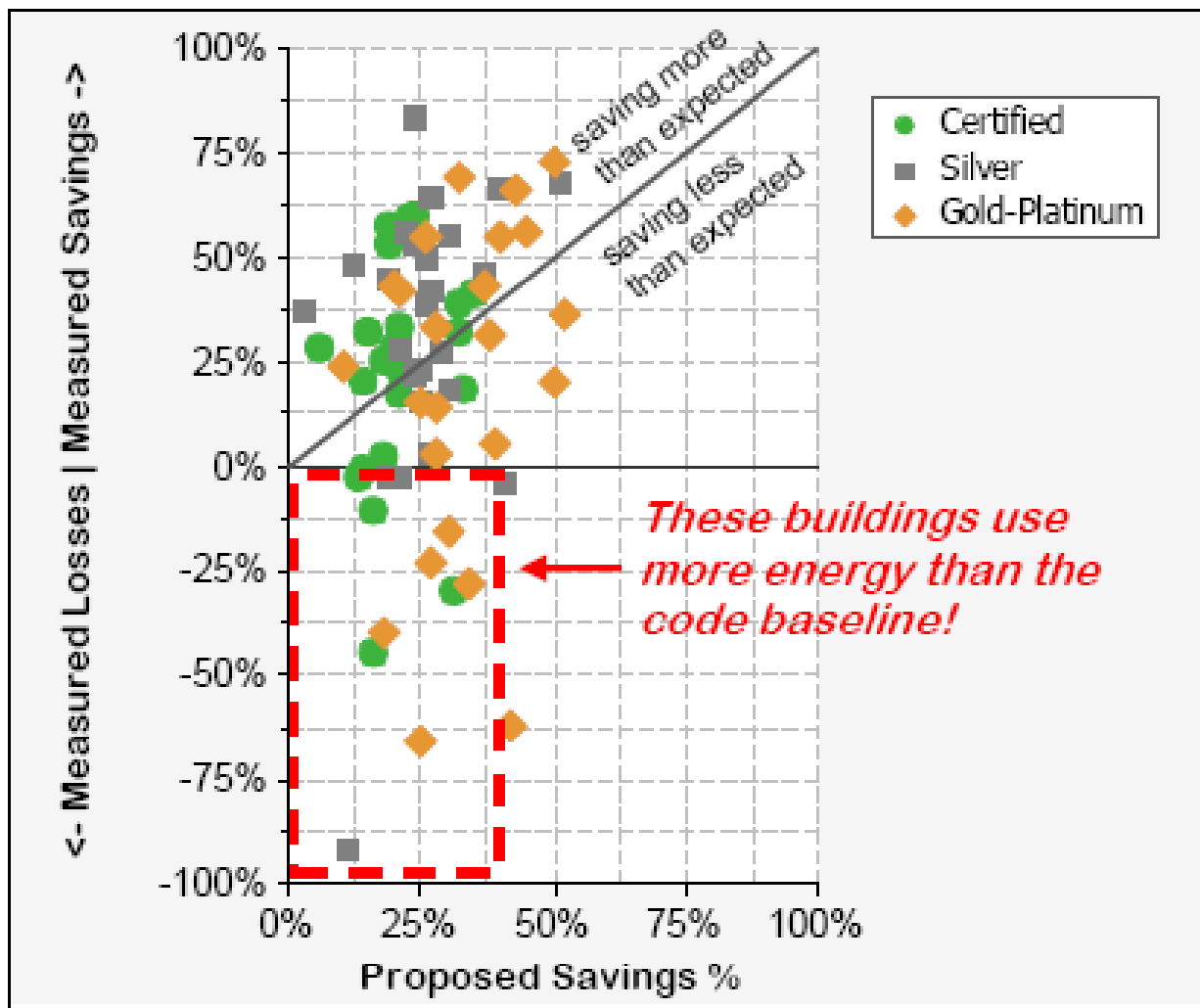
智能管理

优化物业运营，提升管理水平



系统调试

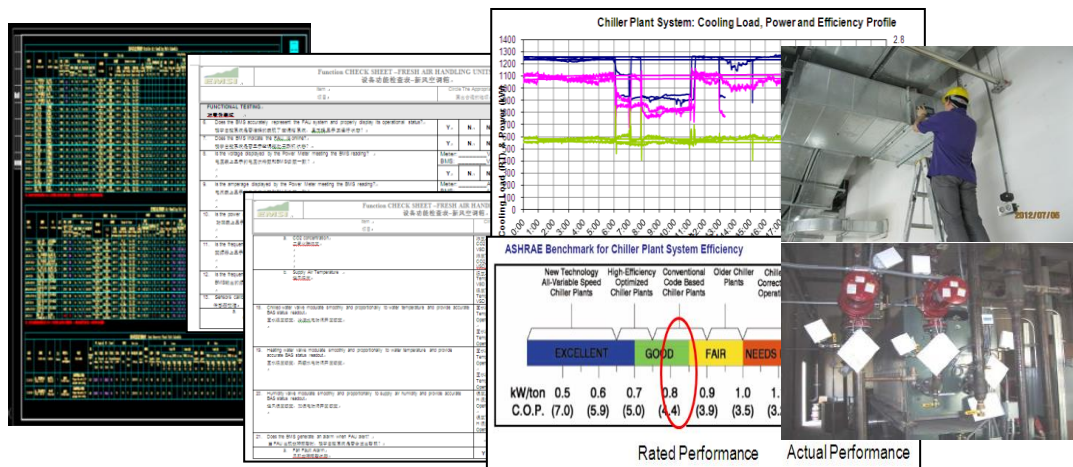
有效衔接设计与运行



系统调试

有效衔接设计与运行

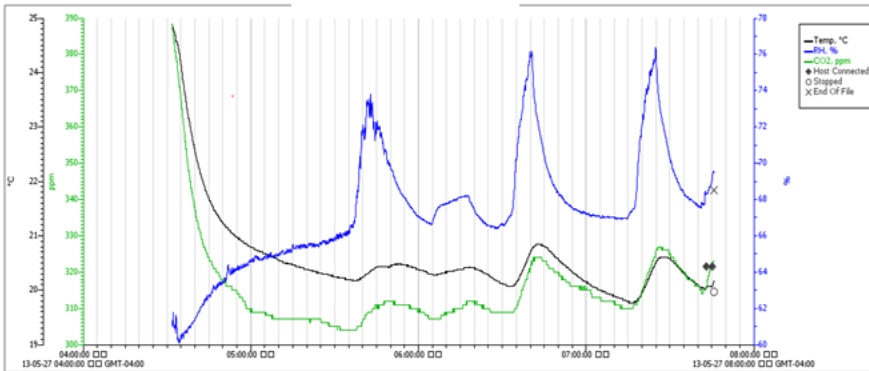
全系统调试
 全过程服务
 功能和性能并重



设计审核 → 调试计划 → 现场测试与诊断 → 性能优化

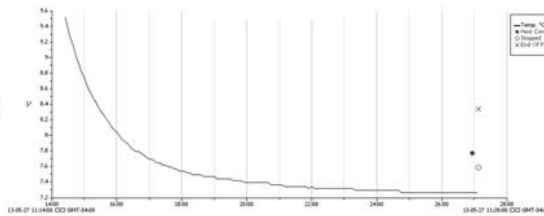
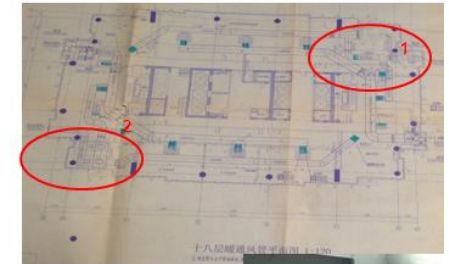
系统调试

有效衔接设计与运行

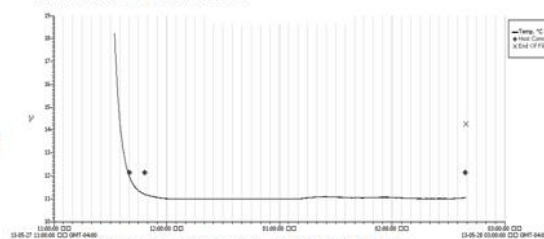


When room temperature reaches setpoint, the valve of the chilled water line is closed. However the supply fan is still running, so the relative humidity rises.

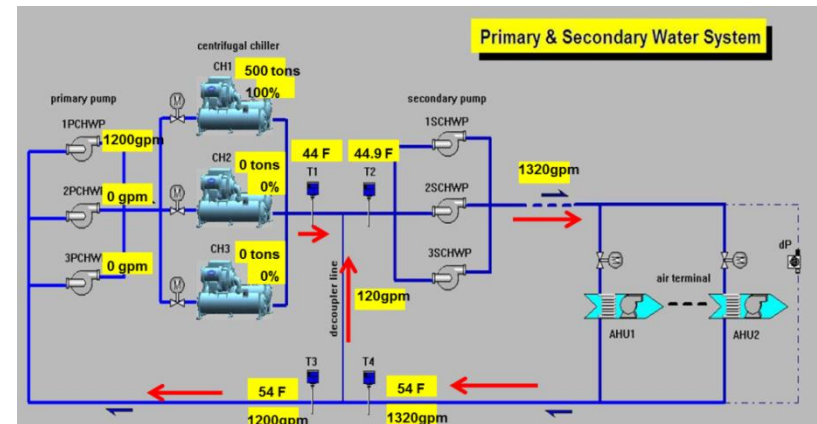
	PAU2 新风机2	PAU1 新风机1	Branch 1 支路1	Branch 2 支路2
Airflowrate (m/s) 空气流量	6	3	1.28	
	6.1	2.7	1.07	
	6.3	3.5	1.08	
	5.8	3.86	1.97	
	5.9	3.38	1.78	
	6.1	4.12	1.9	
	6.4	3.85	1.61	
	6.2	2.7	1.5	
	6.7	2.9	1.35	
	5.8	4.28	2.12	
6.4	3.57	2.11		
6.5	2.77	2		
Average(m/s) 平均值	6.183333	3.410833	1.6475	
Area(m ²) 面积	0.48	0.48	0.3	
Flow(m ³ /h) 流量	10684.8	5893.92	1779.3	
Sum(m ³ /h) 总和	10684.8	7673.22		
Design flow(m ³ /h) 设计流量	18500	18500		
% Difference 实际与设计偏差	42.2%	58.5%		



Main chilled water supply temperature test.
冷冻水主要供水管路的温度测试



Decoupler line temperature test. 旁通管中水流的测试



分析工具

快速响应

ENERGY MANAGEMENT

Chiller standard monitoring interface

Energy consumption monitoring system

Power meter monitoring interface

Optimization suggestion interface

Carrier AdvantEC

OFFLINE DATA ANALYSIS

Chiller Plant System Offline Data Analysis

Functions:

- ✓ Record history data which can be used for system energy analysis and chart plotting (Offline Data Analysis Tool)
- ✓ Record operators' actions which can be used for cause checking and performance feedback.

Carrier AdvantEC

CPM EVALUATION TOOL

Make system proposal

- Evaluate whole-system performance and demonstrate the energy saving potential by different optimized control strategies.
- Help educate clients about the chiller systems through the use of graphics and tabular reports showing how their specific chiller system performs.
- Compare annual energy costs of competing systems or equipment designs.

Phase I Preview all optimized control strategies

Phase II Choose Retrofit control strategies

Choose the most energy-saving strategies as CPM retrofit project and re-calculate

Carrier AdvantEC

DATA MINING FOR OPPORTUNITIES

Coiling tower approach temperature is high which causes the decrease of chiller efficiency. Use optimized coiling tower control strategy.

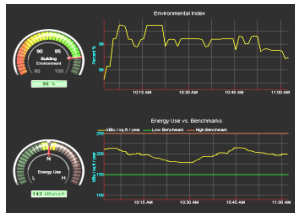
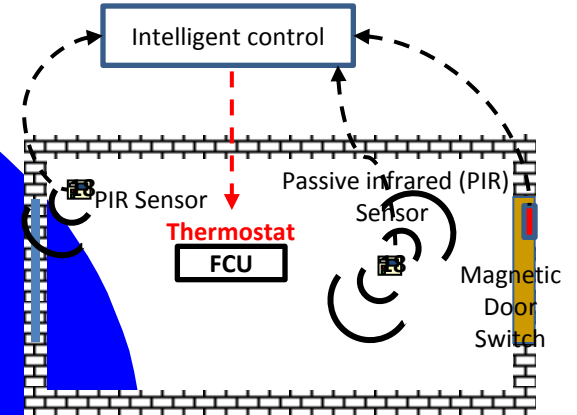
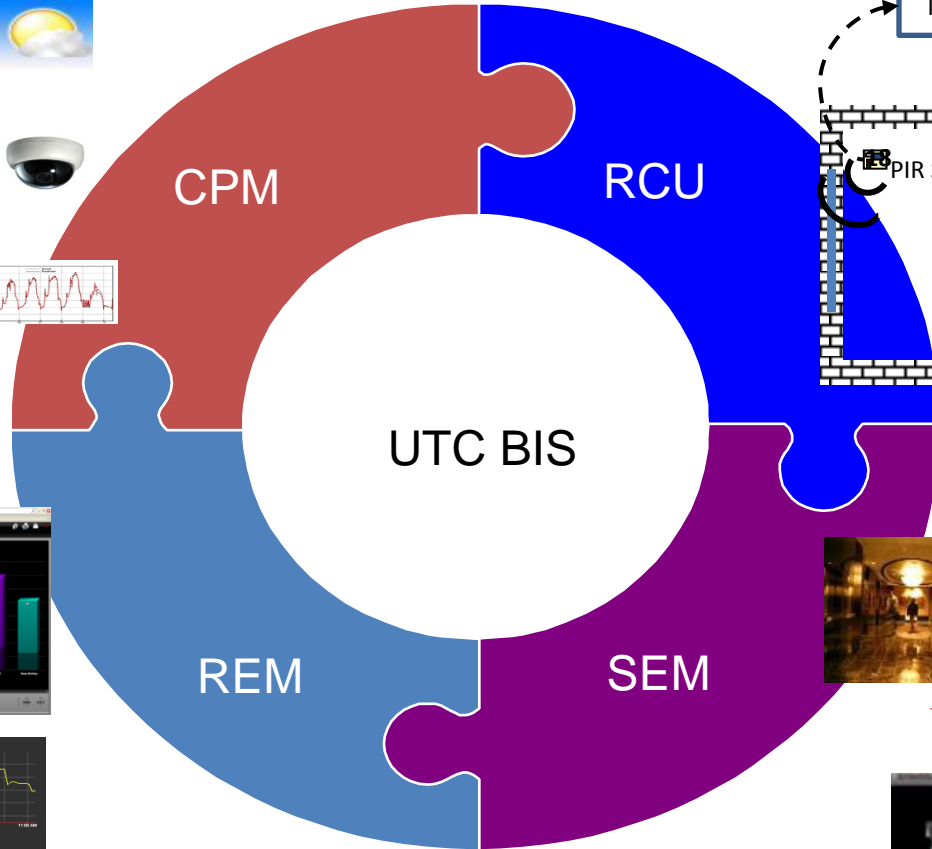
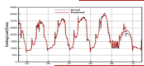
Unreasonable bypass flow before coiling tower which causes the increase of CT fan and chiller power consumption. Check bypass valve and its control.

Data mining tools provide prognostic & energy saving opportunities

Carrier AdvantEC

与大家携手

体验幸福+示范低碳+展现智慧





United Technologies

Building & Industrial Systems