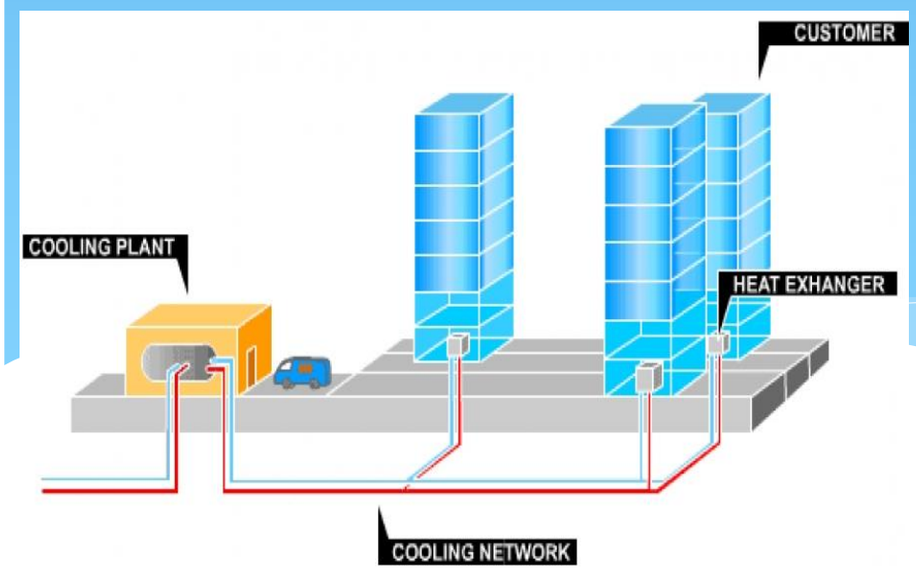
Intelligent Delta-T Analyzer and Detector

Being resilient to support increasing energy demand is district cooling's battle-cry in order to deliver the needs of the customer. Empower is keen to develop, implement continuous improvement programs so as to maximize served energy. One of the innovations implemented is system called **IDTAD** "**I**ntelligent **D**elta-**T** **A**nalyzer and **D**etector" which aims to mitigate all the energy losses and identify individual consumption. The system aimed to maintain major Key Performance Indicators **(KPI)** such Energy Savings, Improved Plant Efficiency, Transmission Loss and Carbon Footprints and Cost Savings. With this, Empower was able to optimize plant production from Empower side and achieved customer satisfaction by minimizing energy losses, efficient consumption and attain the almost ideal cooling load design of the building.

Empower Cooling Dubai



1.43 Million RT

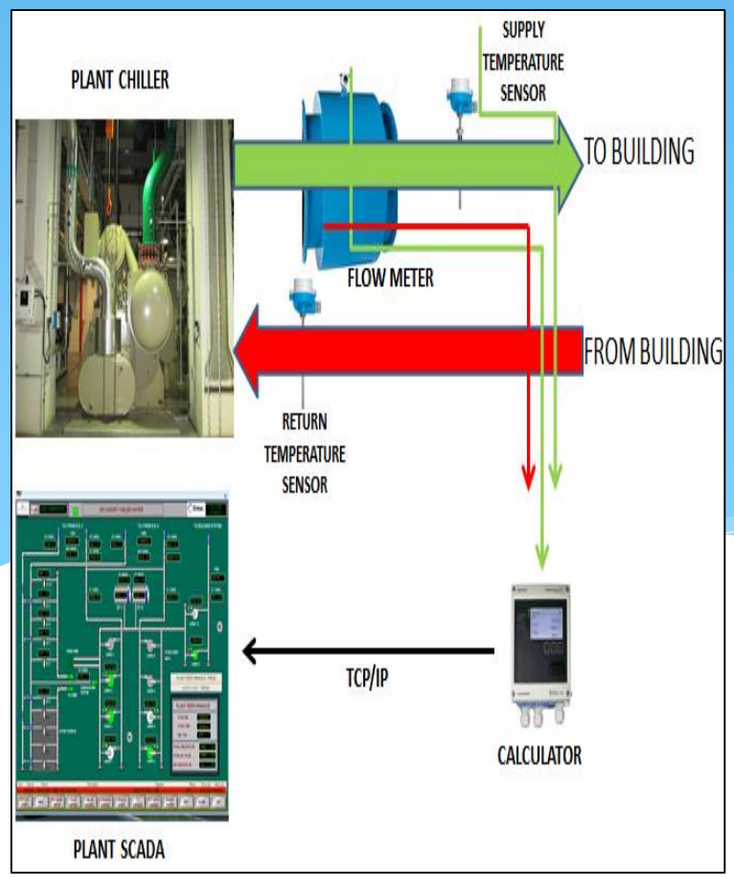
100,000 customers

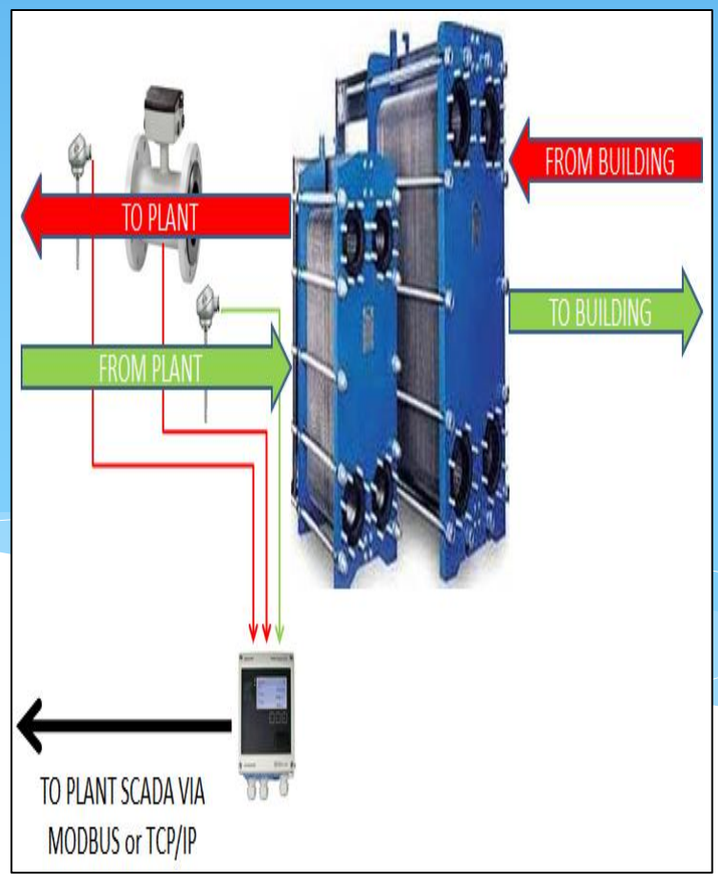
Empower Meter Categories

PLANTMETER – plant production

BULKMETER – building consumption

SUBMETER – apartment consumption



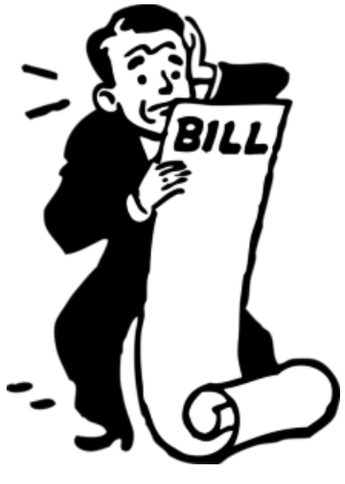


Challenges In Handling Growing Customer Demands

Resource Management

Cooling Complaint

High Bill



Less Customer Satisfaction

How to Solve the Problem?

Fact finding

Innovation thru unique and customized smart system

IDTAD Project Implementation

INTELLIGENT

DELTA-T

ANALYZER &

DETECTOR

Conceptual Model

Plant Operation

- Plant Efficiency Monitoring

Transmission Loss Monitor

- Plant and ETS Temperature Comparison

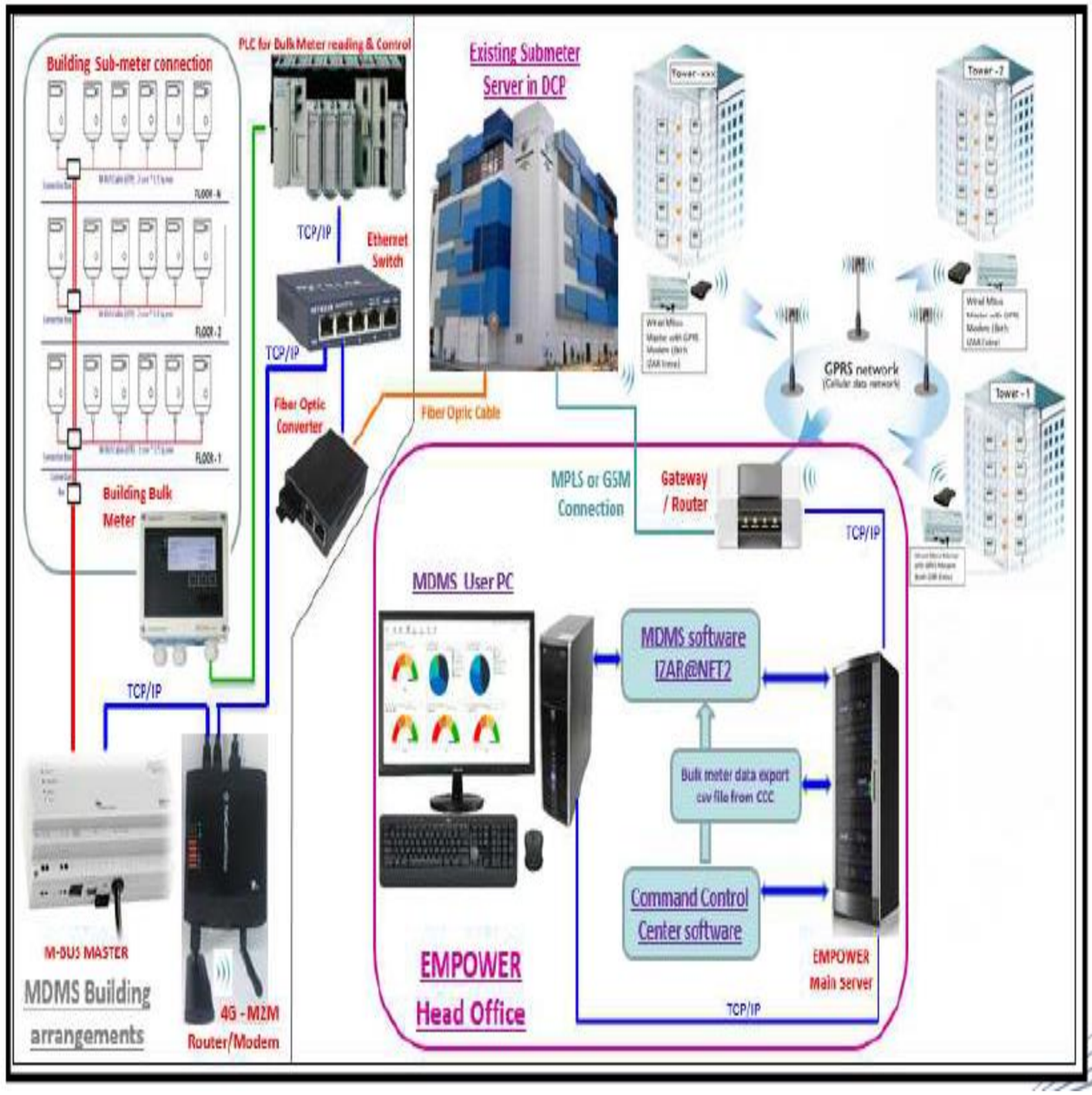
ETS Operations

- Low Consumption
- ETS Automation

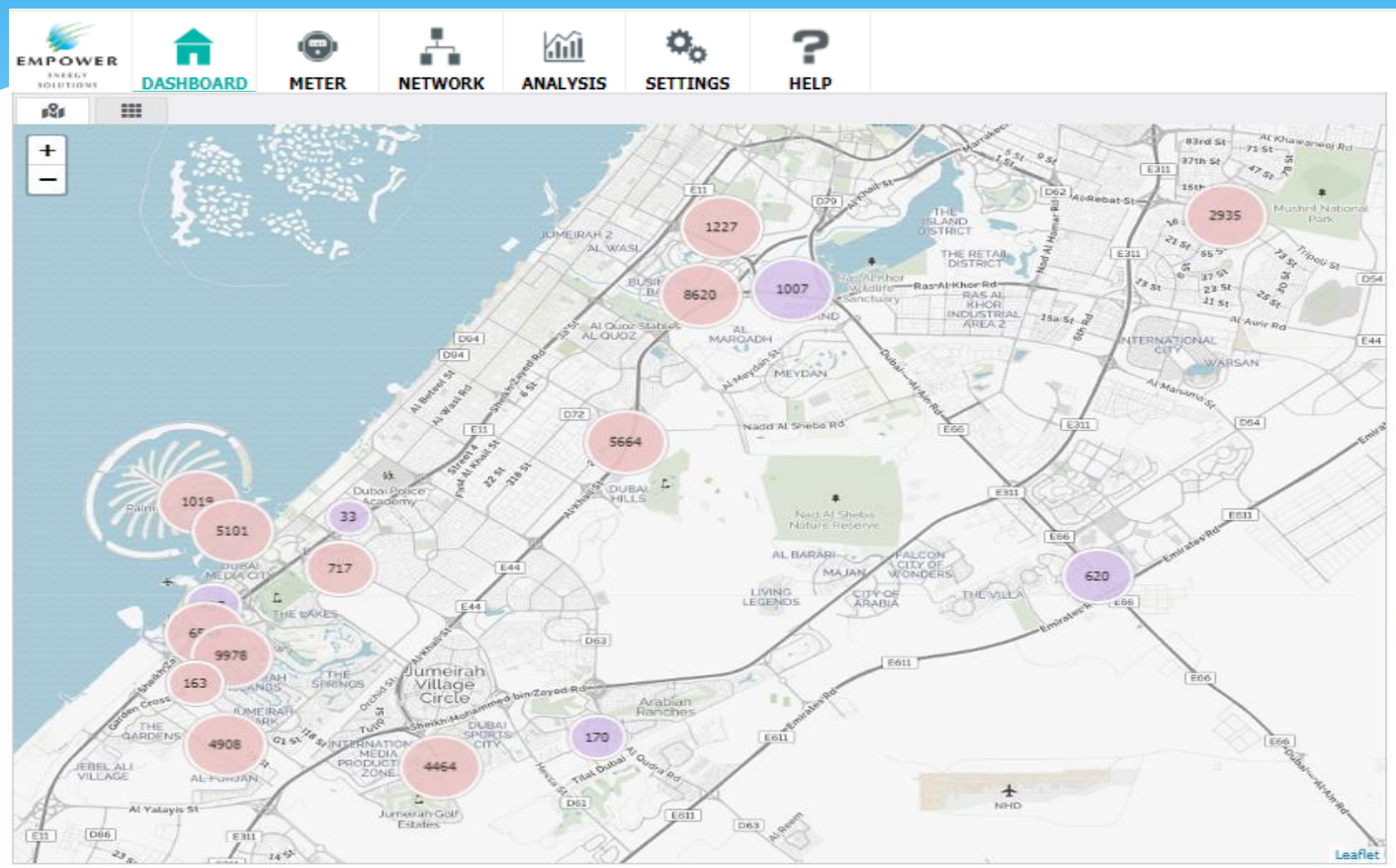
Apartment Consumption

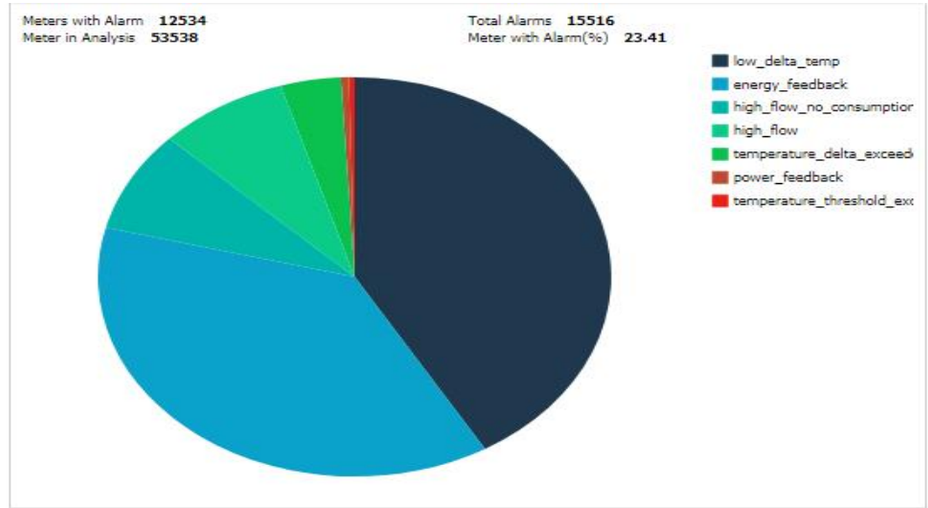
- Faulty FCU Actuator Cases
- Low Cooling
- Flow Balancing

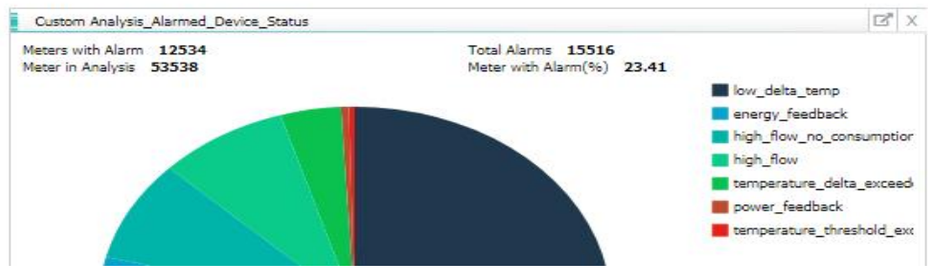
Hardware Architecture

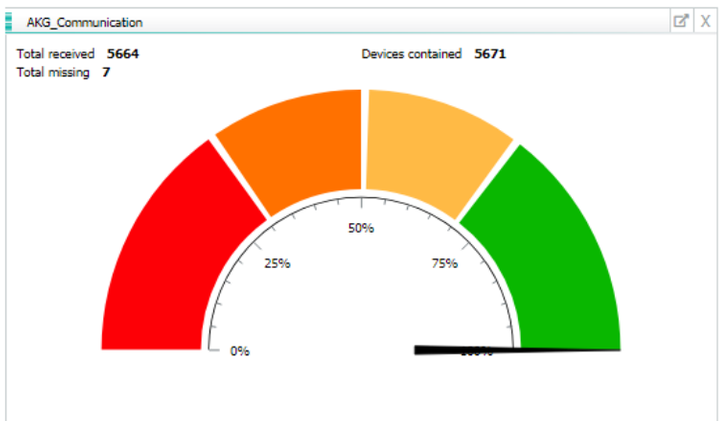


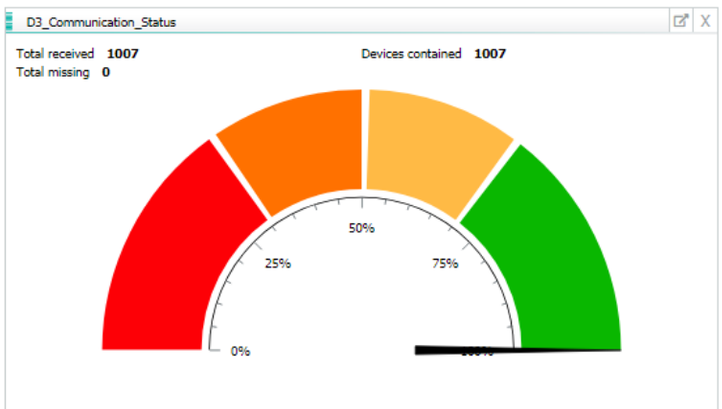
How It Looks Like?









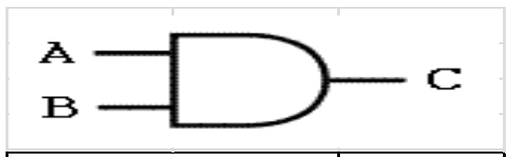


- Remote connection of all meters
- 24/7 reading availability
- Auto-analysis and Fault Detection

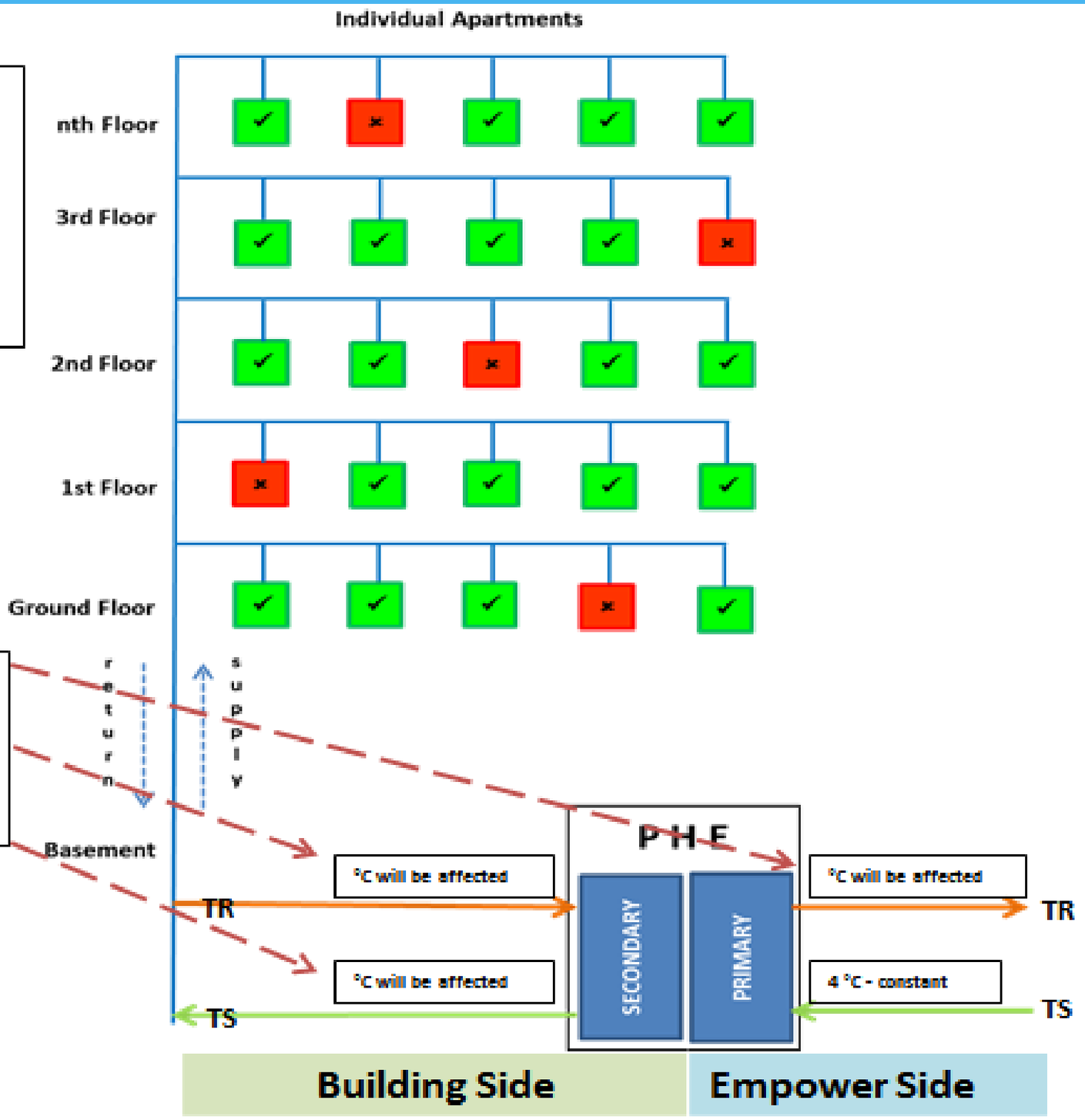
Applied Logics to Detect Delta-T

- Passing actuator valve will be rectified
- Building FM will be notified for those cases
- Will result to better flow balancing and improving delta T.

Since there are some passing FCU actuators, the flow balancing will be affected resulting in low delta T issue.

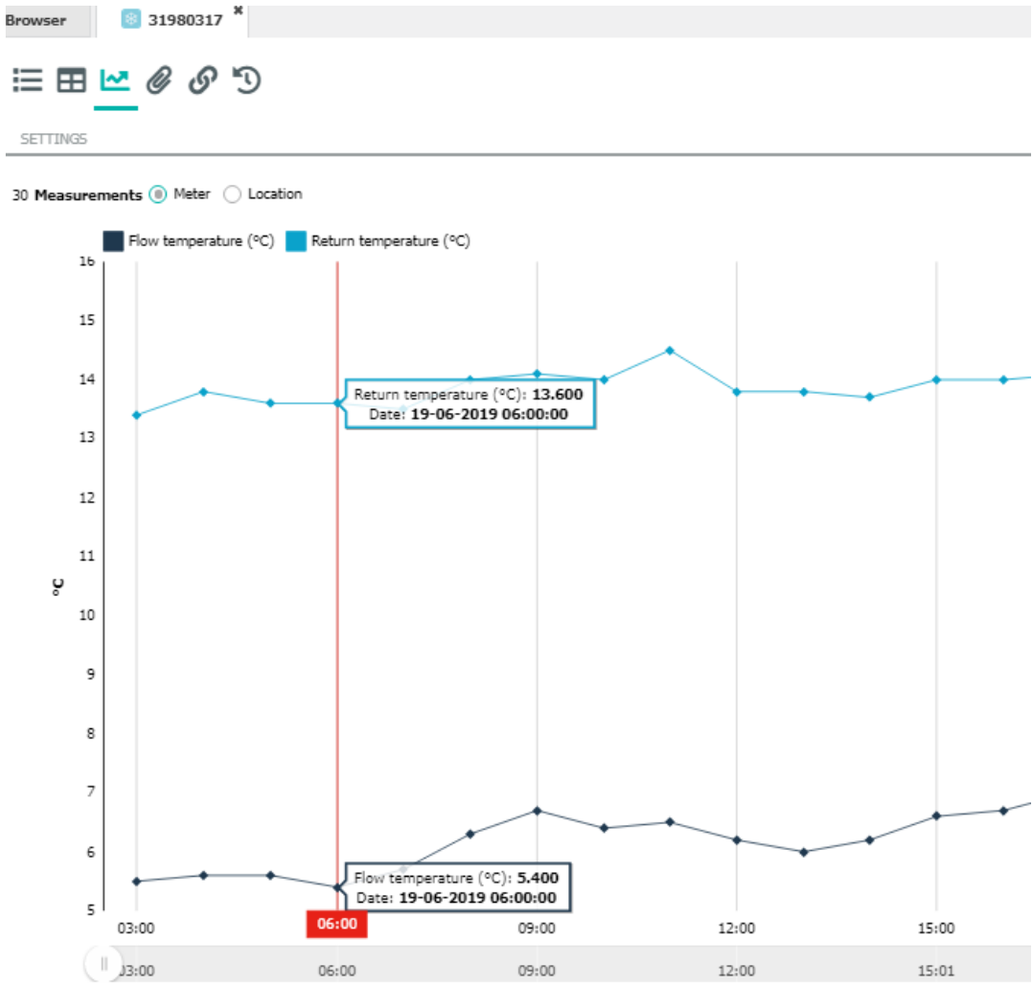


INPUTS		OUTPUT
A / FLOW	B / DELTA T	C / POWER
0	0	0
0	1	0
1	0	0
1	1	1

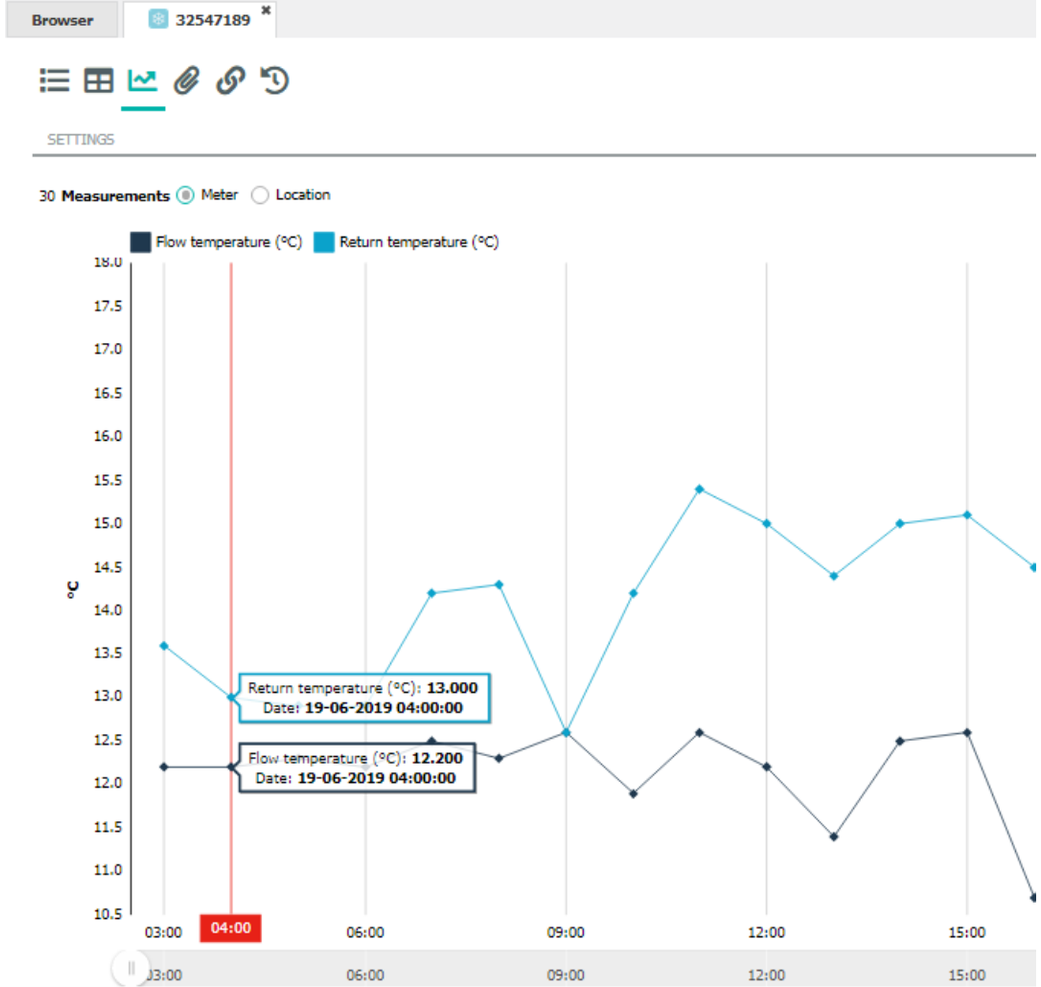


ΔT Detection Thru IDTAD

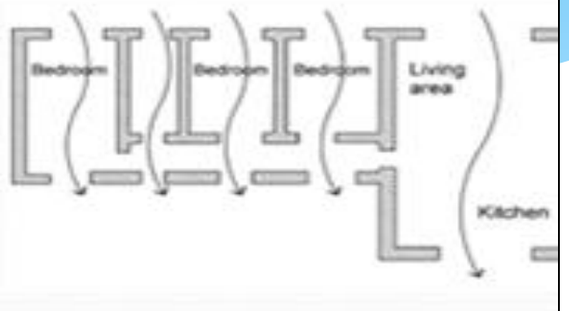
✓ **Good Delta-T, Supply Temperature of 5.4 °C, Return 13.6 °C**



✗ **Bad Delta-T, Good Delta-T, Supply Temperature of 12.2 °C, Return 13 °C**

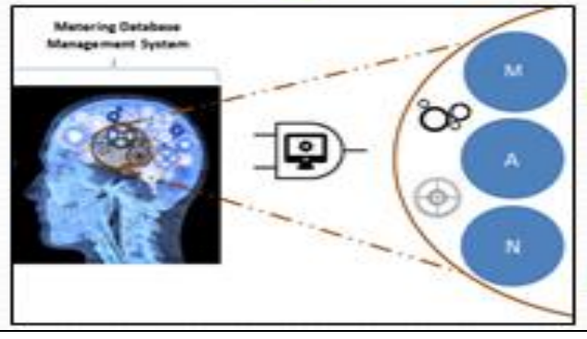


Over-all Benefits



Efficient Pant Production

Sustainable Supply



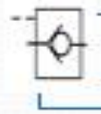
Effective building cooling

Managed delta T by FM

Better secondary side flow balancing

Reduced Bill

Early Fault Detection



Eliminating passing flow

More Efficient Plant Production

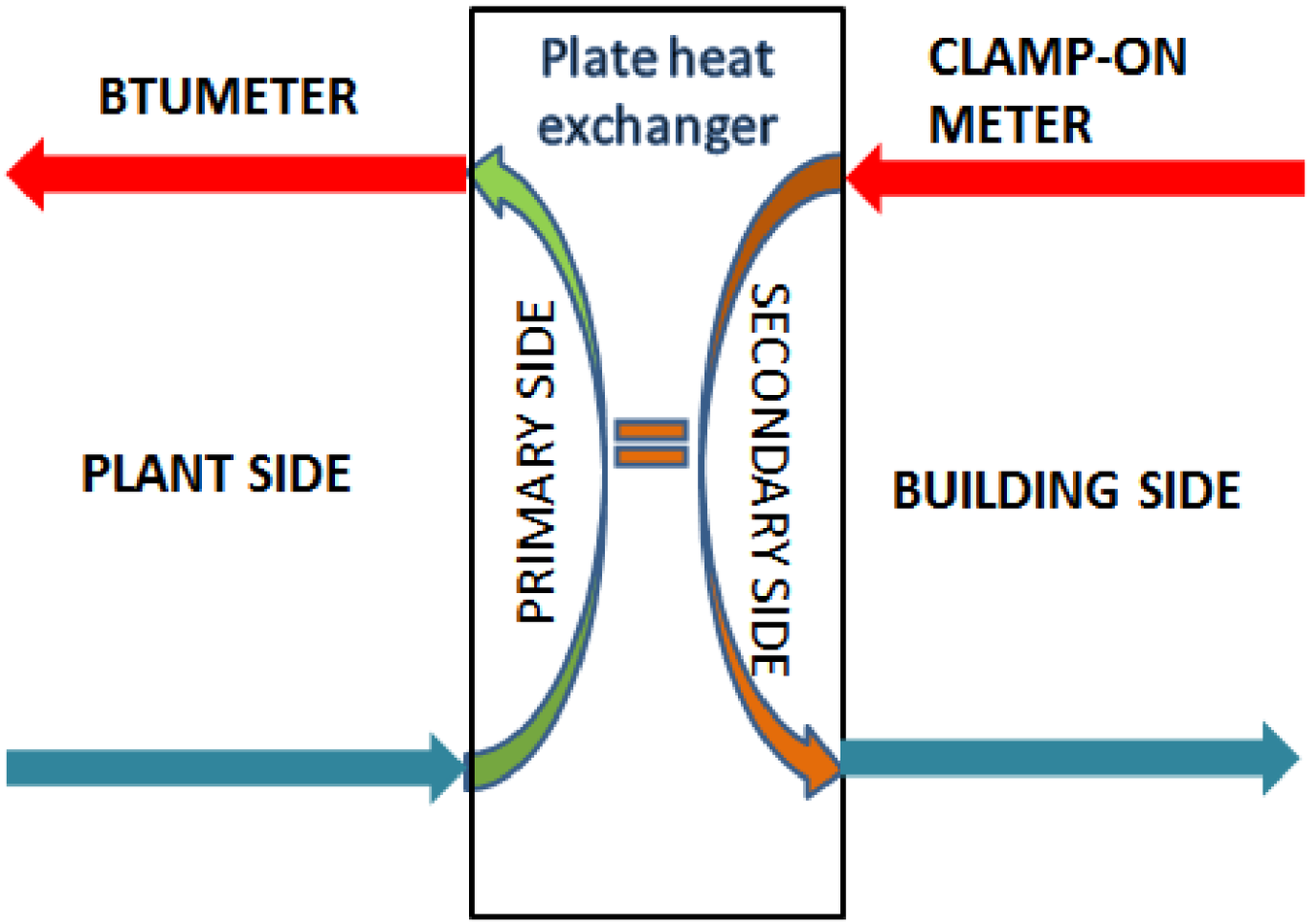
Building Name	Plant Side Supply Temperature °C	Building Side Primary Line Supply Temperature °C	Transmission Losses °C	Rectification
ETS 1	4.1	5.2	1.1	
ETS 2	4.1	5.3	1.2	
ETS 3	4.1	5.4	1.3	
ETS 4	4.1	5.4	1.3	
ETS 5	4.1	5.5	1.4	
ETS 6	4.1	5.5	1.4	
ETS 7	4.1	5.5	1.4	
ETS 8	4.1	5.5	1.4	
ETS 9	4.1	5.4	1.3	Replaced uncalibrated Temperature Sensor
ETS 10	4.1	5.4	1.3	
ETS 11	4.1	5.2	1.1	
ETS 12	4.1	5.1	1	
ETS 13	4.1	5	0.9	
ETS 14	4.1	5	0.9	
ETS 15	4.1	5	0.9	
ETS 16	4.1	5	0.9	
ETS 17	4.1	5	0.9	
ETS 18	4.1	5.1	1	
ETS 19	4.1	5.1	1	
ETS 20	4.1	5.2	1.1	

Comparison	Flow m^3/hr	Temperature Parameters °C			Tonnage Consumption (Kwh)
		Supply	Return	Delta T	
Before	12	**5.5**	13.5	8	19654234
After	12	4.5	13.5	9	22111013

* Efficient chiller operations
* Eliminated false information in transmission losses
* Accurate meter reading from production and consumption sides
* Overhead cost reduction (less manpower)

Efficient Flow Distribution from the Building Side

FLOW BALANCING GOAL → FLOW RATE PRIMARY = FLOW RATE SECONDARY



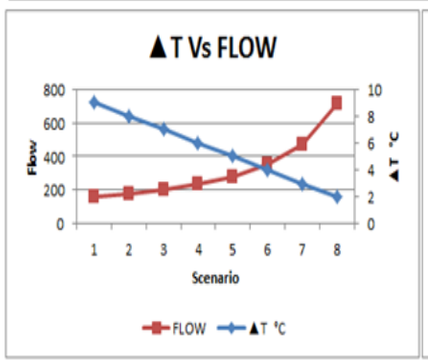
BUILDING SIDE DELTA T ANALYSIS

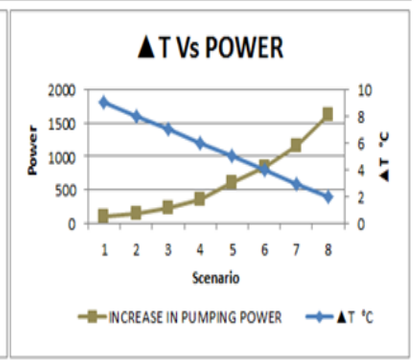
SUPPLY TEMP °C	RETURN TEMP °C	▲T °C	FLOW	INCREASE IN PUMPING POWER
5	14	9	160	115
6	14	8	178	155
7	14	7	203	228
8	14	6	236	357
9	14	5	282	611
10	14	4	352	835
11	14	3	470	1155
12	14	2	712.6	1625

OPTIMUM

COOLING EFFECT

WORST

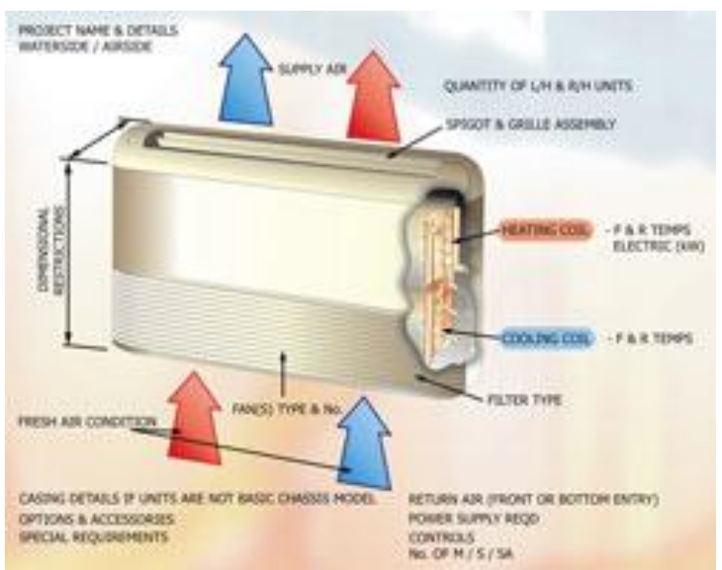




Excessive secondary side pumping will result to high supply temperature

Individual Customer Satisfaction

* Proper Cooling
* Efficient Consumption

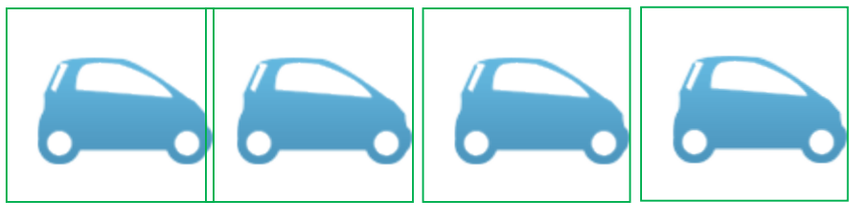


Carbon Footprints

Greenhouse gas emissions saved from 4,248,591 MWH equivalent to 3,004,396 metric ton CO2

49,678,322 tree seedlings grown for 10 years

637,876 passenger vehicles driven for one year



6,955,812 barrels of oil consumed