

High
Efficiency
Solutions.

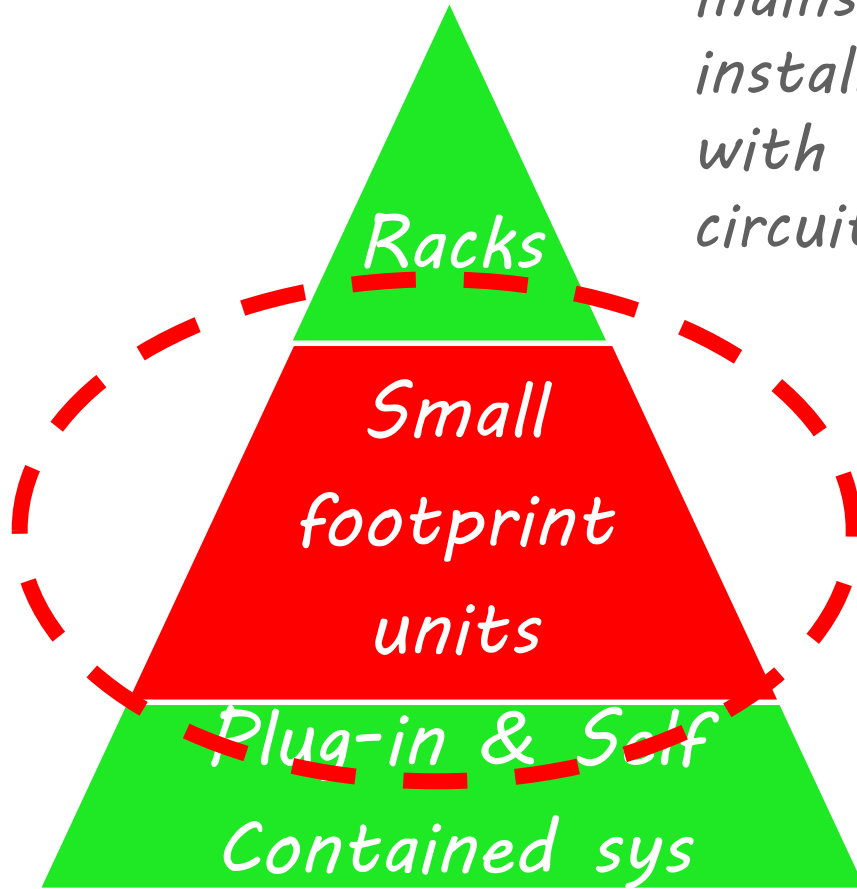
CAREL

Solutions for small footprint CO₂ installations



CO₂ as Main Refrigerant

CO₂ technology is becoming mainstream in medium to large installations or into appliances with self-contained refrigeration circuit



In the lower market segment there is a large number of small and simple installations, where CO₂ strives to be adopted due to capital cost

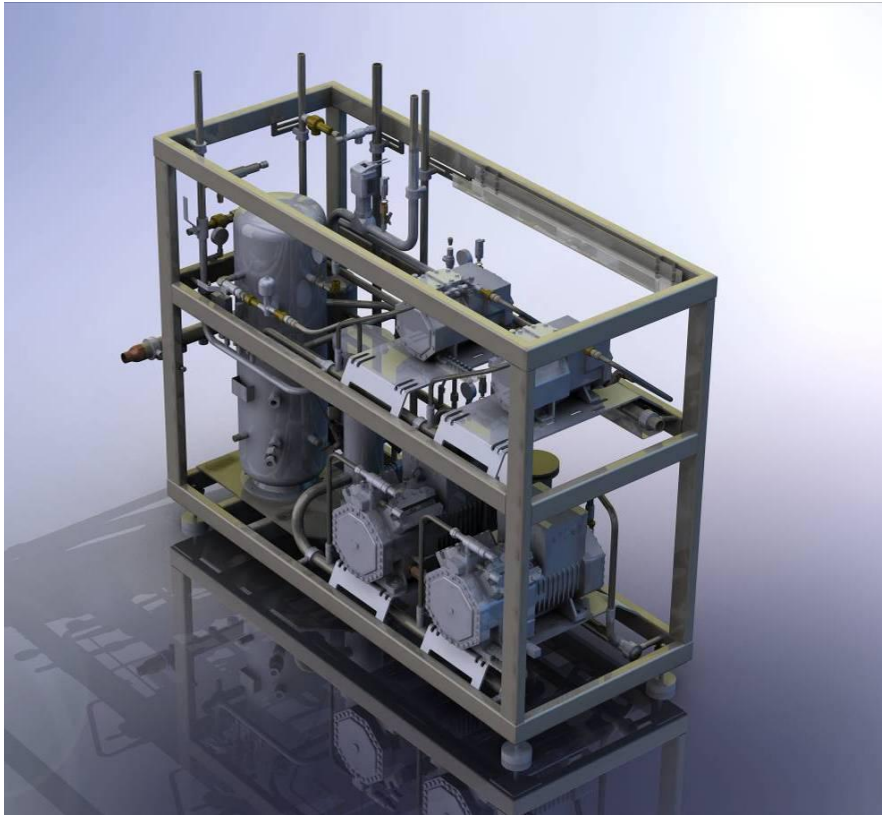
Barriers in Small Installations



Whenever compared with the conventional systems the use of CO₂ as primary refrigerant faces some barriers to be widely adopted in the small installations, mainly for:

- *Extra investment cost*
- *Usability for installers*
- *System complexity*

Background



Favourable System Transcritical Booster

Advantages

- One Refrigerant - Simple System
- Evaporator Optimisation
- MT & LT COP's
- Heat Recovery
- Hot Gas Defrost

Barriers

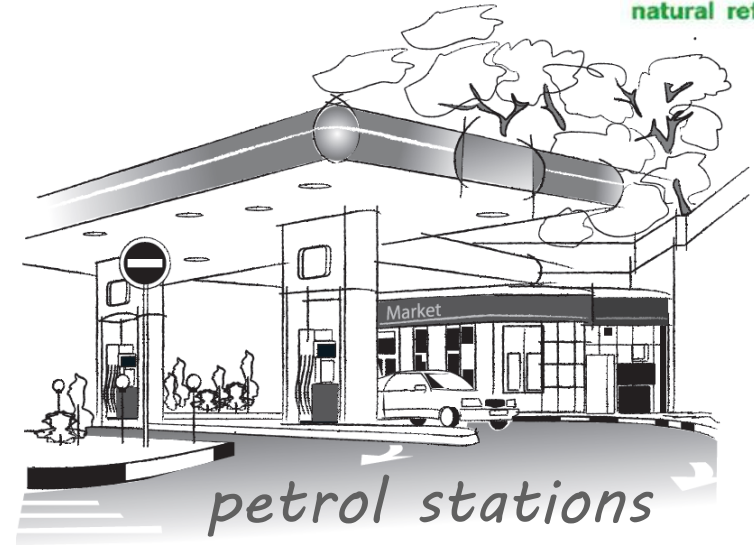
- ~~Warmer Climates~~
- ~~Capital cost~~
- ~~Resilience~~
- ~~Training~~



The Retail Segment



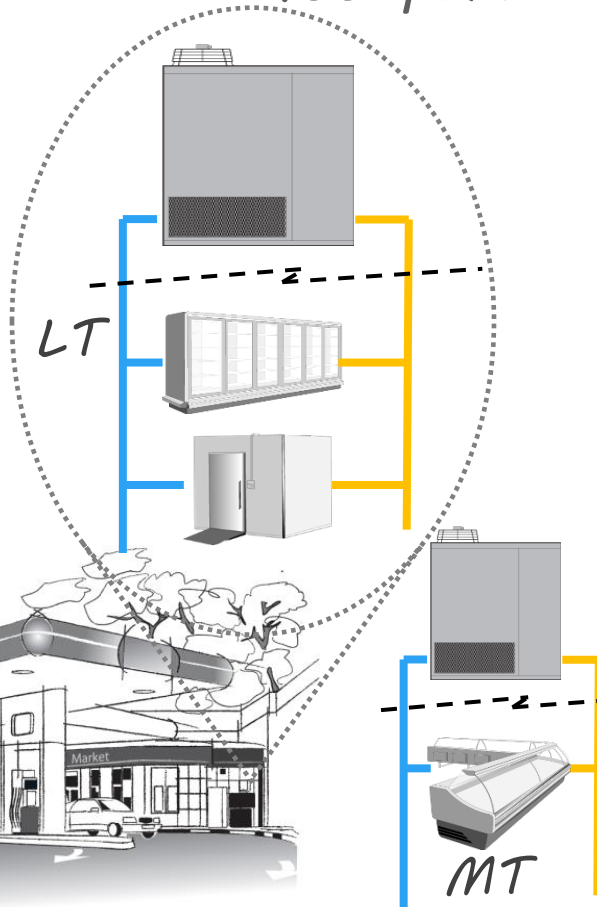
extra small convenience & mini stores



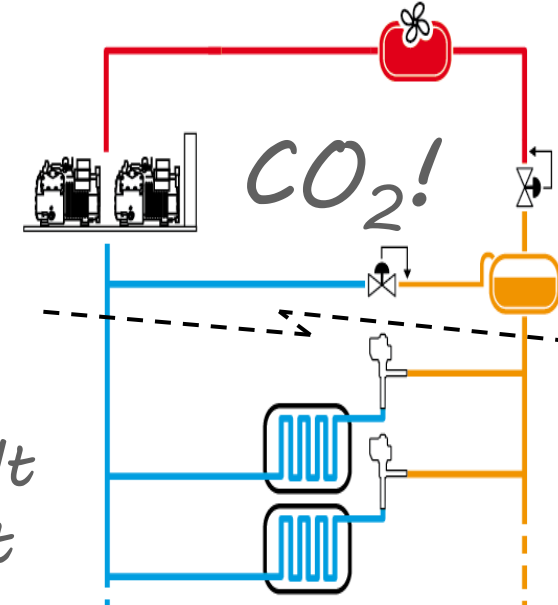
Simple or just cooling units...

The Application

From the traditional “Condensing Unit” to the small footprint Transcritical CO₂ unit...



- One or more condensing unit per site
- Single temperature unit
- Simple and compact unit
- Sometime result of a subsequent installation



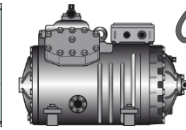
The CO₂ Unit Controller

pRack pR100T Compact

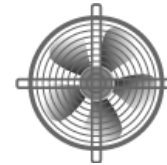


- *Compact: Control hardware with capabilities to drive both High Pressure (140bar) & Receiver Pressure (60bar) valves.*

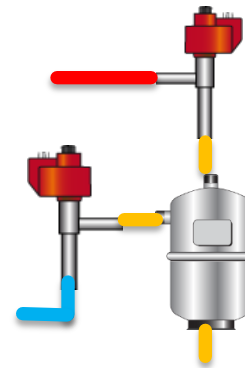
- *Simple user interface*
- *Dedicated software for Co2 condensing footprint.*
-



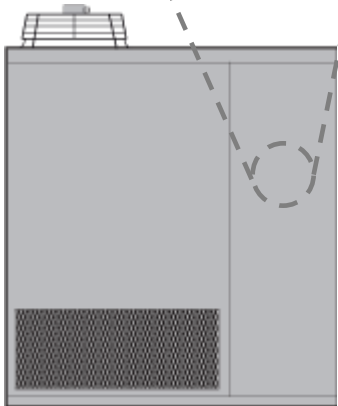
Compressor(s) management



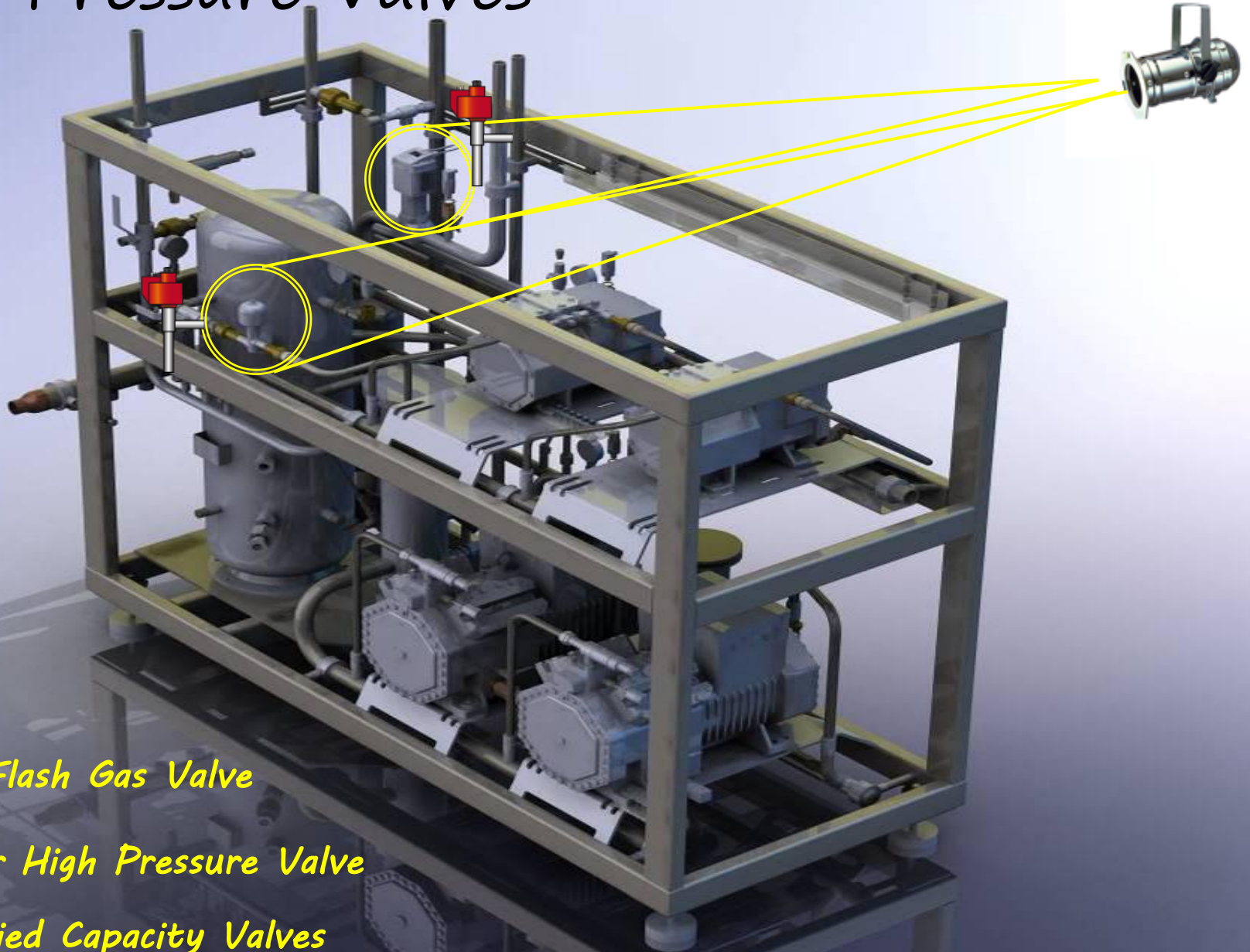
Gas Cooler management



High pressure and receiver pressure valves direct management



High Pressure Valves



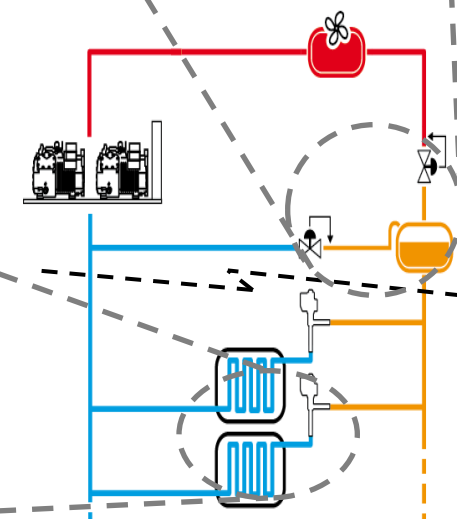
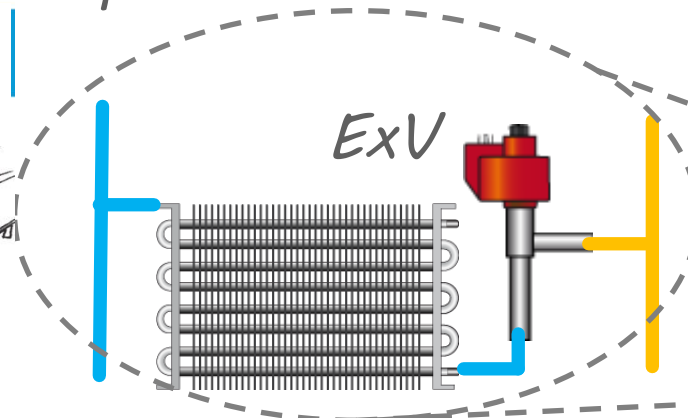
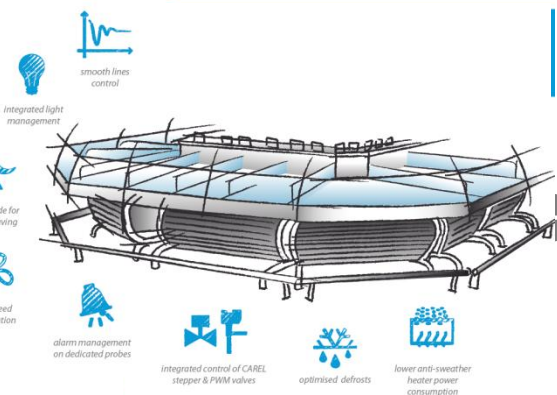
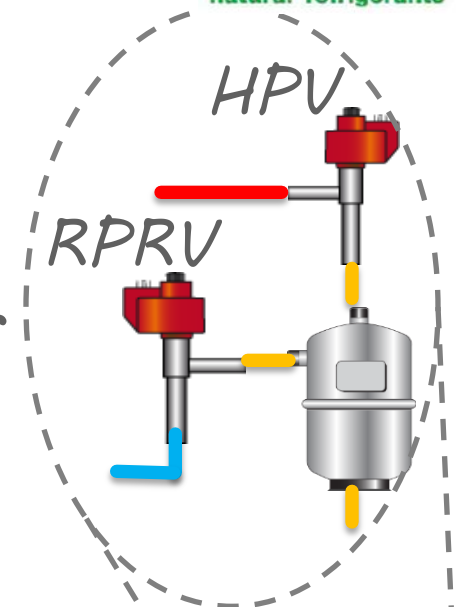
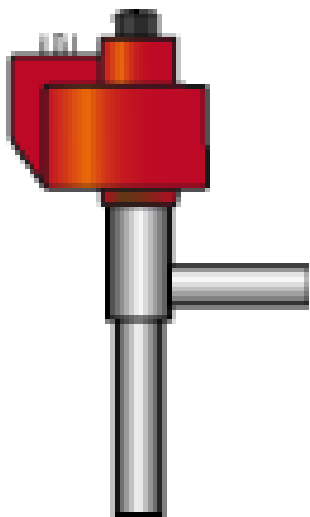
Receiver Flash Gas Valve

Gas Cooler High Pressure Valve

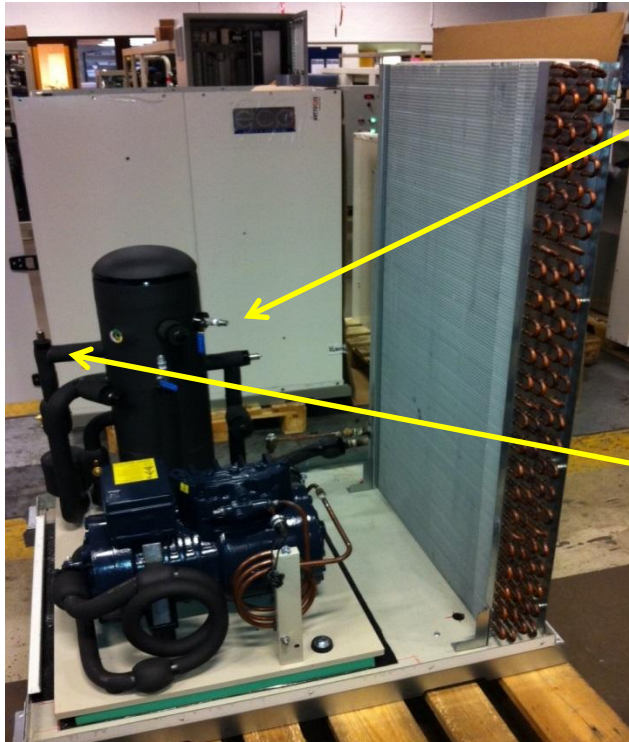
Small Bodied Capacity Valves

High Pressure Valves

- Proportional Stepper Valve
- Dedicated to CO₂
- Max Operating Pressure 140 bar
- Compact design for an easy fitting into the unit
- Suitable as ExV in the evaporators, also as HPV and RPRV up to 40KW units



Transcritical CO₂ Condensing Units



**Transcritical
High Pressure Valve**



**Transcritical
Gas Bypass Valve**

Integrated compact controls



Objectives






	Activities
2013	Finalize condensing unit and evaporator unit designs for CO2 applications
2014	Deliver total CO2 system solutions



CO₂ System Solution

Hilphoenix
A TRISTAR COMPANY

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Condensing Unit	Evaporator	Supervisory
		
<p>The condensing unit is designed as an integrated unit with a cabinet including compressor, tank, controller and condenser</p>	<p>Commercial single discharge unit cooler or general application in small to medium-sized cooler and freezer rooms</p>	
		<p>Total system visibility of real-time operational data to provide local and remote read/write capabilities and 3rd party BMS integration.</p>
<p>A compact controller that provides complete management of CO₂ condensing units</p>	<p>Control of Refrigerated Cases and Coldrooms, with a built in electronic expansion valve driver</p>	



Installations

Completed
Prior to 2014



2 Systems

Completed
YTD 2014



6 Systems

Planned
2014



18 Systems

36 Systems Estimated to be Operating
prior to the end of 2014



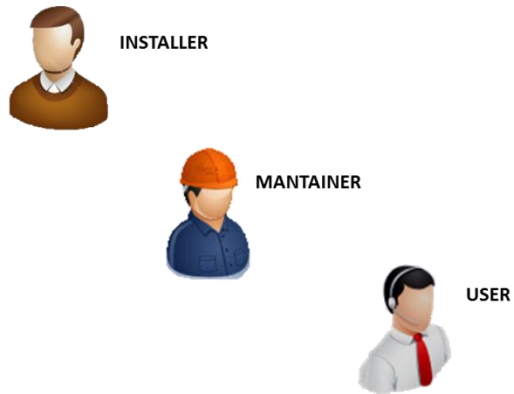
Positives

- Customizable with standard components
- On site start-up and commissioning support



Challenges

- Installation technical capabilities



- Remote access

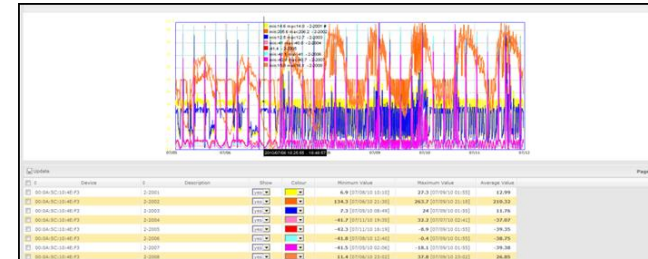
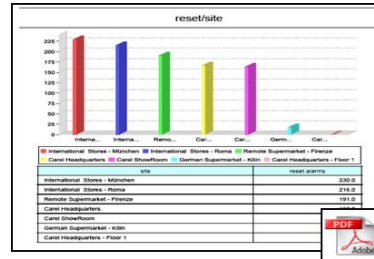


Smartphone
Applications

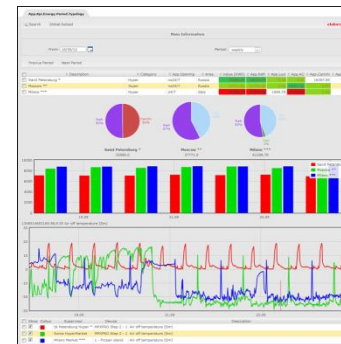


Looking to 2015 and beyond

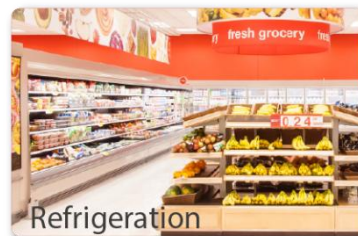
- Optimize system performance



- Benchmark and performance review



- Integration with HVAC systems



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