



## Flexible solutions for food retailers

ADAP-KOOL® Next Generation



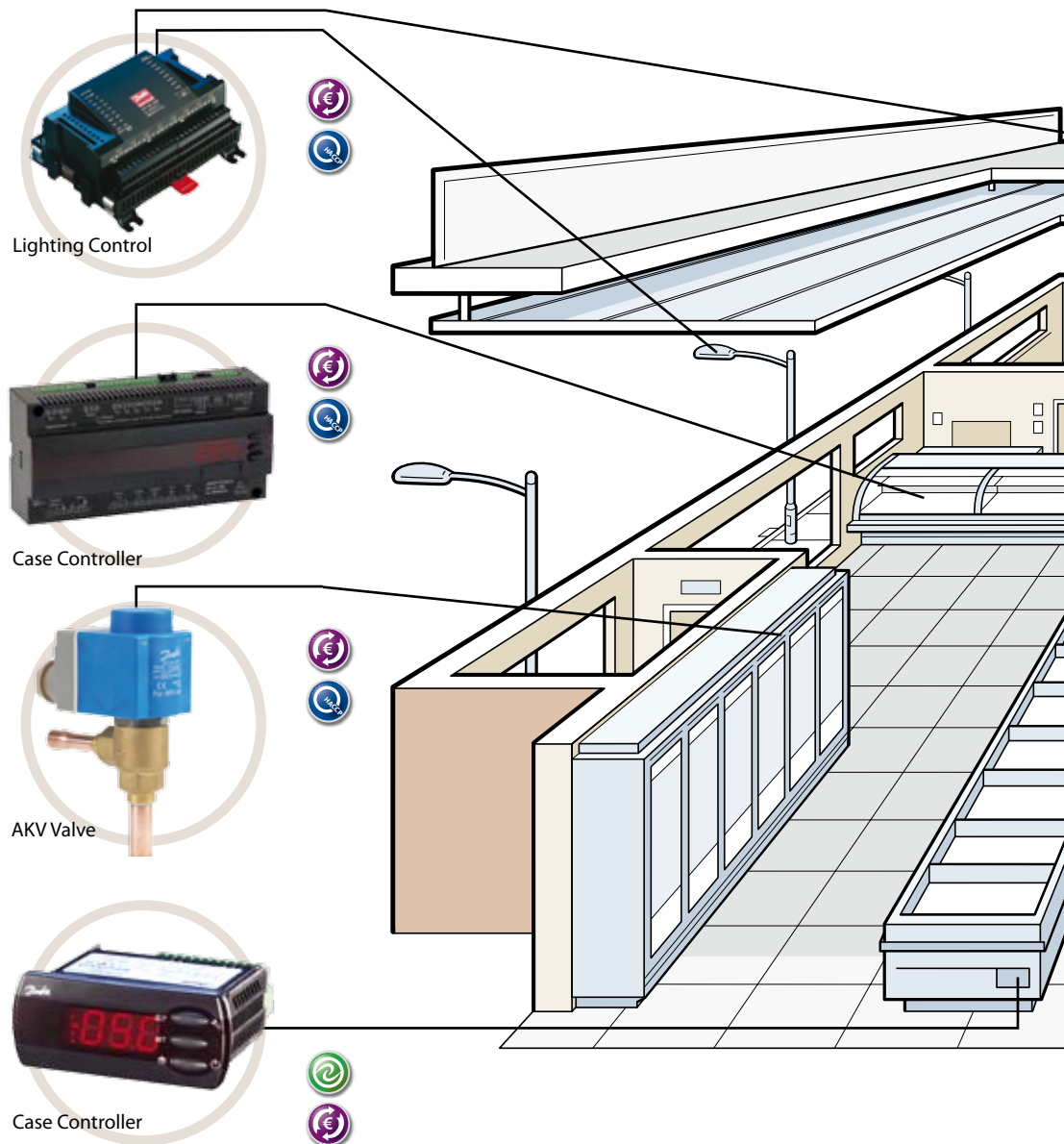
# Optimising your energy and food quality

**Whether it's a small store or a hypermarket,** Danfoss ADAP-KOOL® Next Generation products have been developed to give you the best of both worlds - outstanding performance and reduced running costs.

A totally flexible system for all food retailers featuring a wide range of adaptive products that work to your requirements and allow you to configure the optimum solution for your business, regardless of size.

ADAP-KOOL® Next Generation products are designed to be integrated into a complete system but can easily adapt to work within existing installations if necessary.

ADAP-KOOL® Next Generation products will bring your refrigeration facility and full store costs under control today and protect your investment as industry standards develop in the future.



**All Danfoss ADAP-KOOL® Next Generation products are designed and manufactured to our core business values:**



## Energy and Environment

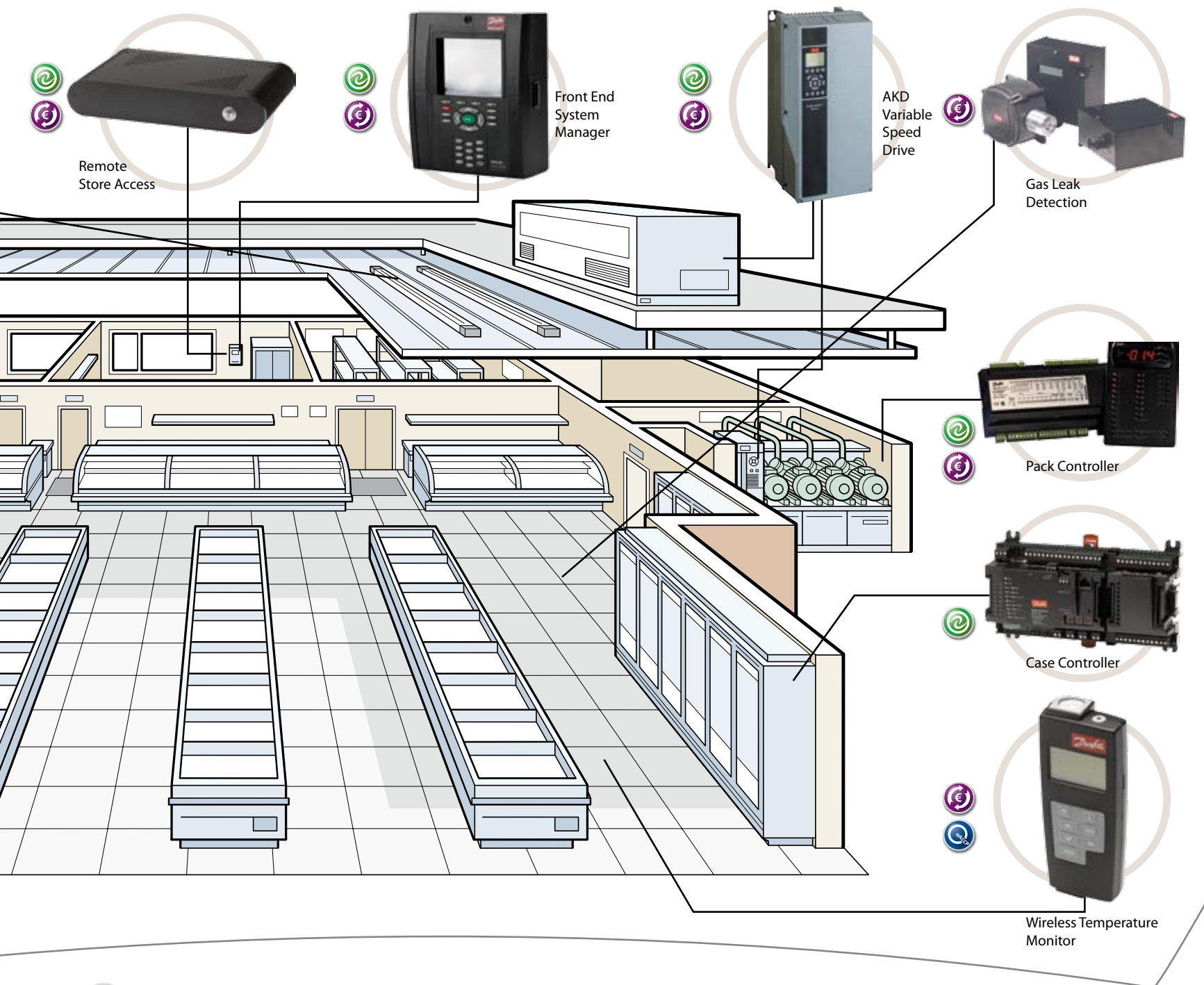
- Maximises store system efficiency
- Minimises environmental impact by reducing carbon footprint



## Total Solution

- Fully integrated control network for remote access to control, monitoring and service support
- Ensures best return on system investment and maximises store up-time
- Accurately maintains temperature performance across the display, storage and store facilities





### Food Quality

- Increased Food Quality is assured through accuracy of control and monitoring of Critical Control Points
- Provides documentary evidence and traceability for HACCP Compliance
- Full local and remote temperature alarm monitoring for increased food safety
- Maintains correct and accurate product temperatures to avoid food loss and wastage costs

# Solution for display cabinets and cold rooms



## Energy Savings

ADAP-KOOL® case controllers offer highly efficient adaptive routines for each cabinet and cold room installation guaranteeing significant energy savings.

ADAP-KOOL® Next Generation evaporator controllers can be used with all refrigerants and with a simple re-setting of the software can be adapted to new refrigerants.



## Total Solutions

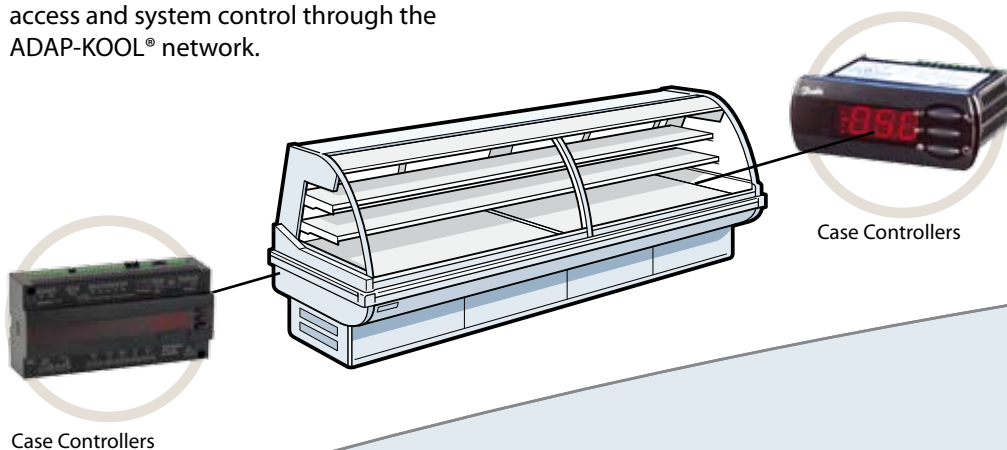
No two store concepts are the same but with our wide range of control products we have the flexibility to supply an evaporator solution for every store installation.

Fully integrated evaporator controllers allow simple installation and use, easy access and system control through the ADAP-KOOL® network.



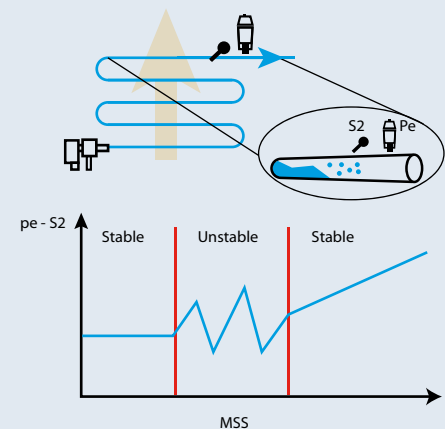
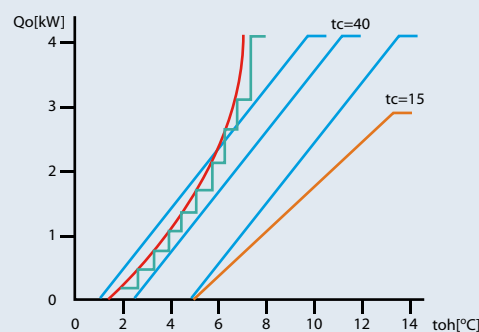
## Food Quality

- The dedicated case and cold store controllers/sensors ensure the optimum temperature and efficiency at all times ensuring food is kept in the best possible condition.
- Evaporator controllers use the adaptive techniques within the complete ADAP-KOOL® control system to give early warning alarms and avoid potential food loss.



### Electronic expansion valve AKV adaptive adjustment

- Adaptive Superheat Control
- Thermostatic expansion valve
- Low dp







# Compressor packs and condenser fan solutions



## Energy Savings

Our latest ADAP-KOOL® pack controllers ensure refrigeration systems operate with less energy while delivering optimal performance. The continuous variable speed control by AKD Drive Units make intelligent capacity control possible. Intelligent compressor and condenser fan control is a 'must' in any optimised refrigeration system.

Our drives can control the speed of up to three compressors and improve control performance by minimising the number of cut-ins and cut-outs.



AKD  
Variable  
Speed  
Drive



Pack Controller

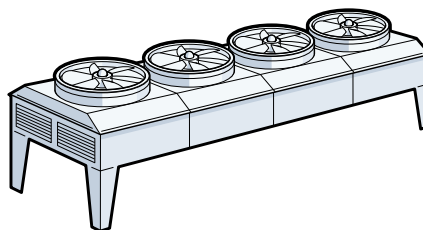


## Total Solutions

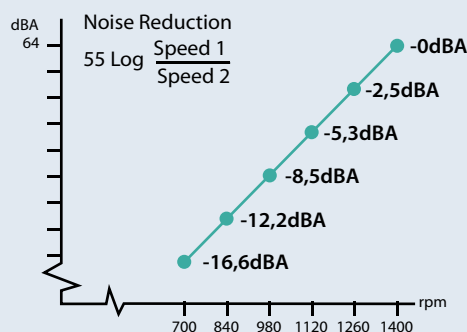
The ADAP-KOOL® Next Generation system allows the integration of both pack controllers and drives to give easy access and system control through the ADAP-KOOL® Lon network. Compact pack design and optimised speed driven compressor selection offer capital cost savings with flexible options.

The Fault Detection and Diagnosis (FDD) functions identify and predict blocked condenser air flow enabling planned site service.

The ADAP-KOOL® AKD drive units provide soft start operation reducing the shock loads to the motors, resulting in improved lifetime performance and operating conditions.

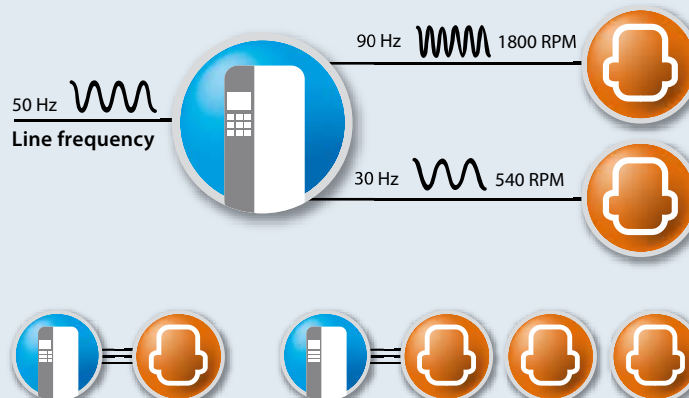


## Noise reduction (fans)



50% speed cuts noise by 16.5 dBA. Improve comfort for the employees and the neighbours.

## Compressor speed control adjusting to demand



# Maintenance management and remote monitoring



## Energy Savings

All systems can be optimised via the system manager or front-end which provides master control ensuring:

- Lowest possible energy consumption
- Energy monitoring for power, gas, water, etc
- Possibility for load sharing
- Fully Adaptive controls



## Total Solutions

Design and integration of the front end controllers and remote monitoring via ADAP-KOOL® Next Generation products ensure that help and support are always at hand.

Web enabling support tools ensure all products on the network can be analysed and integrated seamlessly from remote locations.

The system manager, or front end, is completely user-friendly and accommodates the different needs and processes of the daily user, the service engineer and commissioning engineer.

Early warning of system failure through advanced control technology and remote communication network significantly reduces your maintenance cost.

Over a ten year period the typical operating costs represent 90% of a total life cycle cost with just 10% being the initial capital investment. This makes it vital that retailers are able to monitor, manage and operate their system with the maximum efficiency. The ADAP-KOOL® system enables this control which saves costs, call-out fees and valuable staff time.

The main maintenance benefits of the ADAP-KOOL® system are:

- Reduced installation and commissioning costs
- Ease of remote accessibility and troubleshooting reducing the necessity for costly on-site visits
- Simplified system design for easy operation and support
- Reduced down-time ensuring optimum in-store asset operation
- Early warning of reduced asset and/or system performance



Remote Store Access

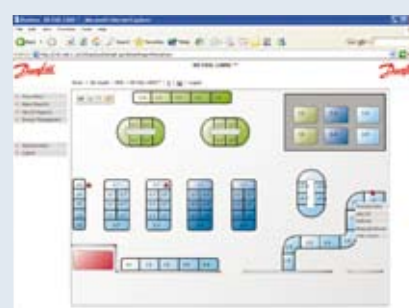


Receiver and Node



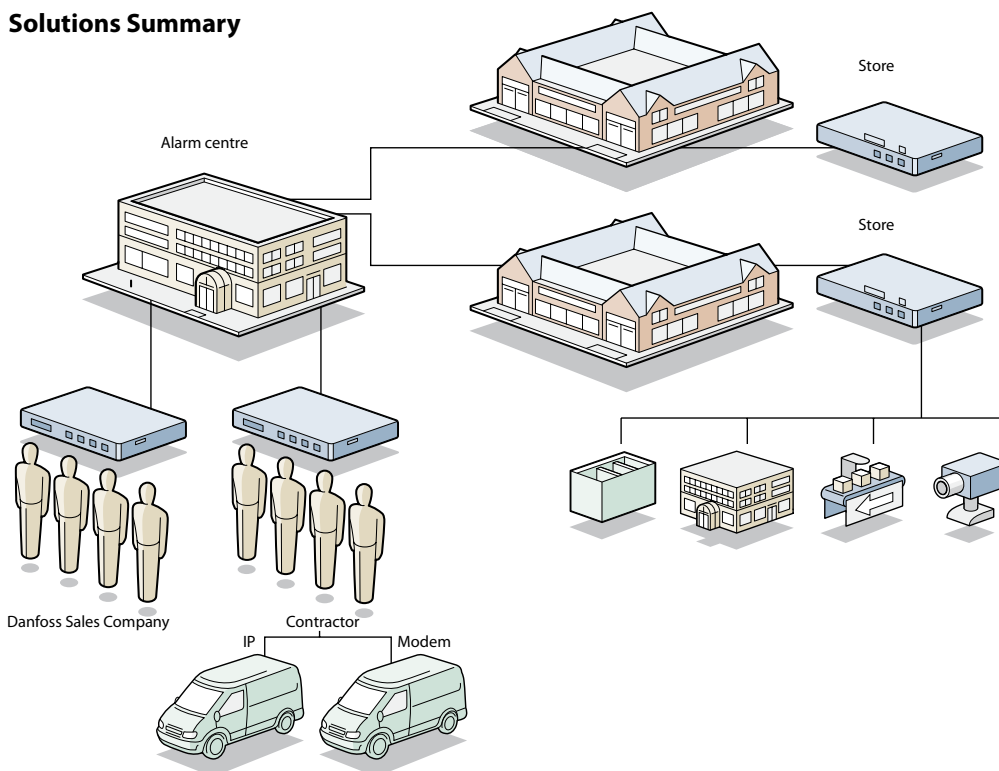
Pack Controller

## Store Mimic





## Solutions Summary



## Remote Services

All ADAP-KOOL® products are designed to be integrated into a complete system.

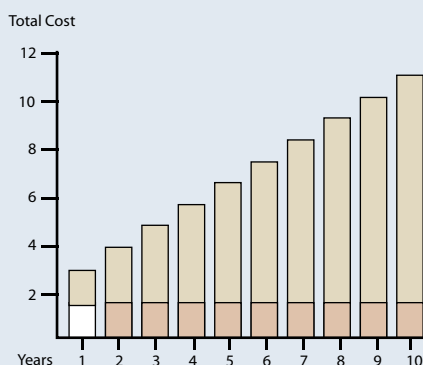
Remote service centres can use the full web-enabled system package Enterprise Management (EM) which ensures full overview and access to all connected stores. This also allows for both a clear, graphical overview for a store and extended activity reports for documentation of HACCP, alarms, logs, energy, etc.

Overall store support and system management of the displayed and stored food can be provided through Danfoss Retail Care™ remote monitoring and reporting services. This service offers:

- 24 hour monitoring
- Automated diagnostic and quick response functions
- Reduced down time and increased food safety
- Retrieve alarms, trend and event logs
- Flexible data communication includes TCP/IP network and GSM

## Life Cycle Cost Accumulated

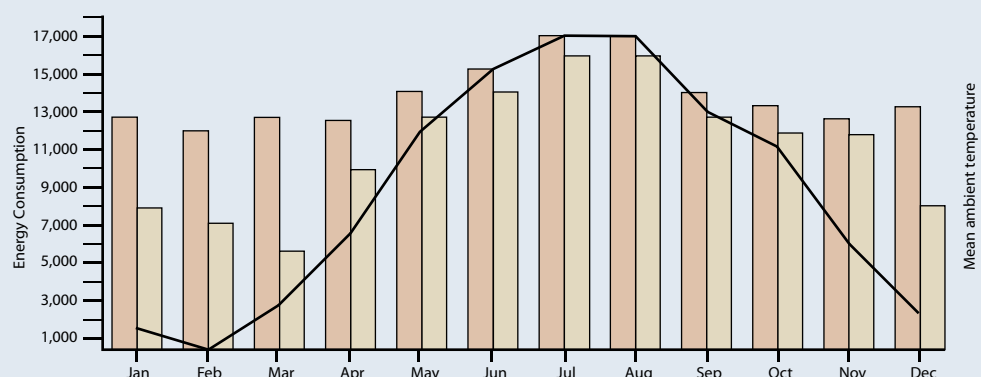
Investment Operation Cost



## Monthly energy consumption for refrigeration plant

The graph below shows the monthly calculated current and predicted energy consumption of the refrigeration plant (compressors + condenser fans)

Current energy consumption New energy consumption Mean ambient temperature





# Saving energy and protecting the environment



Danfoss ADAP-KOOL® solutions can optimise 75% of a typical food retail supermarket's energy consumption. This is achieved by optimising the store refrigeration systems, the store and outside lighting control and the HVAC air handling units and pumps.

## Refrigeration System

A typical store that has an ADAP-KOOL® refrigeration system solution installed could achieve as much as a 33% energy saving when compared to a non-optimised system.

All these energy saving opportunities are only possible through the adaptive techniques accessed and applied through the ADAP-KOOL® system.

## Adaptive suction pressure (PO optimization)

This feature optimises the suction pressure within the complete refrigeration system and ensures that all display cases operate at their own maximum efficiencies. Through the ADAP-KOOL® control system the cases may also be individually selected to gain specific and critical operating data.

## Adaptive Superheat Control

This feature ensures that injection of gases to the individual display cabinets is measured exactly and based upon the actual demands. This eliminates energy wastage and maximises the systems efficiency.

## Condensing Pressure Optimisation

Enabling this feature through the system manager and ambient temperature measurement ensures that the system operates at minimum condensing pressure thereby maximising system efficiency. This will save up to 10% energy use.

## Pulsing of Railheat

This feature allows the system to pulsate the Railheat and adapt energy consumption to the actual system demand which changes between night and day, saving up to 20% energy use.



AKD Variable Speed Drive



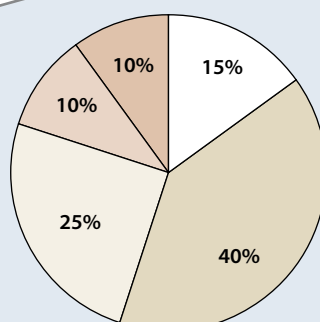
Pack Controller



System Manager



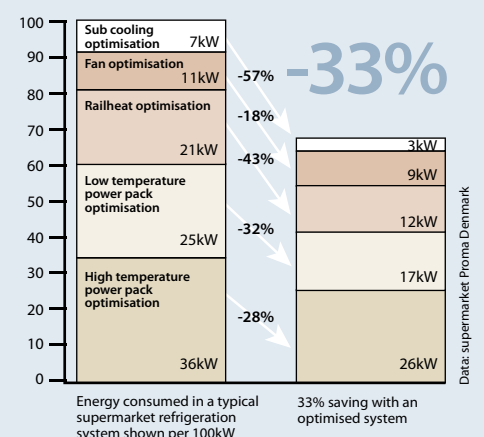
System Manager



Typical energy usage within a food retail supermarket

- Refrigeration
- In store and outside lighting
- HVAC and plumbing
- Store heating
- Other

## Refrigeration energy saving possibilities with ADAP-KOOL® total system solution







### Adaptive Defrost

Adaptive defrost is based upon the monitoring of individual evaporator performance. The energy balance between the refrigerant and air sides of the evaporator is compared, the defrost cycle is only initiated when actually required. Sensors within the display case also monitor ice build up and only when the ice reaches a defined threshold will defrost be initiated. This feature can provide savings of up to 17%.

### Medium Temperature Power Pack Optimisation

Combining the Danfoss AKD, electronic expansion valve and pack controllers within the ADAP-KOOL® system solution offers energy savings of up to 32% over a non-optimised pack control system.

### Low Temperature Power Pack Optimisation

Combining the Danfoss AKD, electronic expansion valve and pack controllers within the ADAP-KOOL® system solution offers energy savings of up to 32% over a non-optimised pack control system.

### Air Handling Units & Pumps

Savings of up to 15% are typically achieved by utilizing the energy saving capabilities of the Danfoss AKD variable speed drive. The drive matches motor speed to actual store demand and can be fully integrated into the ADAP-KOOL® system control

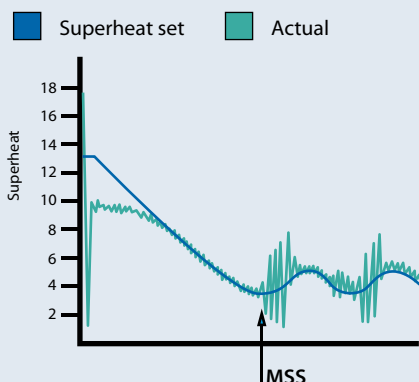
### Lighting Control

By using the information held within the ADAP-KOOL® system control network, internal store and car park lighting can be scheduled to ensure optimum performance for lowest energy cost. Savings of up to 10% are typical.



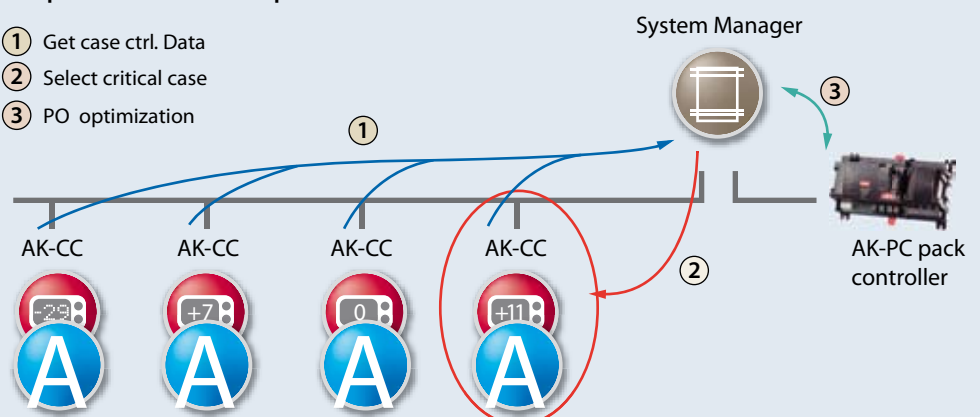
### Adaptive superheat control

Fixed set-point condenser pressure



### Po optimisation – suction pressure

- ① Get case ctrl. Data
- ② Select critical case
- ③ PO optimization



# Improving food quality



Enabling food quality management is a high priority within the ADAP-KOOL® system.

With over 60 years of experience in refrigeration, the ADAP-KOOL® Next Generation products are of proven and reliable technology minimising costly breakdowns. In the event of a system failure all controllers feature an emergency back-up function that prevents a considerable amount of food loss and disruption.

The dedicated case and cold store controllers/sensors offer automatic calibration of control temperatures and manage the evaporators to provide the optimum temperature and efficiency at all times. They also allow for case cleaning procedures, defrost management and adaptive load conditions.

The control of the cabinet and storage facilities is linked to the HACCP procedures to give a totally integrated store system. With ADAP-KOOL® solutions not only food quality is protected but so is your investment as industry standards emerge and develop in the future.



## Remote Services

Overall store support and system management of the displayed and stored food can be provided through Danfoss Retail Care™ remote monitoring and reporting services.



Case Controller



Case Controller



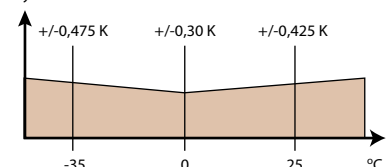
Wireless Temperature Monitoring Equipment



## Pt1000 Sensor Accuracy

$\pm 0,3^{\circ}\text{C}$  at  $0^{\circ}\text{C}$   $\pm 0,005^{\circ}\text{C} \times \text{temp}$

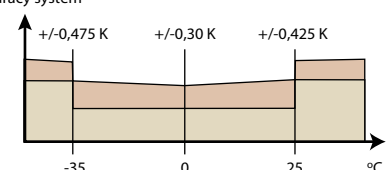
Accuracy Pt1000



## Combined Control Sensor Accuracy

$\pm 0,975^{\circ}\text{C}$  at  $-35^{\circ}\text{C}$

Accuracy system

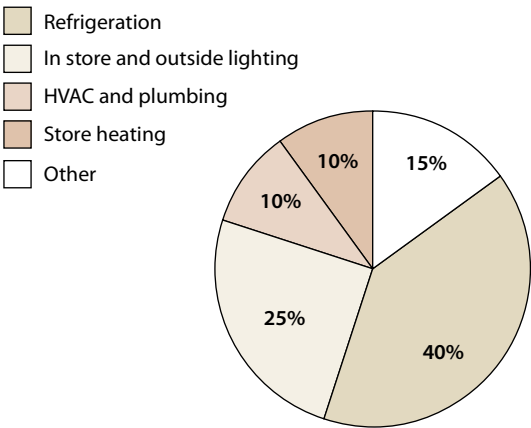




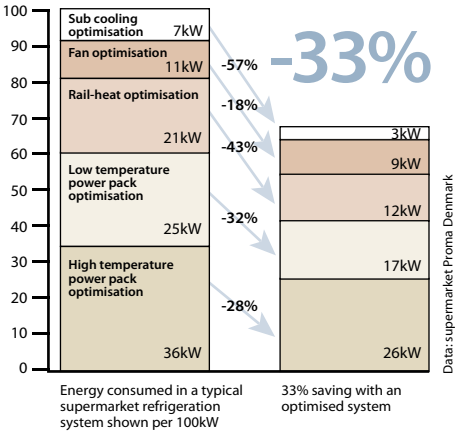
# Flexible solutions for food retailers

## ADAP-KOOL® Next Generation

Typical energy usage within a food retail supermarket



Refrigeration energy saving possibilities with ADAP-KOOL® total system solution







In response to the growing demand for worldwide service and support, Danfoss is setting the record for technological innovation and customer support. All our 27 manufacturing facilities, located on three continents, are ISO 9000, ISO 1400 certified (environmental certification).

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