Daikin
Always Looking For Our Customer Satisfaction
2018
**1924** - Osaka Kinzoku Kogyosho is established and begins production of radiator tubes for aircraft.

**1935** - Fluorocarbon gas is successfully manufactured for a Japanese first.

**1938** - "Mifujirator" refrigeration unit for submarine using fluorocarbon gas is delivered to Japanese Navy.

**1951** - Japan's first packaged air conditioner is developed.
DAIKIN’s first reefer

LKS501

1968

DAIKIN’s first reefer with R134a

LXE10C Series

1981

LXE10E Series

1994

The world’s first reefer with R134a scroll compressor

1997

DAIKIN’s latest LXE model

LXE10E-100 Series (CA Provision)

2001

LXE10D Series

2011

DAIKIN’s first reefer with electronic expansion valve

2015

LXE10E-100 Series

2017

The world’s first reefer with DC inverter scroll compressor

LXE10E-100 Series

2017
Two models – parts commonality

Continuous development

The best & longest sales in scroll reefer

APL, CMA-CGM, COSCO, CSCL, Hanjin, HMM, K-Line, Maersk Line, MOL, NYK, OOCL, PIL, SITC, UASC, WHL, Yang Ming, and 200 others.

Innovation!

The best power saving & highest-end spec

Users: Dole Asia, Dole USA, MOL, Royal Arctic Lines, Hamburg Sud, Seaboard, Tropical, Hapag Lloyd, MERATUS
Approved: APL, CMA-CGM, HMM, K-Line, NYK, YML, FESCO, Seatrade
DAIKIN Customers

- APL
- CMA CGM
- ONE
- Tropical Shipping
- Cosco
- Hapag-Lloyd
- Maersk Line
- Seaboard
- SeaCube
- Tex
- CAI
- Wan Hai Lines LTD.
- Hamburg Sud
- OOCL
- Cronos
- Seaco
- TAL International
- Florens
- HMM
- More than 300
- Sumifru
- Dole
- Dongfang
Controlled Atmosphere Technology
Active CA

Patented VPSA technology

Outside air

Release $O_2/CO_2$ to the outside

Nitrogen

Under pressurized condition, $N_2$ gas is absorbed by Zeolite

Under vacuumed condition, $N_2$ is removed from Zeolite and charged into container

Air Pump Ass’y

Adsorption Cylinder

$N_2$

Zeolite

$N_2$ supply into container

Zeolite

Patented VPSA technology

$O_2/CO_2$
CA Transportation Widens the Market

» Active CA leads market expansion

Passive CA

O₂ level adjustment
reliant on cargo respiration

Active CA

O₂ level adjusted by N₂ injection
High Moisture Content

Injects

Moisture from atmosphere

+  

$N_2$ rich gas

Into the container

Reefer Container
• Daikin Active CA produces its own atmosphere using VPSA technology

• Daikin Active CA blankets cargo with rich nitrogen
  - displaces $O_2$, $CO_2$
  - flushes out unwanted respiration gases such as ethylene

• Adjusting concentration of $CO_2$ inside container by nitrogen purge with different purity, fresh air mode and cargo respiration

• It controls gas levels throughout entire journey

O2/CO2 pull to set point with self generated N2 and cargo respiration
ACTIVE CONTROL OF ATMOSPHERE

Daikin Active CA ensures atmosphere is actively and precisely maintained for entire journey
Active CA for desired Atmosphere

Normal Air

<table>
<thead>
<tr>
<th></th>
<th>O2</th>
<th>CO2</th>
</tr>
</thead>
<tbody>
<tr>
<td>5%</td>
<td>21%</td>
<td>0.03%</td>
</tr>
</tbody>
</table>

Typical Desired Atmosphere

<table>
<thead>
<tr>
<th></th>
<th>O2</th>
<th>CO2</th>
</tr>
</thead>
<tbody>
<tr>
<td>5%</td>
<td>21%</td>
<td>5%</td>
</tr>
</tbody>
</table>

Active CA

- O₂ reduced to SP by product respiration & nitrogen injection
- CO₂ increased to SP by product respiration, control by nitrogen purge and inject CO₂ for high SP
Positive pressure

Passive CA

Negative Pressure

Active CA

Positive Pressure

Air tightness test Criteria
(from 490 to 245 Pa)

NOT AIR TIGHT

240 Sec

Incremental M&R cost require to ensure box meet air tightness requirement

AIR TIGHT

105 Sec
Simulation of internal pressure of BOX

**Active System**

- Filling from CA equipment; 30L/min
- Suction from CA Equipment; 30L/min

**Precondition**

- Maintains optimum CA condition with Active CA

**Passive System**

- +900~+920Pa
- -280~-300Pa

- Atmospheric pressure

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**DAIKIN**
Passive VS Active CA

Rapid O$_2$ pull down

- Stops produce maturity at an early stage
- Prevents water loss

20 tons of avocados @ 5°C with 25% (17m3) empty space

![Graph showing O$_2$ and CO$_2$ levels over time for different conditions]
Daikin SUPPORT

Training classes
- Conduct to shipping lines' sales & marketing team
- Conduct to shippers & exporters
- M&R and Technical training

Service Network & Parts Support
- Key CA load ports with CA parts inventory
- Latin America locations such as Chile, Peru, Ecuador, Mexico, Columbia, Panama
- Other locations like Los Angeles, New Zealand, Kaohsiung etc.
Global Service Organization

- Ronald van Andel: Europe, Africa & Middle East
- Goh Ah Huat: Head of Global Marketing & Service
- J.T. Lin: Taiwan & Hong Kong
- Jill Lin: South East Asia
- Mike Ma: China
- Fumikazu Kobayashi: Japan & Korea
- J.T. Lin: Taiwan & Hong Kong
- Carlos Sanabria: USA & Canada
- Ivan Romero: Central America
- Alvaro Quintana: ECSA
- Arnel Nunes: WCSA
- David Scott: Oceania
- Mike Ma: China
Global Service Support

- Expand coverage to meet customer’s requirement.
- Increase Inland service points in USA intermodal.

372 Authorized Service Points Worldwide

- North America (USA + Canada) 49 service points
- Latin America (Central + South America) 75 service points
- EMEA (EU + Middle East + Africa) 126 service points
- Asia Pacific + Oceania 122 service points
Daikin Active CA Training

M&R and dealer training

- **Agenda**: CA component identification, working principles, CA PTI, air leakage criteria, CA / electrical schematic, trouble-shooting, CA venting etc

- **Venue completed**: -
  - 2017/12 - Lazaro Cardenas, Mexico - 7 participants
  - 2017/12 – Callao, Peru – 21 participants
  - 2017/12 – Paita, Peru – 6 participants
  - 2017/12 – Guayaquil, Ecuador – 19 participants
  - 2018/01 – Colon, Panama – 10 participants
  - 2018/02 – Cartagena, Colombia – 8 participants
  - 2018/02 – Ensenada, Mexico – 10 participants
  - 2018/02 – Puerto Barrios – Guatemala 18 participants
  - 2018/03 – Singapore 10 participants
  - 2018/04 - Limon Port Costa Rica (8 participants)
  - 2018/06 - San Antonio and Valparasio, Chile (10 participants)
  - 2018/11 - Paita, Peru (30 participants)
Active CA expands cargo range

More than 500 commercial shipments have been succeeded!

All move in Long Haul

Dragon Fruits
Custard Apple
Wax Apple
Guava
Snow peas
<table>
<thead>
<tr>
<th>Brand and controls</th>
<th>MAXtend</th>
<th>Liventus</th>
<th>XtendFresh</th>
<th>STARCARE</th>
<th>Daikin Active CA</th>
</tr>
</thead>
<tbody>
<tr>
<td>O2 set point</td>
<td>Nitrogen flushing</td>
<td>Nitrogen Flushing</td>
<td>Rely on cargo respiration</td>
<td>Rely on cargo respiration</td>
<td>Self generated rich nitrogen</td>
</tr>
<tr>
<td>CO2 set point</td>
<td>Hydrated Limes</td>
<td>No capability</td>
<td>Activated Carbon</td>
<td>Vacuum pump/Membrane</td>
<td>Nitrogen purity purge control</td>
</tr>
<tr>
<td>Ethylene Scrubbers</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Air tightness</td>
<td>Leak rate base on cargo</td>
<td>Pressure decay 480 seconds</td>
<td>Pressure decay 480 seconds</td>
<td>Pressure decay 240 seconds</td>
<td>Pressure decay 105 seconds</td>
</tr>
<tr>
<td>Humidity</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Curtain*</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>CA control</td>
<td>Passive</td>
<td>Passive</td>
<td>Passive</td>
<td>Passive</td>
<td>Active</td>
</tr>
</tbody>
</table>

* Except low respiration cargo like blueberry
Passive VS Active CA

Passive CA

- As it relies on cargo respiration to reduce oxygen, cargo is not in optimal CA environment for initial few days potentially affect produce shelf life
- High respiration of cargo during initial days lead to production of ethylene and increase water loss
- Only suitable for high respiration cargo
- Ethylene filters are required
- More difficult to maintain oxygen set point due to outside air permeation susceptibility (negative pressure)
- Relative new boxes needed due to stringent requirement on container tightness
- Perfect air curtain installation required
- Higher cost due to ethylene filters, curtain, nitrogen flushing etc.

Active CA

- Rapid reduction of oxygen, ensuring optimal environment for cargo, extending shelf life
- Rapid cargo respiration reduction reduces water loss and inhibits ethylene production
- High humidity maintenance results in higher cargo weight that safeguards product value and ensure better quality
- Suitable for both short and long voyage, bringing new markets within reach
- No ethylene filters required
- Higher tolerance on container tightness and longer use of equipment
- Possible to operate without air curtain
- Lower operating and maintenance cost as no nitrogen flushing, ethylene filters etc. are required
Active CA opens up more cargo opportunities

Thank you for listening