Making Sense
Webinar Series

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\[ D = \frac{1.86 \times 10^{-3} T^{3/2}}{p \sigma_{12}^{2} \Omega} \sqrt{\frac{1}{M_1} + \frac{1}{M_2}} \]
Making Sense Webinars

Emerson and Our Partners Giving Insight on the Three Most Important Issues in Refrigeration

We’re Making Sense of the promising role of new refrigerants.

We’re Making Sense of energy reduction technologies.

We’re Making Sense of the application of electronics to improve operational visibility.
Making Sense of the application of electronics to improve operational visibility.
Improving refrigerated marine container management with pervasive connectivity.

July 8, 2014

Presented By:
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Marketing Manager
Emerson Climate Technologies—Transportation Solutions, ApS
Agenda

- What is a reefer container?
- The reefer container operation challenge
- Connectivity and infrastructure considerations
- Examples of operational benefits
Properties of a Reefer Container

Typical market price is around 17,000 USD for a complete refrigeration unit with an insulated container box.

Average lifetime for maritime use is 10–12 years.

Typical temperature range from -40 °C to +30 °C, but special units go as low as -60 °C.

Available as controlled atmosphere units, with active management of oxygen and carbon dioxide levels.

It makes 4 to 7 trips per year.

Regulated by ISO standards for interoperability.

Typical sizes: 40 ft and 20 ft.

All models contain an electronic controller.

Average consumption is 3 to 4 kWh; highly dependent on load and conditions.

Typical refrigerants used: R134a and R404a.
Refrigerated Container Development

- Continued growth on container population and vessel sizes
- Container ships carry about 75% of the value of goods shipped via sea

**Growth in world merchandise trade and GDP**

- Average export growth 1993–2013
- Average GDP growth 1993–2013

**Yearly Deliveries — Container Ships**

- Yearly GDP growth 1993–2013
- Yearly export growth 1993–2013

**Yearly New Build of Reefer Containers**

- Fleet Growth
- Replacement

Source: WTO, March 2014
Source: Maritime Insight, Nov. 2013
Source: World Cargo News and others
The Tough Life of a Reefer Container

Cargo Care
- Setpoints ranging from -40 °C to +30 °C
- Value of cargo ranging from 50K$ to 1M$
- Keep the cargo safe

Severe Environment
- Ambient temperatures
- Excessive handling
- Salt water

Intermodal Shifts
- Vessels, terminals, inland haulage
- Requires special handling and manual operations
- Various levels of workmanship
- Many responsible parties

Logistics
- Delays and detours
- Must run very energy efficient
- Must immediately report in case of any malfunctions
Challenges With Reefer Container Operation

“The whole industry is suffering, with collective losses in the past fiscal year (2013) of US$1.5B and a weighted earnings before interest and tax ratio of just 0.4 percent.”
Source: Thomas Knudsen, CEO, Maersk Line, May 2014

“Operating Margin, 2013

Source: Alphaliner, April 2014

“It is all about cost. In their quest for cost cuts it is inevitable that service suffers. With the formation of large alliances, there is a further commodisation of the industry’s services, and this can lead to port stays that are sometimes extended over days.”

Source: Tan Hua Joo, Alphaliner, April 2014
Cost Centers in a Reefer Container Operation

- **Margin**: 0.9%
- **Vessel & Overhead Costs**: 45.0%
- **Handling Costs**:
  - Reefer Trip Loading/Discharging
  - Reefer Trip Connection
  - Reefer Trip Electricity
  - Terminal Monitoring
  - On Vessel Monitoring
  - Repositioning Loading/Discharging
  - Dry Backhaul Loading/Discharging
  - Storage (Empty)
- **Claims Costs**: 24.2%
- **Energy Costs**: 13.0%
- **PTI Maintenance & Repair**: 5.6%
- **Capital Costs**: 10.0%

**Source**: Blue Canyon Marketplace Interviews, 2013

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**Reefer Cargo Claim Causation**

- **Reefer Malfunction** (including CA Unit)
- **Excessive Time Off-Power**
- **Hot Stuffing**
- **Expected Storage Life Exceeded**

**Source**: North of England P&I Association, July 2013
Trends Driving Pervasive Connectivity

- More governmental requirements for documentation and special treatment of perishables

- Continued focus on energy consumption — containerization, slow steaming, special energy-saving container programs

- M2M connectivity everywhere
- GSM global coverage increasing; communication price declining

- Higher customer expectations for fresh perishables with long shelf life
- Customers require more transparency

Source: The Network for Transport and the environment
Market Development on Connectivity

- Strong indications of high penetration within next 3–4 years
- Customer and application focus drives feature set

**Customer Focus**

- Shipping Service Providers (Carriers)
- Shippers
- Cargo Owners, 3PLs, Freight Forwarders

**Application Focus**

- Monitoring & Control
  - Refrigerated
  - Non-Refrigerated
- Tracking & Security

**Solution Providers**

**Installed Base of Intermodal Container Tracking Units**

- Source: Berg Insight, June 2014
Connectivity Considerations

Global System
- Global communication coverage
- Secure two-way M2M network
- Interfaces to shipping lines’ logistics systems
- IT security compliance
- 24/7/365 hosting
- Capable of big data

Vessel System
- Installation costs
- Market acceptance
- Compatibility with existing fleet systems
- Standardizations

Container
- Ease of installation
- Internal or external mounting
- Interface to all manufacturers
- Integrated SIM card
- Technology lifetime
- Compliance to regulatory bodies
Unbroken cold chain is a challenge when bringing food into the Darfur province to support its 2.9 million conflict-affected people.
Real-time Pervasive Connectivity
Geozone Management Adds Benefits

- Monitors if the cargo follows the right route
- Gets confirmation when the containers reach final destination
- Automated on-site alarm handling to reduce container down-time delays
Proactive Alarm Attention

1. Shipping line administrator sets up alarm severity

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2. Shipping line administrator sets up email respondents for each alarm group and depending on geozone

3. Field person receives email notification

4. Field person responds with help from app
Advanced Event Handling

G-force registration

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Going From Trip to Fleet Perspective

• Using data across the fleet
• Spot and analyze trends, patterns and anomalies
• Improve operation in more areas than trip specifics

90% of the world’s data was created in the last two years¹

80% of the world’s data today is unstructured

Source: IBM, 2014
## Improving Shipping Line Operational Efficiency

### Revenue
- Enable shipping line to charge premium for providing end to end reefer container monitoring data to customer

### Capital Costs
- Increase reefer container utilization through better knowledge of fleet location and use
- Increase useful life or residual value of reefer container through improved maintenance and health analysis

### Energy Costs
- Reduce cost by remotely controlling economy mode setting
- Analyze performance of reefer container fleet and identify poor performers for maintenance or retirement

### Maintenance Costs
- Reduce unnecessary terminal PTI repair costs by performing remote health checks and determining if repair is necessary
- Reduce maintenance costs through predictive maintenance to avoid major component failure and repair

### Claims Costs
- Reduce claims administration costs by allowing remote access to information
- Reduce claims incidents through early warnings and predictive maintenance capability

### Handling Costs
- Reduce manual handling by centralizing data log downloads and firmware upgrades
- Optimize reefer monitoring cost by centralized response center

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*Source: Blue Canyon Marketplace Interviews, 2013*
Example 1: Smart Firmware Update

Thermo King

Smart Firmware Update

- Improved insight and management
- Central approval of new FW
- Automated distribution of new FW

- Reduce handling costs
- Reduce roll-out time of new FW
- Avoid human errors
Example 2: Need-based PTI

- Reduction of pre-trip inspection, handling and labor costs
- Increased utilization
Applications Drive Value

Automation of Processes

Equipment Maintenance
- Predictive Maintenance
- Smart Firmware Update
- Need-based PTI
- Trip Reports

Operational Efficiency
- Alarm Management
- Trip Setting Verification
- Utilization Optimizer
- Accountability Reports

Energy Efficiency
- Energy-saving Modes
- Energy Calculation
- Energy Cost Analysis
- Energy Efficiency Benchmark

Cargo Care
- USDA Server Interface
- Customer Real-time Interface
- Supervised Cold Treatment
- Customer Post-trip Analysis

Basic Functionality
- Search Functionality
- Condition Overview of All Parameters
- Remote Commands
- Historic Logs and Export Functions

Infrastructure and Data Hosting
- Secure Data Hosting, Maintenance, Backup
- Years of Data Storage
- Global Roaming Coverage
- Secure M2M Network
Questions?

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