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Green Cooling in South-East Asia
Selected Case Studies from Indonesia and Thailand

Wednesday, 3rd July 2019
Open-Ended Working Group 41, Bangkok
1) Current Green Cooling technology trends in South-East Asia
   Jan Dusek, Shecco

2) Energy performance and safety audit results of propane chiller pilot projects in various fields of application
   Mrs. Herlin Herlianika, Technical Consultant, Green Chillers project Indonesia (Heat GmbH)

3) Initiating a transformation in the commercial refrigeration sector in Thailand – experiences, challenges, and next steps
   Alex Panas, Sanden Intercool, Philipp Pischke, GIZ (RAC NAMA Thailand Project)

4) Discussion & Conclusion
   All

5) Closing
   Bernhard Siegele, GIZ Proklima
Questions? Join us online and participate live!

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Questions of all participants appear here
Agenda

1) **Current Green Cooling technology trends in South-East Asia**
   
   *Jan Dusek, Shecco*

2) Energy performance and safety audit results of propane chiller pilot projects in various fields of application
   
   *Mrs. Herlin Herlianika, Technical Consultant, Green Chillers project Indonesia (Heat GmbH)*

3) Initiating a transformation in the commercial refrigeration sector in Thailand – experiences, challenges, and next steps
   
   *Alex Panas, Sanden Intercool, Philipp Pischke, GIZ (RAC NAMA Thailand Project)*

4) Discussion & Conclusion
   
   *All*

5) Closing
   
   *Bernhard Siegele, GIZ Proklima*
GROWING MARKET PENETRATION OF NATURAL REFRIGERANTS IN SOUTHEAST ASIA

GIZ side event - Green Cooling in South-East Asia
OEWG 2019, Bangkok

Jan Dusek
shecco
What is shecco?

Global market accelerator for natural refrigerant based technologies
GLOBAL TRENDS & DRIVERS IN HVAC&R INDUSTRY

POLICY & REGULATIONS

- Kigali agreement
- EU F-Gas
- Fiscal incentives
- Revised safety standards (IEC)
- Bans on high GWP HFCs
- Phase down of HFCs
- Training initiatives
- …

MARKET & TECHNOLOGY

- Rapid development of NR in all HVAC&R sectors
- Increasing competition among NR + volume = lower price premium vs HFCs
- Technology developments = increasing efficiency & safety
- Increased awareness
- Future proof technology + efficiency = business case of NR
- …
IEC CHARGE LIMIT INCREASE TO 500 GRAMS

The new 500-g charge limit for flammable refrigerants in commercial cases under IEC 60335-2-89:2019 was officially published on June 26.

Source: hydrocarbons21.com
HYDROCARBONS IN LIGHT COMMERCIAL REFRIGERATION

8+ million units using natural refrigerants (HC & CO2) collectively installed

=> 43.5 million tonnes of avoided CO2 (equivalent emissions of more than 8.86 million passenger cars over one year)

Increasing number of consumer brands choosing HCs for their point of sale equipment - often targeting global procurement 100%
HYDROCARBON PLUG INS IN SM & CVS

Global market estimate (August 2018) = 2.5 million units

1,000’s of hydrocarbon plug in units installed in Southeast Asia

Key barrier removed with increase of HC charge limit to 500 grams.

Source: hydrocarbons21.com

AHT R290 Plug-ins at Marketplace Santolan Town Plaza, Manila
HYDROCARBON PLUG-IN + WATERLOOP SYSTEMS

Innovative waterloop solutions are gaining ground in different parts of the world.

There are an estimated 2000 stores globally using R290 waterloop technology

Philippines

Royal Duty Free to install 100% R290 refrigerated store using R290 plug-ins and waterloop systems in August 2019

Source: Accelerate Magazine, June 2019
CO2 TC STORES - FROM 140 TO 20,000 IN 10 YEARS

2008
CO2 TC STORES - FROM 140 TO 20,000 IN 10 YEARS

October 2018

KEY/LEGEND
- N/A 1-9 10-299 300+ 1000+

1 MEXICO
5 COLOMBIA
1 ECUADOR
1 PERU
10 CHILE
10 ARGENTINA
10 BRAZIL
1 MALAYSIA
1 JORDAN
EUROPE
3,530+
3,530+
1 CANADA
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TRANSCRITICAL CO2 SYSTEMS

Several transcritical CO2 systems are in operation today.

Malaysia - First CO2 system installed by Jaya Grocer in 2017

Indonesia - 13 Alfamidi CO2 stores in Jakarta
SOLAR POWERED HYDROCARBON SYSTEMS

Malaysia

Nestle unveils solar-powered R290 ice cream chests in March 2019.

Indonesia

Solar R290 ice machine debuts at R&HVAC Indonesia 2018.

Source: hydrocarbons21.com
INDUSTRIAL REFRIGERATION
Low charge ammonia installations around the world

- Canada = 200+
- US = 220+
- Europe = 1440+
- China = 150+
- Japan = 500+
- Australia = 100+
LOW CHARGE AMMONIA SYSTEMS

NH3/CO2 systems

29+ Mayekawa NH3/CO2 secondary systems installed in Southeast Asia

Indonesia: 14 sets
Thailand: 11 sets
Vietnam: 4 sets

Source: ATMOsphere Asia 2017

Suhaimi Sirad, Director, PT Mayekawa Indonesia exhibiting the NH3/CO2 Reabel at R&HVAC Indonesia 2018
LOW CHARGE AMMONIA SYSTEMS

Indonesia

Kiat Ananda Cold Storage, largest cold storage operator in Indonesia, installs NH3/CO2 system

Source: ATMOsphere Asia 2018

Ray Soraya, CEO, Kiat Ananda Cold Storage speaking at ATMOsphere Asia 2018.
LOW CHARGE AMMONIA SYSTEMS

Philippines

Allforward Warehousing Inc. installs NH3/CO2 cascade system in General Santos in April 2016

5 NH3/CO2 cascade refrigeration systems installed by Ominco Engineering Ltd. in Philippines and Malaysia

Source: R744.com

NH3/CO2 cascade system installed at Allforward Warehousing Inc. in the Philippines.
UPCOMING PROJECTS

Malaysia: Low charge ammonia central style DX system for cold storage facility

Thailand: ITC commissions prototype CO2 transcritical system for cold storage

Indonesia: Transcritical CO2 for margarine production plant
HEAT PUMPS & HVAC
HYDROCARBON CHILLERS

Growing interest in HC based water chillers targeting commercial air-conditioning and process cooling applications.

Growing number of manufacturers: SRS Frigadon, JCI, Euroklimat, GEA, CTA, Cool-Therm, Geoclima, Bundgaard, RSA Cooling, Roccheggani, Aicool (Indonesia)
HYDROCARBON CHILLERS

Indonesia - PT Phapros installed and commissioned two propane (R290) chillers at its production facility in Semarang, Central Java.

Source: Accelerate Asia
COMMERCIAL CO2 HEAT PUMPS

Growing interest in CO2 heat pumps targeting commercial hot water supply, air-conditioning applications

Globally estimated 15,000 commercial CO2 (majority in Japan & China)
Looking to the future with CO$_2$ heat pumps

Thailand-based Charoen Pokphand Foods is one of the largest food processing companies in the world. By installing CO$_2$ heat pumps at one of its facilities, it is demonstrating how natural refrigerant systems can help Southeast Asian companies to mitigate greenhouse gas emissions while sustaining growth in today’s fast-paced economy.

– By Devin Yoshimoto & Jan Dusek

Thailand-based Charoen Pokphand Foods is one of the largest food processing companies in the world. By installing CO$_2$ heat pumps at one of its facilities, it is demonstrating how natural refrigerant systems can help Southeast Asian companies to mitigate greenhouse gas emissions while sustaining growth in today’s fast-paced economy.

– By Devin Yoshimoto & Jan Dusek

As one of Southeast Asia’s largest businesses, CP Foods understands its leadership role when it comes to environmentally sustainable business growth and development.

According to the company’s 2017 Sustainability Report, CP Foods aims to reduce energy consumption by 15% and greenhouse gas (GHG) emissions by 15% per production unit by 2020 (compared to the base year 2015).

Source: Accelerate Asia
UPCOMING PROJECTS

Vietnam: Sofitel Metropol installing CO2 heat pump

Source: ATMOsphere Asia 2018
CO2 FOR TRANSPORT REFRIGERATION

Maersk Line testing 100 refrigerated shipping containers fitted with Carrier Transicold’s NaturaLINE CO₂ refrigeration system

MSC Mediterranean Shipping announced it will lease 2,000 containers using Carrier Transicold’s NaturaLINE CO₂ refrigeration system

Source: R744.com
TRAINING

05
NATURAL REFRIERGANT TRAINING INITIATIVES

Thailand - SCM Ref CO2 training
Thailand - TEKO CO2 training
Philippines - HC Training

Source: r744.com

SCMREF THAI opened a new CO2 training center in Bangkok in June.
CONCLUSIONS - SOUTHEAST ASIA LEAPFROGGING TO NR?

• Global market opportunities are shifting to Southeast Asia
• HC is good fit for high ambient temperatures countries (high efficiency, simple, cost-effective)
• Low-charge ammonia systems are penetrating industrial refrigeration
• CO2 training is happening
• Revision of safety standards, awareness rising, more training of technicians needed
• Milestone projects wit NatRefs planned to be completed in 2019
• With the increased HC charge limit and the continued momentum with training, transcritical CO2 and low charge ammonia technology, we expect the market in SEA to develop rapidly in the next few years
ATMOSPHERE ASIA 2017

http://www.atmo.org/Asia2017/programme

“Our company is turning into a green organisation and it makes everyone happy.”

— Corngrit Serchom, Thai Union Group
ATMOSPHERE ASIA 2019

25 September 2019 in BITEC, Bangkok
THANK YOU!
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GREEN CHILLER PROJECT RESULTS

Bangkok, 03 July 2019

Herlin Herlianiaka, HEAT GmbH
Green Chillers NAMA Project Overview

• Cooperation between Ministry of Energy and Mineral Resources (MEMR) Indonesia and Federal Ministry for Environment, Nature Conservation and Nuclear Safety (BMU)

• Jointly implemented by Directorate General of New Renewable Energy and Energy Conservation (DG NREEC) with Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH.

• Project Duration: June 2014
Focus Area

Focus Area 1
Inventory and NAMA Strategy Development

Focus Area 2
Economic Instrument

Focus Area 3
Implementation of Pilot Measures

Focus Area 4
Capacity Development
Project Achievement

Climate Impact from RAC sector in Indonesia

• Indonesia is 3rd largest RAC market in Asia, 6th worldwide
• 77.31 Mt CO₂eq of GHG emissions, making approx. 15% of the energy sector-related emissions
• Unitary AC sector key for GHG mitigation and energy savings: 51 Mt CO₂eq (65% of total RAC sector emissions)

*) Detailed information available in RAC sector inventory report in Indonesian Bahasa and English
Total Mitigation Potential
more than 50 Mt CO2eq p.a. until 2050
Three (3) SNIs related to the cooling sector have been published through Green Chiller Project:

<table>
<thead>
<tr>
<th>No &amp; year SNI</th>
<th>Tittle</th>
<th>SK</th>
<th>Publish by</th>
</tr>
</thead>
<tbody>
<tr>
<td>SNI ISO 817-2018</td>
<td>Refrigerant – Designation and safety classification</td>
<td>SK 33/KEP/BSN/2/2018</td>
<td>2-Apr-18</td>
</tr>
<tr>
<td>SNI 6500-2018</td>
<td>Fixed installation refrigeration system – safety and environmental requirements</td>
<td>SK 85/KEP/BSN/2/2018</td>
<td>23-Apr-18</td>
</tr>
<tr>
<td>SNI 8476-2018</td>
<td>Method of rating and testing for performance of liquid chilling packages using the vapour compressing cycle</td>
<td>SK 116/KEP/BSN/5/2018</td>
<td>24-Mei-18</td>
</tr>
</tbody>
</table>
Politeknik Negeri Bandung
Cold Storage
- Location: Bandung, West Java
- Cooling Capacity: 0.475 TR / 1.663 kW
- Refrigerant type: R290 (Propane)
- Refrigerant Charge: 300 g
- MoU Signing: 9 August 2016

University of Indonesia
- Location: Depok, West Java
- Type of Chiller: Air Cooled
- Cooling Capacity: 56.14 TR / 197.61 kW
- Refrigerant type: R290 (Propane)
- Refrigerant Charge: 2 x 14 kg
- MoU signing: 10 December 2016

Politeknik Negeri Bali
- Location: Bali
- Type of Chiller: Water cooled chiller
- Cooling Capacity: 12.39 TR / 43.63 kW
- Refrigerant type: R290 (Propane)
- Refrigerant Charge: 6.5 kg
- MoU signing: 9 August 2016
FA-3: Installed Pilot Projects

Pertamina R&D
Roof top AC and ducted split units
- Location: Pulogadung, Jakarta
- Cooling Capacity: 60.58 kW
- Refrigerant type: R290 (Propane)
- Refrigerant Charge: 2 x 3 kg

PT. Phapros, Tbk
- Location: Semarang, Central Java
- Cooling Capacity: 2 units x 228.36 kW
- Refrigerant type: R290 (Propane)
- Refrigerant Charge: 4 x 15.45 kg
- MoU Signing: 24 November 2016
FA-3: Pilot Projects

- Quality test of hydrocarbon refrigerant produced by PT Pertamina and PT Artek.
- Hydrocarbon chillers safety installation audit and certification by Institut für Kälte- Klima- und Energietechnik (IKET) GmbH.
## Pilot Project – PT Phapros

### Technical Comparison

<table>
<thead>
<tr>
<th>Type of</th>
<th>Green Chiller*</th>
<th>Old Chiller **</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cooling Cap. Manufacturer Spec [kW]</td>
<td>231.9</td>
<td>643</td>
</tr>
<tr>
<td>Actual Cooling Capacity [kW]</td>
<td>239.5</td>
<td>175</td>
</tr>
<tr>
<td>Refrigerant (GWP)</td>
<td>R290 (GWP=3)</td>
<td>R22 (GWP=1700)</td>
</tr>
<tr>
<td>Refrigerant [kg]</td>
<td>23</td>
<td>141.4 ***</td>
</tr>
<tr>
<td>COP [W/W]</td>
<td>4.30</td>
<td>1.45</td>
</tr>
<tr>
<td>In Operation since</td>
<td>since 2018</td>
<td>1992 - 2017</td>
</tr>
</tbody>
</table>
Pilot Project – PT Phapros

- **Annual Electricity Consumption**: 54%
- **Annual CO₂ Emission**: 526 tCO₂ eq
- **Direct CO₂ emission* during lifetime**: 673 tCO₂ eq
- **Indirect CO₂ emission* during lifetime**: 9,600 tCO₂ eq

*18 years lifetime, 10% leak rate
** 18 years lifetime, faktor emisi 0.877 tCO₂/MWh
### Green Chiller Project Results

#### Technical Comparison

<table>
<thead>
<tr>
<th>Type of System</th>
<th>Green Chiller*</th>
<th>R22 Chiller**</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cooling Capacity [kw]</td>
<td>39.3</td>
<td>32.5</td>
</tr>
<tr>
<td>Refrigerant Type (GWP value)</td>
<td>R290 (GWP=3)</td>
<td>R22 (GWP=1700)</td>
</tr>
<tr>
<td>Refrigerant Charge [kg]</td>
<td>4.5</td>
<td>8</td>
</tr>
<tr>
<td>COP [W/W]</td>
<td>4.14</td>
<td>2.95</td>
</tr>
<tr>
<td>In Operation since</td>
<td>since 2017</td>
<td>since 2006</td>
</tr>
</tbody>
</table>

*Green Chiller*

**R22 Chiller**
Pilot Project – Bali State Polytechnic

**Annual Electricity Consumption (MWh/yr)**

- Green Chiller: 96
- R22 Chiller: 100

**Annual CO₂ Emission (tCO₂/yr)**

- Green Chiller: 73
- R22 Chiller: 85

- **✓** Annual Electricity Consumption: 16%
- **✓** Annual CO₂ Emission: 12 tCO₂ eq
- **✓** Direct CO₂ emission* during lifetime: 38 tCO₂ eq
- **✓** Indirect CO₂ emission* during lifetime: 207 tCO₂ eq

*18 years lifetime, 10% leak rate
**18 years lifetime, faktor emisi 0.877 tCO₂/MWh
# Pilot Project – Pertamina RTC

<table>
<thead>
<tr>
<th>Type of System</th>
<th>R290 packaged unit</th>
<th>Split AC system</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spec COP from Manufacturer [W/W]</td>
<td>3.00</td>
<td>3.48</td>
</tr>
<tr>
<td>Actual COP [W/W]</td>
<td>3.14*</td>
<td>2.35**</td>
</tr>
<tr>
<td>Refrigerant (GWP)</td>
<td>R290 (3)</td>
<td>R22 (1700)</td>
</tr>
<tr>
<td>Refrigerant Charge [kg]</td>
<td>6.42</td>
<td>2.2 (R22)</td>
</tr>
<tr>
<td>Direct CO₂ During Lifetime (tCO₂eq)</td>
<td>0.04</td>
<td>49.95</td>
</tr>
<tr>
<td>In operation since</td>
<td>Since 2017</td>
<td>n/a</td>
</tr>
</tbody>
</table>

**Technical Comparison**
Pilot Project – Pertamina RTC

- Design COP [W/W]
- Actual COP [W/W]

R290 Packaged Unit: 5% difference
AC Splits: 33% difference
FA-4: Capacity Development

Training “Safe and Efficient Use of Hydrocarbon Refrigerant R290: Installation, Maintenance and Service”

- Development of training facilities in Bali State Polytechnic (PNB) and Bandung State Polytechnic (POLBAN)
- Training of Trainers (18 of 32 instructors are certified)
- Training of Technicians (68 of 87 certified)
- Training of Auditor and planners (62 trained)
- On-site chiller certification audit training (18 trained)
- Brazing training for hydrocarbon installation (21 trained)
- Development of special National Special Competencies Standard of Indonesia (SKKNI) for refrigerant hydrocarbon handling with National Profession Certification Body (BNSP)
FA-4: Capacity Development
FA-4: Capacity Development
FA-4: Certificate of Competence
Conclusion

• Three SNI that will support policies on natural refrigerant application and minimum energy performance for chiller has been approved.

• Training and technician certification scheme that will support market readiness for hydrocarbon application on cooling sector are in place.

• Safety audit for R290 installation has proved that Indonesia local manufacturer has capacity to produce hydrocarbon unit that already comply to International standard.

• Energy performance proved that R290 has a better energy performance for the same compressor technologies.
Next Steps

• R290 Markets share is not there yet, even though there is a big potential market for R290 split unit in Indonesia considering the current situation which R290 widely used as drop in refrigerant to replace HCFC and HFC.

• Indonesia can continue the efforts to encourage local manufacturers to build AC split production line.

• EE compressors for R290 is still very limited for only piston type for big capacity and scroll for small capacity

• Safety issue is still a big consideration for compressor supplier to supply to local manufacturers.
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Supporting **Transformation** in the **Commercial Refrigeration Sector**

**Business case:** Thailand and South East Asia
SANDEN Intercool Group is designing, manufacturing and trading commercial, professional and retail refrigeration equipment and complete in-market solutions for the beverage, dairy, ice-cream, food-service and retail markets.

We manufacture and export to Asia (except Japan & China), Africa, Middle East and Europe (350,000 units p.a.)

SANDEN Intercool - WHO WE ARE

SANDEN Intercool Group

HQ in Thailand

✓ 3 Plants (0.5m units per annum)
  ➢ Thailand (Mega Plant)
  ➢ Egypt
  ➢ Nigeria

✓ 22 Business Locations
  ▪ Asia: Thailand (Group + Local), Indonesia, Malaysia, Laos Vietnam, Myanmar, Cambodia, Singapore, Pakistan, Sri Lanka
  ▪ APAC: Taiwan, Australia, Philippines, Korea
  ▪ Africa: Kenya (HQ), Nigeria, Egypt
  ▪ ME: Bahrain (HQ), S. Arabia
  ▪ Europe: Italy (HQ), Greece
Complete Product Range

Coolers & Freezers

Convenience Store, Retail & Supermarket Systems

Foodservice Refrigerators & Freezers
Our approach to sustainability has been shaped by the overall principle of creating a better future on the basis of the economical, human, environmental and social contribution to the communities we operate.

As a world-wide corporate citizen, Sanden Group recognizes that the outmost shared responsibility is to preserve the earth's environment.

In order to fulfill this responsibility, and pass on a safe and clean earth to the next generation, we are taking all the appropriate steps and precautions in all areas within our business activities.

Environmental Doctrine:

Our actions include, but are not limited, the following:

- **Green Approach**: Use environmentally friendly refrigerants, technologies and materials
- **Low Energy** Design for our products
- **Material Recyclability**
- **4Rs Concept** (Reduce, Reuse, Recycle, Recover) in all our activities in the plants and offices
- **Coexistence** Principle – taking all actions to reduce the carbon footprint of our manufacturing facilities

We aim to develop, offer and promote **Green Refrigeration** gradually in all our Product Groups.
Green Refrigeration

**STEP 1:** Direct, Measurable

- Natural Refrigerants
- Energy
  - Illumination
  - Components
  - Controller
  - “Heat loss”

**STEP 2:** Indirect, difficult to assess

- Equipment Life-Time
  - Expand Life-Cycle
    - Quality
    - Durability
- Serviceability
  - Reduce Service
    - Low Maintenance
    - Simplicity
- Re-usability
  - Increase Re-Use
    - Recyclability
    - Refurbishment
Component Suppliers, Equipment Manufacturers and Opinion Leaders (MNC users) must embrace the need and actively support the development of Green Refrigeration (GLOBAL).

Technology advancements are affecting positively the adoption of green solutions (GLOBAL).

Legislative direction and policy-makers (REGIONAL – Local) – need further steps to facilitate widespread use of environmentally friendly refrigeration.

Equipment Manufacturers: investments to develop & produce green equipment
End-users: life-time vs. acquisition cost

Need to educate Customers, Dealers, End-users, Service Technicians.
Case Study - Hydrocarbon Refrigerants in S.E. Asia

Strategic Intention

✓ Component suppliers have already adjusted to hydrocarbon refrigerant requirements (full range of compressors, suitable heat exchangers and temperature controllers)

✓ Key refrigerator equipment manufacturers have developed models for “advanced” markets and customers; they can drive the market forward (Opinion Leaders 1)

✓ Most multinational food and beverage companies (Opinion Leaders 2) are embracing hydrocarbon refrigerants and advising or mandating their use; **though still lagging behind in Asia**

Technology

✓ Hydrocarbon coolers and freezers under existing IEC standards (150g refrigerant charge) can efficiently cover all plug-in cooler and freezer requirements up to 1500L capacity

✓ Hydrocarbon cooling systems are more energy efficient than HFCs (est. 2% to 10% on parity configuration)

✓ Switch from HFC to HC requires minimal changes in the cooling components; though requires some investments in production line

✓ Migration to HC refrigerant has been achieved in domestic appliances
IEC, the international standardization body, has just approved to increase the maximum charge amount for hydrocarbon refrigerants from 150 g to 500g. This will facilitate the prompt and cost-efficient utilization of hydrocarbon refrigerants in large units and support the transition to green refrigeration.

In Europe a top-down approach (legislation, multinational beverage companies) have driven the almost 100% adoption of hydrocarbons; we can duplicate this in our area.

Institutional and regulatory framework to support the use of HC refrigerants in S. E. Asia region

Switchover from HFCs to HCs will require some additional investments for the manufacturing and servicing of the equipment.

The acquisition cost per unit will marginally increase but the life-time cost will be lower (less energy, lower service) – especially if switch-over to HC is combined with high efficiency components.

Utilize government environmental agencies and policies to actively promote

Instigate / support MNC food and beverage companies (Opinion Leaders 2) switchover to HC systems

Sponsor Green Refrigeration benefits to dealers & consumers (advertisement, incentives)
Case Study - Hydrocarbon Refrigerants in S.E. Asia

**Green Commercial Refrigeration**

**Strategic plans**

A. Invest on hydrocarbon refrigerant production lines
   (will be completed in August for coolers and freezers)

B. Invest on developing full range of HC refrigeration equipment:
   1. Freezers: COMPLETED
   2. Coolers: 67% COMPLETED
   3. Convenience Store equipment: 10% COMPLETED
      (technology barriers for large equipment to be resolved with new IEC regulation for higher refrigerant charge)
   4. Food-service equipment: in plan

C. Offer & promote HC equipment to all regional beverage companies

D. Advertise & Promote Green Refrigeration to Consumers / Dealers
Case Study - Hydrocarbon Refrigerants in Thailand

Advertise & Promote Green Refrigeration to Consumers / Dealers

- Preserve the environment
- Save energy
- Payback of incremental cost within few months

HFC (R134a)
Category 5 ★

HFC (R290)
Category 5 ★

HFC (R290)
Category 5 ★★

HFC (R290)
Category 5 ★★
6/2019:
- 100% of sales to Europe and Africa is with green refrigerant
- Migration of customers in S. E. Asia has started this year
- Full range of freezers and 67% beverage coolers are offered with green configuration

2020:
- Offer complete beverage cooler range with HC refrigerant 60% with additional energy saver
- Promote sales of green refrigerants in SE Asia (top-down approach) and Thailand (bottom-up / top-down)
- Start developing green CVS products (key models, HC and CO2 refrigerants)

2021:
- Establish green equipment in Thai and SE Asia market
- Finalize development of green CVS products (key models, HC and CO2 refrigerants)
- Start developing green Food- Service equipment (key models, HC and CO2 refrigerants)
Thank You
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4) Discussion & Conclusion  
   All

5) Closing  
   Bernhard Siegele, GIZ Proklima
Agenda

1) Current Green Cooling technology trends in South-East Asia  
   Jan Dusek, Shecco

2) Energy performance and safety audit results of propane chiller pilot projects in various fields of application  
   Mrs. Herlin Herlianika, Technical Consultant, Green Chillers project Indonesia (Heat GmbH)

3) Initiating a transformation in the commercial refrigeration sector in Thailand – experiences, challenges, and next steps  
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• Any further queries?
• Please contact Julia Schabel (Julia.Schabel@giz.de) or
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