2023 ASHRAE–UNEP Lower GWP Refrigeration and Air-Conditioning Innovation Award

For Next Cycle, Visit:
ashrae.org/lowerGWP

About the Award:

The award promotes innovative design, research, and practice by recognizing people who have developed or implemented innovative technological concepts applied in developing countries to promote lower global warming potential (GWP) refrigerants through refrigeration and air-conditioning applications.

The award is only presented to individuals and to teams of individuals who are involved in the research, design, or introduction of the technology used in the project. While one or more individuals may be involved through their work with institutions, private sector organizations, or firms, awards are only made to and in the name of individuals rather than to their firms or other types of employers.

The selection takes into account the following criteria:

- Innovative aspects in transforming conventional concepts,
- Technical replicability to developing countries,
- Extent of need, and
- Economy feasibility to developing countries.

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Panel of Judges:

Co-Chairs

James S. Curlin (UNEP)

Ginger Scoggins (ASHRAE)

Judges

Nesreen Ghaddar (Lebanon)

Cesar Lim (Philippines)

Roberto Peixoto (Brazil)

James Wolf (USA)

Commercial/Industrial Applications

HC-290 (Propane) as an Alternative Refrigerant in Commercial Applications (Ecuador)

HILSEA INVESTMETS LIMITED COMPARISON OF TEMPERATURE IN THE ESMERALDA SUN COLD STORE WITH CON R22 Y R290							
R22				R290			
Fecha	Hora	Temperatura °C	Humedad %	Fecha	Hora	Temperatura °C	Humedad %
2/25/2019	0:00:26	1.9	82	12/23/2019	0:00:24	2.6	79.9
2/25/2019	0:00:56	1.9	82	12/23/2019	0:00:54	2.6	79.9
2/25/2019	0:01:26	2	82	12/23/2019	0:01:24	2.6	79.9
2/25/2019	0:01:56	2.1	82	12/23/2019	0:01:54	2.5	79.9
2/25/2019	0:02:26	2.2	82	12/23/2019	0:02:24	2.5	79.9
2/25/2019	0:02:56	2.3	82	12/23/2019	0:02:55	2.4	79.9
2/25/2019	0:03:26	2.3	82.1	12/23/2019	0:03:25	2.3	79.9
2/25/2019	0:03:57	2.5	82.1	12/23/2019	0:03:55	2.3	79.9
2/25/2019	0:04:27	2.5	82.1	12/23/2019	0:04:25	2.2	79.9
2/25/2019	0:04:57	2.6	82.1	12/23/2019	0:04:55	2.2	79.9
2/25/2019	0:05:27	2.6	82.1	12/23/2019	0:05:25	2.2	79.9
2/25/2019	0:05:57	2.7	82.1	12/23/2019	0:05:56	2.1	79.9
2/25/2019	0:06:27	2.8	82.1	12/23/2019	0:06:26	2.1	79.9
2/25/2019	0:06:58	2.8	82.1	12/23/2019	0:06:56	2.1	79.9
2/25/2019	0:07:28	2.9	82.1	12/23/2019	0:07:26	2.1	79.9
2/25/2019	0:07:58	2.9	82.1	12/23/2019	0:07:56	2	79.9
2/25/2019	0:08:28	3	82.1	12/23/2019	0:08:26	2	79.9
2/25/2019	0:08:58	3.1	82.1	12/23/2019	0:08:56	2	79.9
2/25/2019	0:09:28	3.1	82.1	12/23/2019	0:09:27	2.1	79.9
2/25/2019	0:09:58	3.1	82.1	12/23/2019	0:09:57	2.1	79.9
2/25/2019	0:10:28	3.1	82.1	12/23/2019	0:10:27	2.2	79.9
2/25/2019	0:10:58	3.1	82.1	12/23/2019	0:10:57	2.2	79.9
2/25/2019	0:11:29	3.1	82.1	12/23/2019	0:11:27	2.3	79.9
2/25/2019	0:11:59	3.1	82.1	12/23/2019	0:11:57	2.3	79.9
2/25/2019	0:12:29	3.1	82.1	12/23/2019	0:12:27	2.4	79.9
2/25/2019	0:13:00	3.1	82.1	12/23/2019	0:12:57	2.5	79.9
2/25/2019	0:13:30	3.2	82.1	12/23/2019	0:13:27	2.5	79.9
2/25/2019	0:14:00	3.2	82.1	12/23/2019	0:13:57	2.6	79.9
2/25/2019	0:14:30	3.2	82.1	12/23/2019	0:14:27	2.6	79.9
2/25/2019	0:15:00	3.2	82.1	12/23/2019	0:14:58	2.7	79.9
2/25/2019	0:15:30	3.2	82.1	12/23/2019	0:15:28	2.7	80
2/25/2019	0:16:00	3.3	82.1	12/23/2019	0:15:59	2.7	80
2/25/2019	0:16:30	3.3	82.1	12/23/2019	0:16:29	2.7	80
2/25/2019	0:17:00	3.3	82.1	12/23/2019	0:16:59	2.7	80
2/25/2019	0:17:30	3.4	82.1	12/23/2019	0:17:29	2.7	80
2/25/2019	0:18:00	3.4	82.1	12/23/2019	0:17:59	2.6	80
2/25/2019	0:18:30	3.5	82.1	12/23/2019	0:18:29	2.6	80
2/25/2019	0:19:01	3.5	82.1	12/23/2019	0:18:59	2.5	80
2/25/2019	0:19:31	3.5	82.1	12/23/2019	0:19:29	2.5	80
2/25/2019	0:20:01	3.6	82.1	12/23/2019	0:19:59	2.5	79.9
2/25/2019	0:20:31	3.6	82.1	12/23/2019	0:20:30	2.4	79.9
2/25/2019	0:21:01	3.6	82.1	12/23/2019	0:21:00	2.3	79.9
2/25/2019	0:21:31	3.6	82.1	12/23/2019	0:21:30	2.3	79.9
2/25/2019	0:22:01	3.6	82.1	12/23/2019	0:22:00	2.3	79.9
2/25/2019	0:22:32	3.7	82.1	12/23/2019	0:22:30	2.2	79.9
2/25/2019	0:23:02	3.8	82.1	12/23/2019	0:23:00	2.2	79.9

Temperature Comparision between R22 and R290

HILSEA INVESTMETS LIMITED COMPARISON OF POWER IN THE ESMERALDA SUN COLD STORE WITH R22 Y R290					
R22			R290		
Date	Hour	Kw	Date	Hour	Kw
3/6/2019	15:17:45	16.94	12/26/2019	13:31:28	11.3
3/6/2019	15:47:45	17.42	12/26/2019	14:01:28	0
3/6/2019	16:17:45	16.64	12/26/2019	14:31:28	11.3
3/6/2019	16:47:45	9.68	12/26/2019	15:01:28	19.9
3/6/2019	17:17:45	17.35	12/26/2019	15:31:28	21.8
3/6/2019	17:47:45	9.42	12/26/2019	16:01:28	11.5
3/6/2019	18:17:45	15.58	12/26/2019	16:31:28	21.4
3/6/2019	18:47:45	9.45	12/26/2019	17:01:28	10.7
3/6/2019	19:17:45	14.38	12/26/2019	17:31:28	11.7
3/6/2019	19:47:45	8.15	12/26/2019	18:01:28	11.2
3/6/2019	20:17:45	14.60	12/26/2019	18:31:28	11.4
3/6/2019	20:47:45	9.52	12/26/2019	19:01:28	10.7
3/6/2019	21:17:45	12.38	12/26/2019	19:31:28	11.1
3/6/2019	21:47:45	8.91	12/26/2019	20:01:28	0
3/6/2019	22:17:45	7.64	12/26/2019	20:31:28	0
3/6/2019	22:47:45	18.85	12/26/2019	21:01:28	0
3/6/2019	23:17:45	7.67	12/26/2019	21:31:28	0
3/6/2019	23:47:45	8.63	12/26/2019	22:01:28	0
3/7/2019	00:17:45	8.29	12/26/2019	22:31:28	0
3/7/2019	00:47:45	8.64	12/26/2019	23:01:28	0
3/7/2019	01:17:45	17.78	12/26/2019	23:31:28	0
3/7/2019	01:47:45	9.09	12/27/2019	00:01:28	0
3/7/2019	02:17:45	17.10	12/27/2019	00:31:28	0
3/7/2019	02:47:45	7.12	12/27/2019	01:01:28	10.9
3/7/2019	03:17:45	16.65	12/27/2019	01:31:28	0
3/7/2019	03:47:45	8.32	12/27/2019	02:01:28	10.7
3/7/2019	04:17:45	17.30	12/27/2019	02:31:28	11.8
3/7/2019	04:47:45	8.46	12/27/2019	03:01:28	0
3/7/2019	05:17:45	8.17	12/27/2019	03:31:28	21.1
3/7/2019	05:47:45	9.01	12/27/2019	04:01:28	11.8
3/7/2019	06:17:45	8.34	12/27/2019	04:31:28	11.7
3/7/2019	06:23:49	8.19	12/27/2019	05:01:28	11.7
3/7/2019	06:53:49	7.05	12/27/2019	05:31:28	21
3/7/2019	07:23:49	8.55	12/27/2019	06:01:28	20.3
3/7/2019	07:53:49	0.00	12/27/2019	06:31:28	11.8
3/7/2019	08:23:49	0.00	12/27/2019	07:01:28	11.6
3/7/2019	08:53:49	0.00	12/27/2019	07:31:28	17.2
3/7/2019	09:23:49	0.00	12/27/2019	08:01:28	0.5
3/7/2019	09:53:49	0.00	12/27/2019	08:31:28	11.1
3/7/2019	10:23:49	0.00	12/27/2019	09:01:28	20.5
3/7/2019	10:53:49	0.00	12/27/2019	09:31:28	1.6
3/7/2019	11:23:49	19.36	12/27/2019	10:01:28	10.6
3/7/2019	11:53:49	18.44	12/27/2019	10:31:28	11.3

Power Comparision between R22 and R290

About the Project:

This cold store project used HC-290 as an alternative refrigerant in commercial applications. The project resulted in a 36% reduction in energy consumption and a 41% decrease in total equivalent CO_2 emissions. It also strengthened local technical capacity and provided inputs for updating regulations on flammable refrigerants. A part of the project was to perform a flammability risk assessment following the refrigeration safety standard (EN-378) and the explosive atmospheres standard (EN-1127-1) to identify possible sources of ignition and then to implement actions to eliminate them including HC-290 sensors inside the room.

Project Team:

Rodrigo Serpa
Fernando Del Castillo
Omarly Acevedo
Ana Correa

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Commercial/Industrial Applications

Flammable Refrigerant Use in a Draft Beer Machine (Brazil)

About the Project:

This project developed a new heat exchanger composition for draft beer machines, allowing the use of flammable refrigerants and improving cooling efficiency. The new design reduces the refrigerant charge, eliminates oil accumulation issues, and enhances heat exchange between fluids and the intermediate material. The project demonstrated the environmental benefits by achieving lower energy consumption and CO_2 emissions, while maintaining the size and usability of the equipment.

Project Team:

Eduardo Arjona Esteves
Lucas Cavalin
David Marcussi
Davi Telles
Roberto Cavalin

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Commercial/Industrial Applications

Ammonia Use in Multipurpose Cold Storage (India)

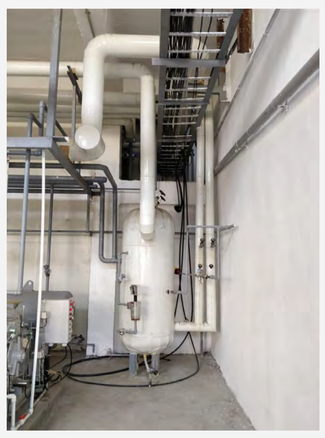
Air-Cooled Condenser with Adiabatic Precooling Pads (Left) and Dry-Cooled with Adiabatic Cooling Pads (Right)

Compressors in Machine Room

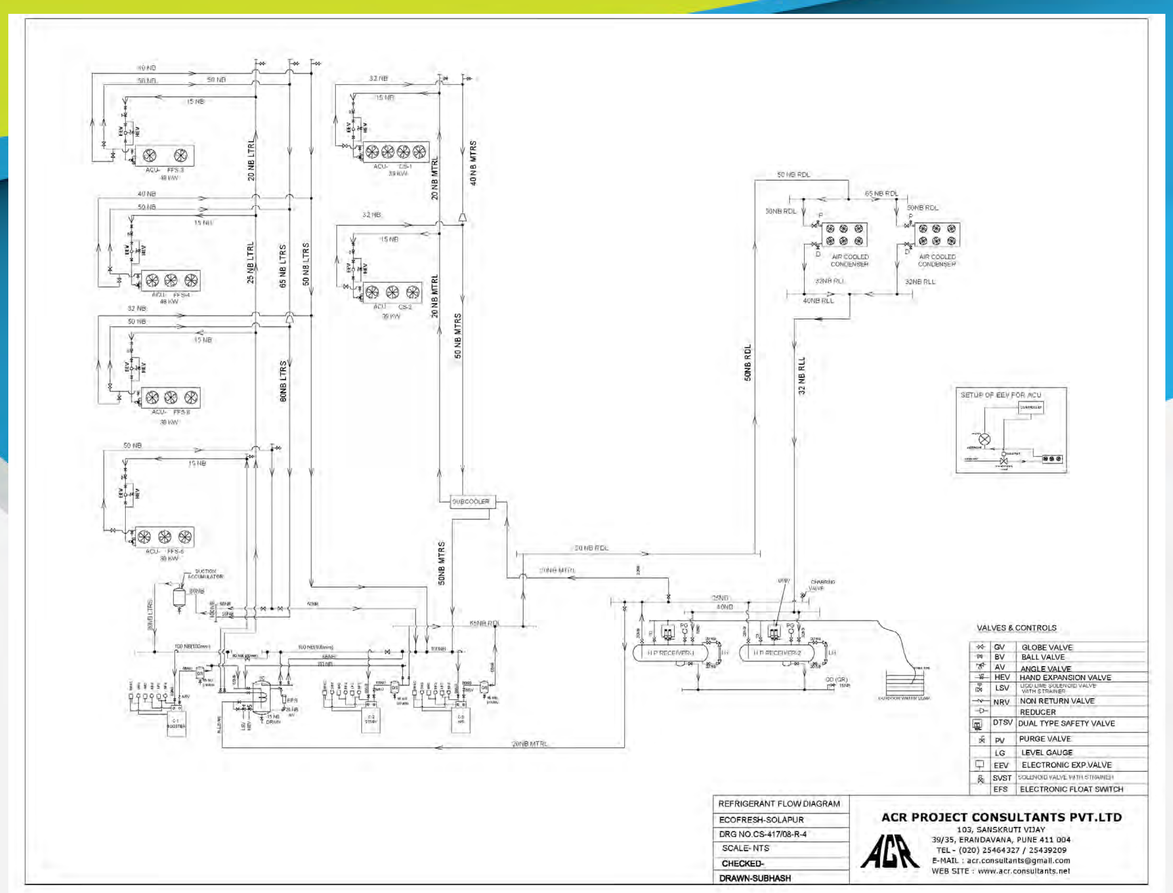
Valve and Controls Setup

Building View (During Construction)

Inside a Chamber with Products Stacked Up



Intercooler in Machine Room



P&ID for Refrigeration System

About the Project:

The project is a multipurpose cold storage utilizing a low-charge DX ammonia system with air-cooled condensers and electronic expansion valves, a first of its kind in India. This innovative system allows for the storage of perishable produce in both chilled and frozen conditions, offering flexibility and economic viability. By using ammonia as a refrigerant, which has a low Global Warming Potential (GWP) and zero Ozone Depletion Potential (ODP), the project has a positive environmental impact while reducing water consumption and energy consumption through the use of adiabatic pre-cooling systems. Three main features are innovative:

1. An air-cooled condenser is considered with adiabatic cooling that starts when ambient temperature exceeds 32°C. This avoids high condensing pressures for ammonia.
2. Ability to convert storage chambers based on market demand to low or positive temperatures without increasing energy cost.
3. A dry cooler with adiabatic pre-cooling of condenser inlet air is used for this compressor jacket cooling avoiding excessive use of water and keep the compressor jacket corrosion free.

Project Team:

Harshal Surange
Arvind Surange

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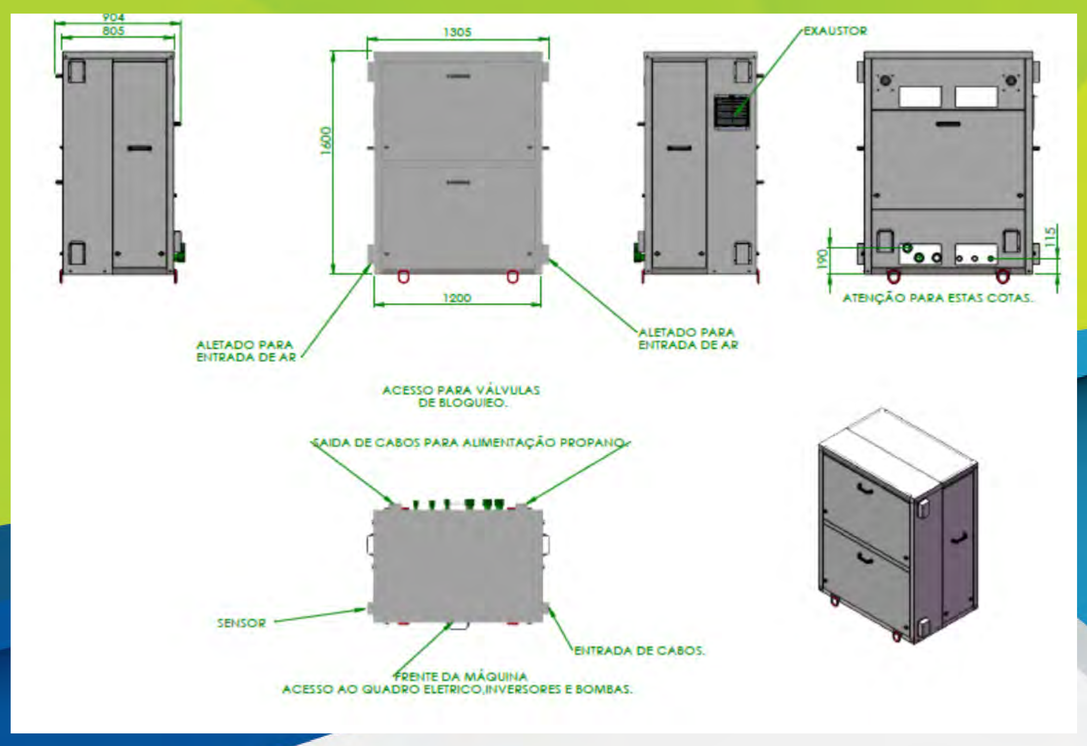
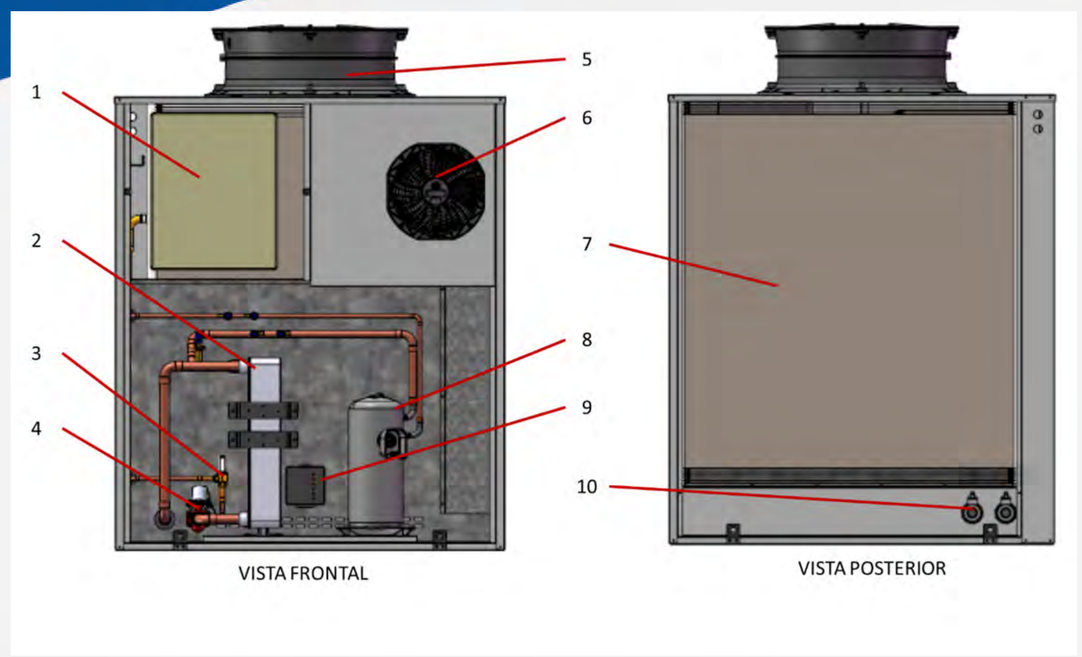
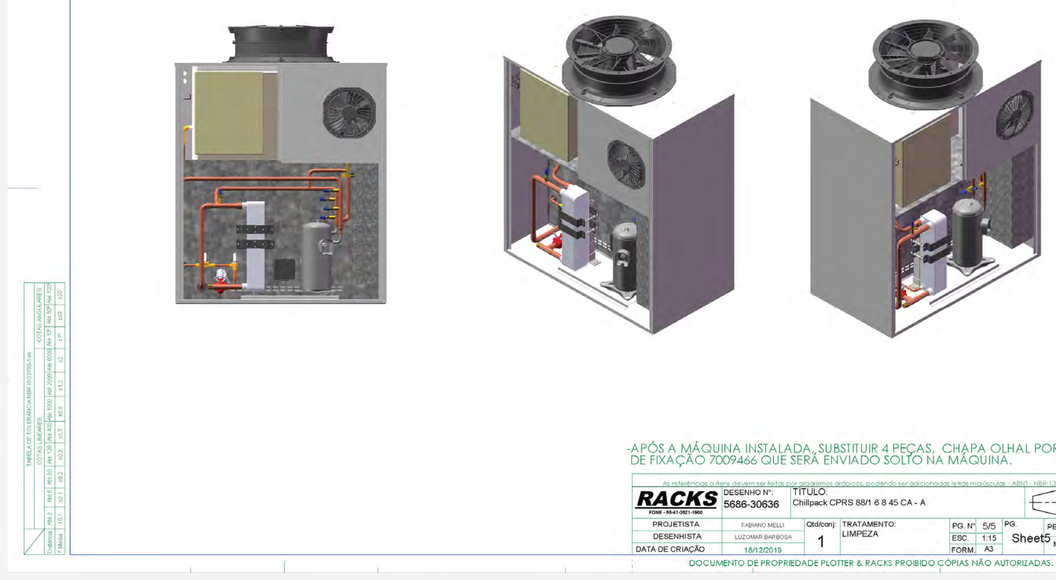
Commercial/Industrial Applications

Propane Chiller Use in a Convenience Store (Brazil)







About the Project:

The project involves the development of a modular low-charge refrigerant chiller using propane as a replacement for HCFC in commercial facilities in Brazil. The innovation includes:

- a centralized control system,
- capacity control by mass flow variation, and
- the use of low internal volume evaporators and condensers to minimize refrigerant charge.

The modular system allows for easy replacement of faulty equipment and eliminates the need for maintenance in the field. The benefits of this project include optimized performance, enhanced safety, reduced environmental impact through natural refrigerants, and potential future retrofit opportunities in developing countries. The adoption of the concept of a control and pumping unit separate from the cooling modules enhanced safety, since all the electrical power and control parts were separated from the propane circulation environment, thus avoiding possible generation problems.

Project Team:

Fernando Sayols Marchioro
Éder Paluch
Elielton Polityto

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