Startup/Industrial prospective for the upcoming eco-friendly technology in India

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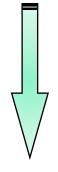








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Current Scenario

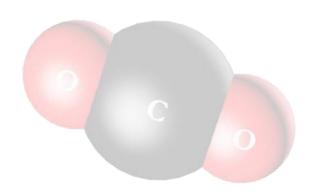
Solution and Motivation

R744 heat pump under development

INDEE+ installations

Collaboration opportunities

Acknowledgments

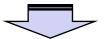


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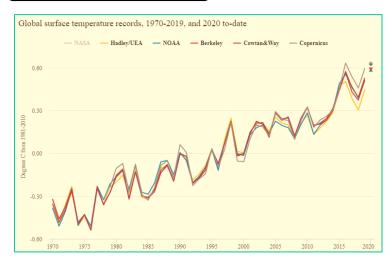
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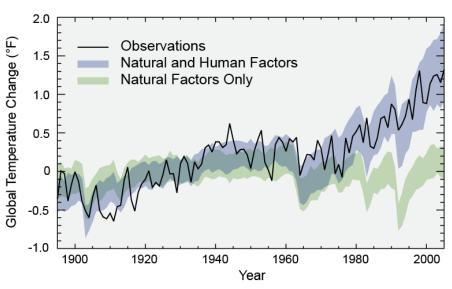
Need of the Hour



- Recent climate changes, however, cannot be explained by natural causes alone.
- Rather, it is extremely likely that human activities have been the dominant cause of that warming.

The temperature anomalies changes relative to the 1981-2010 average temperature for each year since 1970, along with the average over the first nine months of 2020.

Separating Human and Natural Influences on Climate



https://www.weforum.org/ and EPA





Solution and Motivation

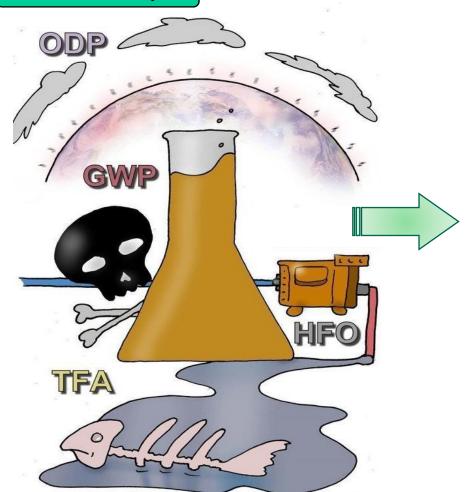
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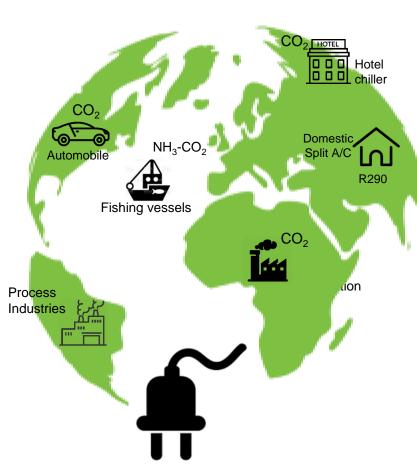
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Problem >> Key







- Most car manufacturers
 - Europe, Korea, Japan and the US
- System and component suppliers
- Institutes and universities all over the world
- Related industries are either developing or are already in production with CO₂.
 - Residential / commercial hot water systems
- Commercial and industrial refrigeration
 - stationary, supermarkets
- US Army is developing in both stationary and wheeled vehicles
- Helicopter and airplane air conditioning and refrigeration
- Transport refrigeration









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CO₂ transcritical installations in the world

sheccoBase 👺







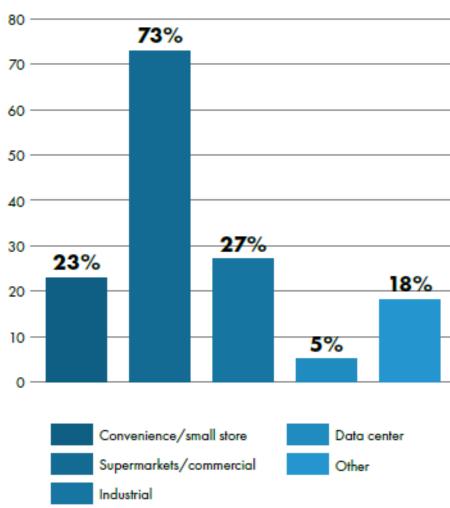
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Transcritical in Commercial Refrigeration Around the World

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INDEE: CO₂ supermarket cooling test-rig

Cooling Capacity 33 kW

AC Evaporator 20 kW MT Evaporator 10 kW LT Evaporator 3 kW

Ejectors:

High Ejection Ratio Low Ejection Ratio Liquid Ejector

Gas cooler (Air Cooled)

Heat Recovery

IHX

Sub cooler





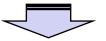


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Akshay Patra Foundation

Mid-Day Meal Scheme in government schools and government-aided schools. Aims at countering malnutrition and supporting the right to education of socio-economically disadvantaged children.

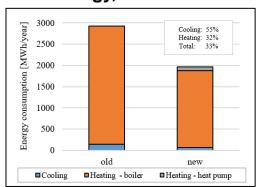
- Each cauldron has a capacity to cook at least 500 litres of rice and up to 3000 litres of dal.
- The Bengaluru kitchen supplies midmeals to 551 schools, on 27 routes covering a radius of 50 km.

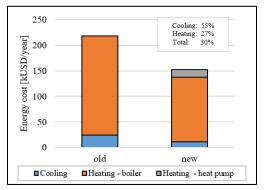


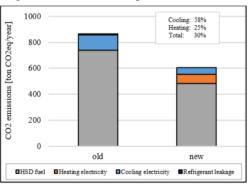


Internal view of Akshaya Patra's kitchen

Energy, Economical and Environmental Benefits with the Proposed R744 system









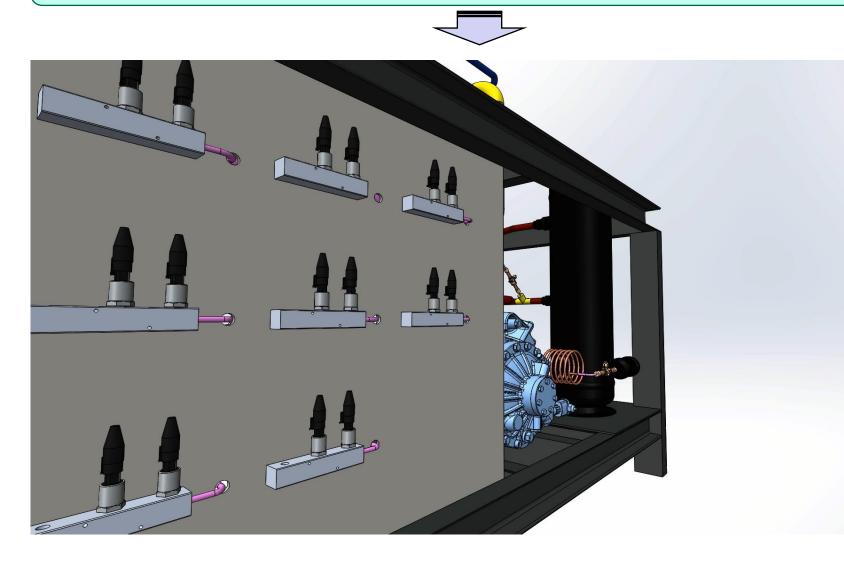


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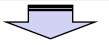


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Components Status

Heat Exchangers

Evaporators

Medium Temperature

Low Temperature

Receiver/Separator

Oil Separator





STAB. DI VILLA BARTOLOMEA (VR-ITALY)
COSTRUZIONE COMPONENTI
REFRIGERAZIONE E CONDIZIONAMENTO
VIA DEL COMMERCIO, 3, www.frigomec.com

Compressor



Sensors and Controls



Assembly and Testing







Solution and R744 heat pump **INDEE+** Collaboration Current Scenario Motivation under development **Installations** opportunity **Demo Sites** Supermarket unit Hotel Heat-pump chiller Fish process plant Industrial engagement Knowledge dissemination Local news papers Articles Magazines Advertisement New local vendors **Indian Journals** and potential rig assemblers Design an Theoretical background of advanced level CO2 technology CO₂ course New skilled **Uplifting** technical staff current Hands on practice sessions **HVAC** Workshop and with the advanced multipack



test-rigs

Test-rig results and

conclusions at Indian context

market

scenario

Enhancement in

the availability of basic rig

Components

training programs

Project website

Solution and R744 heat pump **INDEE+** Collaboration Current Scenario Motivation under development **Installations** opportunity Civil CO₂ System System Mechanical Electrical commissioni Electrical ng connection Cooling (operation s for the units Puff and results) unit (Ducting + Paneling of System (Control Evaporator the cooling switches. Piping and position) Positioning chamber Lightening, insulation of the Earthing) Cabinet (Floor and (CO2, cabinet and wall CO2 Electricity, and component paneling) Water. system foundation components Drainage, assembly +Control Make-up, room Fire line





Industrial Collaboration for INDEE+

3 Demo-sites

















SUMMARY

- ✓ Replacing the HCFC air-conditioning units with the CO₂ heat pump offers more than 50% reduction in power consumption for the space cooling system and almost 60% reduction in GHG emissions.
- ✓ By implementing the heat pump for producing hot water to the cooking process reduces the kitchens total energy consumption (HSD fuel) of more than 30% and the CO₂ emissions with 25%. Steam boilers must still be applied for raising the water temperature to boiling point and keep it boiling during cooking.
- ✓ A CO₂ heat pump producing simultaneously hot and cold water is an extremely efficient way of supplying both heating and cooling needs, especially if they occur at the same time. However, by installing hot and cold-water storage tanks, the mismatch in both load and time can be balanced.
- ✓ Possible collaboration with Indian Industries to develop the three upcoming installation of the CO2 cooling and heating units

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ACKNOWLEDGMENT



