

## Using inverter technology lowers CO<sub>2</sub> emissions.

CO<sub>2</sub> is the most produced greenhouse gas. It can lead to rising sea levels that pose a very real threat to some island nations and densely populated river delta areas. Contributes to a sustainable future in all regions.

## What are the benefits of inverters for laboratories?

### How inverters reduce CO<sub>2</sub> and save energy.

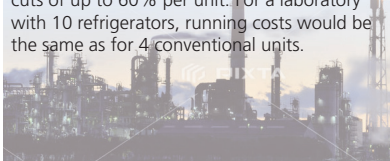
#### Scope of Applications:

Inverters are found in eco-friendly models of ACs, refrigerators, freezers and HVAC systems, but also in EV cars and other high-end products. For applications that make use of liquid (compressed) gas refrigerants in a cooling loop, the inverter regulates the input frequency to the compressor. In doing so, the input becomes realtime adjustable.



#### Save energy, save costs

A conventional laboratory uses up to 1000 kWh per m<sup>2</sup> per year. The biggest share of that is used for ventilation, temperature adjustment and cooling. In warm climates and R&D that requires 24/7 frozen storage, the power bill can have a significant impact on the available budget. Inverters enable energy consumption cuts of up to 60% per unit. For a laboratory with 10 refrigerators, running costs would be the same as for 4 conventional units.



#### Carbon Footprint

Inverters contribute to a large cut in CO<sub>2</sub> exhaust. The largest energy consumers in laboratories are HVAC, fume hoods and 24/7 cold storage solutions. In an effort to reduce CO<sub>2</sub> exhaust, A/C and cold storage each can make a large contribution by switching to models with inverter-controlled compressors. An 800 kWh reduction for a single unit means half a ton reduction.

Source: <https://energyfactbook.com/co2-equivalent/>

### LifeScience and biolabs

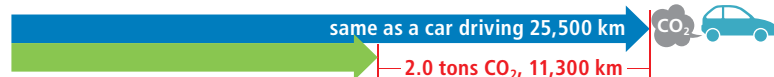
Fume hoods are refreshing air constantly, so supplying cooled air causes a large carbon footprint. The energy bill can be reduced 20-60% by using inverter controlled compressors in refrigerators and freezers.

■ **ULT freezer -80°C (8,000 kWh/y) 6.5 tons CO<sub>2</sub>**



■ **INVERTER ULT Freezer (3,000 kWh/y) 2.5 tons CO<sub>2</sub>**

■ **A/C (6230 kWh/y) 5.0 tons CO<sub>2</sub>**



■ **INVERTER A/C (3471 kWh/y) 3.0 tons CO<sub>2</sub>**

■ **Conventional Industrial 500L freezer -30°C (2,000 to 3,000 kWh/y) 1.6 to 2.4 tons CO<sub>2</sub>**



■ **INVERTER Industrial 500L freezer -30°C (1,000 kWh/y) 0.8 tons CO<sub>2</sub>**

Source: <https://link.springer.com/article/10.1007/s41825-020-00033-y>

#### OTHER benefits:

Non-inverter models run at a single speed, turn off, then turn on again. As the start-up of a compressor requires the most energy, repeated ON and OFF cycling causes noise, speeds up product wearout, and frequent energy consumption peaks.

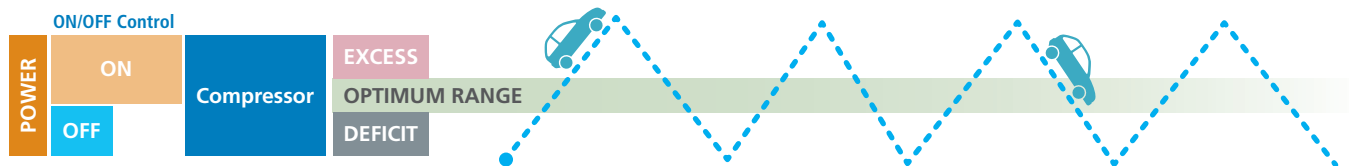
#### INVERTERS feature:

- less maintenance
- longer product life
- less noise
- flat energy consumption
- better accuracy

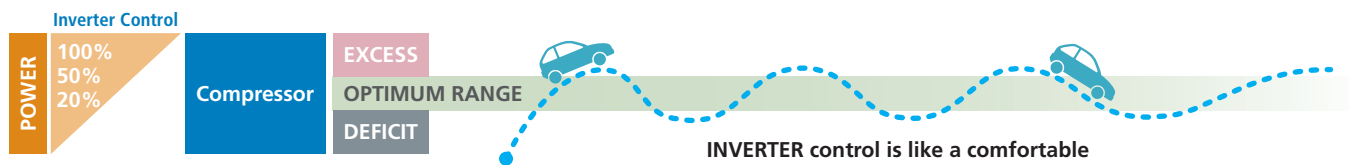


# How the inverter works





## NON-inverter



## Inverter



## Example of CO<sub>2</sub> reduction per country.

	 INDIA	 SINGAPORE	 JAPAN	 AUSTRALIA
CO <sub>2</sub> emissions in million ton	1,222.6 in 2005	40.9 in 2005	1,315.9 in 2013 (1,304.4 in 2005)	535.7 in 2013 (617.0 in 2005)
2030 Reduction target	33-35% (compared to 2005)	36% (compared to 2005)	26% compared to 2013 (25.4% compared to 2005)	26-28% (compared to 2005)
ADOPTED POLICY	Even though energy demand will triple, clean coal, renewable energy, smart grid implementation, clean technology funding and planting trees will be among the largest of <a href="#">India's CO<sub>2</sub> emission cuts</a> .	Singapore is implementing clean technologies and increasing energy efficiency <a href="#">to meet the CO<sub>2</sub> target</a> . The government <a href="#">sponsors</a> buying household appliances with inverters, aiming at 357,000 ton less CO <sub>2</sub> emission by inverter refrigerators only.	By enhancing the use of inverter technology, Japan aims to save 5.33 TWh of energy per year. This directly translates into a 3.4 million ton reduction in CO <sub>2</sub> emissions, exactly 1% of planned <a href="#">340 M ton reductions</a> .	Australia works with the <a href="#">Emissions Reduction Fund</a> , rewarding every ton of carbon reduction with carbon credits, which gives converted into money, so giving incentive to implement clean technologies.

### References and sources:


<https://www4.unfccc.int/sites/submissions/indc/Submission%20Pages/submissions.aspx>

JAPAN: <https://www.nedo.go.jp/content/100903678.pdf>



AUSTRALIA: [https://www.apf.gov.au/About\\_Parliament/Parliamentary\\_Departments/Parliamentary\\_Library/pubs/BriefingBook45p/EmissionsReduction](https://www.apf.gov.au/About_Parliament/Parliamentary_Departments/Parliamentary_Library/pubs/BriefingBook45p/EmissionsReduction)

INDIA: <https://www.macrotrends.net/countries/IND/india/carbon-co2-emissions>

**PHCbi INVERTER Technology Line-up**



**Cut Down on Electricity.  
Reduce Power Consumption.  
Save Energy.**

**Ultra-Low Temperature Freezer**  
MDF-DU502VH / MDF-DU502VHL  
MDF-DU702VH / MDF-DU702VHL  
MDF-DU901VHL

**Biomedical Freezer**  
MDF-MU339HL  
MDF-MU539HL  
MDF-MU549DH

**Vaccine Refrigerator**  
MPR-S150H / MPR-S300H  
MPR-N250FH / MPR-N250FSH  
MPR-N450FH / MPR-N450FSH  
MPR-S500H / MPR-S500RH

