



2 Door Cooler Energy History

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History

Founded in 1942 and operating under the SKOPE brand since 1965, SKOPE is a Christchurch-based company that provides commercial refrigeration and food service products for the global market.





Extensive Product Range

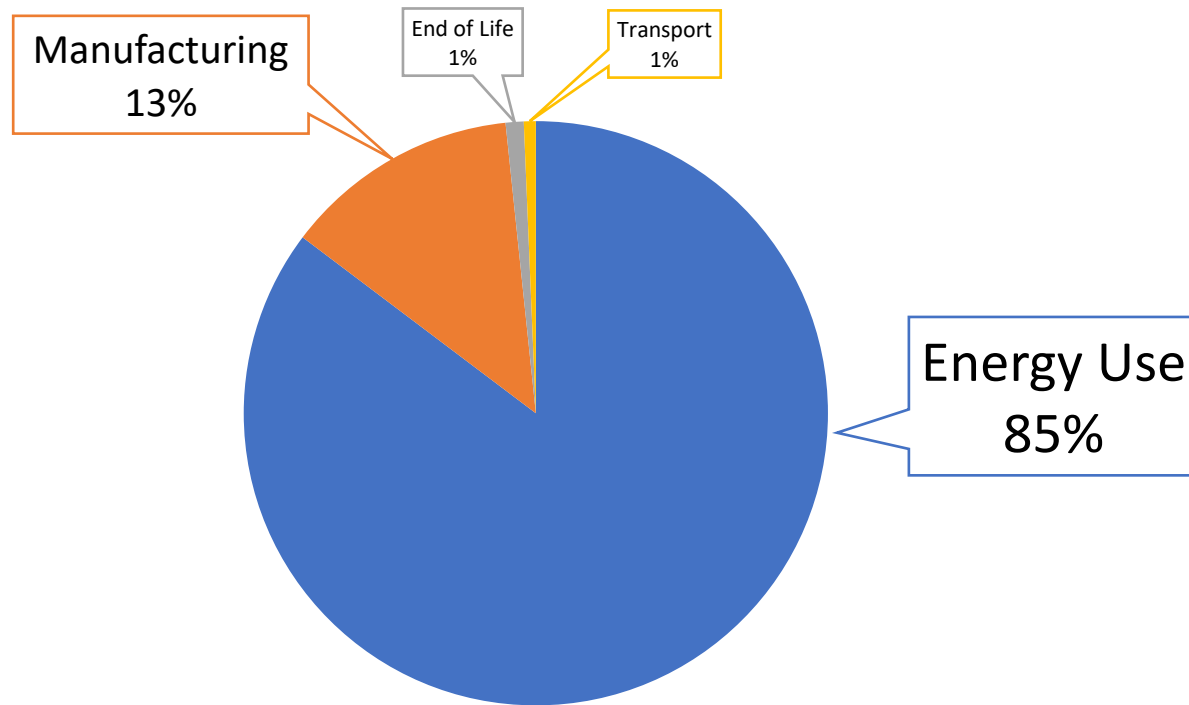
SKOPE designs, manufactures and imports a complete range of commercial refrigeration equipment - fridges, freezers, blast chillers and shock freezers, cool and freezer rooms, ice makers and a bespoke customization service.

Catering to All Sectors

We offer refrigeration solutions to all sectors across hospitality and retail industries – including restaurants, cafes, clubs, pubs, bars, health and aged care, fuel and convenience stores, supermarkets, food production facilities and bakeries.



Lifetime carbon footprint

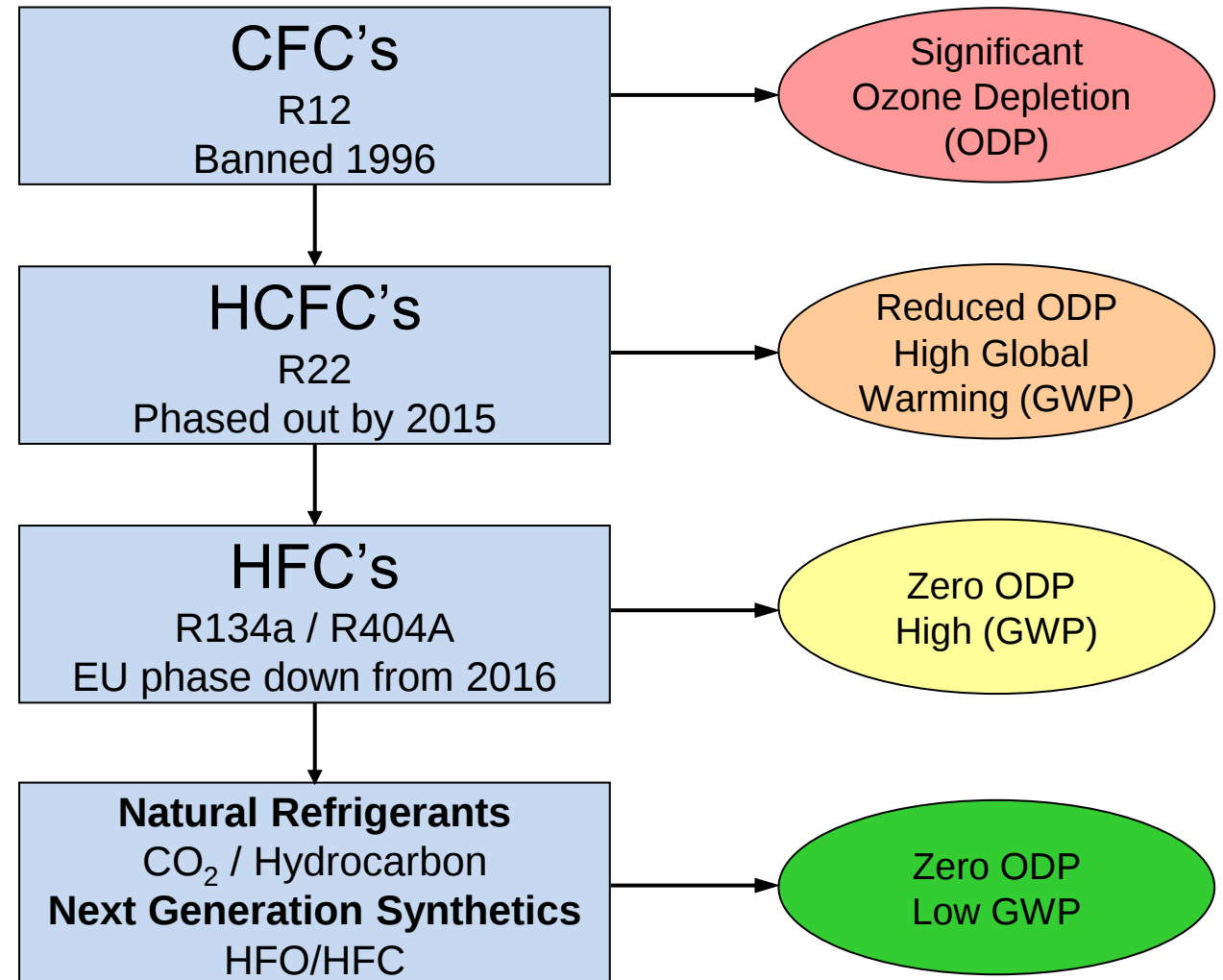


1 kWh electricity =
NZ ~130 grams CO₂e
OECD ~400 grams CO₂e
Australia ~700 grams CO₂e

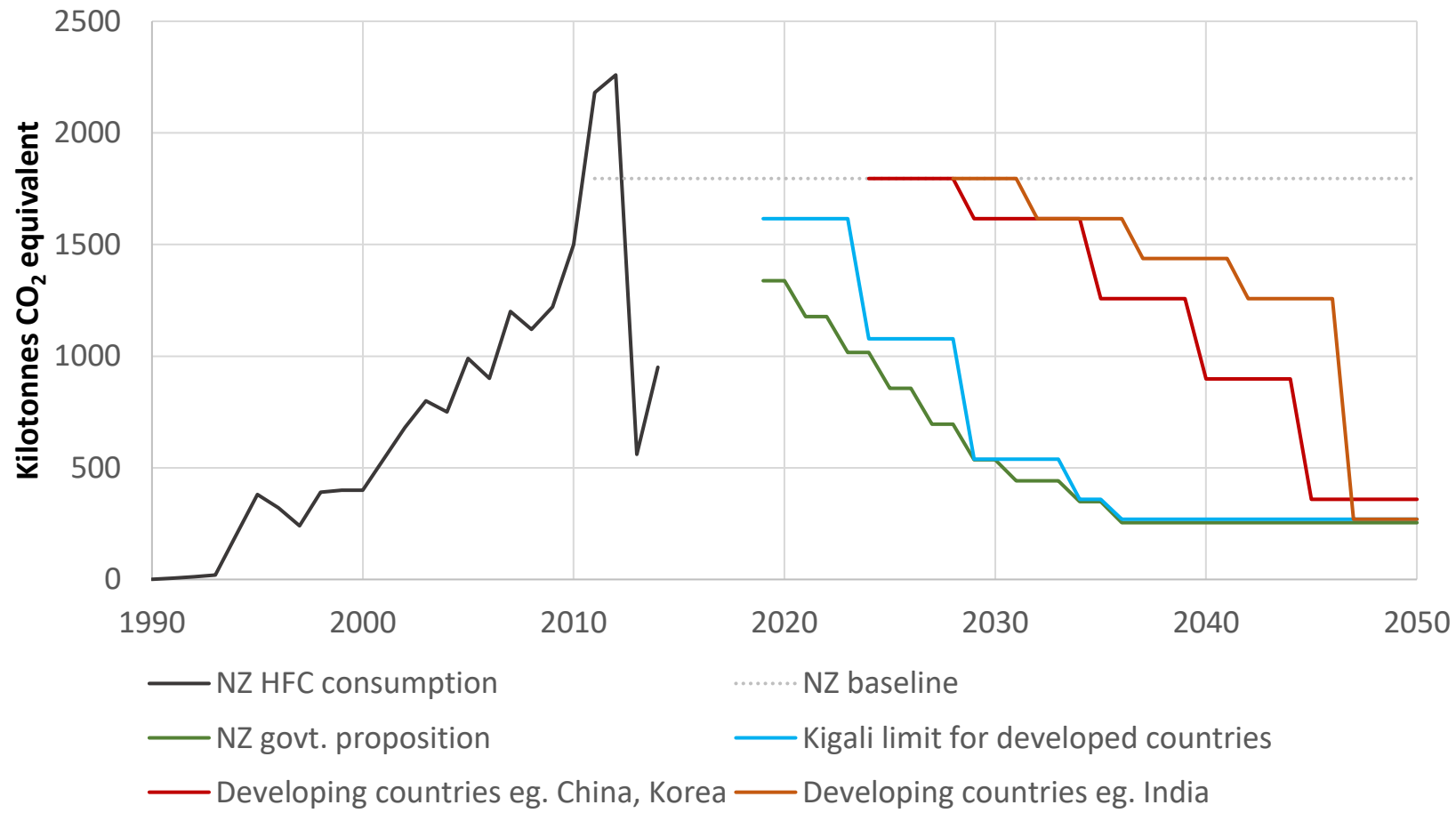


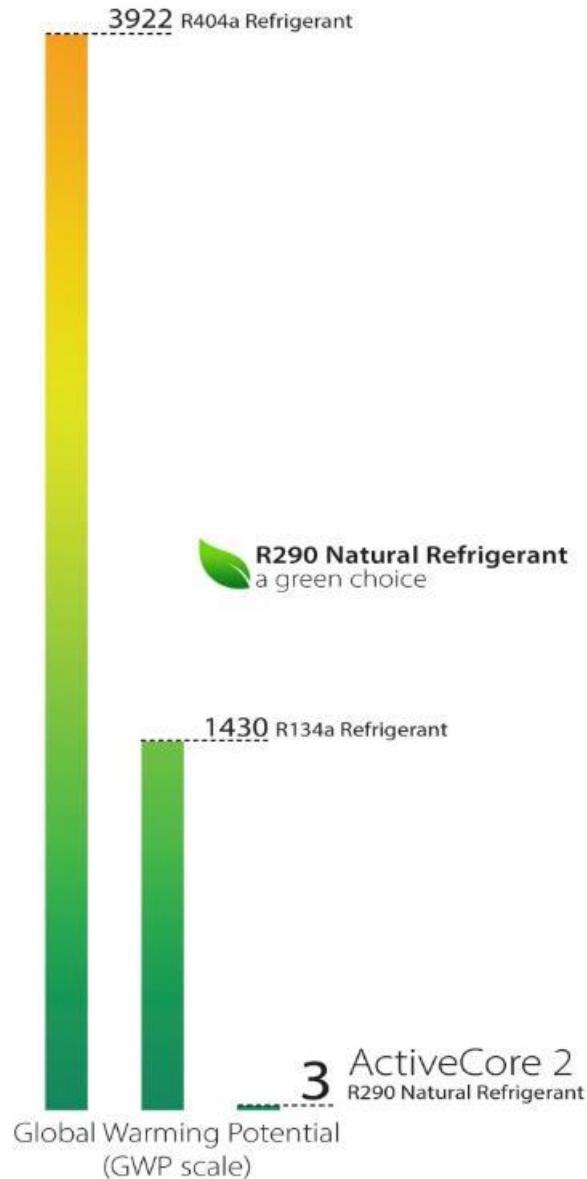
Environment Driver of Refrigerant Change

- CFC (Chlorofluorocarbon) in 1930's provided first non-toxic, non-flammable refrigerants
- HCFC (Hydrochlorofluorocarbon) and HFC (Hydrofluorocarbon) introduced in 1990's as safe alternative, without ODP effect
- 2000's recognized the GWP effect of HFC (long atmospheric life)



HFC Refrigerant Phase Down



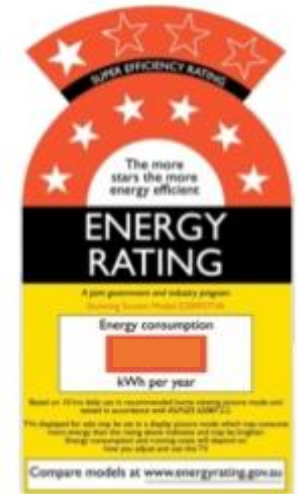


Using hydrocarbon refrigerants

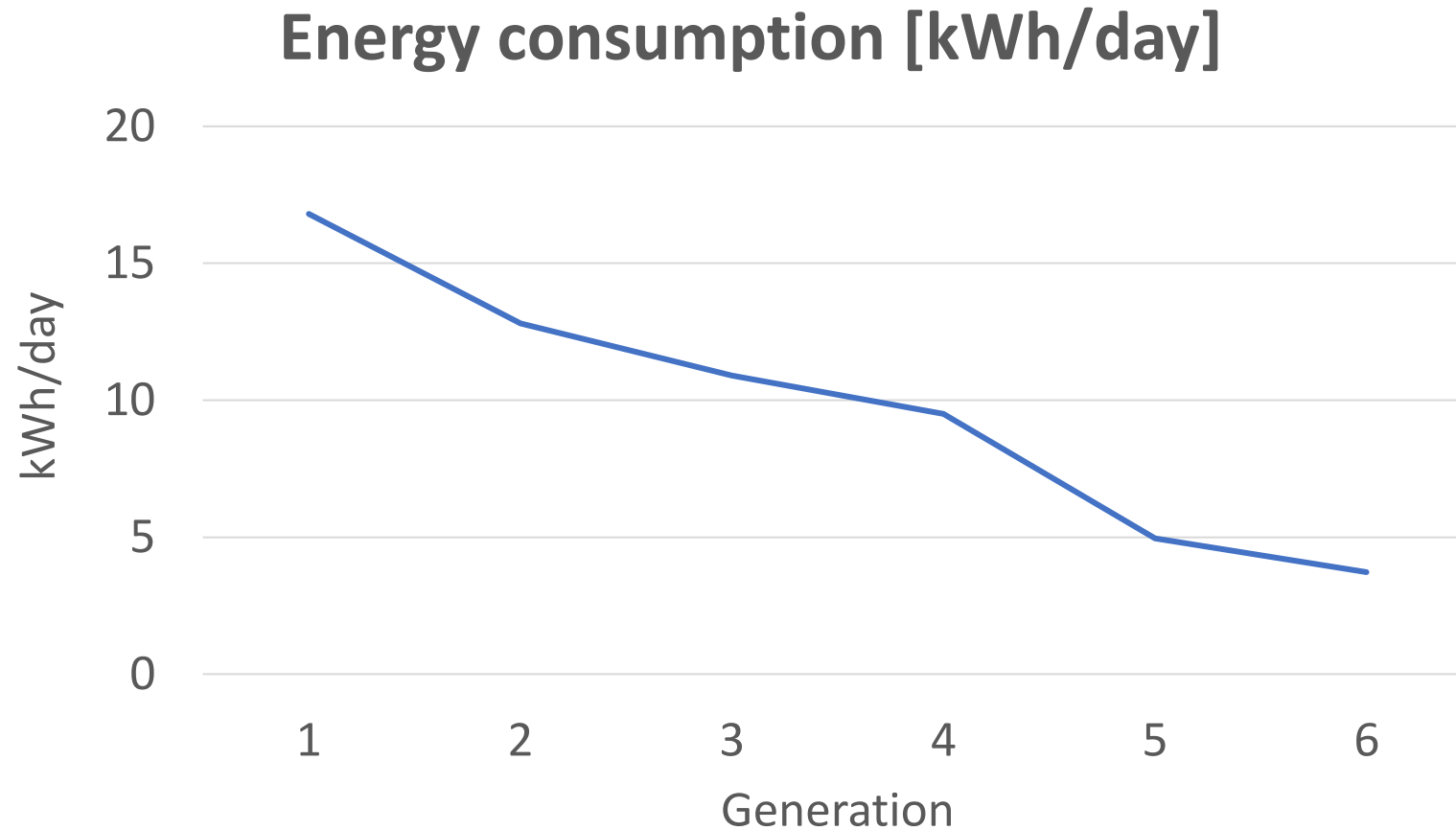
- Natural, non toxic gas
- SKOPE using primarily R290 Propane
- R290 has no ozone depletion potential and low global warming potential (GWP)
- $380 \text{ g R134a} = 540 \text{ kg CO}_2\text{e} \rightarrow 99 \text{ g R290} = 0.3 \text{ kg CO}_2\text{e}$
- Intrinsically safe electrical components e.g. lights, fans
- Legislated limit of 150 grams flammable refrigerant per self contained system
- Minimise refrigerant charge - target high pressure side
 - Liquid density $\sim 0.5 \text{ grams / mL}$
 - Remove liquid receivers
 - Minimise filter-drier size
 - Reduce condenser pipe size e.g. $\varnothing 9.5 \text{ mm} \rightarrow \varnothing 6 \text{ mm}$, $100 \text{ grams} \rightarrow 35 \text{ grams}$

Energy consumption testing

- Greenhouse and Energy Minimum Standards (Refrigerated Cabinets) 2020
- Fill cabinet with test packages
- 25 °C, 60% relative humidity
- 12 hours door openings, 12 hours closed
- Energy Efficiency Index + Star Rating

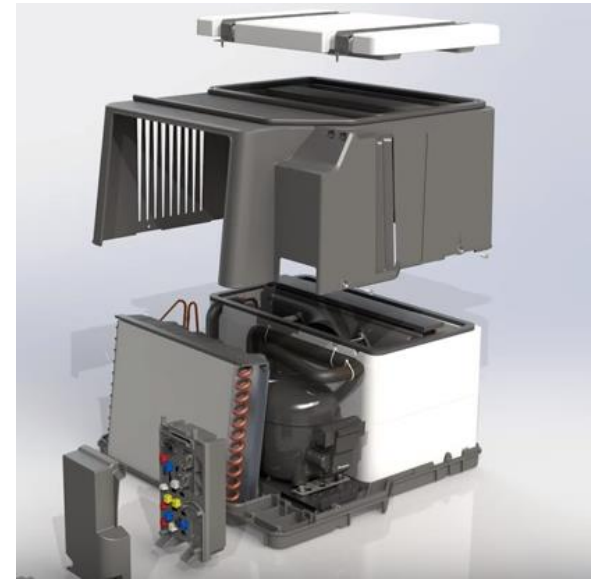


SKOPE Two Door Cooler – Recent History



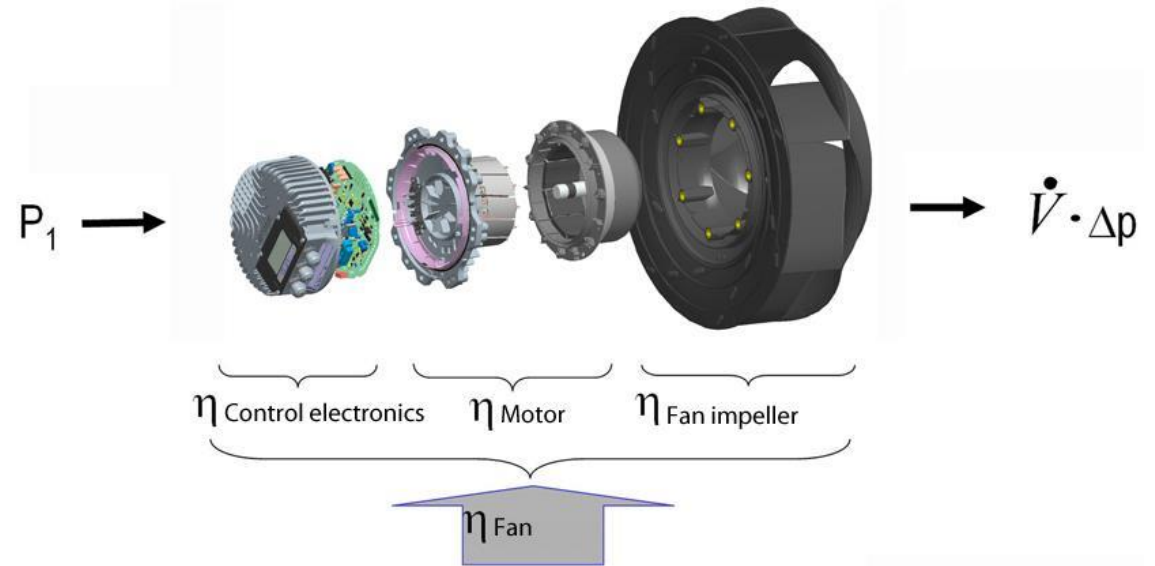
Evolution of Compressors and Refrigeration System

- Self-contained commercial fridges 0.5~2 kW cooling capacity
- Compressors generally becoming more efficient.
- Compressor manufacturer focus on CoP (coefficient of performance)
 - R134a vs R290
 - Improvements to clearances, surface roughness etc. and motor efficiency
- Design condenser, evaporator, expansion device to match load
- Previous generation system CoP ~2.0 W/W
- Current generation system CoP ~2.6
- Next gen CoP 2.8 ~ 3.0
- VSD – now being used in some fridges. Single speed are pretty good, some more options coming in for our size (0.5~2 kW)

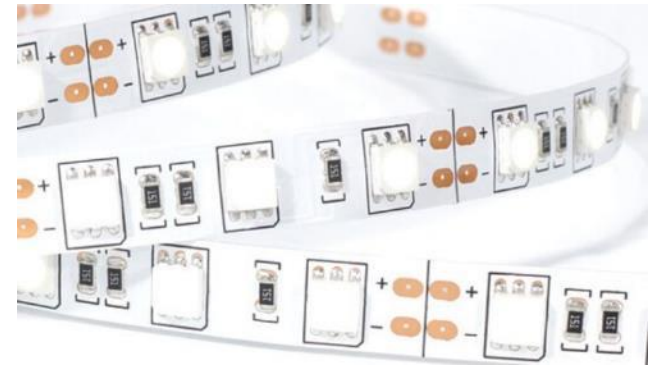


Evolution of Fan Motors

- Shaded Pole (2004)
 - Efficiency ~25%
- Permanent Split Capacitor (PSC) (2007)
 - Efficiency ~50%
- Electronically Commutated (EC) (2015)
 - Efficiency ~75%
- Electronically Commutated Variable Speed (2018)



Evolution of Lighting



Type/year	Efficacy (lm/W)
T5 Fluorescent (mid-2000's)	90
T8 LED Tube (2013)	95
LED Strip (2015)	90
LED Strip (2018)	130



Evolution of Thermal Break Design

- Minor impact – heat transfer into cabinet
- Major impact – anti-condensation measures
- Double hit to energy consumption
- Liquid line foamed into cabinet
- Better thermal break design
 - Perforated sheet metal
 - Plastic extrusion



Evolution of System Control

- Mechanical Thermostat
 - slow to react
 - wide temperature fluctuation
- Basic Electronic Controller
 - accurate temperature control (digital sensors)
 - configurable inputs and outputs
- Advanced Electronic Controller
 - 200+ configurable parameters
 - active power saving night mode
 - SKOPE-connect™ app-based connectivity allowing owners to monitor and control their fridges



SKOPE-connect

- Help user get the most out of their fridge
- Set appropriate temperature level
- Lighting settings
- Blocked condenser alert
- Hush mode

