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The Eco-Efficiency Model

Making More Sustainable Investment Decisions with a Validated Tool

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Decision-making on refrigeration systems

You business is operating or using refrigeration systems

- Food retail stores: supermarket chains, independent stores, etc.
- Food service: catering, cold rooms, etc.
- Industrial processes: Food processing, plastic & material processing, chemical & pharmaceutical industry, etc.

You need to make investment decisions on your refrigeration systems

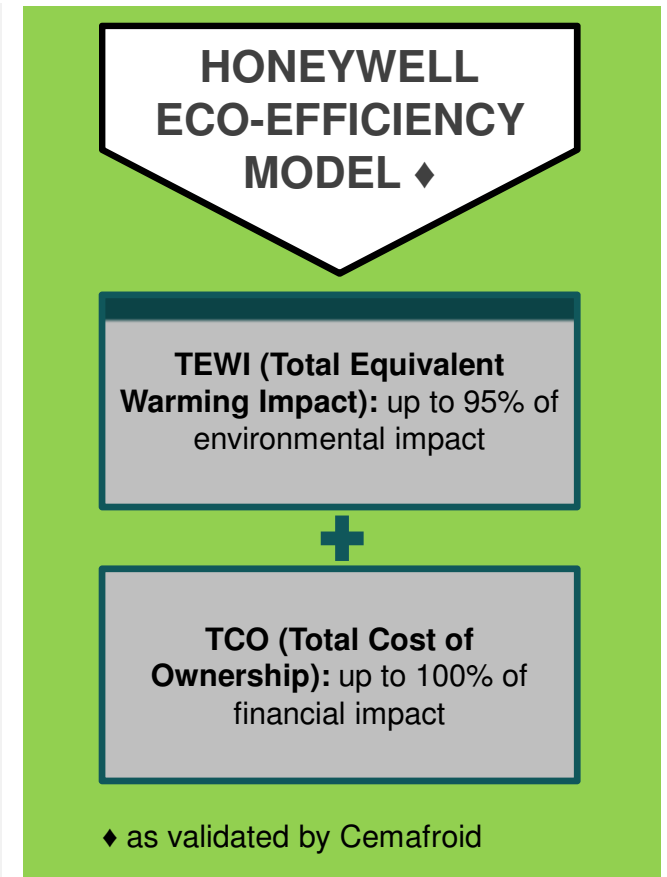
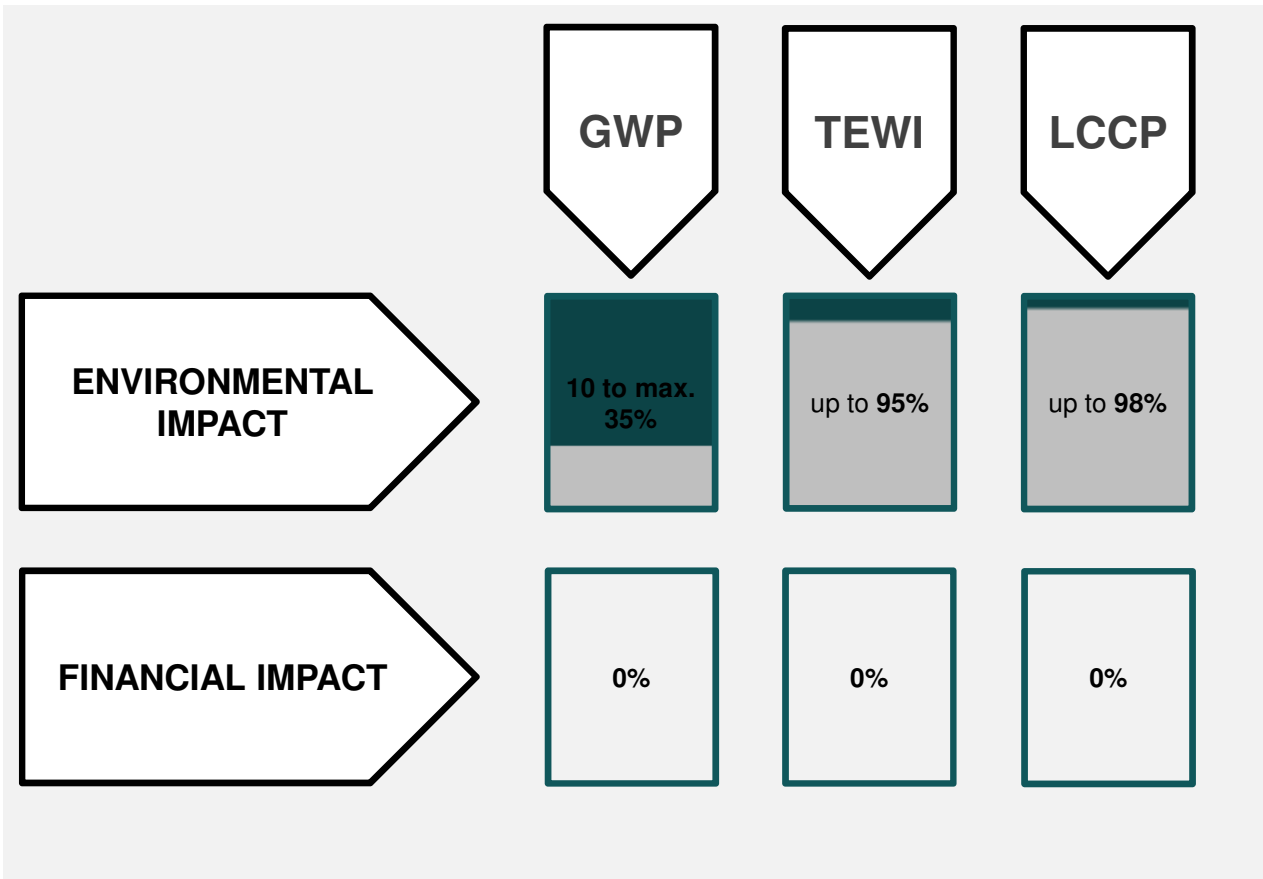
- Evaluating retrofitting an existing system vs. servicing with reclaimed refrigerant
- Building new refrigeration systems and evaluating alternative technologies
- Adding hardware to improve system efficiency

You are looking for the right decision-making tool

- Considering the environmental footprint improvement
- Taking into account the economical/financial impact
- Comparing alternatives based on a life cycle analysis (over the whole operation span of the installation)

Meet your performance & environmental targets at minimum cost

Common Metrics for Decision-Making



The Eco-efficiency Model by Honeywell

The Eco-Efficiency model developed by Honeywell strives to reach an optimum between:

- the comprehensive consideration of parameters influencing the results;
- the possibility to conduct sensitivity analyses on specific parameter values;
- the ease of use and understanding of the results.

Calculate both the financial and environmental impact of your investment decisions

- Find out which type of system & architecture offers you the best environmental impact at the lowest possible TCO.

Conduct sensitivity analyses

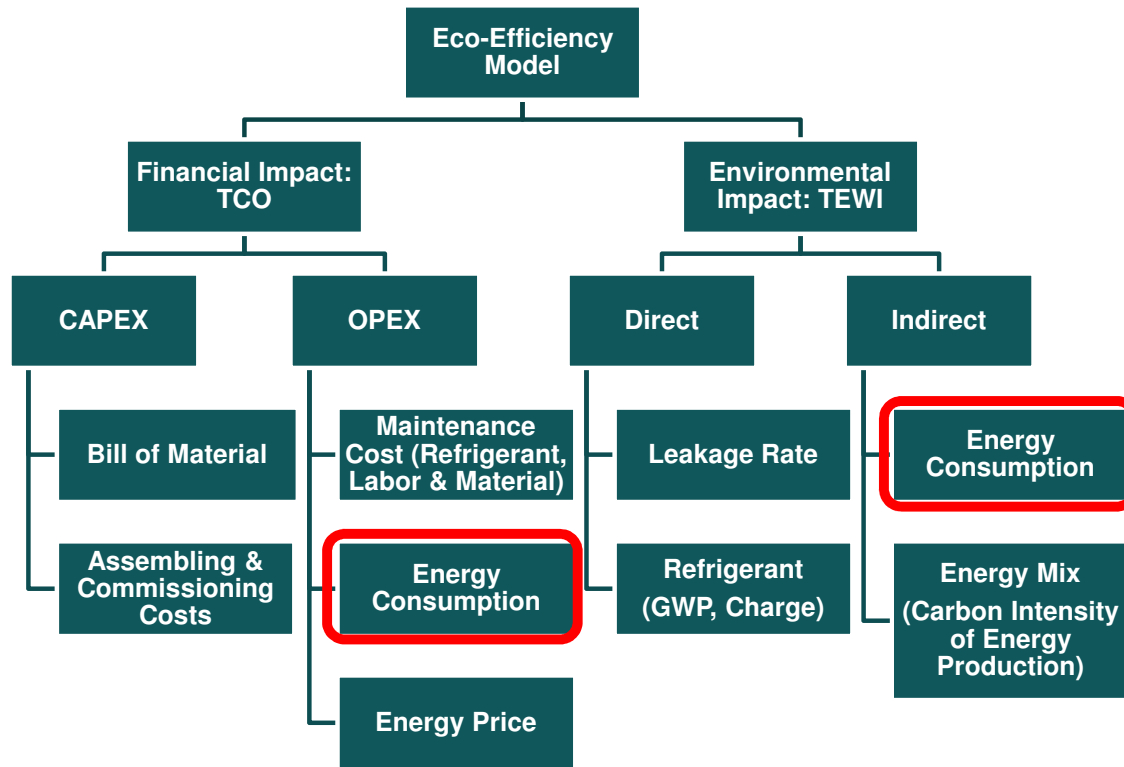
- Check how calculation results change when specific parameter values change.
- This gives you the possibility to know how solid your decision would be, in view of the uncertainty on the development of specific parameters.

Validated by the independent technical center and cold chain expert institute Cemafrroid

„(...) the Eco-Efficiency model as developed by Honeywell, and associated with our approach of sensitivity analysis which makes it possible to define zones of sensitivities according to the main impact factors, already offers a powerful “decision-making tool” to compare several commercial refrigeration architectures“

(Source: Cemafrroid, validation report 16th Sep 2020)

Structure of the Eco-Efficiency Model



Possible Additions:

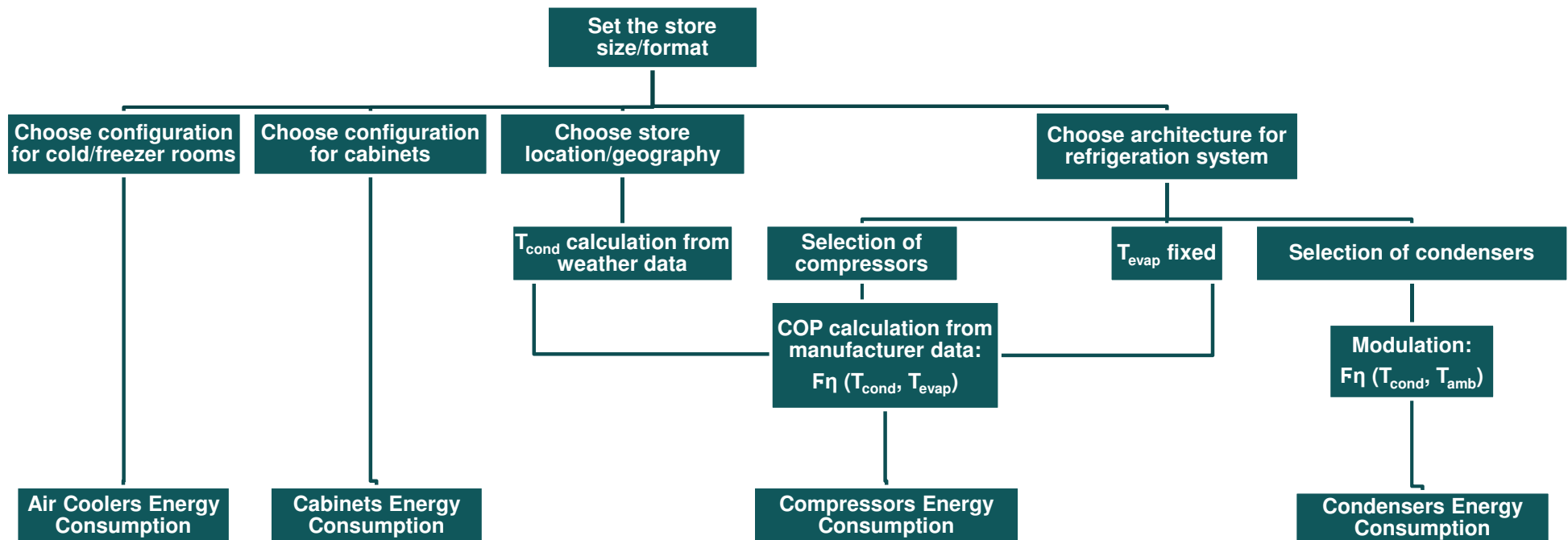
- Insurance costs
Depending on the safety risks created by the refrigerant used: pressure levels, toxicity, flammability etc.)
- Public incentives
- Other refrigerants
- Other compressor technologies

Sensitivity Analyses:

- Refrigerant prices and/or taxes
- Electricity price
- Carbon intensity of electricity production
- Impact of total/partial system failure

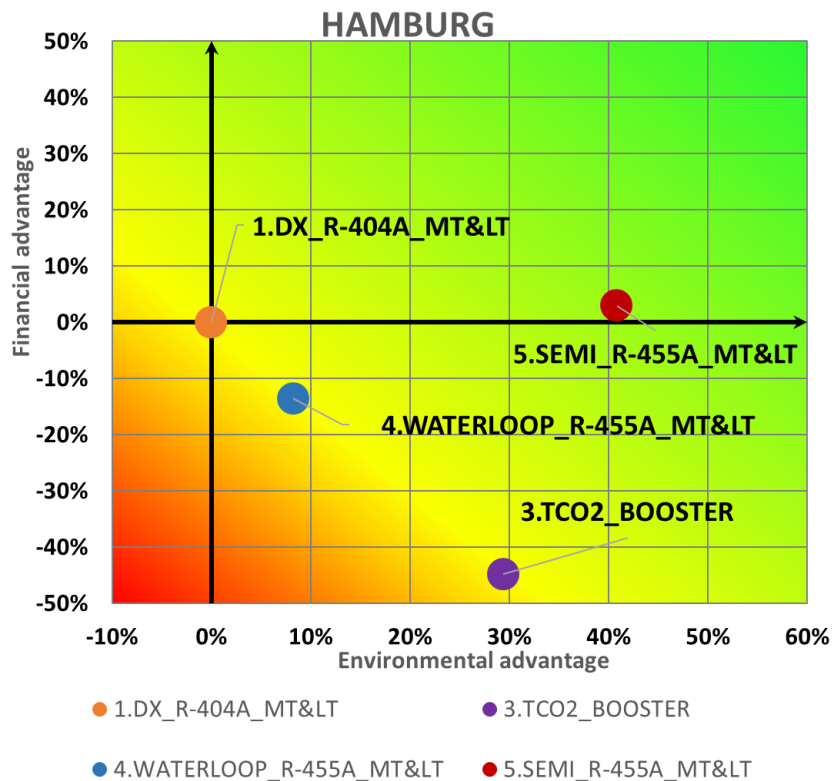
Structure of the Eco-Efficiency Model

Drivers of Energy Consumption



Examples of Eco-Efficiency Comparison

Small supermarket in Hamburg (DE) – New System (life cycle 15 yrs.)

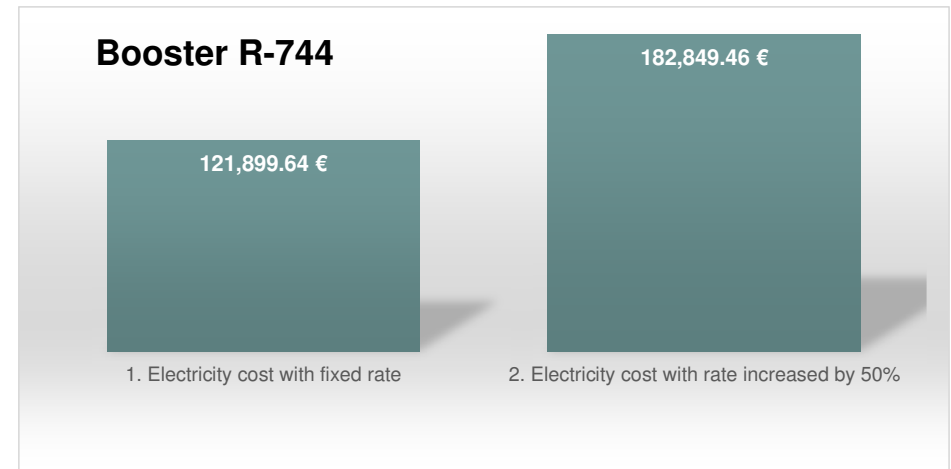
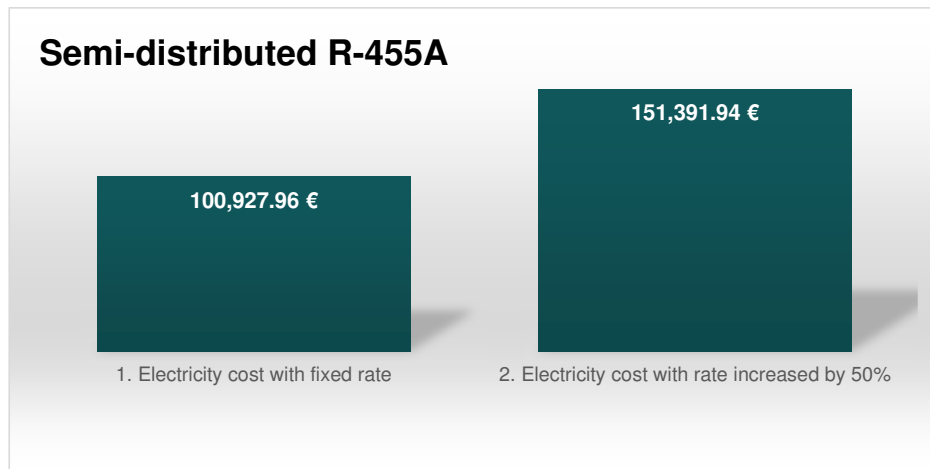


Results from the specific model calculations:

- Semi-distributed architecture with R-455A reaches highest environmental footprint improvement at lowest Total Cost of Ownership.
- Compared with Baseline DX 404A:
 - Semi-distributed R-455A reaches ~40% lower environmental footprint at ~4% lower TCO
 - Booster R-744 reaches ~30% lower environmental footprint at ~45% higher TCO

Examples of Eco-Efficiency Comparison

Small supermarket in Hamburg (DE) – New System (life cycle 15 yrs.)

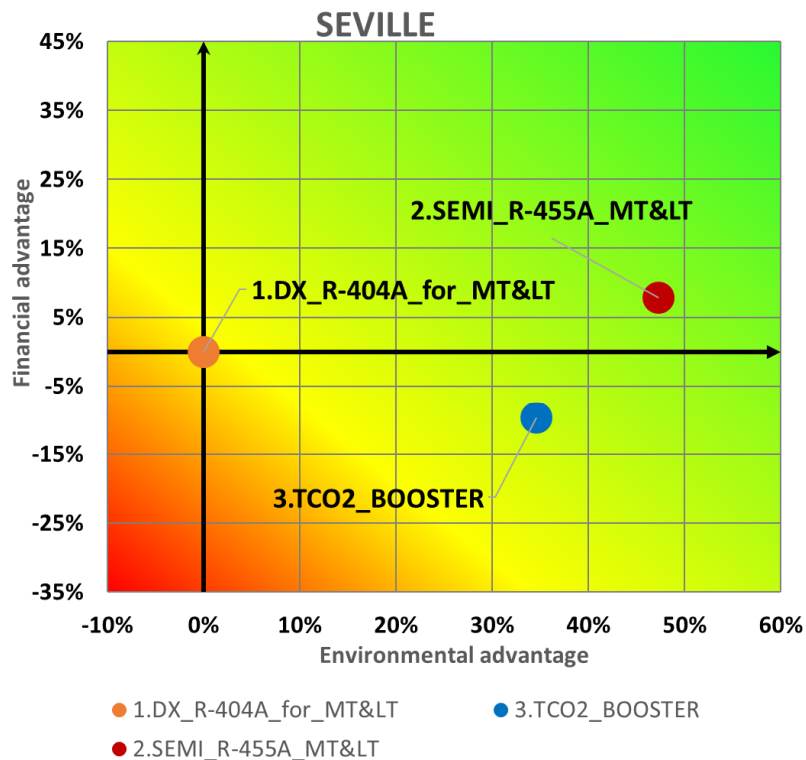


Sensitivity analysis on electricity cost – increase by 50% over life cycle:

- Semi-distributed R-455A shows electricity bill increase by ~50k€ over life cycle
- Booster R-744 shows electricity bill increase by ~60k€ over life cycle
- Semi-distributed R-455A keeps higher scoring on TCO.

Examples of Eco-Efficiency Comparison

Large supermarket in Sevilla (SP) – New System (life cycle 15 yrs.)

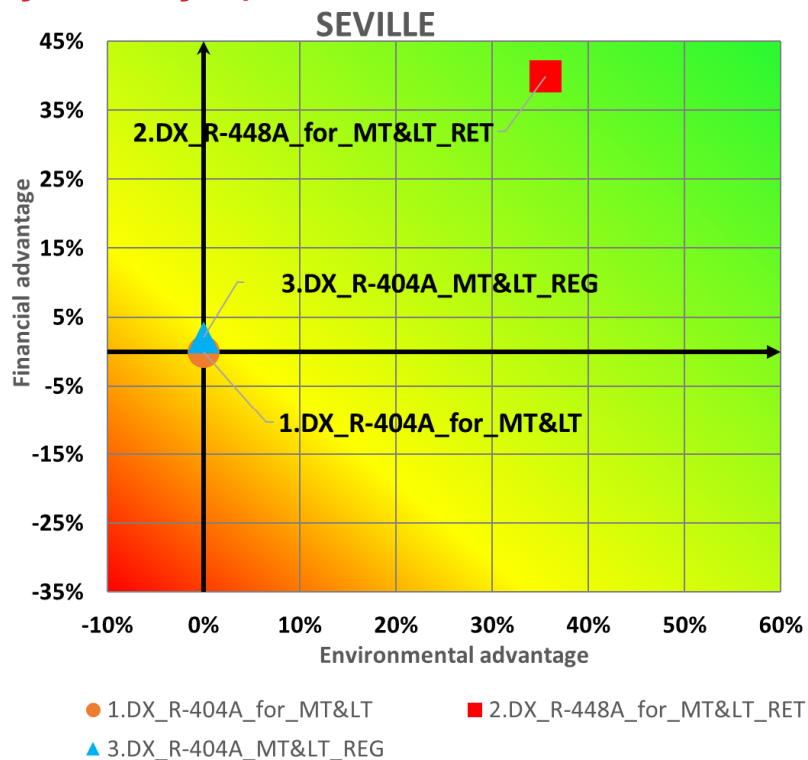


Results from the specific model calculations:

- Semi-distributed architecture with R-455A reaches highest environmental footprint improvement at lowest Total Cost of Ownership.
- Compared with Baseline DX 404A:
 - Semi-distributed R-455A reaches ~47% lower environmental footprint at ~8% lower TCO
 - Booster R-744 reaches ~35% lower environmental footprint at ~10% higher TCO

Examples of Eco-Efficiency Comparison

Large supermarket in Sevilla (SP) – Retrofit of existing system (after 5 yrs – remaining life cycle 10 yrs)



Results from the specific model calculations:

- Comparison of retrofit of existing DX R-404A system to R-448A vs. operation of existing system with reclaimed/regenerated 404A.
- Retrofit to R-448A allows an environmental footprint improvement by ~35% with a ~40% reduction of the Total Cost of Ownership.

Conclusions

Make your investment decisions based on facts & figures

- No refrigerant has „green“ credentials alone – the main driver of environmental impact is the energy efficiency it enables the system to reach and hold over its whole life cycle.
- No decision should be taken based on the cost of the refrigerant alone – assuming low leaks, it has a minor impact on the total cost of owning and operating the system, over its whole life cycle.
- Your decision may differ depending on climate zones, on installation size, complexity of maintenance, expected system reliability, acceptable safety risk level.

Honeywell's Eco-Efficiency model is a powerful decision-making tool

- Publicly available, easy-to-use decision-making tool.
- Make cost-effective decisions i.e. confirm which alternative allows you to reach your performance and environmental targets at the lowest possible Total Cost of Ownership.
- Conduct sensitivity analyses by evaluating the influence of specific parameter changes onto the overall calculation results.
- **Validated by the independent expert institute Cemafruid.**

Make objective decisions with best environmental impact & shortest payback

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