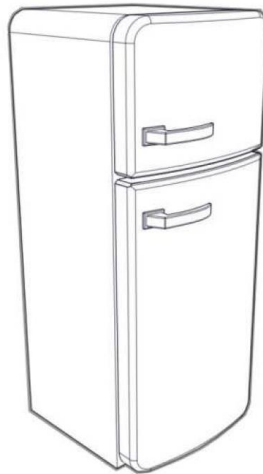


# Cooling System Energy Efficiency Improvement



**Development activities to increase the efficiency of  
appliances with an incorporated cooling system**

## Introduction

Re/genT is an ISO 17025 accredited testing and Research & Development laboratory in the field of refrigeration. Technical development of domestic refrigerators, commercial coolers or freezers and heat pumps, is a daily activity being performed by experienced, well educated, hands on refrigeration engineers and scientists. Energy efficiency improvement is a general objective and a substantial part of the Re/genT work.

Projects are being performed for a variety of customers spread all over the world. These customers include manufacturers of refrigerated appliances or heat pumps and customers who sell products such as ice cream or beverages, which are being stored in these appliances.

## Target products for energy efficiency improvement

On a general basis energy efficiency improvement studies are performed on, but not limited to, the following appliances:

- Domestic refrigerators and freezers with single or multiple compartments
- Wine coolers
- Commercial refrigerating appliances with direct sales function:
  - Beverage coolers
  - Ice cream freezers
  - Refrigerated vending machines
  - Ice cream scooping cabinets
  - Horizontal or vertical supermarket refrigerators or freezers
- Professional refrigerated storage cabinets
- Heat pumps
- Portable air conditioners
- Dispensers



## Re/genT facilities

Re/genT has the knowledge and testing facilities to increase the energy efficiency of existing appliances with incorporated cooling systems. Software tools and practical test rigs are available to characterize the performance of appliances as well as their cooling system components. As a first step a thermal energy balance will be established and secondly the cooling system will be optimized, taking into account the requested specifications desired by the customer. Energy saving options can be generated, combined with cost impact studies. Examples of these energy savings options are:

- Selection of a more efficient refrigerant
- Selection and design of more efficient refrigeration system components such as the compressor, evaporator, condenser and fans
- Heat load reduction by improvement of insulation quality and minimization of thermal bridges
- Control optimization
- Capillary size versus refrigerant mass optimization.

## Re/genT global network for refrigeration system components

Re/genT has developed a strong international network of suppliers of refrigeration system components, which is effective for fast development actions.



## Re/genT key knowledge of energy efficiency standards and legislation

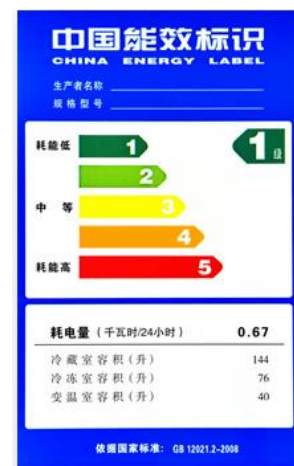
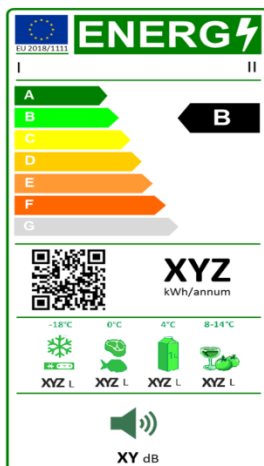
Re/genT engineers are actively participating in standardisation committees, which develop energy consumption and performance standards of domestic and commercial refrigerators. Re/genT is also regularly consulted by governments (European Commission) for technical advice to be able to create realistic legislation related to energy efficiency or energy use. This know-how is extremely useful when specifications have to be defined ensuring appliance compatibility with future requirements. Note that detailed knowledge is also available related to company standards created by multinational companies such as Coca-Cola, PepsiCo, Heineken and Nestlé.



## Why increasing the energy efficiency?

In general energy efficiency related projects are driven by one or more of the following arguments:

- Mandatory energy labelling and/or energy consumption limit legislation
- Company targets related to CO<sub>2</sub> footprint reduction
- Lifetime costs reduction targets; payback time of purchase costs due to low energy use
- Reduction of energy consumption to ensure longer battery use (relevant for solar driven cooling systems or appliances designed for weak grid electrical supply).



## Development phases

In general energy efficiency improvement studies of refrigerated appliances or heat pumps contain the following project phases:

- Definition of requested specifications such as climate class, energy consumption and performance as well as selection of the relevant testing standard
- Performance testing of the baseline appliance using the Re/genT testing facilities, resulting in an energy balance characterisation
- Theoretical modelling of the tested performance of the baseline appliance using various heat transfer simulation tools; the theoretical model will be “fitted” on the baseline test results
- Listing of realistic improvement options using the theoretical model and associated costs
- Construction of a prototype with improvements selected in close cooperation with the customer
- Detailed testing and further optimisation of the prototype in the Re/genT climate rooms, whilst benchmarking against the requested specifications
- Reporting and transfer of knowledge to the customer.

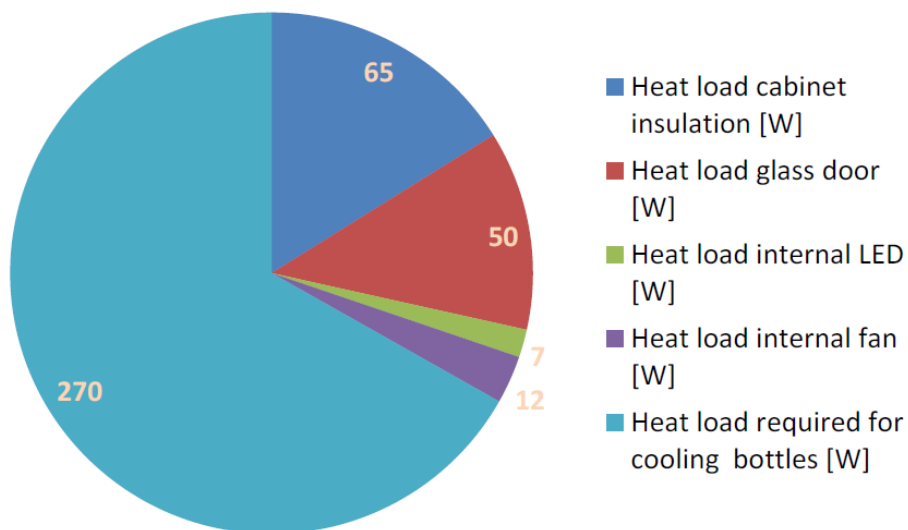


Figure 1; Example of heat load contributions of a beverage cooler

## Training of our customers

Re/genT is offering training sessions to educate refrigeration engineers how to increase the efficiency of appliances with an incorporated cooling system. Such a training can be provided combined with ongoing development projects performed for these engineers or their company.

