

A Case Study – Eco Design at Foster Refrigerator

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Introduction

Eco Design has extended a design direction of efficient product design and manufacturing at Foster Refrigerator that started with the development of the EcoPro series of storage cabinets in 2008, being replaced with the G2 range of cabinets in 2012. Eco design builds on the ECA schemes that operates in the UK and Denmark and takes reference from the Energy Star and MEPS present in other countries. Eco design is a continual improvement process which will lower the energy consumption of refrigeration products. It has necessitated investment in facilities to increase the rate of testing, and has provided useful data to further optimise products.

Background to Eco Design

Eco design in this context is used to describe a series of standards that have the primary aim of improving the energy efficiency of appliances through setting Minimum Energy Performance Standards (MEPS) and publication of results to create a competitive environment. Comprising of two pieces of legislation, firstly, test standards containing criteria through which an appliance can be measured and secondly the Energy Labelling prescribing how this test information is collated and presented to the purchasers of product. Compliance to the Ecodesign standards are mandatory and are included within scope of the CE declaration.

Eco design standards in food catering were first introduced in domestic household products, and now the same process is being applied to commercial products. This is currently being introduced for professional refrigeration and will be extended to cover all professional kitchen appliances including cooking and warewash.

The Eco Design Standards Process

The application of Eco Design standards to a market sector is based on research to establish that the market size is sufficiently large to ensure that regulation will have a material impact and through the introduction of technology there are the necessary opportunities to improve the efficiency of products currently being sold. This being confirmed, a group of interested industry partners and trade associations chaired by EU regulatory personnel is established to review relevant existing legislation and data to create appropriate test standards.

In the case of professional refrigerated service cabinets selected parts of EN441 and EN23953 were incorporated in conjunction with new product specific criteria to form a new test standard EN16825. The test standard incorporates specific environmental conditions, loading patterns with tylose food simulant, temperature measurement points and door opening sequences. Similarly refrigerated display cabinets (EN23953), Commercial Beverage Coolers (EN16092) are now available with similar testing principles. Coldrooms and Blast Chiller test standards are under development with their own specific criteria.

Implementation of Eco Design Compliance

Foster Refrigerator is within the Food Equipment Group of ITW, which also includes Gamko (NL) and CIB (France) and has close working relations with Traulsen (US) and Kairak (US)

brands in the ITW refrigeration group. This has proved invaluable in technology transfer to accelerate the testing processes. Whilst the primary focus of Eco design for Foster Refrigerator is the Professional Refrigeration Storage Cabinets (PRSC) category, it was critical to consider energy labelling of the other categories of product that would be on stream shortly after, inclusive of blast chilling, display cabinets, bottle coolers and coldrooms, all of which are inside the portfolio of FEG Refrigeration. The close proximity of the F-Gas directive timeline means that this has to be included in the approach to Eco Design.

Core to the approach to compliance is ensuring the integrity of the development and testing to Eco-design standards was consistent with the brand reputation for performance and reliability. Eco design has stimulated a series of changes throughout the organisation some of which are detailed below;

To meet the requirements of Eco-design across all brands has resulted in the investment of additional dedicated testing facilities that meet with the test room requirements of all standards. Whilst the environmental requirements for PRSC were taken from EN441 to be more in keeping with the existing testing facilities of food service equipment manufacturers, it was necessary to achieve the higher requirements of EN23953 to accommodate refrigerated display products. To ensure testing was fully compliant to the test standard and repeatable, the control of the climate conditions and door opening sequences are fully automated. Each product is allocated a test station that remains with the product throughout the testing process ensuring instrumentation and test data is traceable.

The EU focus on developing multiple product test standards within the refrigeration industry (PRSC, refrigerated display, beverage coolers, coldrooms and blast chillers) has placed a significant demand on organisations that support several product categories. Sharing the standards setting and implementation across catering disciplines (e.g. refrigeration, cooking & warewash) would have been a more pragmatic approach for industry. Eco design has increased the focus on energy consumption for general market products but also includes products built to end user specifications requiring additional testing to eco design test criteria.

The manufacturing facilities within Foster have been segmented and optimised to achieve high production efficiencies whilst accommodating a diverse product requirement. Within the manufacturing process, the use of testing methods that simultaneously measure different parts of the refrigeration system guarantee a high level of product repeatability meaning that no further investment was necessary. However, where there has been the introduction of higher efficiency products it does necessitate the development of new testing profiles.

Implementation of component change as a result of process optimisation or supply chain replacement/substitution, specifically for functional components must be assessed beyond technical attributes of cooling performance, quality and reliability to include the potential for impact on energy consumption.

Once the product has been sold, there is an ongoing aftersales requirement to educate, support and maintain the integrity of the original product specification. The provision of data to ensure technicians have the relevant information quickly available increases the likelihood that during maintenance or repair, a product is maintained to its original specification.

Within the market, there is an ongoing education process to convey the eco-design methodologies but needs to be used in conjunction with other requirements such that products purchased are appropriate to the users needs (i.e. additional performance criteria may be required for a cabinet being placed adjacent to a chargrill).

Positive Benefits to the Foster Organisation

Implemented and policed robustly, Eco design provides our customers with a useful comparison tool for energy consumption against recognised standards. It should be considered as a factor in the buying decision alongside product functionality and pre/post sales service levels.

It builds on the successful Enhanced Capital Allowance (ECA) scheme with a wider portfolio of products, with the ultimate goal of allowing purchasers to look at refrigeration from a total life cycle investment perspective of both capital and energy costs.

The volume of testing highlighted the need to be more clinical and independent during the testing process so the decision was taken to isolate the compliance testing process from the design process. This stage gated process encouraged the design process to reach a level of finality before passing into testing, thus avoiding "*designing during the test*".

Testing always highlights potential for improvement. As the test criteria of Eco design has necessitated retesting of product, opportunities have been taken to integrate hydrocarbon refrigerants into products not already converted and to implement new componentry developed since the previous design iteration. Extending the use of hydrocarbon refrigerants, air distribution changes and implementing new control logic has yielded reductions in energy consumption and has identified potential improvements for future design iterations.

Whilst manufacturers bear the responsibility to optimise design of products for low energy and efficient food cooling, it also incentivises the supply base to the industry to innovate in new higher efficiency components.

Limitations of Eco Design

Eco design follows the same implementing process as CE, being completely self-certified, and as such the success of Eco design will rely in part on an effective policing process. The implementing measure requires national bodies to implement a routine testing process to ensure compliance to the testing standards and energy labelling are maintained.

It is an expectation that policing is focussed uniformly across products at all levels from A to G. Substantiating claims at all levels will be fundamental to maintaining the integrity of the labelling process. It should not be the responsibility of the manufacturers to maintain the integrity of the whole market. This is one of the primary concerns of the effectiveness of the energy labelling process.

The widely held regulatory assumption that the implementation of Eco design standards will improve energy consumption is true but the willingness of the market, particularly in the budget segment to fund the potential costs of advanced efficiency products in some cases will be prohibitive. This may result in the fragmentation of product ranges to create both high and lower efficiency products to cater for customer needs and price points.

Eco design measures the performance of equipment in new condition. This can be an issue with refrigeration where routine maintenance is less common. For example; over sizing of condensers to protect against high condensing temperatures due to blockage can have a detrimental impact on energy consumption in a new condition, but the products must be developed for real use conditions to maintain the refrigeration performance over the lifecycle of the products.

Energy labelling has its foundation in household products. These are relatively standardised with a low SKU count whereas professional refrigeration with both general market products and customer specific products cumulates in a diverse high SKU count range of products. Within the energy labelling standards, it allows for the use of calculation / simulation methods for deriving energy metrics. This is an area that is poorly understood due to the absence of historical test data but the standardised eco design methods will provide a useful library of data to design and validate simulation tools.

Eco-design will be a significant advance in allowing customers to compare products on their food cooling and energy consumption credentials. It is likely to take 3-5 years to debug the test standards and ensure they support industry in driving best in class products.