FOODSERVICE CONSULTANTS SOCIETY INTERNATIONAL

# FOODSERVICE INSIGHT

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SPECIAL
REPORT

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**Improving performance**
How total value of ownership (TVO) impacts energy efficiency and sustainability

**Improving ROI**
Display refrigeration can generate significantly increased revenues for operators



## BEYOND TCO: WHY THE FUTURE OF COMMERCIAL REFRIGERATION IS TVO

### REFRIGERATION AS A CATALYST FOR MAKING EFFICIENCY GAINS AND BOOSTING SALES

# HOW OPTIMAL SPECIFICATION CREATES REVENUE, CUTS COSTS & OPTIMIZES WORKFLOW

**From product presentation to key factors including energy efficiency, sustainability, and smart connectivity, this new whitepaper from FCSI, supported by Liebherr, looks ahead to the future of refrigeration**

## EXECUTIVE SUMMARY

The core science of keeping things cold may not change, but refrigeration technology is constantly undergoing a process of innovation. The path it takes is determined by many factors, but the underlying goal seems always to be the same – to boost profitability for operators through efficiency.

While that is true to some extent, there is another important driver that cannot be ignored – boosting revenue by improving how chilled products are presented to customers.

Behind the scenes, energy efficiency, sustainability, and smart connectivity have emerged as the key factors that operators consider when investing in refrigeration. It has become clear to them, partly through the work of foodservice consultants and manufacturers, that optimizing energy efficiency can dramatically cut operating costs.

That is achieved not only by investing in more energy-efficient refrigeration units, but also by integrating systems that provide real-time performance data to optimize how they are used, and to prolong their lifespan through predictive maintenance. In front-of-house areas, however, improved display refrigeration can be a powerful revenue generator for foodservice and hospitality operators.

Ultimately, the key discussion in the world of refrigeration is not only about lower total cost of ownership (TCO) through efficiency gains but also improving total value of ownership or total value of opportunity (TVO) by using refrigeration units to boost sales.

## KEY TAKEAWAYS

**Operators are increasingly focused on not only reducing energy consumption and operational costs, but on integrating systems that provide real-time performance data and predictive maintenance.**

"It has become clear, partly through the work of foodservice consultants and manufacturers, that optimizing energy efficiency can dramatically cut operating costs"

## INTRODUCTION

Alongside cooking equipment, refrigeration is the essential ingredient in keeping commercial foodservice operations running. Whether it is display refrigeration in the retail setting, walk-in and reach-in units in restaurants, hospitals or hotels, or industrial units storing food for central production kitchens servicing multi-site operations, the equipment that keeps food cold keeps the business running.

Regulation plays a key role in this, as it puts food safety at the top of the agenda in any foodservice operation. Keeping food within optimal temperature ranges can make the difference between a busy operation and a closed kitchen. Yet regulatory compliance is just one of many challenges that the sector faces, as the rules governing not only food safety, but also sustainability become ever stricter.

The pressure is on equipment manufacturers to design refrigeration units that perform more efficiently using specified refrigerant gases that are less polluting, while also meeting customers' expectations in terms of performance, durability and, importantly, upfront and operating costs. It is to get the maximum advantage from more energy-efficient equipment and not put customers off with a heavier upfront price tag that the conversation is right turning away from upfront capital expenditure towards TCO and TVO.

As energy prices rise, refrigeration costs come under intense scrutiny. According to sustainability specialist Dr Sam Mudie of Hospitality Energy Saving & Sustainability Ltd, refrigeration accounts for around 40% of total foodservice cost.

"Sustainability is naturally a huge driver," remarks UK-based consultant Ed Bircham FCSI of Humble Arnold Associates. "As a practice, we have been involved in lots of sustainability-focused projects, and we always demand more of refrigeration manufacturers in terms of understanding the actual data about the carbon footprint for any piece of equipment and its energy usage. So far, there has been a mixed response from manufacturers, though more do recognize the need to provide clients with that information."

Refrigeration costs are now under intense scrutiny, so achieving a good ROI is paramount

**"Compact, modular, and flexible refrigeration units are becoming popular to support evolving kitchen layouts, especially in space-constrained environments"**

Top: Ed Bircham FCSI, Humble Arnold Associates; George Haddad FCSI, Luminescenza

"Operators are focusing not only on reducing energy consumption and operational costs, but also on integrating systems that provide real-time performance data and predictive maintenance alerts," adds Middle East-based consultant George Haddad FCSI, managing director of Luminescenza. "Compact, modular, and flexible refrigeration units are also becoming popular to support evolving kitchen layouts, especially in space-constrained environments," he says.

Operators need more flexible, more efficient, more reliable equipment, so manufacturers have a big task ahead of them.

## THE TALE OF TCO IN KITCHEN AND STORAGE REFRIGERATION

Upfront cost has long been the determining factor in purchasing decisions about refrigeration. There was an understanding that more expensive equipment might bring advantages, but often there was no nuance in the calculations operators would make about long-term cost. The fact that a more expensive piece of equipment might, in fact, provide much better value in the long run was often overlooked. Considering both initial cost and operating cost brings the focus to TCO, which can dramatically change the decision-making process.

High-quality refrigeration units are designed for durability and efficiency, resulting in significant savings over their operational life. Reduced energy consumption, minimal maintenance needs, and the longevity of components all contribute to lower TCO, and also to higher TVO, as employees can focus on their jobs in the knowledge that the refrigerator is there to support them instead of disrupting their daily workflows.

Understanding TCO not only benefits the bottom line but also supports sustainable practices by reducing the need to replace expensive components. Furthermore, it is worth considering that the longevity of refrigeration components, when coupled with greater ease of cleaning, maintenance and

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servicing, can significantly reduce an operator's overall cooling costs.

Although conversations between operators, consultants and equipment manufacturers are increasingly turning towards TCO, the full impact of a long-term perspective on cost and efficiency is still massively underestimated.

Furthermore, the discussion around TCO must become more sophisticated as regulatory bodies turn their gaze towards the end-of-life environmental impact of refrigeration equipment. In an era of rising energy costs, operators are aware of the potential cost savings that come from more energy-efficient equipment, but that is only part of the story. Manufacturers must also account for the embodied carbon – greenhouse gas emissions associated with the materials and construction processes throughout the entire lifecycle of equipment.

"Cheaper upfront cost leads to claims of overspecification but the extra expense can often be made back in year one," says Bircham. "There is a lot of work to do on embodied carbon, which has been a gray area, but no one expects data to be perfect. It is hard for manufacturers, but the quality will improve because they will be thinking about the data they need from their supply chain partners."

Sustainability is a complex subject, and it cannot simply be reduced to lower energy usage.

"Embodied carbon is important, and clients are increasingly asking manufacturers for data on it," says Mudie. "Fridges can give you worse lifecycle carbon figures because insulation, for example, has embodied carbon, though it reduces carbon emissions hugely while in use. So, you can't look at embodied carbon alone."

## THE COMPLEXITY OF SUSTAINABILITY

Mudie calculates that operational energy use accounts for 90–95% of lifetime emissions for commercial refrigeration. Ultimately, embodied carbon is an important consideration, but operational performance is far more important.

For that reason, equipment manufacturers are increasingly focused on reducing energy consumption through the use of energy-efficient components and improved insulation. The design of the equipment, however, is only part of the story. The other major component is how a unit is used.

Often, the basics are not taken care of, so door seals or curtains may not be properly closed, temperature settings may be sub-optimal, maintenance and cleaning may be neglected, and simple defrosting procedures may be overlooked, say the experts.

"You must get the basics right," Mudie remarks. "Appropriate cleaning and defrosting, checking on door seals by staff can all be done for free. Smart technology and IoT monitoring systems have a cost, so get the low-hanging fruit first, although I do advocate for remote temperature monitoring."

When it comes to innovation, Mudie observed in a recent study for a large foodservice chain many areas that might bring benefits in capital costs, returns on investment, and resource savings:

- Low global warming potential (GWP) refrigerants: can reduce 'fugitive' (leaked) emissions from refrigerants by 80%.
- Food mimic probes: a payback of less than three years (depending on freezer

**Dr Sam Mudie FCSI, Hospitality Energy Saving & Sustainability Ltd.**

**"There is a lot of work to do on embodied carbon, which has been a gray area, but no one expects data to be perfect"**

A basic level of care for equipment will reduce costs and energy usage, says Dr Sam Mudie FCSI

vs fridge); installation cost around £550 (€635), with a potential annual saving of £500-1,000 (€580-1,155).

- Door closers: payback in less than 3.5 years payback (depending on freezer vs fridge): installation cost around £200 (€230), with potential annual saving £200-800 (€230-925).
- Enhanced controllers: real-time-clocks may facilitate the 'three-degrees of change' principle, which sets temperatures at, say -15°C overnight (when doors are not being opened), instead of -18°C, resulting in significant energy savings with no impact on food safety.
- Phase change materials (PCMs): these absorb or release large amounts of thermal energy during a phase transition (like melting or freezing); they deliver improved insulation and while expensive to retrofit, they should be included in newly specified coldrooms.
- Improved EC (electronically commutated)/high efficiency fans: though the impact is borderline, payback could potentially happen in four years with annual savings of £200 (€230) per freezer at a cost of around £775 (€895); for a fridge the payback is likely to exceed 10 years.
- Installation of LEDs and Passive Infrared (PIR) coldroom lighting is an immediate win, showing significant reduction in energy usage for fridges and freezers, with payback in less than three years.

"I would say sustainability is the most important thing, and the majority of my clients agree," she explains. "We are energy managers because energy is a cost, and it should be at the forefront of any sustainability plan. The money saved can be reinvested in other areas of the operation."

"Refrigeration is on 24/7, so it is one of the highest consumers of energy," she adds. "Most of my clients' operations have 14 or 15 individual refrigeration appliances. So, innovation is great, but it is more important to look after what you've got. A basic level of care for your equipment will reduce costs and energy usage."

Manufacturers cannot determine how their equipment is used, but they

"Energy is a cost, and it should be at the forefront of any sustainability plan. The money saved can be reinvested in other areas of the operation"

A decentralization of cooling can lead to significant energy savings

can make those processes easier by designing maintenance-free components, such as self-cleaning condensers and long-life fans. A focus on reliability and precision controls can also impact food safety and waste reduction, which have an indirect cost benefit.

In Germany, for example, around 1.9m tons of food is disposed of as waste in the out-of-home catering sector every year.

"This is why precision cooling matters," says Thomas Huber, head of product management at professional refrigeration appliance manufacturer Liebherr. "Maintaining tight temperature tolerances can prolong shelf life, reduce food loss, and preserve premium food such as fresh fish, pastry, or pre-portioned ingredients. Our fan-controlled, multi-sensor regulation ensures uniform temperature, even during frequent door openings. Up to 30% longer shelf life for vacuum-packed fresh protein can be achieved when stored at consistent 0°C compared to 3-4°C."

For kitchen cool storage, there is also an important comparison to make between walk-in and reach-in units. The choice can have a major impact on workflow and energy costs. Frequently, the potential of energy savings using more reach-ins is underestimated.

There are distinct advantages to each. Walk-in fridges often have larger storage capacity, but can be highly inefficient due to the need to cool walkways where no food is stored. This results in wasted energy if the use of space is not fully optimized.

In contrast, reach-in fridges are more energy-efficient, as there are no cooled walkways, and they can be placed closer to the workspace, making them easier to use.

This decentralization of cooling can lead to significant energy savings and better operational efficiency, particularly in smaller kitchens.

**"Maintaining tight temperature tolerances prolongs shelf life, reduces food loss, and preserves premium food such as fresh fish, pastry, or pre-portioned ingredients"**

## TVO: PRODUCT PRESENTATION TO BOOST SALES AND ADD VALUE

As well as TCO, refrigeration can deliver substantial TVO in many ways. Units designed for product display can do much more than simply offer a cold space to store food and beverages. With the right design, they boost a product's profile and increase sales.

In the competitive foodservice industry, effective product presentation is crucial. Refrigeration solutions need not merely be storage units, but also marketing tools. Requiring no additional labor, such a unit can act as a 'silent salesperson'.

Just as wine cabinets steer guests visually to select a bottle for dinner, a well-designed fridge can increase impulse purchases and drive upselling. By drawing the focus to the stored products – such as premium wines, meats, or cheeses – units can enhance visibility and create an inviting atmosphere. The design and lighting of such units play a huge role in making the product the focal point and enhancing customer experience.

"Our refrigeration units are engineered to maximize sales potential," says Manuel Rehm, Liebherr's key account manager for foodservice. "We test run small, efficient self-service fridges equipped with stock management systems that can yield over €1,000 in sales per month. This not only enhances profitability, but also aligns with sustainability goals by reducing energy and labor costs."

"These appliances can become functional showpieces," he adds. "They visually communicate craftsmanship, freshness, and exclusivity. This is particularly important in open kitchens, chef's tables, hotel lobbies and premium buffet lines. They support storytelling, transparency, and premiumization – even when no staff member is present to explain."

The value of the longevity and TCO of such units, which can generate up to €20,000 in savings over 15 years, is significantly enhanced when a boost to revenue is added on top.

"A fridge can be a storage place to cool, but can also create revenue and minimize costs," says Huber. "It is often an underestimated presentation tool, and is hidden in a warehouse or a kitchen, but it could also be a powerful generator of sales."

## SMART REFRIGERATION: CONNECTED KITCHENS AND DATA-DRIVEN EFFICIENCY

Digital transformation is a hot topic in refrigeration. From smart homes to smart airports, digitally enhanced refrigerators systems are becoming a key component of the connected kitchen ecosystem.

Refrigerators and freezers are now IoT-ready, offering integration with building management systems, kitchen management platforms, and even supply chain software. This allows for remote diagnostics, automated HACCP reporting, and energy consumption benchmarking across multi-site operations.

Indeed, the future of foodservice equipment will depend on smart technologies. Real-time monitoring and data-driven decision-making will enhance operational efficiency. Operators can view the performance of refrigeration assets at a specific site or across their entire estate, spotting inefficiencies quickly, and more easily determining whether they result

Top: Manuel Rehm, Liebherr; Thomas Huber, Liebherr

**"These appliances can become functional showpieces. They visually communicate craftsmanship, freshness, and exclusivity"**


Open API, allows seamless integration of monitoring systems

from equipment failure or problems with how the equipment is being used.

Features such as remote diagnostics and integration with building management systems can streamline kitchen operations and ensure compliance with hygiene standards. For instance, systems from Liebherr can help track the temperature stability that is critical for food safety and can extend the shelf life of products by up to 30%.

One key component of smart technologies will be open API, which allows seamless integration of monitoring systems with building management systems, remote monitoring software, and HACCP documentation. Future-ready devices must integrate not only with kitchen workflows, but also with purchasing and maintenance tools. Optional remote service diagnostics will also minimize service visits and keep devices operational with minimal disruption.

"Predictive maintenance reduces emergency repairs and downtime," observes Haddad. "Real-time data improves compliance with food safety standards such as HACCP, and energy optimization. Such systems can also auto-adjust to usage patterns, minimizing wastage and energy use. The result is both a reduction in TCO and improved sustainability performance by lowering energy and product waste."

"Real-time data improves compliance with food safety standards such as HACCP, and energy optimization. Such systems can also auto-adjust to usage patterns"

## CASE STUDIES:
## MONITORING SYSTEMS MAKE THE MOST OF EFFICIENCY GAINS

1) At a large central hospital kitchen in Prague, Czechia, Liebherr successfully implemented its SmartMonitoring system to connect 13 large, heavy-duty refrigeration units. The system monitors all aspects of performance, and can raise alarms if, for example, doors are left open unnecessarily. As a result, the operator was able to ensure an optimal operation in terms of energy consumption, and maintain strict compliance with HACCP temperature protocols for food safety.

2) A hotel in Carinthia, Austria, put in place Liebherr's connected self-service fridges. Subsequently, it reported substantial labor savings and increased guest satisfaction due to enhanced product visibility and accessibility, which can be managed and controlled remotely.

3) A nursery in Berlin operates two separate locations with five large freezers playing essential roles in the central production kitchens. By connecting these freezers to a central monitoring and control system, the operator was able to implement automated temperature monitoring to ensure food safety and optimal energy usage.

SmartMonitoring systems help operators adhere to HACCP temperature protocols for food safety

**"The operator was able to ensure an optimal operation in terms of energy consumption, and maintain strict compliance with HACCP temperature protocols"**

## CONCLUSION

The choice of refrigeration equipment for any commercial application, whether it is a major production kitchen or a front of house or retail display unit, cannot ignore the key issues of sustainability, efficiency, and revenue maximization. TCO and TVO should be common language in any discussion of refrigeration specifications involving operators, consultants and manufacturers.

Regulation is driving the development of more sustainable equipment, but so is the recognition among equipment manufacturers that operators increasingly understand the need for durability, maintenance-free operation, and low energy consumption. Their view of cost, food waste, and environmental impact is increasingly long-term, and that is changing the dynamics of the discussion.

Optimal refrigeration specification generates revenue, cuts costs, optimizes workflow, cuts down labor requirements, and – thanks to digital transformation and remote monitoring systems – puts more control in operators' hands than ever before. And that story is far from complete. Regulation on sustainability will no doubt become more stringent, and technological advances such as artificial intelligence (AI) will automate many of the monitoring and intervention processes that make a big difference at the margin.

Refrigeration is now more than just a tool to keep food and drinks cold, it is a strategic asset that can greatly impact the commercial viability of any foodservice operation.

## FURTHER DETAILS

For information on the latest advances in components, display equipment, sustainability, IoT integration and smart refrigeration, contact Liebherr for a demonstration.

Refrigeration is a strategic asset for operators

LIEBHERR

## ABOUT LIEBHERR

### ADVANCED COOLING TECHNOLOGY AND MODERN DESIGN

Liebherr is a leading manufacturer of domestic and professional refrigeration and freezing equipment, with a strong focus on the foodservice industry. Through the commitment to quality and innovation, Liebherr's products are engineered to meet the rigorous demands of commercial kitchens, ensuring optimal food preservation and presentation. Their equipment features advanced technologies that enhance energy efficiency and reduce total cost of ownership, making them a preferred choice for operators seeking reliable and sustainable solutions. Additionally, Liebherr emphasizes hygiene and ease of maintenance, with designs that facilitate compliance with HACCP standards. The company's extensive experience and focus on customer needs position it as a trusted partner in the foodservice equipment sector.

Innovative ideas, modern design, and clever solutions for easy handling characterize the products in the refrigerators and freezers product segment. When developing all appliances, to be optimally prepared for continuous 24-hour use every day, the focus is always on customer needs. The broad product portfolio of freestanding appliances is characterized by formidable energy efficiency and smart features. The portfolio is rounded off by a large selection of wine storage and multi-temperature wine cabinets and humidors.

Liebherr offers all the benefits that really matter for refrigerators and freezers in this area for professional use in trade and commerce, as well as in labs and the medical industry: in addition to efficient cooling capacity and reliable temperature stability, the appliances impress with a low energy demand and maximum efficiency. Liebherr refrigerators and freezers are considered a symbol of top quality in the industry and by customers – in Europe and beyond.

### OUR QUALITY PROMISE – BUILT TO LAST

For over 70 years, we have been the refrigeration specialists for high-quality fridges and freezers. The quality of our products is the solid foundation for the high level of trust that customers place in the Liebherr brand. At our production sites, we are working constantly on the further development and optimization of all appliance components and materials.

**For more information visit home.liebherr.com**

## FURTHER INFORMATION:

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