



---

# OXFORD ENERGY SOLUTIONS

---

THE OXFORD GROUP OF COMPANIES

---

OXFORD REFRIGERATION INC • OXFORD ENERGY SOLUTIONS INC  
OXFORD CO<sub>2</sub> TECHNOLOGIES • OXFORD GAS COMPRESSION SYSTEMS INC



---

## MAKE TOMORROW TODAY

---

# The Oxford LPP™ Platform:

- Reduces overall mechanical devices
- Reduces required evaporator superheat
- Reduces heat of compression
- Increases overall system refrigeration effect
- 2 stage compression for dual temperature systems - provides a medium temperature condensing system with a low temperature ability
- Eliminating the entire low temperature condenser, receiver, oil separation, etc.
- Fifty percent of the refrigerant in conventional architecture is eliminated
- Non-overloading compression
- No ambient limitations
- True floating/non-flooded condenser control
- VFD controlled scroll compressors
- Lowest GWP design with HFO refrigerants
- 1-, 2-, and 3- year warranties available depending on model and options

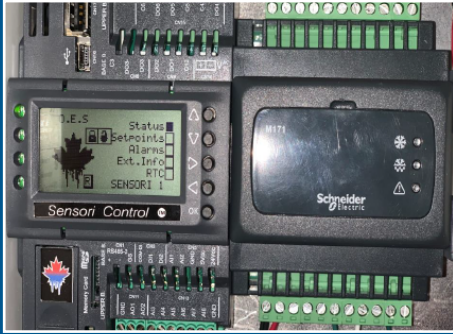
## AND THERE IS MORE...

The fundamental design of the Oxford LPP™ system is to always maintain the lowest operating refrigerant pressure differentials as possible, using advanced controls and sensor technologies while limiting internal heat generation to a minimum.

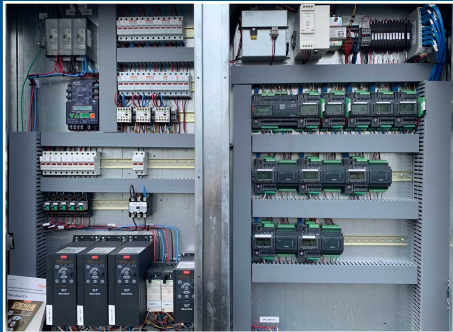
The overall system architecture does not rely on one main component as a key contributor to the success of the system efficiency. The OLPP™ platform relies on the combined net effects of all the individual benefits of these system components working together to achieve improved system efficiency. HFO blended low pressure refrigerants are combined with a low pressure drop system and compound refrigeration architecture design, built on a zero-leak rate approach, to provide a sustainable system that is setting a new standard in reliability, low maintenance and energy efficiency.



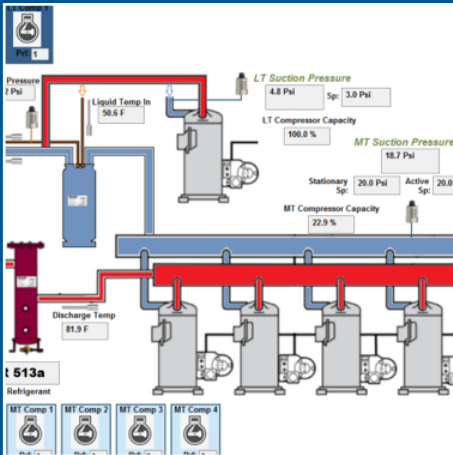
# Oxford Sensori™ Control System



Having a lack of information regarding operation thresholds can be detrimental to the health of a system. The inability to locate an issue at its place of origin can impede correcting a larger problem, leading to significant repair costs. Oxford addressed this core problem and developed a foundation in which monitoring, diagnostics and control are available for every part of the system.

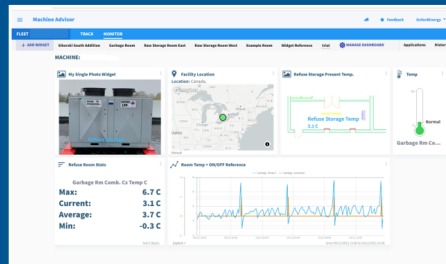


Integrating automated equipment/controls eliminates some of the fundamental problems in dated control platforms. Oxford systems are reliable and one of the highest automated refrigeration platforms available on the market today. Information from every individual device is compiled together into one automation system. Offering a 'Plug and Play' system, the OLPP is fully automated through Schneider Electric's Modicon M172 logic controller (designed and engineered with the SCADA system, IPC, Gatemanager, HMI). Connection to the internet is built-in and set-up is automatic.

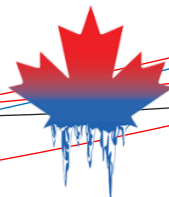


The Sensori Control™ system delivers user-friendly interactivity, with graphical display- allowing easy access to information. It gathers and processes data generated by equipment enabling on-premises analytics as well as cloud-based, remote connectivity. Collecting critical data and meaningful insights enables action based on real-time information. If an issue were to arise within the system, an alert is sent via email so that quick resolutions are found and can be remotely executed.

Machine learning and adaptive predictability allows our integrated and connected system to display all data, trends, and notifications so that end users can address abnormalities before they become detrimental and lead to costly repairs. We can see all temperatures and pressures at each compressor individually and assess their operation and efficiencies. Adapting to ambient conditions, temperature changes in cases, load profiles and adding more sensors for greater information makes the system more efficient and provides end-users better system management.



Utilizes HFO Refrigerant R-513a, R-515b and adaptable to any future refrigerants





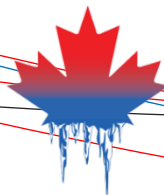
# Low GWP - Zero ODP HFO Refrigerant

Owners and operators of refrigeration systems are facing the requirement to address systems which utilize legacy refrigerants (HCFC/HFC) that are known to have detrimental effects on the environment. As previous refrigerant fluids are ushered out, a new refrigerant fluid class, Hydrofluoro olefins (**HFO**) steps in to be the most promising alternative with *ultra-low global warming potential* (GWP) and *zero ozone depleting potential* (ODP). HFO based refrigerants meet regulatory requirements of reducing harmful atmospheric emissions with a GWP of approximately 60% lower than Hydrofluorocarbon based refrigerants.

The Oxford LPP™ utilizes the low-pressure, low GWP, zero ODP, HFO based refrigerant, **R-513a** and **R-515b** - giving this platform the first real solution to refrigerant concerns in all refrigeration sectors (supermarkets, warehouse storage, small stores etc.). Both refrigerants have been given excellent safety ratings with R-513a (in A1 group L1), having low toxicity and is non-flammable while R-515B is both non-flammable and non-toxic with an even higher safety rating (A1).

The platform architecture has been refined to take advantage of the low-pressure refrigerant. Employing a lower pressure refrigerant has shown less mechanical stress on key system components such as piping, fittings, gaskets and connections while lowering the risk of potential refrigerant leaks. The energy savings of a low pressure HFO refrigerant is apparent when comparing to alternative higher-pressure fluids. The reduced system refrigeration charge due to the design architecture improves system safety. Without limits on its adaptability, upcoming refrigerants can be used and essentially dropped in, requiring no changes to the components.

The Oxford LPP™ and HFO refrigerants when designed in conjunction with evaporator/case layouts meet all current California state guidelines and European directives while maintaining a 50lb or lower refrigerant charge (small stores etc.).



# Oxford's Vapour Drive™ Technology

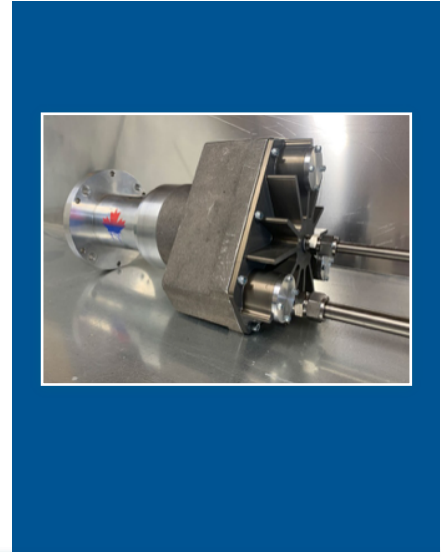
By addressing the limitations and challenges in the design and architecture of conventional systems, Oxford has developed an oil-less, magnetic-drive scroll compressor for the refrigeration industry.

The typical oil dependant piston and scroll compressor designs are accompanied by additional challenges which include heavy maintenance requirements, high cost of oil, installation limitations and chiefly operational limitations. Due to the way in which these oil dependent compressors operate they are limited to 50% to 100% load variation, limiting the ability to infinitely match compression to evaporator load requirements and thus involving many different sized compressors. This creates added complexity, maintenance and significantly impacts overall efficiency.

Oxford's Vapour Drive™ Technology compressors to operate from 0% to 100% load-replacing compressor sizes with just two standard sizes that run at variable rates to match load. Further, the design allows for incredible flexibility in installations as the orientation of the unit would no longer be a concern. This compressor can be used in a standard system with oil, an 'oil-reduced' system or a completely oil free system.

An open motor drive with a magnetic drive coupler maintains the motor out of the refrigerant stream, reducing the secondary heat input on the refrigeration system. This maintains the same hermetically sealed system architecture without a shaft seal. This also allows the use of a replaceable electric motor and a fully field repairable scroll compressor that the scroll section can be repaired if needed or at time of wear.

Oxford's Vapour Drive™ technology dramatically reduces energy consumption, system complexity, maintenance requirements and utilizes environmentally friendly low-pressure refrigerants (R-513a, R-515b from Honeywell). It is controlled by a Schneider control platform lending to its reliability and full integration.



---

**Items such as Electronic Expansion Valves and Floating Head systems offer lowest pressure functionality which maximizes work being done at the lowest possible kW input.**

---



## EXV- Electronic Expansion Valves



Oxford uses Emerson's extremely reliable Electronic Valves and Danfoss Colibri EXV's to replace traditional mechanical expansion valves. Both are a bipolar, fully hermetic stainless-steel valve, integrated with the Sensori Control™ system and optimize the control of refrigerant throughout the refrigeration circuit. Each valve has a 0-bleed rate close-off meaning there are no solenoid valves in the architecture.

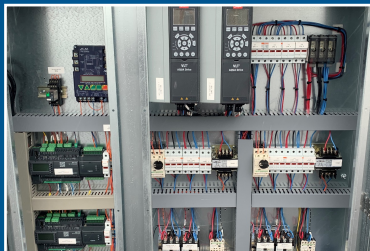
The valves can be double or triple dutied acting as pressure limiting and/or capacity limiting devices without changing location from EXV in liquid line.

Lower overall evaporator superheat with tighter control increases system absorption rates.



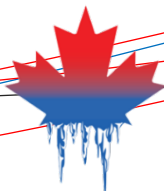
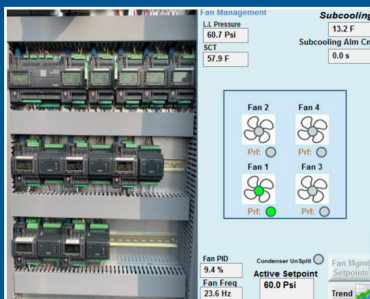
## VFD- Variable Frequency Drives

The use of Danfoss VFD's to optimize the operation of compressors and condenser fans has always been the backbone of our systems. The only way to truly optimize refrigeration control through an ever-changing systems capacity profile is with smooth and steady control. Smooth start-up and shut-down processes, elimination of system hammering, and cycle vibration leads to a dramatic increase in reliability and longevity of the entire system. These VFD's coupled with Sensori Control™ integration is the only way to manage a low-pressure refrigerant platform.



## Floating Head Pressure

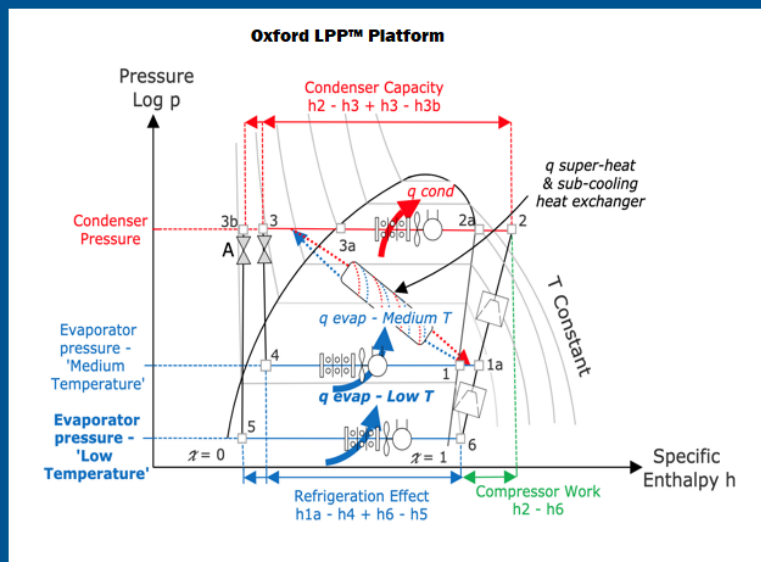
Conventional refrigeration systems that run with fixed head pressures, force compressors to run at maximum output, operating at higher pressures than necessary. In the past, high head pressures were necessary to make the mechanical valves work properly. With the technology and the accuracy of today's electronic valves, we now have expansion devices that allow us to float (vary) the head pressure and take advantage of the lower ambient temperatures. The low-pressure platform that Oxford has developed eliminates the need for high pressures, while smart controls regulate temps. Full Floating Head condenser control that truly floats with the ambient allows for more stable system pressures, increased system net refrigeration effect and smooth overall operation.



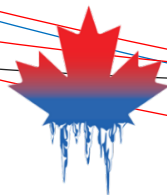
# Compressors

Copeland's Scroll compressors and the Sensori™/EXV sequence provides the foundation for the successful implementation of a Low-Pressure differential Platform with today's low GWP/HFO refrigerants (HFO-513a/515b). Compression starts as low as 5 PSIG differential across the scrolls. Compression ratio is energy. Operating at the minimum compression ratio based on evaporator temperature and ambient temperature are the only true system limitations. All other pressure dependant components have been removed to let the core system components complete the work that is intended (movement of heat energy) instead of creating artificial limitations with mechanical devices and lack of proper control architecture.

Lower input energy = lower secondary heat influences, lower compressor discharge temperatures, lower heat of compression, lower frictional losses, less condenser power, longer life of equipment, less internal damage from heat such as winding degradation on motors and oil breakdown as well as reduced noise output.



- 5 PSIG across the scroll allows us to start compression work
- Two-stage coupled compression approach
- The replacement of hot gas defrost in conventional systems with an electric defrost reduces stress with expansion and contraction on all piping resulting in longer compressor/equipment life
- Addition of Vapour Drive™ Scroll eliminates all oil management, even in an oil rich system
- Vapour Drive™ Scroll compressor reduces energy further by eliminating oil pumps and pressures





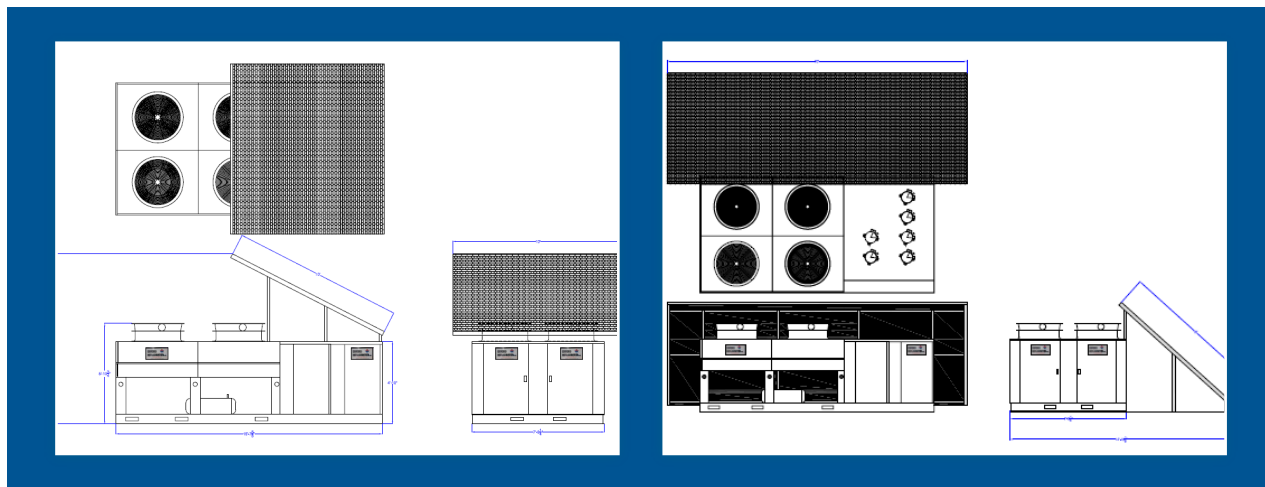
# Solar Power Ready



The Oxford OLPP™ is about creating the best core refrigeration platform possible with unlimited future adaptability.

The OLPP™ is looking toward the future with the fully integrated solar kit that can be added to any system. This solar kit ties into the main power supplied to each unit and automatically 'sheds' power as we harness available energy from the sun. Sustainability is not about 'off grid' or huge solar/wind fields only. It is about each component we use and reducing its overall impact. When we continue to take incremental steps towards conservation, our overall impact is very big.

OLPP™ Solar, ready as a complete integrated option or as an added kit to any existing Oxford Refrigeration system already in the field.



---

IT'S TIME TO REVOLUTIONIZE THE INDUSTRY!

---

