

Proudly marketed and supplied by

New Zealand Marine Distribution Limited

Install 12 or 24 volt Refrigeration into your cabinet.....

Typically suited to providing galley refrigeration for pleasure craft, motor homes and any remote off-grid situation. We have complete system packages suitable for most cabinet shapes and sizes.

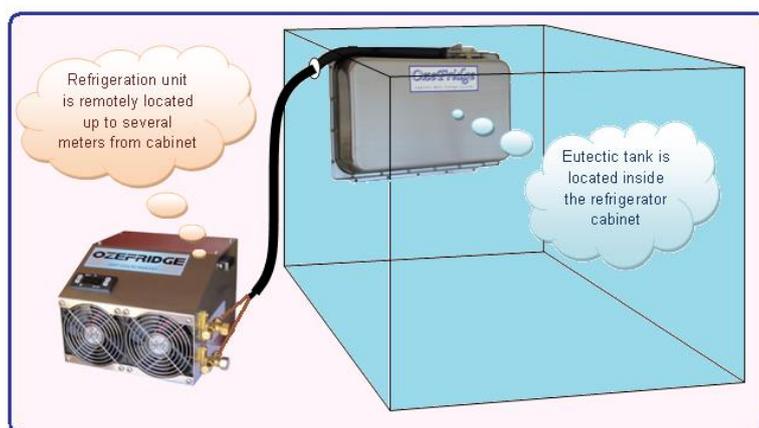
.....Without Killing your Battery!

Adding refrigeration can create new power problems. The built-in 'ECO2' power management provides the solution.

To explain: Firstly, all Oze fridge eutectic systems store up to a day's refrigeration requirements in advance, usually involving only one or two long run periods per day. Cabinet temperatures are sustained by the eutectic mass. (Hold-over refrigeration... cooling in advance!) Other refrigeration types with virtually no similar hold-over ability, have to cycle once or twice per hour every hour, therefore consuming more power. Unlike the eutectic hold-over system, they rely on having constant battery power available every hour, 24 hours a day.

Secondly, the built-in ECO2 power management monitors the power type and voltage available then causes the Oze fridge unit to automatically start up and run **whenever power is abundant** and also to automatically operate from the highest voltage presented. Abundant power is whenever battery voltage reads above 13.7 VDC, (power that would otherwise be wasted) or if 240 VAC is detected via the optional AC/DC converter.

Running whenever power is abundant reduces the demand on the battery increasing its life, and often eliminates the need for an additional battery. Apart from providing greater surety of refrigerated product storage, there are also cost, battery consumption and weight savings with a eutectic holdover system and Oze fridge ECO2.



Above: The stainless steel eutectic plate is located inside the fridge cabinet and acts like a very low temperature renewable ice-block, storing thermal energy whenever electrical power is abundant.



Above: Each system is pre-gassed with the safe R134a refrigerant, ready to install. See 'Packages' page for full details..

Note: All comments and values quoted in this website, relate to operating as a domestic use refrigerator in typical Australian conditions and within an adequately insulated cabinet .

Eutectic Systems use much less battery power

COMPONENTS

We offer two condensing units, one air cooled only the other both air & water cooled, and six eutectic plates.

The separate items that make up a complete package are described below. When a unit and eutectic plate are selected to form a system package we include in the package price, all the fittings etc required to complete and install.

REGARDS PRICE: please consider:

Compared to similarly equipped imported systems you will find the Ozefridge package more than competitive. As the largest manufacturer of these systems in Australia, Ozefridge is built to suit Australia's harsh conditions.

12VDC REFRIGERATION CONDENSING UNITS. Two models: A480 and AW480

The refrigeration condensing unit is the heart of the Ozefridge system. All models have a stainless steel case neatly housing the standard BE90 compressor, condensers, electronics, fan, control system, external refrigeration



and electrical couplings.

Above: A480 Details: With relocatable control panel on the front. (12 or *24 volt DC)

The model A480 is a compact air cooled condensing unit capable of refrigerating any of the Ozefridge eutectic plates. (Single plate only) Operating from 12VDC or *24VDC, this BE90 compressor powered unit with its massive air cooled, twin fan, triple pass condenser, provides high refrigeration output but at a budget price. ECO2 is included.

*With converter.

The A480 is *240mm wide x 250 deep and 185 high. 8.7Kg. (* plus couplings)



Above: AW480 Details: With relocatable control panel on the front. (12 or *24 volt DC)

Operating from 12VDC or *24VDC, this BE90 compressor powered AW480 refrigeration unit is both air and water cooled providing the highest refrigeration output and efficiency. Most suited to larger cabinets or cabinets requiring twin eutectic plates and for operation in extreme conditions. (Tropics)

With it's digital 'sure-thaw' controller providing accurate control and monitoring, this unit will easily refrigerate any of our standard range of eutectic cold plates.

The AW480 is *240mm wide x 250 deep and 185 high. 9.3Kg. (* plus couplings)

Features of the A480 & AW480:

- Water pump on/ off switch. (AW480 only)
- Pump is thermostatically controlled. (AW480 only)
- Water pump, tubing and check valve supplied. (AW480 only)
- Remote- ready controller panel with splash proof switches.
- ECO2 on-off switch.
- Pre-gassed with R134a refrigerant.
- Sure-Thaw controller/ LED. (Water proof)
- Fail-safe warning/ indicator lamp.
- Two speed fans thermostatically controlled

EUTECTIC PLATES:

3 sizes, 2 thicknesses, either 'portrait or landscape' mount.

A total of Six models to suit a variety of cabinet shapes and sizes. Single or twin plate application.



'Portrait' eutectic plates (right) are best suited to taller cabinets, otherwise 'Landscape' plates are a better option.

Plates are normally mounted high inside the cabinet.

Note: Pipe line normally exits left as shown and is nominally 2 meters long.

Advise if exit right is preferred or longer pipe run is needed.

Models and Overall Eutectic Plate Dimensions:

Likely cabinet size match

- Model P33-29-4 322mm x 290 x 40. (Fridge cabinet up to 70Lt)
- Model P33-29-6 322mm x 290 x 60 . (Fridge cabinet up to 80Lt)
- Model P40-33-4 400mm x 330 x 40. (Fridge cabinet up to 100Lt)
- Model P40-33-6 400mm x 330 x 60. (Fridge cabinet up to 110Lt)

- Model P53-35-4 530mm x 355 x 40. (Fridge cabinet up to 170Lt)
- Model P53-35-8 530mm x 355 x 80. (Fridge cabinet up to 200Lt)
- (or freezers to similar capacity with twin eutectic plates from one condensing unit.)

Features of the Ozefridge Fabricated Eutectic Plates:



- 1: Eutectic plate case pressed from 316 grade stainless steel.
- 2: Rear mounting plate has wall offset included.
- 3: Mounting holes at rear on off-set back-plate mount.
- 4: S.S. Bolted construction with flexible seal.
- 5: Decal indicates orientation. (This one is 'Portrait')
- 6: Single hose 25mm Diam, houses pipes and wiring.
- 7: Spare twin wire from the condensing unit.
- 8: Sure-Thaw's temperature sensor reads from deep inside the eutectic mass ensuring proper eutectic operation.
- 9: Brass filler. Eutectic solution is best filled after mounting.
- 10: Pipes, brass filler and temperature probe are normally fitted on top for exiting to the left. (Order for exiting right if preferred.)
- 11: Polished stainless steel case with rounded surfaces allows for easy cleaning and resistance to damage.
- 12: Stainless steel screws for mounting the eutectic plate(s) and unit are supplied.
- 13: Offset mount allows the rear of each plate to assist cooling and angled corners accommodate round cabinet edges.

Temperature control and switch panel:

The AW480 and A480 both have their controls mounted on the front but on a relocatable stainless steel plate.



(Remote location kit is optional)

Both controllers provide the following standard features:

- The Oze fridge 'Sure-Thaw' eutectic control method.
- The digital controller is actually sensing the eutectic mass's temperature allowing the system to refreeze the eutectic mass before cutting off, then thawing correctly (through phase change) before restarting. This ensures it operates truly as a eutectic system.
- The controller is easily programmed with memory retention. It has a large LED display along with a compressor run / delay indicator.
- The LED is a fault indicator, flashing a sequence if a problem occurs. (Details of the indicated sequence are in the manual)
- The left side switch is simply an on / off switch. 'Off' allows the system to 'Sleep'.
- The 'Manual / Auto' switch is normally on Auto. Should a controller problem occur or the fridge is being loaded, then 'Manual' can be used. This bypasses the control system and allows the unit to run manually.
- The "Air / Water" switch allows the automatic pump to be turned off. (AW480 only)
- Warning alarm. Sounds if temperature goes above or below the pre-set temperature parameters.

Couplings, Power and Refrigeration:

All electrical, water cooling and refrigeration couplings are located on the right side of the unit.

- Schraedar valves are fitted for easy service access.
- Refrigeration valves allow system pump-down.
- A decal with coupling legend, details connections.
- Separate fuses protect the pump and DC outlets. (AW480)



OPTIONS:

ECO2 power management system is now **standard with both the A480 and AW480 Mains Power Converter:**

The A480 and AW480 can be supplied with the optional 240 VAC supply.

This 250 watt power converter accepts 240 VAC and 12VDC. (Connections supplied) It can remain connected to both AC and DC power as it automatically chooses to operate from the highest voltage presented. This solid state converter usually is fitted on the unit and is water proof.



FEATURES:

Standard system protection on both models:

On both models the motor driver's fail-safe provides the following protection: (After cut-out, restart is automatically attempted every 60 seconds)

- Low voltage and high voltage cut-out when on DC power supplies protects for compressor and batteries.
- Compressor over-load and over temperature cut-out.
- Compressor soft start. Six speed stepped ramp up eliminates harmful current rush and high consumption when starting.
- Start delay after any power disruption. (Prevents damaging rapid start attempts if the power supply is erratic.)
- Externally located, fuse protected power terminals for pump supply. (AW480 only)
- Spike arrestor to clamp and prevent any transient high voltages causing damage.
- External terminals for DC connection.
- Condenser thermostatically controlled to prevent over condensing. Fan speed varies on both units while the AW480 water pump cuts off automatically when not needed)
- Automatic compressor speed ramp up to maintain highest possible refrigeration output as evaporator temperature lowers. No start load.
- LED fault indicator advises if the system has defaulted. (Six warning sequences, all described in the operators manual

Hermetic Compressor: and condenser: ***NOW WITH FIVE YEAR WARRANTY!!***

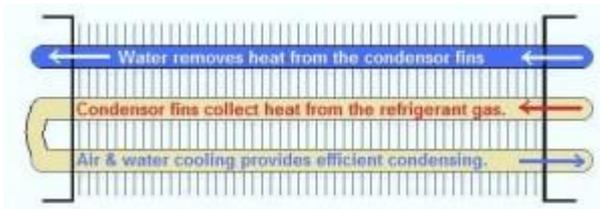


Since 2011 when Danfoss stopped manufacturing their BD range of compressors, we now only provide systems powered by the proven Oze fridge Hermetic BE90 compressor. This compressor is the same capacity as the now

obsolete Danfoss manufactured BD80, and much greater capacity than the old BD50 and BD35. The success of the BE80 has allowed us to now offer a **5 year compressor warranty**.

Using a much larger compressor increases power draw whilst running but a proportionate decrease in running time means that the BE90 does the job much faster without using any more power and the compressor is doing it easy. This is particularly important with the optional ECO2 included as more thermal energy can be stored during periods of abundant power, resulting in lower overall demand on battery(s) at later times. Only the BE90 compressor has a five year warranty. (Labour and gas included if returned to Ozefridge)

Condenser:



Sketch of Condenser (Plan View)

Ozefridge Multi-function condenser: (180mm x 180mm x 60mm. Conformal coated) AW480 only.



This Ozefridge engineered condenser has two separate circuits. One circuit allows cooling (yellow) of the refrigerant like a normal condenser, while the second circuit (blue) allows water to cool the actual condenser fins and therefore the refrigerant without having any direct contact with the refrigerant galleries. The common problem of electrolysis destroying systems is eliminated. The condensers are from cupro-nickel and conformal coated.

Able to operate as an air only condenser with twin fans or air plus water cooling, ensures proper condensing in any environment especially tropical.

Micro Pump Kit: (Included with AW480 condensing unit)



The P3 micro pump kit includes a 12 volt centrifugal micro-pump, ten meters of food grade vinyl tubing and check valve. This kit is supplied standard with each AW480 Package. Recycling your fresh water is a popular, harmless and trouble free method. Using raw water can result in increased maintenance and electrolysis damage. Consumption is less than 0.4a/h.

WARRANTY:

Ozefridge provides a minimum of 12 months warranty subject to the conditions described in the owners manual.

Five year compressor Warranty. This warranty is limited to the supply of replacement parts by post or a complete unit rebuild if the unit is returned to Ozefridge. We **do not reimburse costs** incurred as a result of work carried out by others.

Please also note: *Although the Oze fridge system can be easily installed as a DIY project by following instructions in the owner's manual, some countries including Australia require that the refrigeration pipe coupling etc., be done by a licensed person.

PACKAGES

Oze fridge systems are supplied as complete packages, pre-gassed ready to install rather than piece by piece. Each package includes an A480 air cooled or AW480 air & water cooled refrigeration unit that couples to either a single or twin eutectic plate.

This is a simple *DIY project with a 16 page instruction manual included.

Landscape eutectic plates are wide with their longest dimension being horizontal and mounting flanges on the horizontal sides as indicated. Best for wide or long cabinets. (Nominate orientation when ordering) Twin eutectic plate systems suit freezer cabinets over 60 liters and fridge / freezer combination cabinets using the Thermo-fan option to refrigerate the adjacent cabinet. (see sketch at 'Cabinet Ideas')

Now to choose the most suitable package..

A: Establish the capacity of the cabinet to be refrigerated. (Hcm x Wcm x Lcm divide by 1000 = litres. ie: a cabinet 50cm H x 50cm W x 70cm L would be 175Lts.)

B: Check the chart on the 'Cabinet Tips' page. Locate the suggested package for your cabinet's size, insulation thickness and operation. (Eutectic plate(s) can be 'portrait or landscape' orientation.)

C: Next choose the condensing unit preferred. (Details on 'Products' page.

D: Now refer to the following package examples as a starting point but discuss your project with us before ordering so pipe lengths etc., can be customized. Each package can be supplied with a second eutectic plate to suit larger fridge cabinets or freezers.

Package One

A480 Refrigeration Unit with a P33-29-6 or P33-29-4 Eutectic Plate.

or

AW480 Refrigeration Unit with a P33-29-6 or P33-29-4 Eutectic Plate

This compact system package has our smallest eutectic plate and suits properly insulated refrigerator cabinets up to 70 litres, or properly insulated freezers up to 50 litres, with a single



plate.

Extremely low power consumption. Typically if installed in a 70 litre refrigerator it would consume approximately 14 to 16 amps per day during cooler months and up to double that during summer. The new A480 is particularly suited to this and other smaller eutectic plates.

The AW480 operates best with water cooling although not essential for single plate operation. The additional 1/4 amp consumed by the water pump is more than compensated by the much lower compressor consumption rate and run times. The water pump and fan are both thermostatically controlled to prevent over-condensing when in cooler environments. Water cooling is essential for all twin plate systems and if for tropical use.

Package Two

A480 Refrigeration Unit with a P40-33-6 or P40-33-4 Eutectic Plate.

or

AW480 Refrigeration Unit with a P40-33-6 or P40-33-4 Eutectic Plate

This compact system package has our mid-sized eutectic plate and suits properly insulated refrigerator cabinets up to 100 litres, or properly insulated freezers up to 60 litres, with a single plate. The twin (thin) eutectic plate package suits larger properly insulated cabinets. Also see package selection chart at the 'Cabinet Ideas' page.



Extremely low power consumption. Typically if installed in a 100 litre refrigerator it would consume approximately 16 to 19 amps per day during cooler months and up to double that during summer. .All AW480 models are equipped with the unique Ozefridge twin coil, air/water cooled condenser. This amazing condenser allows the unit to operate as an air cooled or water cooled system without the usual problems of electrolysis or fouling. The additional 1/4 amp consumed by the water pump is more than compensated by the much lower compressor consumption rate and run times. The water pump and fan are both thermostatically controlled to prevent over-condensing when in cooler environments. Water cooling is essential for all twin plate systems and tropical use.

Package Three

A480 Refrigeration Unit with a P53-35-6 or P53-35-4 Eutectic Plate.

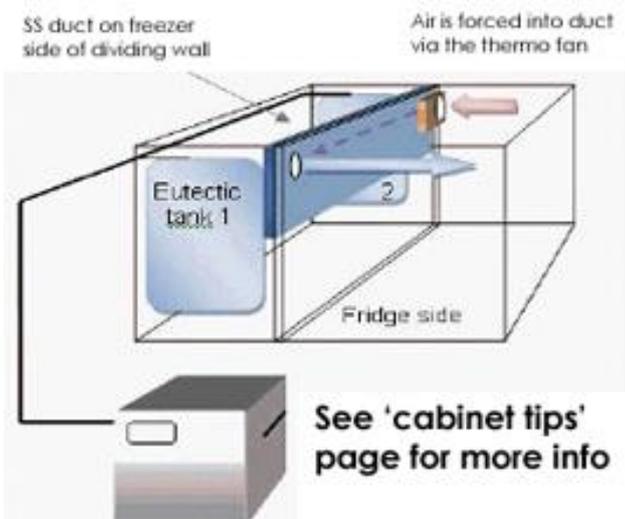
AW480 Refrigeration Unit with a P53-35-6 or P53-35-4 Eutectic Plate.

This system package has a large capacity eutectic plate and suits properly insulated refrigerator cabinets up to 200*litres or freezers up to 100* litres. (*With a single plate in a properly insulated cabinet.. or up to 350 litre fridge with a twin plate model.) *Must be with water condenser water cooling (Water cooling is essential for twin plate systems, or tropical use) The thinner P53-35-4 plates are best when operating as a freezer. Extremely low power consumption. Typically a 200 litre refrigerator would consume approximately 27 to 30 amps per day during cooler months and up to double that during the summer. The controller is programmable and the switches allow the unit to be in



(A) Sleep Mode or Run Mode (B) Manual run or Auto run (C) Optional ECO2 on or off. (D) Air only or Plus water. The 'Manual' switch allows the system to continue running if the control electronics fail or if extra cooling required when loading. An LED indicates default and advises likely cause such as low or high voltage, overload cut-off, overheat cut-off, faulty fan etc...

This model with twin thin plates, is ideal for larger freezers or combination fridge/freezer cabinets. See sketch below



Right:

A fridge / freezer combination cabinet can be refrigerated using twin (thin) eutectic plates. These plates service the freezer while the adjacent fridge area is refrigerated via air cooled as it is forced through the stainless steel heat exchanger, by the thermo-fan unit.

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Each Ozefridge System Package includes:

1 x A480 or AW480 12VDC refrigeration unit evacuated and gas charged.

- 1 x Single or Twin eutectic Plate with *2.0 Metres of pipe run.
- 1 x P3 Water pump with 10Mts of tubing and check valve.
- 1 x ECO2 Power Management system. (Built-in)
- 1 x Miscellaneous pack includes SS screws, spare fan, etc.
- 1 x Installation and user's Manual.
- 1 x Secure packaging and delivery to your address.

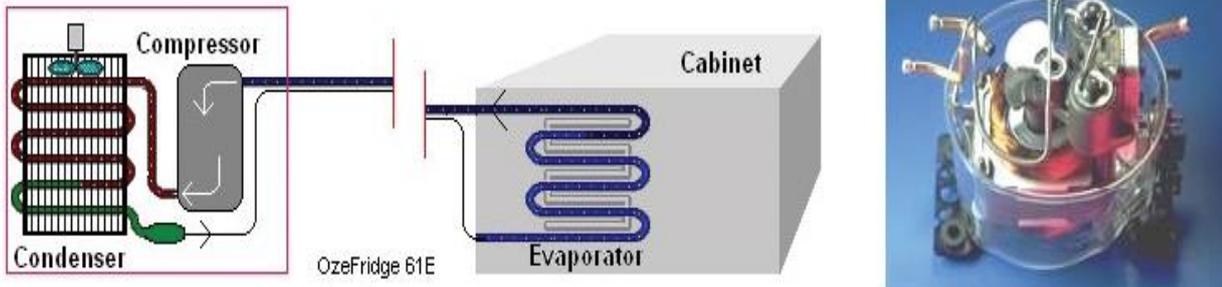
12 months plus parts warranty. (Minimum) 5 Years on compressor.

WARRANTY: Ozefridge provides a minimum of 12 months warranty with 5 years on the compressor subject to the conditions described in the owner's manual. This warranty is limited to the supply of replacement parts by post or a complete unit rebuild if the unit is returned to Ozefridge. We do not reimburse costs incurred as a result of work carried out by others.

Why Eutectic

Eutectic Refrigeration = far less battery power consumption. Here is why..

The diagram below is of a simple eutectic refrigeration system showing the basic components and how they rely on each other, and below right is a cut-away showing the internals of a multi-voltage compressor, followed by a brief explanation.



Above left: Refrigerant gas is pumped around the system by the compressor, in a re-circulating manner somewhat similar to water circulating around a cars cooling system, collecting heat from one area and disposing of it in another.

The three main components are: 1: Evaporator (Eutectic cooling pipes, inside the fridge cabinet), 2: Condenser (Disposes the heat outside), 3: Compressor pumps the refrigerant gas that transports the heat. These components are connected in a closed loop.

The evaporator collects heat from the eutectic tank and the compressor pumps / compresses it into the condenser where it is disposed of. Therefore, each of these major components relies on the other. each doing their job effectively and proportionately.

For example, if the condenser can not efficiently dispose of the heat load because it is undersized or has a restricted air / water flow etc., then the compressor is overloaded and stressed, the evaporator is unable to collect heat effectively and so on. The result of this chain reaction is a system that consumes excess power and provides poor, if any, refrigeration. Systems must be engineered with compatible components.

Eutectic Refrigeration, an explanation:

We all know that a drink with ice in it will stay cold and drinkable at a constant temperature while the ice remains, but will warm rapidly once the ice thaws.

The ice is an example of the eutectic principle, absorbing relatively huge amounts of heat while it thawed from a



solid to a liquid. (Phase changed)

The term 'Eutectic System' refers to a refrigeration system that uses the phase change of a liquid medium to absorb and dissipate large amounts of thermal energy while remaining at a constant pre-arranged temperature. Phase Change occurs when we freeze a solution solid by removing its heat or as it thaws into a liquid again while it absorbs heat. The phase change medium or eutectic solution is stored in the stainless steel eutectic plate and acts like a renewable ice block, freezing solid during the refrigeration run cycle and thawing during off periods and all the time maintaining a constant cabinet temperature like the ice did for the cool drink!

Other products such as a thin aluminium evaporator plate can also absorb and dissipate thermal energy but when a relatively large volume of solution is used as in the eutectic plate and it is allowed to freeze solid on the refrigeration run cycle, then thaw during the off cycle, a massive amount of stored thermal energy is in play.

By comparison with a thin aluminium cold plate, the first and most obvious advantage the eutectic system has is its far greater mass and therefore thermal hold-over storage capacity. (A thin slice of ice will disappear much quicker than a 60mm thick block would)

But this thermal storage advantage pales into insignificance compared to the other unique benefit that the eutectic system's phase change phenomenon delivers. This phenomenon called 'Latent heat', multiplies the eutectic's thermal storage capacity many times providing huge hold-over periods where the unit stays off for many hours even days in cooler times.

As an example, using a quantity of water as a eutectic solution and knowing that water's phase change occurs at approximately 0°C, this water will absorb and dissipate 80* (Yes eighty!) times as much thermal energy while freezing and thawing as it would for any other rise or fall of a degree centigrade.

A eutectic system will run for a long period while refrigerating the eutectic solution until frozen solid. It then stays off for relatively much longer periods while this thermal mass thaws completely before running again. All the time maintaining cabinet temperature.

Eutectic systems have many advantages including the following..

- Long 'hold-over' off periods due to the large thermal mass and more importantly because of the eutectic's phase change.
- Refrigeration can be at a time that suits the power supply, or during cooler periods when refrigeration systems are more efficient.
- Much lower overall power consumption due to more efficient refrigerant evaporation in a saturated environment,
- With ECO2 the eutectic mass is automatically refrozen whenever sources of power are abundant, reducing demand on batteries.
- Virtually 'cooling in advance', use of abundant power supplies provides a day or so of refrigeration requirement in storage.
- A day or two of sailing without the need of additional cooling is possible if battery power supply is down. (i.e. solar but no sun!)
- Eutectic systems store energy at a third of the weight that would be required in batteries to provide the same refrigeration effect.

Oze fridge Sure-Thaw Controller: Its Importance.

The vast majority of so-called Eutectic systems do not and simply cannot function properly as true eutectic systems. We have found that either the eutectic solution mix is not appropriate for the cabinet temperature required

therefore phase change is not occurring, and / or the system is controlled by a thermostat reading cabinet air temperature or worse still, also using an ancient mechanical type temperature controller!

If the eutectic solution doesn't freeze on each run cycle and then thaw completely during off periods, then the system cannot operate correctly. It is as simple as that!

The Ozefridge Sure-Thaw control system allows the user to digitally set the compressor cut-out below the eutectic freeze point and cut-in above the eutectic thaw temperature, with a controller that reads the actual eutectic temperature. This unique control method guarantees that each on / off cycle of the refrigeration system provides proper phase change and benefits of the eutectic principle.

Power Efficiency Tests:..

(An Ozefridge Package 2 fitted to a domestic cabinet)

This 150 litre cabinet maintained a temperature of between +2°C and +4°C.

It consumed 19.6 Amp hours per 24 hours, averaged over a fourteen day period with daily temperatures 34°C to 44°C.

This cabinet only has 70mm thickness walls and was tested empty.

The Ozefridge data logger (left) provided cabinet and ambient temperatures, DC voltage, current, run wattage and accumulated watts. Averaging less than 20 A/H per day in extreme conditions, it is an example of the efficiency of the eutectic refrigeration method.

This cabinet / system can operate as standalone powered by a single 80 watt solar panel. With ECO2 causing the eutectic mass to refreeze during 'abundant power' periods, and holding over at night, no draw from battery is needed making it an ideal install for off grid users.

Why Eutectic Refrigeration uses far less power: The technology...

Power consumption differences: Cold Plate Cyclic Refrigeration compared to Hold-Over Eutectic Refrigeration.

Given a refrigeration cabinet to refrigerate, the amount of heat to be removed (measured in watts) is exactly the same regardless of the refrigeration method used. But, how the cabinet is refrigerated and the refrigeration method used, will determine how power efficient the conversion from electrical energy to thermal energy will be and the differences are extreme.

The following charts are indicative of the two system types refrigerating the same cabinet. They indicate the power savings using the eutectic refrigeration method due to far less daily start-ups and operating in a COP range providing a 50+% better conversion of electrical energy. Read on, it's a no-brainer!

CHART A: 12 Volt DC Cold Plate Cyclic Refrigeration:

This lowest capital cost method is to use a cyclic refrigeration system employing a thin aluminium evaporator. (cold-plate)

Advantages of this system:

- Low capital cost.
- Rapid initial cabinet cool down.
- Light weight. (Although additional battery(s) may be needed))

Disadvantages of this system:

- Soft aluminium evaporator is easily punctured and prone to corrosion if/ when powder coating is damaged.
- Virtually no hold-over thermal storage therefore power is needed all the time. Total reliance on battery supply.
- Inefficient use of electrical energy due to:
 1. Many cycles per 24 Hr/day (24 as in chart but often many more!) Each start of a cycle wastes power.
 2. Operating in an inefficient COP* range mostly less than 1.3. This relates to longer running per cycle.

*COP indicates the compressor efficiency which reduces as the evaporator temperature lowers. For example if a compressor consumes 100watts of electrical energy while removing only 130watts of heat its COP is 1.3. Operating at low evaporator temperatures and therefore low COP, is very inefficient and wasteful of battery power.

The chart below is typical of a Cold Plate System refrigerating a 150 Litre insulated cabinet:

The green line indicates that cabinet temperature was maintained between +2C and +4C, ideal fridge temperature.

The blue line indicates how the evaporator cold plate quickly lowers in temperature when the compressor runs but then quickly rises again during off cycles. No hold-over.

The green and yellow blocks indicate Run (Battery use) and Off periods, with totals to the RHS.

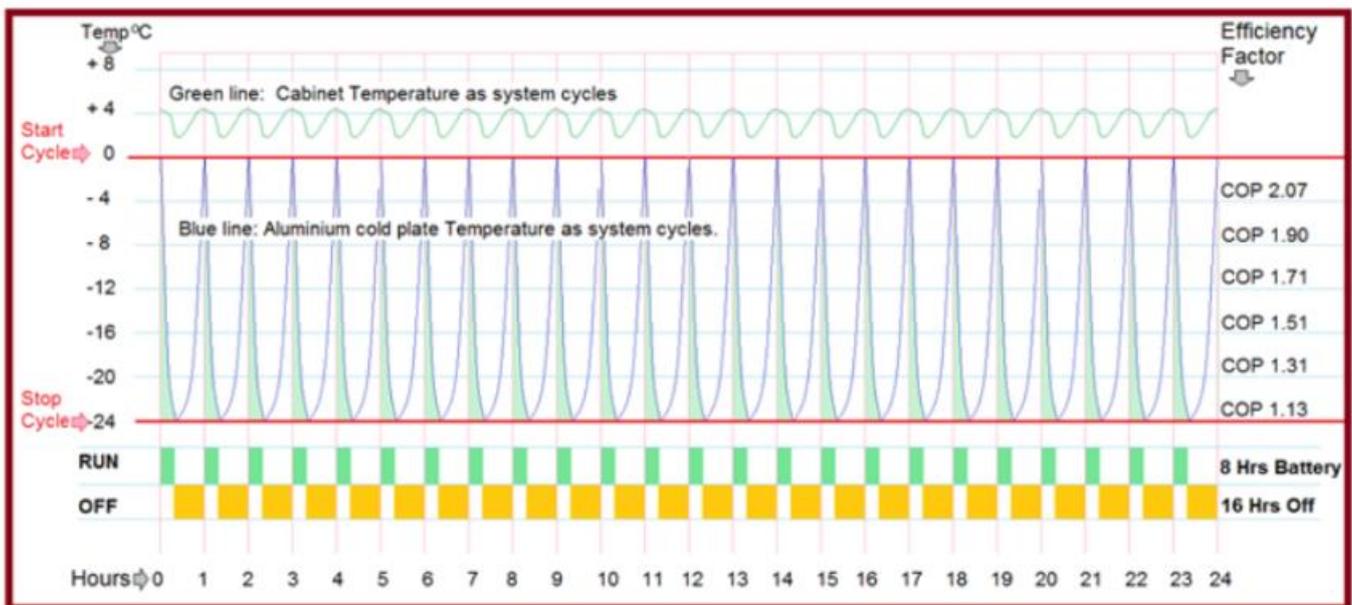


Chart A

CHART B: 12 Volt DC Hold-Over Eutectic Refrigeration:

This has a similar Refrigeration condensing unit to the Cyclic system but the evaporator and it's operation mode is vastly different. Eutectic refrigeration uses a refrigerated stainless steel holding tank to store thermal energy. (Eutectic Plate)

Advantages of this system:

- Longer life expectation due to more rugged stainless steel evaporator, less run time and far less start ups.

- With stored thermal hold-over to support the units cooling ability, there is less cabinet temperature rise when adding warm products. Less rapid movement in cabinet temperature.
- Although heavier than cyclic systems, project weight overall is less due to not requiring as much battery storage.
- Far less use of electrical energy (Battery) due to:
 1. Only one or two run cycles per day so less start up losses.
 2. Operating in a very efficient COP* range mostly approx 2.0. This being a 50% more efficient COP factor than a cyclic system relates to shorter run time per cycle and far more efficient conversion of energy.
 3. Full fail safe automatic resetting. Manual over-ride switch to bypass all control system if needed.

Disadvantages of this system:

- Higher capital cost.

*COP indicates the compressor efficiency which reduces as the evaporator temperature lowers. For example if a compressor consumes 100watts of electrical energy while removing 200 watts of heat its COP is 2.0. Operating at higher evaporator temperatures and therefore higher COP, is very efficient and conserves battery power.

The chart below is typical of a Hold-Over Eutectic System refrigerating the same 150 Litre insulated cabinet:

The green line indicates that cabinet temperature was maintained between +2C and +4C, ideal fridge temperature.

The blue line indicates how the evaporator cold plate slowly lowers in temperature when the compressor runs as the Eutectic mass is frozen, then slowly rises again as the Eutectic thermal mass thaws during off cycles.

True hold-over refrigeration.

The green and yellow blocks indicate Run (Battery use) and Off periods with totals to the RHS.

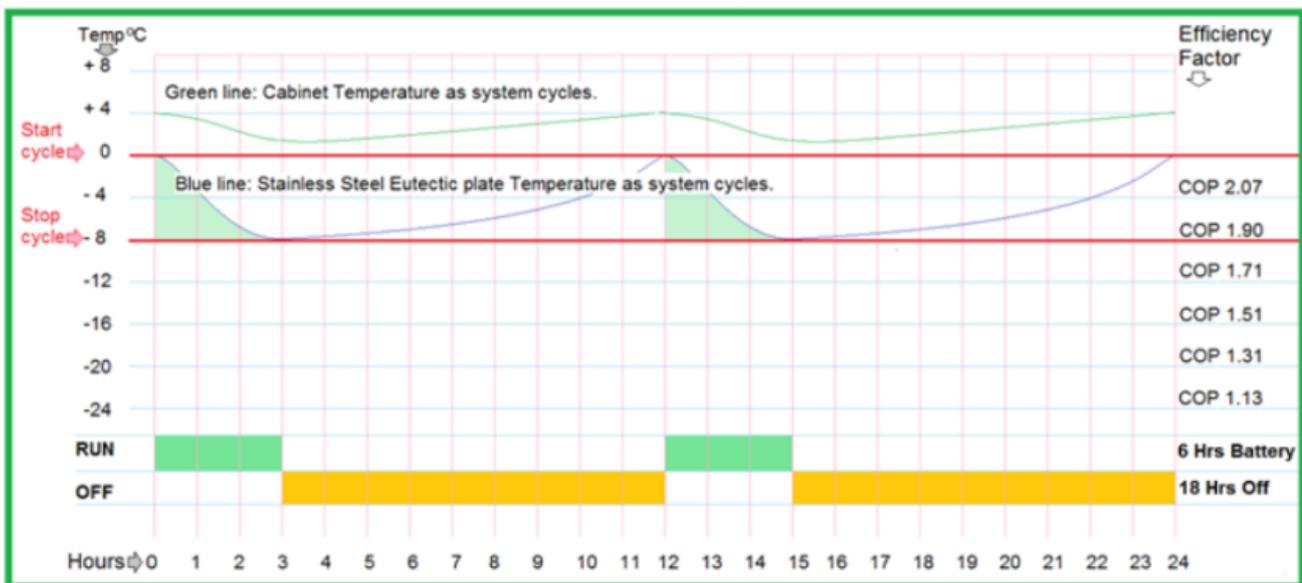


Chart B

CHART C: 12 Volt DC Hold-Over Eutectic Refrigeration with ECO2 .

This has a similar Refrigeration condensing unit and Eutectic evaporator as described above but with the addition of an in-built ECO2 power management system. ECO2 monitors the voltage(s) presented and if the DC exceeds 13.7

volts (or if the optional 110 / 240 VAC power supply kicks in) it knows that batteries are topped up and further power from solar etc is now otherwise wasted, so it tricks the digital controller into run mode. We call this 'using abundant power', power that is otherwise wasted. ECO2 is standard now on all Oze fridge Eutectic systems as is the automatic failsafe bypass system.

Advantages of this system:

- Longer life expectation due to more rugged stainless steel evaporator, less run time and far less start ups.
- With stored thermal hold-over to support the units cooling ability, there is less cabinet temperature rise when adding warm products. Less movement in cabinet temperature.
- Although heavier than cyclic systems, project weight overall is less due to not requiring as much battery storage.
- Far less use of electrical energy (Battery) due to:
 4. Only one or two run cycles per day so less start up losses.
 5. Operating in a very efficient COP* range mostly approx 2.0. This being a 50% more efficient COP factor than a cyclic system relates to shorter run time per cycle and far more efficient conversion of energy.
 6. Full fail safe automatic resetting. Manual over-ride switch to bypass all control system if needed.
 7. ECO2 automatically causes running when power is abundant reducing the demand on battery(s) ECO2 also increases compressor speed to make best use of abundant power.
 8. ECO2 often eliminates the need for additional battery power to service the fridge unit.

Disadvantages of this system:

- Higher capital cost.

The chart below is typical of a Hold-Over Eutectic System with ECO2 refrigerating the same 150 Litre insulated cabinet:

The green line indicates that cabinet temperature was maintained between +2C and +4C, ideal fridge temperature.

The blue line indicates how the evaporator cold plate slowly lowers in temperature when the compressor runs as the Eutectic mass is frozen, then slowly rises again as the Eutectic thermal mass thaws during off cycles.

The green and yellow blocks indicate Run (Battery use) and Off periods with totals to the RHS.

The brown area indicates running without battery drainage whenever ECO2 sights 13.7VDC or optional AC. (Automatic)

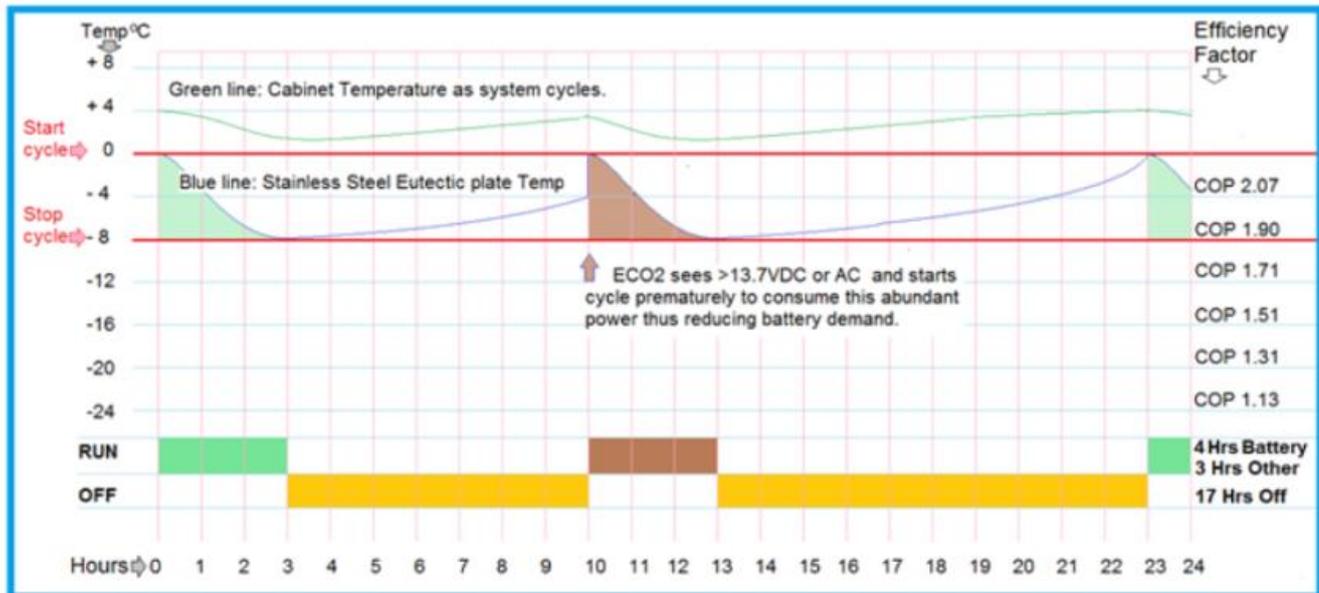


Chart C

As can be seen by these charts above, a Eutectic system with the built-in Ozefridge ECO2 Power Management will use far less battery power to provide the same cooling.

When making your enquiry if you could please address the following questions in your email we can then recommend the system best suited to your specific requirements.

1. Cabinet Dimensions
2. Thickness and, if possible, type of insulation
3. Voltage 12 or 24
4. Use – fridge or freezer
5. Location of use – Local, subtropical, tropical, or worldwide
6. Is AC power required, if so voltage needed (110v/240v)
7. Distance from cabinet to where the Ozefridge box will be installed