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ITALY

Presentation of kWh and CO2 reduction ⇨

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THE PURPOSE OF CATALYST® / SWC

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Reduces the KW or peak power of the compressor.

Reduces thermal resistance in the refrigerant heat exchange process by reducing/eliminating oil deposits in coils and hoses.

Improves the efficiency of the heat scrubbing process and the heat carrying capacity of the refrigerant.

Reduces and prevents oil contamination/sludge in refrigerant filter driers.

Reduces kWh consumption.

Reduces costs for the operation of HVAC systems.

Reduces the facility's carbon footprint.

Extends the life of the system.

DEVELOPMENT HISTORY

The Kyoto Protocol was signed in 1997, phasing out R22 and all HFC-based refrigerants and mineral oil in compressors. This led to the development of R134A and R410A refrigerants.

The replacement refrigerants are complex, multi-chemical mixtures that are the opposite of R22, which is a simple molecule. The need to improve the efficiency of the HVAC systems in the space shuttles and space station initially led to NASA's research and development of Catalyst® refrigerant.

NASA began independent research on synthetic oils and new refrigerants a few years later and developed HVAC treatments that have been used successfully for over 23 years.

A market was secured for the Catalyst® because these new refrigerants had less heat capacity than the old refrigerants. The chemical composition of the Catalyst® improved the performance of the R134A and R410A refrigerants while significantly reducing oil deposits.

Testing and development of the Catalyst® was carried out on DX systems, heat pumps, geothermal energy sources and chillers, resulting in KWH reductions of 19-35%.

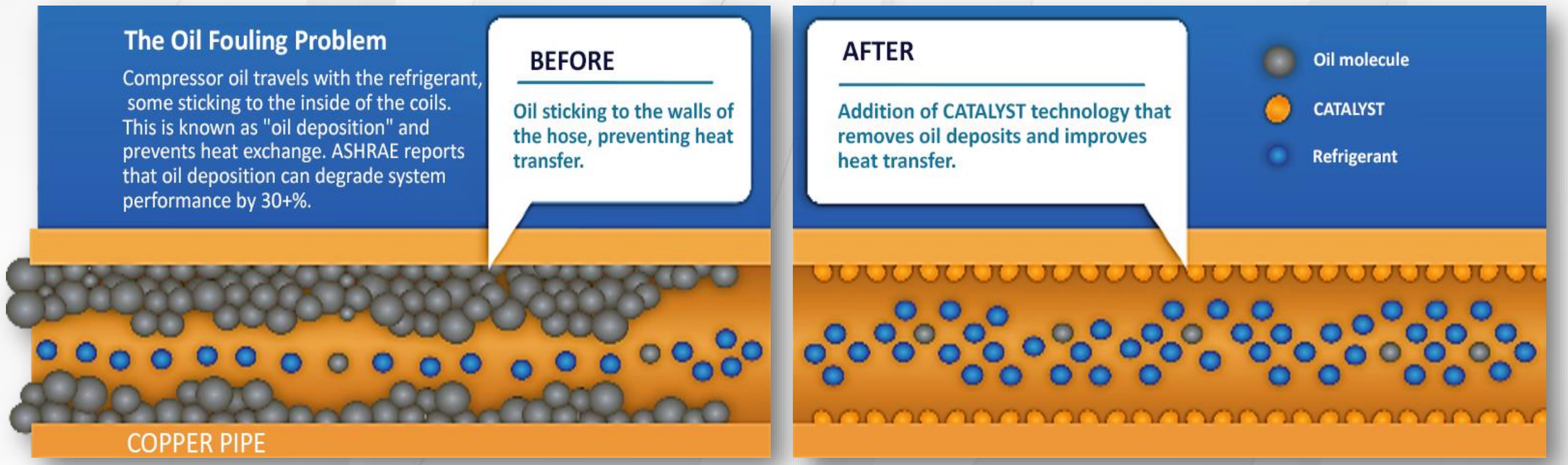
HOW DOES CATALYST® WORK?

Explore three unique areas of use

Catalyst #1 eliminates oil deposits by breaking surface tension (Van Der Waals forces).
The Catalyst® removes the plaque-like oil coating that forms on the internal surfaces of the system, allowing the refrigerant to come into direct contact with the heat exchanger coils, improving heat transfer. The released oil circulates back through the system but does not stick to the heat exchanger walls or hoses. Catalyst® releases stuck TXV electronic valves.

Catalyst #2 causes the refrigerant to boil at a lower temperature and release its heat faster. The cumulative effect of the two catalysts allows the spaces to reach set temperatures faster. The compressor works less, saving energy and extending the life of the equipment.

Lubricant #3 increases the lubricity of the compressor oil.
The compressor is cooler, works better and lasts longer.



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PROAS was originally developed almost 35 years ago to solve the problem of oil deposits in HVAC systems. Although PROAs initially showed promise in increasing efficiency and reducing oil deposits, major problems began to appear in systems treated with PROAs in the form of catastrophic compressor failures. System failures usually started 2-4 years after the injection of PROAs.

The problem with PROAs was that the main chemical used was OxyChem's Chlorowax, which contains chlorine, sulphur, solvents, acids, soaps and waxes. Chlorine wax used in refrigeration systems breaks down and produces HCl which attacks iron and zinc and destroys compressor bearings/seals.

A typical example is the Crown Casino in Melbourne, Australia, where more than 150 50-ton compressors broke down three years after the installation of PROA.



Results of PROA

PROA's (Polarized Refrigerant Oil Additives)

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Catalyst® is a proprietary three-part synthetic chemical technology of fifth generation chemical engineering.

Catalyst® does not contain sulfur or other impurities that can harm your system.
Catalyst® is non-toxic and harmless, unlike many PROAs (Polarized Refrigerant Oil Additives).

Catalyst® is compatible with most types of HVAC systems used in commercial, industrial, refrigeration, home and transportation, including most compressors, heat exchangers (direct exchange or DX, etc.) and refrigerants, heat pumps, ground source heat pumps/ground source cooling systems, chillers, rooftop units (RTU), packaged systems/split systems. It is also used in specialized systems, such as reefers and computer room air conditioning systems (CRAC).

Catalyst® cannot be used in oil filter systems with coalescing oil filters or with R123 or R11.

How exactly are the cost savings realized?

Catalyst® improves the heat transfer capacity of your system. This allows the system to reach its thermostatic set point faster and maintain the temperature longer. This results in an average reduction in system uptime of more than 30% when installed together with SWC.

How will I be able to measure my energy savings?

According to many sources, HVAC accounts for 35-50% of your total energy consumption.
A 30% reduction in air-conditioning costs would result in a 10-15% reduction in the total energy bill.

Although this is a general guideline, actual savings are affected by a number of factors, such as changes in energy prices and outdoor temperatures, as well as changes in your operating environment, e.g. new equipment, construction, more employees, changes in opening hours, etc.

What physical changes will our facilities undergo?

The air coming out of the vents will be noticeably cooler.
Usually, 2-6 degrees lower temperatures are experienced in the vents within a few days after installation. In addition, the relative humidity is reduced by 12-15%, which contributes to a more comfortable indoor environment. In general, the thermostat can be raised by 2-3 degrees, which also helps to reduce electricity consumption.

Is the use of 'additives' used to improve the efficiency of air conditioning new?

No, the first 'additives' were introduced about 25 years ago.
Although the concept was good, these products contained corrosive ingredients such as chlorine, sulphur and wax that could irreparably damage systems. In recent years, Catalyst® has taken this concept and evolved the technology by developing a synthetic catalyst technology consisting of benign, non-toxic and non-corrosive ingredients to achieve the desired effects.

Ultimately, what sets Catalyst® apart from PROA's is Catalyst®'s performance history and successful installations, as well as AEO's warranty, which is backed by a $3,000,000 insurance policy.

Will installing Catalyst® void my warranty?

Only if the contract states that "no additive or catalyst may be installed in the unit before the manufacturer's warranty (usually 1-3 years) has expired". To provide additional protection to the customer, the manufacturer of Catalyst® offers a comprehensive warranty (up to five years) and a 3 000 000 dollar insurance policy for all devices where the technology is installed.

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If the Catalyst® system is so good, why doesn't the OEM (Original Equipment Manufacturer) support it?

There are two main reasons for this, which have to do with "conflicts of interest".
Typically 85% of OEM revenue comes from the sale of repair parts and replacement units and maintenance Catalyst® does not eliminate this revenue for the OEM, but it does delay this revenue.
Many studies have shown that "disruptive" technologies are generally seen as a "threat" to established players in any industry and the predictable reaction is to threaten, discredit or displace, examples of this are the iPod, Linux O/S and "alternative" medicine, e.g. chiropractic, naturopathy.

How does the guarantee work?

When installing the Catalyst®, the model and serial number of your units are sent to our office for registration. During a compressor failure, the following sequence of events occurs:

First call your local HVAC maintenance provider and have the defective compressor replaced
Give us a call and ask for help with the warranty.
A sample of the compressor oil is sent to a laboratory for analysis.
The compressor is removed and sent to a lab for analysis.

If The Catalyst® is found to be responsible for the system failure,
the compressor will be repaired or replaced at no cost to the customer.

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SWC DEVELOPMENT HISTORY AND HOW IT WORKS

Catalyst® / SWC has been developed and tested to reduce the limitations of refrigerant filters and dryers in HVAC systems. The development was conducted in systems owned and operated by the federal government. AEO was asked to develop an alternative method to replace filters/dryers in their HVAC systems.

Package units, rooftop units (RTU), and split units were tested under the strict guidelines of the federal procurement regulatory system and in accordance with IPMVP guidelines.

SWC has been proven to reduce restriction problems in liquid line filters and dryers found in most plumbing, heat pumps and cooling systems.

The test results showed reductions of 12.8-18.2% kWh.

SWCs transducers send low intensity sonic and ultrasonic waves into the filter/dryer, helping to remove the oil sludge that builds up on the filter screens. This reduces obstructions and allows the refrigerant to flow.

How does SWC work?
SWC delivers low sound waves and ultrasonic waves
to the liquid line filter/drier to reduce resistance to refrigerant flow.

What types of HVAC equipment is SWC intended to be used on?
SWC is intended for use on Direct Expansion (DX)
units/equipment with in-line liquid line filters/dryers.

When should SWC be used?
SWC is recommended for any system where the "Delta T"
of the liquid line filter/dryer is above 2.5° Fahrenheit / 1° Celsius.

An elevated "Delta T" indicates fluid line filter/dryer limitations.
SWC should be installed on all DX units when
Catalyst® is installed and the filter/drier is not replaced.

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Can SWC reduce the energy used by the system?
SWC reduces energy consumption by 11-21%
depending on the amount of oil contamination in the system.

What is the cost compared to changing the filter/dryer?
SWC is economical and cost-effective compared to filter/dryer replacement.
A typical filter/dryer replacement for a 15-ton dual-circuit HVAC system costs over 900 USD
and takes the system out of service for more than 6 hours with no reduction in energy use.

How long does it take to install SWC and how much does it cost?
SWC is installed in 20-30 minutes by an HVAC technician and costs less than 600 USD,
with the added benefit of reducing energy use by an average of 12-19%.
SWC provides a return on investment of over 500% over the life of the system.

INSTALLATION AND COST OF CATALYST® AND SWC

The amount of Catalyst® used to treat a system is 10% of the system's oil volume or 1 ounce per ton of rated capacity, whichever is greater.

Catalyst® is installed through the low pressure port, the system is not damaged.

Inspection and installation must be performed by a licensed HVAC technician. The inspection and installation report must be submitted to AEO, LLC in order for the warranty to be registered.

Catalyst® is a one-time treatment for DX air-to-air units, refrigeration units require a booster charge after the third oil change.

The SWC is connected to the filter/dryer and the 24-volt electrical input.

All installations are subject to charges for service visits.

All projects are priced per job.
We collect all information about the device to verify your individual needs.

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PERFORMANCE GUARANTEE INSURANCE

AEO, LLC Catalyst® guarantees that if the catalyst does not provide a reduction of at least 12% of the kWh used in the treated HVAC units, AEO will refund 100% of the product cost, excluding labor and service fees.

Warranty, AEO provides a warranty of 60 (sixty) months from the date of installation of the Catalyst® to protect the units in the event of catastrophic failure. The warranty is backed by a 3 000 000 dollar product liability insurance policy. For systems that are within 24 months of their expected lifetime, the warranty period is shortened to 24 months.

AEO/SWC provides a 12 month warranty from the date of installation.
If for any reason the unit does not work, simply return it to the manufacturer and a replacement unit will be sent back via FedEx.

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Can the installation of The Catalyst® affect my warranty?

The Federal Trade Commission Magnuson-Moss Act (Equipment Warranty) 15 U.S.C. ss230, January 1, 1997; 61 FR 69366, states that "a manufacturer cannot void or refuse to honor its equipment warranty because a non-OEM manufactured component from another party or an aftermarket component or supplier has been installed in or with their equipment".

If the Catalyst® system is so good, why don't the Original Equipment Manufacturers (OEMs) support it?

The main reason is "conflict of interest". ASHRAE states that "typically +/- 85% of OEM revenue comes from repairs, parts, maintenance and replacement unit sales". Catalyst® does not eliminate this income for the OEM, but it does delay this income.

ESTIMATED SAVINGS KWH

Calculation based on 450 kWh per RT.
130 RT for a four-story office building with heat pumps for tenants.
130 RT x 450 kWh = 58 500 kWh consumption per month.

58 500 kWh x 121 öre/kWh = 70 785 SEK monthly cost.

Catalyst® saves 25%.

58 500 kWh x 0.25 = 14 625 kWh savings per month.

14 625 kWh x 121 öre/kWh = SEK 17 696.25 savings per month.

This calculation is based on the current electricity market.
Electricity spot price on 2022-05-31: 121 öre/kWh.
Website: https://elen.nu/

RT = Cooling tones
Kr = Swedish krona (SEK)
LB = Pounds
Mon = Month
kWh = Kilowatt hour

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Calculation based on well maintained equipment < 5 years old.
Individual consumption may vary.
14 625 kWh x 12 months = 175 000 kWh.

175 000 kWh saved annually.

175 000 kWh x 0.823 LB CO2/KW = 144 000 LB reduced annually.

144 000 LB x 5 year project = 720 000 LB CO2 reduced.

The calculation is based on the following.
Average CO2 per kWh is 0.823 LB, may vary depending on equipment.

LB = Pounds
Mon = Month
kWh = Kilowatt hour

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ESTIMATED DIESEL SAVINGS

This calculation is based on a real case study of a 48' trailer equipped with a Carrier Transicold (TM); powered by a diesel engine.

Before Catalyst®
Operating hours per year: 4 608 hours.
Fuel capacity: 50 gallons.
Fuel consumption: 0.595 GPH (2,25 LPH).
Refueling schedule: 84 hours.

After Catalyst®
Refueling schedule: 144 hours.
Fuel capacity: 50 Gallons.
Fuel consumption: 0.347 GPH (1,31 LPH).

41% reduction in diesel consumption is 1 142.82 gallons (4 326.04 L).
CO2 Reduction: 22.46 LB per gallon of diesel.
1,142.82 gallons x 22.46 LB = 25,649 LB CO2 reduced annually.
Consumption varies between seasons.

L = Litres
H = Hour
LB = Pounds
LPH = Litres per hour
GPH = Gallons per hour

AEO, LLC offers "Proof of Performance testing in accordance with IPMVP guidelines option **"B"**.

The results are certified by a third-party engineering firm,
Impact Industrial Services, Inc. Steven King, P.E., CEM.

The testing uses Revenue Grade Onset data loggers and follows a strict protocol.
Data is collected at 60 second intervals on all operating parameters, including unit cycle, power consumption, KwH, ambient temperatures/humidity, supply and exhaust air/humidity.

The test results include certification of KWH reduction and CO2 and GHG emissions, which can be used to secure rebates and carbon credits. Under the Paris Agreement, the carbon reduction must be re-certified within six years to be eligible for rebates and carbon credits.

THE BENEFITS OF CATALYST®

Improves equipment efficiency
The load on the working parts
Carbon dioxide emissions
Energy consumption

Sustainable development
Companies can take a step closer to net zero emissions with a onetime installation to reduce carbon emissions over the lifetime of the equipment.

Extends the life of the equipment
Shorter duty cycles and increased lubrication reduce stress on working parts and help extend the life of equipment while reducing maintenance costs.

Reduced energy costs
The reduced energy consumption will have a direct impact on the company's energy costs and will continue to provide a return on investment.

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HELP YOU WORK TOWARDS ZERO NET EMISSIONS

Catalyst® is a 5th Generation Synthetic Catalyst.
Catalyst® will reduce energy and carbon whilst improving HVAC efficiency and longevity of equipment.

What does Catalyst® do?

Reduces oil fouling
Improves heat transfer
Lubricates the compressor

Prolongs the life of the equipment

With shorter duty cycles and increased lubrication there is less strain on the working parts prolonging the life of the equipment and reducing maintenance costs and unnecessary visits.

Improves the efficiency of the equipment

Reduced energy consumption, reduced carbon output, reduced greenhouse gases.

Sustainable Development

Everybody can take a step closer to carbon net zero with a one time install to reduce the carbon output and greenhouse emissions for the life of the equipment.

Green Technology

Non-Toxic, no harmful chemicals, no damage to equipment and friendly to the environment.

The Science

Part 1 Catalysts
Part 2 SWC

How does it work?

Catalyst® contains two syntetic catalysts and a lubricity agent that enable an HVAC to run at maximum efficiency.

The first catalyst breaks the surface tension (Van Der Waals) between oil molecules. This breaks up oil contamination and allows for maximum efficiency in heat exchange.

The second catalyst allows the refrigerant to evaporate at a lower temperature. This draws more heat from the supply air so the fan blows cooler air.

The lubricant increases the compressor oil's lubrication by up to 54%. This means that the compressor will work better and last longer.

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H&V news AWARDS 2022

HEADLINE SPONSOR WOLSELEY PIPE

WINNER

Best Commercial HVAC Technology



Catalyst® System, the winner of the prestigious **H&V NEWS AWARD 2022 for the BEST COMMERICAL HVAC COOLING TECHNOLOGY**,is proven to reduce energy consumption in HVAC / Refrigeration systems, reduces direct operating cost and lowers Carbon emissions. Catalyst® is a unique product comprised of an additive with 2 catalysts and a lubricity agent along with an electromechanical device installed on the filter/drier. Catalyst® has proven to reduce energy consumption by 35-43% and works in most HVAC / Refrigeration systems, CRAC, DX and chillers. Catalyst® is a 1-time treatment in DX units and lasts for the life of the equipment.

3rd party Case Study Oz Highland Farms

Catalyst® installed in a 48’ reefer equipped with a Carrier Transicold unit.
Diesel usage was reduced from **0.595 gal / hr to 0.347 gal /hr** resulting in a **41.7%** reduction in energy use. Annual fuel use reduced by **1,142 gal** and carbon footprint reduced by **11.637 mt**.

Oz Highland Farm 24-month retest March-April 2023

Reefer was retested to confirm long-term effect of the Catalyst® System, 24 months after the installation. Fuel consumption was monitored over 10 days and averaged **0.284 gal / hr** resulting in a **52.3%** reduction from the original baseline.

The U.S. trucking industry has more than 500,000 refrigerated trailers and the railroads have 16,600 refrigerated railcars. These fleets deliver almost 90% of all food in the U.S. and many other products including pharmaceuticals that require a temperature stabilized controlled environment.

Mobile refrigeration units typically are powered by a diesel engine while the trailer / railroad is hauling its cargo. Reefer units consume 0.4 -1.1 gallons of diesel fuel per hour, averaging 0.595 gallon. The U.S. reefer fleets annually consume more than 1,338,750,000 gallons of diesel fuel, releasing more than 13,630,467 metric tons of Carbon emissions.

Catalyst® could reduce the CO^2 emissions by 4,770,663 metric tons or the equivalent of removing 1,192,665 automobiles from the roads, while saving 468,562,500 gallons of diesel fuel.

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REFERENCES

STIGMA of Sweden

SIEMENS

Telefónica

TESCO

Grand Prairie TEXAS

SM

PERRICONE FARMS

DIGITAL REALTY
Data Center Solutions

Schneider Electric

Pizza Hut

هيئه المجتمعات العمرانيه الجديده
New Urban Communities Authority

SUPERCOR

Oakhurst
The Natural Goodness of Maine

CINES DREAMS
PALACIO DE HIELO

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