ADDCON

HYCOOL

✓ green ✓ safe ✓ efficient





Your refrigerant for sustainable chilling and freezing:

- ✓ Free of CFCs, HCFCs and glycols
- ✓ Non-toxic and non-explosive
- ✓ Food certificated
- ✓ Global Warming Potential (GWP) =0
- ✓ Ozone Depletion Potential (ODP)=0

HYCOOL

HYCOOL 50, HYCOOL 45, HYCOOL 20, HYCOOL Blue

HYCOOL is a state of the art, non-hazardous aqueous, low-temperature heat transfer fluid for all indirect refrigeration systems. It is used in the secondary circuit and is characterized by a low freezing point, outstanding thermodynamic properties (high thermal conductivity), a low viscosity, a high environmental profile and good material compatibility with all commonly used metals and polymers.

The low freezing point of HYCOOL enables the use in systems operating down to -50°C, with burst protection down to -60 °C.

HYCOOL –
3 grades for demanding applications

HYCOOL is available in three ready-to-use formulations – tailor-made for the needs and requirements of our customers:

HYCOOL 20

HYCOOL 45 and

HYCOOL 50.

The number indicates the freezing point of the refrigerant (e.g. HYCOOL 20 freezes at -20°C).

ADDCON also offers HYCOOL Blue, a dye additive for HYCOOL enabling leak detection.

- ✓ environmentally friendly and biodegradable
- ✓ non-toxic and food certificated, even in larger quantities
- ✓ non-flammable and non-explosive
- ✓ low viscosity and excellent thermodynamic properties enable a high COP
- ✓ reliable and long-term chemically stable
- ✓ compatible with all major used metals and polymers
- ✓ low working pressure of the systems

HYCOOL –
the story of its success

HYCOOL's story of success dates back more than 15 years and customers with demanding and critical applications all over the world trust in their systems operated with HYCOOL.

Businesses that rely on HYCOOL as a secondary working fluid in their systems can be found in the Food and Beverage Industry, Retail and Wholesale, Pharmaceutical Industry, Chemical Industry, the Shipping Industry and other businesses where sustainable and reliable refrigeration and freezing processes are required.

HYCOOL – the green refrigerant

Environmental issues such as ozone depletion and global warming have considerably affected the refrigeration and air-conditioning industry over the last 10 years. In 1996 the Montreal Protocol banned the hazardous CFCs, and from 2010 on HCFCs were banned.

HYCOOL was developed to provide the market with an environmentally friendly and equally efficient refrigerant for the future.

With a GWP=0[1], an ODP=0[2] and being CFC and HCFC free, HYCOOL enables sustainable and at the same time, reliable and efficient refrigeration processes for demanding applications. A low TEWI[3] underlines the excellent environmental profile of HYCOOL as well as the high efficiency of the systems operated with HYCOOL.

HYCOOL is based on potassium formate and a highly effective corrosion inhibitor. Potassium formate is an organic salt that boasts outstanding environmental and application characteristics. Through its low freezing point, its excellent thermodynamic properties, even at low temperatures, and its high environmental profile, potassium formate is the ideal ingredient for cooling fluids in circulating systems.

The corrosion inhibitor used is non-toxic, safe, long-lasting and the reason for HYCOOL's high material compatibility with the metals and polymers commonly used in cooling and heating systems.

HYCOOL – the safe refrigerant

HYCOOL is an aqueous solution with no toxic fumes or explosive gases that might complicate installation work, maintenance and service (e.g. welding). The liquid is non-toxic, biodegradable and non-explosive and the systems operated with HYCOOL operate with low and non-hazardous working pressures. Due to these outstanding product characteristics, HYCOOL is safe in handling and does not present a hazard to employees, customers or the environment.

Adding to this, HYCOOL guarantees reliable and constant refrigeration on the temperature level you choose. Even if the pumps have a breakdown or there is a power cut, HYCOOL's excellent heat capacity enables a safe storage of sensible goods for a long period.

HYCOOL – the energy saving refrigerant

HYCOOL is characterized by a high thermal conductivity and low viscosity even at low temperatures.

Due to HYCOOL's low viscosity, systems require less expensive, lower output pumps. This smaller pump capacity causes smaller systems with an increased number of cooling circuits and leads to a more efficient refrigeration process.

This saves energy on a significant basis (15-20 %).

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[1] Global Warming Potential (GWP): relative measure to calculate the climate impact of a compound in the atmosphere acting as a greenhouse gas. HYCOOL is stable in processes as well as under external conditions.

[2] Ozone Depletion Potential (ODP): relative measure of the effect a compound has on the ozone layer. HYCOOL is stable in processes as well as under external conditions.

[3] Total Equivalent Warming Impact (TEWI): Parameter to calculate the theoretical contribution to global warming of a cooling system. TEWI measures the direct and indirect global warming impact of the cooling system.

$$TEWI = (GWP \bullet L \bullet n) + (GWP \bullet m \bullet [1-R]) + (n \bullet E \bullet B)$$

(L = primary refrigerant leakage each year [kg], n = operating life of the system [years], m = amount of primary refrigerant [kg], R = recovery ratio of the primary refrigerant, E = energy consumption per year [kWh], B = CO_2 emission per kWh)

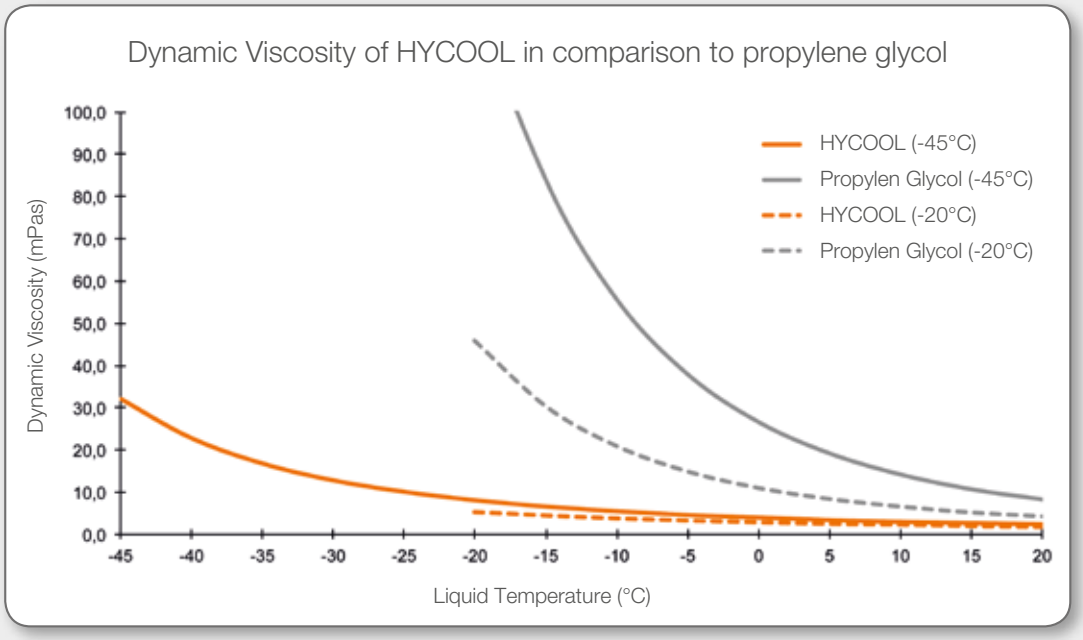


Figure 1: Low viscosity of HYCOOL even at low temperatures leads to a lower energy consumption of systems operated with HYCOOL (in comparison to Propylene Glycol). Energy savings of 15-20 % can be achieved with HYCOOL.

Thanks to its excellent thermodynamic properties, HYCOOL allows large amounts of energy to be absorbed and transported cheaply and highly efficiently. The excellent thermodynamic properties of HYCOOL paired with the low viscosity enable highly efficient refrigeration processes which are characterized by a high COP[4] (Coefficient of Performance) of the systems.

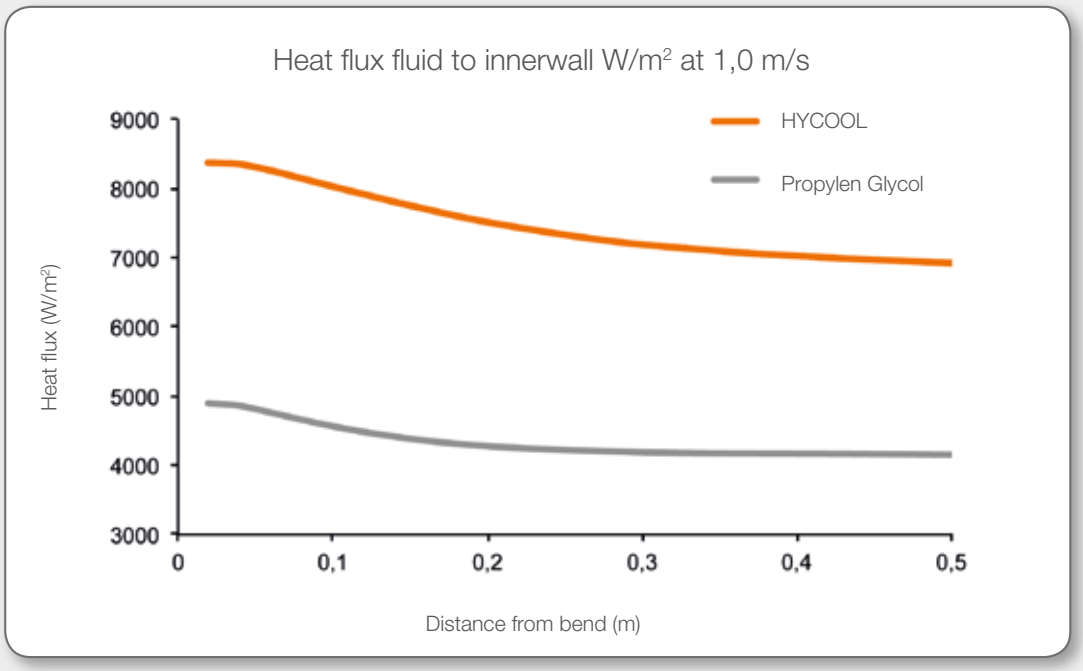


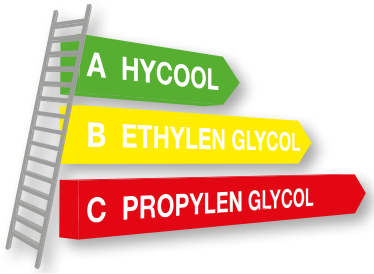
Figure 2: HYCOOL with outstanding heat transfer properties – Comparison of Heat Flux, HYCOOL vs. Propylene Glycol.

In addition to this, HYCOOL's excellent material compatibility and its outstanding stability enable systems to run longer while still working at the optimum capacity.

[4] Coefficient to measure the performance and efficiency of a refrigeration plant. Calculates the ratio (Q/P) of the amount of cooling being carried out (Q in kW) and the amount of power consumed (P in kW).

HYCOOL – potential savings and additional benefits

Secondary refrigeration systems operated with HYCOOL generate considerable energy savings through its excellent thermodynamic properties.



- ✓ *Improved system efficiency and reduced energy consumption enables energy savings up to 20%*
- ✓ *increased number of operating cycles*
- ✓ *reduced system size*

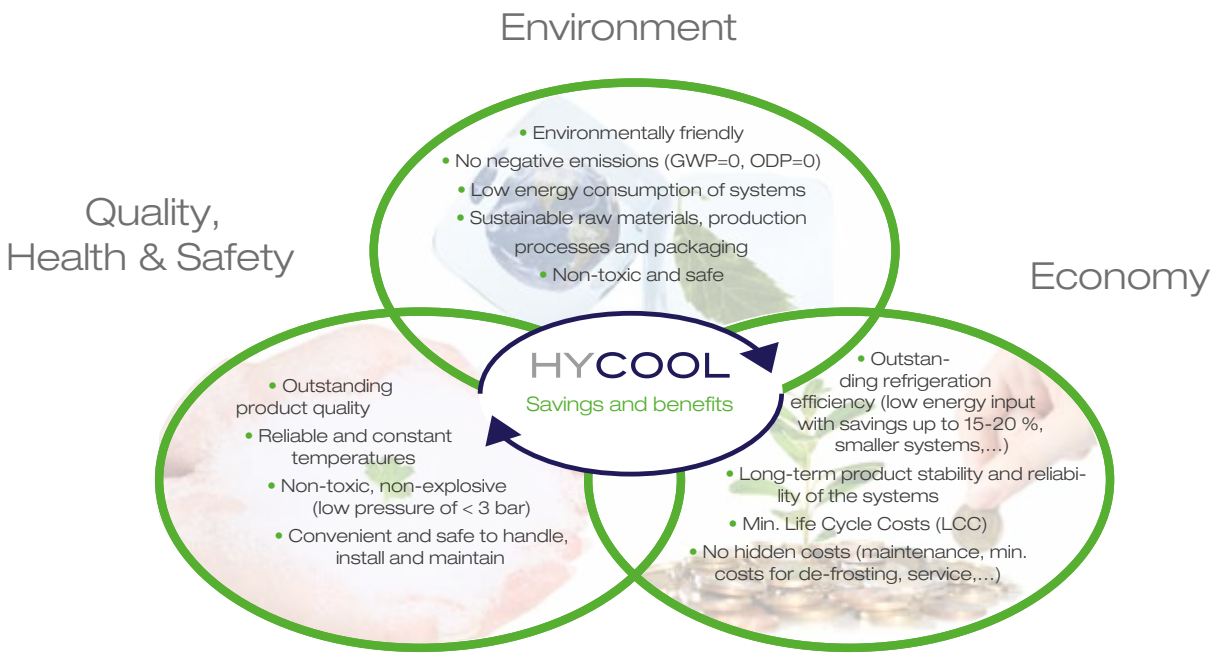
HYCOOL minimizes both capital and operational costs and at the same time protects the environment through its excellent non-toxic and biodegradable properties. But also the long-term stability which enables a long operating life with low maintenance and servicing costs minimizes the Life Cycle Costs (LCC) over the whole running time. HYCOOL refers in comparison with glycol to significant lower LCC. The LCC consist of the running costs and the investment costs.

Energy used for refrigeration and air-conditioning systems in Germany consumed already 14% of the total energy consumption in 1999. This number points out the importance of saving energy, especially in the refrigeration segment. Additional doors on cold displays are one way to save energy – the systems efficiency itself is an additional opportunity.

In addition to the low energy consumption of secondary systems operated with HYCOOL, the systems provide “free heat” that can be used for underfloor heating or to easily defrost systems. This is modern and sustainable heat-recycling that saves money and the environment.

HYCOOL’s comprehensive approach of sustainability

This sustainable approach does not only consider environmental aspects but follows a comprehensive strategy that additionally includes efficiency- and cost-related aspects as well as safety concerns.



Through its unique and outstanding product properties, HYCOOL provides a product that meets todays highest requirements on application features as well as the increasing demand for sustainable and safe products.

That makes HYCOOL the preferred working fluid in secondary refrigeration systems.

[5] Klimaschutzbeitrag von Kälte- und Klimaanlagen, Forschungsrat Kältetechnik, 2008

HYCOOL - users

Food industry

Food processors require constant temperatures and trust in their reliable and efficient systems operated with HYCOOL. The extra benefit of HYCOOL being non-toxic ensures a safe food production. Final products are fresh and of the highest quality.

Production of beverages

HYCOOL plays an important role during the manufacturing process of dairy products, beer, wine or juices. The energy savings achieved through the use of HYCOOL enable a more energy efficient production, which in turn saves money.

Operators of cold stores

Operators of cold stores for meat, fish or dairy products depend on exact and constant temperatures and a reliable refrigeration system. Systems operated with HYCOOL offer them security, needed especially for the storage of perishable goods.

Operators of cold stores for fruits and vegetables also appreciate the constant temperature levels achieved with HYCOOL refrigeration. If stored in controlled atmosphere and cold storage facilities operated with HYCOOL, fruits and vegetables retain the quality of freshly harvested goods – even after long storage times.

Operators of Freezing facilities

Freezing processes need to adhere to exact temperature curves and constant temperature levels so as not to threaten the quality of goods. Systems operated with HYCOOL reliably freeze at the levels our customers choose.

Owners of Warehouses

Large warehouses for the storage and distribution of different and sometimes perishable goods require constant temperature levels throughout the whole building. The refrigeration of these large facilities requires a lot of energy. Operators of these warehouses appreciate the significant energy savings achieved through HYCOOL.

Retail Business – Displays, cabinets and cold rooms

The operation of cold displays and cabinets in supermarkets presents a special challenge. Systems need to be permanently open or doors are regularly opened – but temperatures need to comply with defined levels. HYCOOL achieves these constant temperature levels, thus guaranteeing food safety and at the same time achieving energy savings of 15-20 %.

Through the use of HYCOOL, customers can improve their carbon footprint and show environmental commitment.

Industrial applications and Chemical Industry

Cooling and freezing processes are required in different industries and need to have large capacities. Operators require safe systems that do not present a hazard in the plant and that contain non-explosive gases. HYCOOL complies with these high standards and is therefore the right refrigerant for several demanding applications in the industrial segment.

Pharmaceutical Industry

Many medical products need to be chilled or frozen so as not to threaten the quality and safety of the products. The pharmaceutical industry relies in their systems operated with HYCOOL and appreciates the safety and non-toxicity of this unique refrigerant.

Shipping Industry

Cruise ships as well as fishing vessels trust in their systems operated with HYCOOL. The systems keep all applications associated with refrigeration or freezing processes on board – from freezing applications to process cooling, air-conditioning and the chilling of pool water.

HYCOOL is environmentally friendly and biodegradable and presents no hazards thanks to its non-flammability and non-explosiveness. These are the reasons why HYCOOL is the preferred refrigerant in the shipping industry.

Ice rinks and Indoor-Skiing

Operators of ice rinks and indoor skiing facilities in all climate zones of the world prefer HYCOOL as a refrigerant. The capital and energy intensive freezing processes achieve energy savings of 15-20 % through HYCOOL.

Additional benefits such as biodegradability, non-toxicity and non-explosiveness are further properties of HYCOOL that can be communicated in order to demonstrate corporate responsibility.

Geothermal Heating & Solar applications

The use of HYCOOL in Geothermal Heating and heat recovery devices adds to the “green” character of these applications. Using HYCOOL in these areas of application means that no compromise is made between efficiency and eco-friendliness.

HYCOOL – material compatibility

HYCOOL is compatible with the metals commonly used in indirect refrigeration systems. This was tested in accordance with general corrosion tests (e.g. ASTM). Brazing rods and silver solder have also been tested for galvanic corrosion.

Metals compatible with HYCOOL

- Copper
- Brass
- Carbon steel
- Stainless steel
- Cast iron
- Aluminum
- Magnesium
- Brazing rod
- Silver solder

Metals not compatible with HYCOOL

- Galvanized steel
- Zinc
- Tin solder (soft solder)

HYCOOL does not affect common sealing materials used in refrigeration systems.

Polymers compatible with HYCOOL

- LDPE Polyethylene, low density
- HDPE Polyethylene, high density
- PP Polypropylene
- PTFE Polytetrafluoroethylene
- PA* Polyamide
- PVC Polyvinyl chloride
- PPO Polyphenylene oxide
- PMMA Polymethyl methacrylate
- PES Polyethersulfone
- Aramid Aromatic Polyamide
- ABS Acrylonitrile Butadiene Styrene
- EP Epoxy resins
- NBR Nitrile Butadiene rubber
- UP Unsaturated polyester resins
- Acrylic plastic
- CR Chloroprene rubber (Neoprene)
- NBR Nitrile Butadiene rubber
- EPDM Ethylene Propylene rubber
- SBR Styrene Butadiene rubber
- MVQ Silicone rubber
- IIR Butyl rubber

* Compatible below 40°C

Polymers not compatible with HYCOOL

- FPM Fluorocarbon rubber (Viton rubber)

PRODUCT INFORMATION

Composition:	Potassium formate 30-50 %, De-Ionized water, Corrosion inhibitor package
pH:	10,6-11,4
Freezing point:	-20 bis -50°C (depending on the HYCOOL formulation)
Density/Specific gravity:	1194 - 1348 kg/m^3
Dynamic Viscosity*:	1,8 - 2,6 mPas (cP)
Specific heat capacity*:	2,5 - 3,0 kJ/kgK

* at 20°C

PACKAGING

- 1.000 liter IBC Container
- bulk (silo truck)

Please contact us if your requested pack size is not listed. Thanks to flexible production structures and short decision processes, we are delighted to fulfill individual customer requests.

PRODUCTION & DELIVERY

HYCOOL is produced by ADDCON NORDIC AS in Porsgrunn, Norway. ADDCON NORDIC AS is a subsidiary of the German based ADDCON GmbH.

ADDCON GmbH is specialized in the development and production of sustainable product solutions for the industry and agriculture – respective “green” chemistries.

QUALITY

To ensure that all products comply with highest requirements of our customers, ADDCON produces in accordance with comprehensive quality standards. The whole production facility for HYCOOL fully complies with the requirements of DIN EN ISO 9001:2008.

ADDCON Nordic offers support and chemical analysis of HYCOOL samples.
Individuals handling HYCOOL should be informed of the recommended safety precautions and should have access to this information.
The data stated in this document is based on studies and experience and is the best of our knowledge and belief. There are specific and external conditions during the use of HYCOOL that cannot be influenced and taken into consideration by ADDCON NORDIC AS. Therefore data referring to HYCOOL should never be taken to constitute a guarantee on our part or an assumption of our responsibility.

Should you require further information regarding HYCOOL, please feel free to contact us:

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