Heat Transfer Base Fluid Selection

PrixMax carboxylate based technology or organic acid technology (OAT) provides the option of formulating a heat transfer fluid as **BOTH** a concentrate and premixed coolant with extended life corrosion properties for a wide variety of operating conditions.

PrixMax Long-Life Coolants (LLC) are available with the following heat exchange base fluids.

Base Fluid	Product
Ethylene Glycol	PrixMax MEG95
Propylene Glycol	PrixMax MPG95
Water	PrixMax RCP+

Ethylene Glycol (EG) formulations are the most common antifreeze and coolant products providing year-round, cost-effective freezing, boiling and corrosion protection. Ethylene Glycol is preferred over Propylene Glycol (PG) not only because of its higher flash point but mainly because of its better thermal or heat transfer properties. In particular, EG has a lower viscosity (better fluidity) compared to PG, thereby assisting heat transport.

In temperate climates, where freeze protection is not required, formulated water-only systems remain the better heat exchange fluid even compared to any mixture of EG and water. With EG or PG systems a compromise between the required freezing protection and heat exchange efficiency has to be made. As engine efficiency is increased, in part by increasing engine temperature, more heat must be rejected through the cooling system. Additional cooling can be provided by higher cooling system pressure and by allowing the coolant to circulate at a higher maximum temperature. The boiling point difference of say premixed 50% vol. EG coolant versus water-only systems is only about 8°C.

EG is about 10 times more toxic if ingested than PG and the latter should be considered as a possible substitute for EG antifreeze preparations marketed via retail channels for example, to avoid accidental poisoning of small children or animals.

PG formulations however have several drawbacks:

- PG is considerably more expensive than EG
- The oxygen demand in the biodegradation process for EG is lower than for PG and wastewater treatment plants can handle EG more easily than PG. Disposal of PG based antifreeze must therefore be considered carefully possibly affecting licences to discharge to sewer and accidental spillage can cause fishkills in waterways depleted of dissolved oxygen.
- Silicate-free OAT formulated PG based antifreeze is available as a concentrate PrixMax MPG95 (approx. 95% propylene glycol) or as a 50% premix with deionised water (approx. 47% propylene glycol). PG does not dissolve silicate and conventional antifreeze products contain some silicate for aluminium protection which limits their availability as a PG concentrate and limits the PG concentration in premixed PG coolants often to approximately 40% PG. Hence commercial PG premixed coolants may contain lower glycol levels than their EG equivalent and exhibit inferior

antifreeze properties. The user can be effectively shortchanged on the glycol content.

- It is still necessary to handle PG with care and use appropriate protective clothing particularly in areas of low humidity as PG being a deffating agent can remove water from the skin. It is named as a primary irritant to the skin and eyes even in low levels and can cause allergic skin reactions. Ingestion of PG can aggravate pre-existing kidney disorders.

Note that PrixMax OAT formulated PG product PrixMax MPG95 does not contain any nitrate, molybdate, nitrate, amine, phosphate or borate conventional inhibitors often associated with environmental toxicity or OH&S issues. For example, many conventional PG formulations still contain these chemicals which may dilute any say toxicity advantage that PG may offer, Many countries have banned the use of nitrate as a rust inhibitor due to the potential formation of nitrosamines (ie. N-nitrosodiethanolamine or N-DELA) which are known carcinogens. Phosphates contribute to eutrophication and hard water scaling while borates are associated with plant wither and reduced agricultural yields and are subject to strict limits in groundwater.

The PrixMax OAT product range offers a comprehensive choice of heat transfer base fluids and the application, climatic conditions and target market should all be carefully considered before selection of the base fluid.

The new generation PrixMax carboxylate technology is equally effective in ethylene glycol, propylene glycol or water.

The selectively adsorbed PrixMax carboxylate molecular film attaching to metal surfaces provides maximum protection against corrosion at hot spots near heat-rejecting surfaces (e.g. around exhaust valves) or against erosion-corrosion of wet liners in severe diesel cavitation situations. These films are very difficult to remove even with ASTM test method chemical cleaning agents. Under the conditions described above, nucleate boiling conditions are often maintained on the metal surface resulting in a far more corrosive condition on the surface. Under such conditions conventional inhibitors such as nitrate must constantly repair broken down films, a process which is enhanced by the lower surface tension and improved wetting properties of EG or PG a process which is not critical for the effective action of the carboxylate chemistry.

NB. If freeze protection is not required the water-only PrixMax RCP+ formulated coolants can provide the best of several worlds – better heat transfer/operating temperature flexibility, maximum corrosion protection and low toxicity coupled with environmental care. PrixMax RCP+ has proven field performance even under the most severe operating environments. For example, a large scale minesite fleet using PrixMax RCP+ since 1997 in heavy-duty equipment including Cat 789B and C trucks, O&K RH200 Face Shovels. Elphinstone Loaders etc etc has demonstrated proven performance under very adverse conditions of high rainfall/humidity and altitudes around 7,500 feet. PrixMax RCP+ overcame thermal problems such as cylinder head cracking and cracking on deck surfaces experienced with EG formulated coolant.

PrixMax RCP+ is a universal cooling system treatment for old and new gas, petrol or diesel vehicles and is the ideal product for automotive workshops and radiator repair centres. PrixMax RCP+ is a water based organic inhibitor concentrate recommended for high temperature protection of aluminium and light alloy late model car and light duty vehicle engines. The product is acceptable for warranty usage in Ford Australia 6 cylinder Falcons and meets the new Ford specification ESD-M99B166-C introduced by Ford Australia in July 1997 with an extended drain period of 3 years or 100,000 km. PrixMax RCP+ is also compatible with Ford's Factory Fill corrosion inhibitor. PrixMax RCP+ is recommended for use in all reconditioned engines and all late model cars both locally produced and from USA, European and Japanese manufacturers. 1 litre of RCP+ treats 16 litres of cooling system water. Always flush with PrixMax **Radiator Flush** when changing brands of coolant. RCP+ is available in 1 litre, 5 litre and 20 litre packs.

PrixMax MEG 95 antifreeze is recommended for mixed fleet heavy duty and automotive applications and meets the warranty requirements of many engine manufacturers. PrixMax MEG 95 is an OAT technology universal antifreeze/antiboil concentrate meeting a range of engine manufacturer factory coolant specifications. The product meets the requirements of General Motors new global extended life antifreeze/coolant specification GM6277M providing protection for 5 years or 100,000 miles. PrixMax MEG 95 is also approved for use in the new Mercedes-Benz Actros heavy truck range (500 series) with a 5 year extended drain interval and is a compatible with Caterpillar's EC-1 extended life engine coolants or Detroit Diesel's extended life coolants. PrixMax MEG95 meets AS2108.1-1997 Engine Coolant Type A requirements. The minimum recommended concentration is 33% and to meet warranty requirements 50% dosage is required. Always flush with PrixMax **Radiator Flush** when changing brands of coolant. MEG 95 is available in 1 litre, 2.5 litre, 5 litre and 20 litre packs.

For further information:

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