



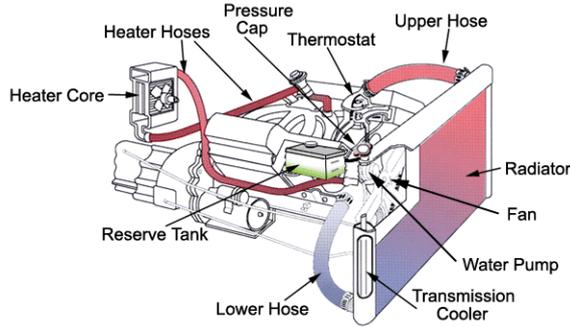
TECHNICAL BULLETIN

Coolant Types and their Purpose

Issue: April 2015

WHAT IS COOLANT?

Automotive coolant is a solution mixed with water to improve heat transfer and control the operating temperature of an engine. Besides its function in cooling down the engine, coolant also contains ingredients that inhibit rust, corrosion and scale. These are called inhibitors. They also prevent cavitation which is oxidation from water circulating around the system. Some coolants have an Anti-freeze and Anti-Boil package that raises the boiling point and lowers the freezing point of water. Some coolants change the surface tension of the water allowing it to circulate better, removing heat spots and actually lowering the running temperature of an engine.



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TYPES OF COOLANT

TYPE "A" COOLANTS

- Inhibitors
- Water
- Glycols
(Anti- Freeze Anti Boil)

Type "A" has an **Anti-Freeze / Anti-Boil** component such as Ethylene Glycol or Propylene Glycol that raises the boiling point of the water and lowers the freezing point. There are different types of inhibitor packages used in Type A Anti-Freeze Anti-Boil coolants and different dosages of glycol depending on the application.



TYPE "B" COOLANTS

- Inhibitors
- Water

Type "B" **DO NOT** have Anti-Freeze Anti-Boil components but are essentially inhibitors only. There are different types of Inhibitor formulations used in Type B coolants. Not all are compatible with one another.



All coolants are not created equal!

The Characteristics of a good coolant

- Prevention of corrosion, cavitation, overheating & freezing
- Excellent heat transfer
- Prevention of deposits
- Stability at a high temperature
- Compatibility with hard water
- Compatibility with rubbers and plastics
- Little foaming tendency

Hint - Coolant Colour

Just because a coolant is coloured doesn't mean it's an anti-freeze anti-boil product. The colour in coolant is a dye and should never be used to distinguish the type coolant. Coolants are generally clearly labelled Type "A" or Type "B"



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WHAT IS IN COOLANTS?

Corrosion Inhibitors

A **corrosion inhibitor** is a chemical compound that, when added to a liquid (in this case coolant) decreases the corrosion rate of a material, typically a metal or alloy.

A common mechanism for inhibiting corrosion involves formation of a coating, often a passivation layer, which prevents access of the corrosive substance to the metal.

Inhibitors only make up a small fraction of the overall coolant as water and glycol form the majority of the product but they can have a vast effect on the performance of the coolant in maintaining the system in good condition. See Photos below -



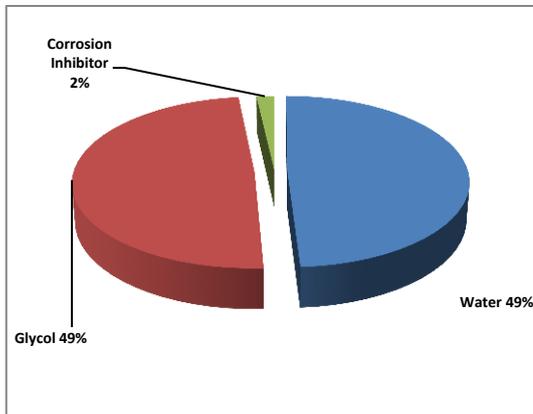
Results with & without coolant – Radiator, Head Gasket & Thermostat Housing

Glycol

Coolants that have an Anti-Freeze / Anti-Boil component generally have a Glycol base. Glycol never loses its Anti-Freeze Anti Boil properties but inhibitors deplete over time causing the need to change coolant. The level of Glycol in the coolant mixture, gives an indication of the freezing point and boiling points. The coolant mixture needs to be between 33% and 55% for best results.

Glycol Content			
	Dose Freezing / Point Boiling Point		
	33%	-18° C	104° C
	50%	-38° C	109° C
	Example Penrite 8 Year 500,000km Red Coolant Glycol Content (concentrate), g/L 1075 Glycol Content (Premix 50%), g/L 537		
	Note It is imperative that mixing rates are between 33% & 55% as this provides the best possible anti-freeze & anti-boil protection		

Coolant Composition



Water is an excellent heat transfer liquid especially in an internal combustion engine but when it freezes, it actually expands which is called **Negative Thermal Expansion**. If the water freezes inside an engine radiator or engine it can then cause damage due to this expansion.

Water combined with a glycol and inhibitor pack forms a Type "A" engine coolant. The typical break up of a premixed Type "A" are shown on the chart opposite. Glycol & water form the majority of the cooling system solution. Inhibitors only a small percentage of the coolant.



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WHAT ARE THE DIFFERENT COOLANTS?

Type "A" Coolants

There are several varieties of **Type A** coolant. The two most commonly used by auto manufacturers are **OAT** (Organic Acid Technology) based and **Hybrid or HOAT (Hybrid Organic Acid Technology)**. Both of these types contain Ethylene Glycol as the anti-freeze / anti-boil component but they have different types of inhibitors.

	
Si-OAT & OAT Coolants (Organic Acid Technology)	Hybrid Coolants (Hybrid Organic Acid Technology – HOATS)
Salts of Organic Acids, Phosphate, Molybdate, Nitrate, Triazoles	Salts of Organic Acids, Nitrite, Nitrite Equivalent (EU), Phosphate, Borate, Nitrate, Triazoles, Silicate

OAT FORMULATIONS

OAT formulations are not normally compatible with conventional anti-freezes

OAT antifreeze reacts to some extent with some of the inorganic salts and caustics used in conventional anti-freeze.

The result in combining the two leads to a generation of cloudiness and loss of extended life properties.

Characteristics of OAT Coolant

- Low inhibitor depletion rates- fill-for-life coolant (Long Life)
- Compatibility with many coolant standards
- Extreme stability under high temperatures
- Provides excellent heat transfer rate

HYBRID FORMULATIONS

Hybrid formulations are called Hybrid because they contains ingredients from both OAT and conventional formulas

Hybrid formulations partially or totally eliminate the problem of straight OAT or straight conventional antifreeze compatibility.

Hybrid formulations contain significant concentrations of conventional antifreeze inhibitors as well as organic carboxylate salts.

Characteristics of Hybrid Coolant

- Nitrates form a stable layer that protects the internal surfaces against corrosion, cavitation and scaling.
- High reliability
- Compatible with engines and cooling systems of different design
- Good expertise over years from many car producers
- Extended change intervals

Other Coolant Facts

- Type A Anti-Freeze / Anti-Boil coolants are now found in most new vehicles.
- The type of coolant whether it be an OAT or Hybrid formulation is dependent upon the vehicle manufacturer and determined by region, climate, type of vehicle etc.
- The colour of the coolant is a dye only and may change from region to region depending on the preference of the vehicle manufacturer and the supplier of the coolant to the manufacturer.
- Depletion rates of inhibitors determines the lifespan of coolants. Long life coolants can last up to and beyond 8 years.
- There are OEM approvals on coolants for some manufacturers –
(Penrite is the only company to provide aftermarket OEM approved coolants!)



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Penrite Type A Coolants

Penrite manufacture 11 x Type A Coolants & Premixes including 6 OEM Approved Coolants.

OEM APPROVED PRODUCTS

8 Year Red 500,000KM AFAB Concentrate	8 Year Red 500,000KM AFAB Premix	7 Year Green 450,000KM AFAB Concentrate	7 Year Green 450,000KM AFAB Premix	7 Year Blue 450,000KM AFAB Concentrate	7 Year Blue 450,000KM AFAB Premix

- **OEM APPROVED** products carry manufacturer warranty for vehicle service and are guaranteed to meet the auto manufacturers original specifications.
- **OEM APPROVED** products are recognised as the equivalent of genuine product as used by the manufacturer in initial factory fills. This preserves quality of product when servicing occurs.
- **OEM APPROVED** products provide "Peace of Mind" for vehicle owner and servicing agent that products used meet and are certified by the vehicle manufacturer.

OTHER PENRITE ANTI-FREEZE ANTI-BOIL PRODUCTS

8 Year Red 500,000KM AFAB Concentrate	8 Year Red 500,000KM AFAB Premix	Universal Top Up Premix	HD EC-01 Concentrate	HD EC-01 Premix	PGXL (Propylene Glycol) Premix

- **Penrite Coolants** meet or exceed many manufacturers specifications and provide an economical solution where the vehicle maker does not require an OEM approved product for vehicle service.
- **Universal Top Up** can be mixed with any type of coolant and will not discolour the original coolant.
- **PGXL Coolant** uses Propylene Glycol (a non-toxic glycol) and is widely used in sensitive environmental conditions such as the marine industry so as environmental poisoning is minimised.
- **HD EC-01 Coolant** has an inhibitor pack designed especially for heavy duty diesel applications.

ANTI-FREEZE ANTI-BOIL HISTORY

Ethylene Glycol Anti-Freeze was first used in Automotive in 1926 (*The same year Penrite was born*). Prior to this it was used to manufacture Dynamite. Alcohol made from Methanol was originally used as anti-freeze as it had a lower freezing point than water. The problem with Alcohol is that it can accelerate corrosion in metals and would evaporate over time. Other glycols used are Propylene Glycol and Glycerol which are non-toxic.

Ethylene Glycol is very toxic and should be disposed of carefully if changing a vehicles cooling fluid.



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TYPE "B" COOLANTS

Type B coolants are generally inhibitors and water. They **DO NOT** contain ethylene or propylene glycols and have no anti-freeze or anti-boil properties.

Type B coolants vary in appearance from concentrates to ready to use products. They can also be different colours and appear to be like a Type A anti-freeze anti-boil product but are far from it. These type of products are generally a green coloured solution at a very low price.

Type B coolants were used extensively in new vehicles manufactured up until the late 1990's. They still have many uses today including in competition and race conditions where Glycols are banned.

Some Type B coolants have agents that can help reduce the overall running temperature of a vehicle by changing the cooling fluids water tension, thus allowing it to circulate better and transfer heat more effectively than just plain water.

Characteristics of a good Type "B" Coolant

- Long lasting inhibitor package
- Prevents cavitation
- Protects all metals incl. Magnesium, Cast Iron, Alloys, Brass & Copper
- Compatible with seals, pipes & hoses
- Biodegradable & environmentally Friendly
- Compatible with all coolants
- Suitable for use in hard & soft water

Penrite Type "B" Products

Penrite Type B coolants, Radiator Flush and Radiator Stop Leak.

TYPE "B" INHIBITORS, FLUSHES, STOP LEAK			
			
RCI100 Radiator	10 Tenths Race Coolant	Classic Car Coolant	Radiator Inhibitor Concentrate
<ul style="list-style-type: none"> • Type B coolants DO NOT have Anti-Freeze Anti-Boil properties. • Type B coolants are rust, scale and corrosion inhibitors • Type B coolants are suitable for competition use where Type A products are banned 			

		
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<p>Penrite 10 Tenths Race Coolant protects all types of racing and competition vehicles including some of world's finest machines that require the ultimate in cooling system protection</p>		



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OTHER COOLING SYSTEM PRODUCTS

RADIATOR FLUSHES

"When in doubt, Flush it out"

Flushing the cooling system prior to using new coolant ensures that the old fluid won't contaminate the new (especially if they are incompatible) as well as improving the operating efficiency of the cooling system by cleaning out the system internally.

Characteristics of a good radiator flush

- Be fast acting
- Remove rust, scale and other deposits
- Prepare the system for the new coolant.
- Neutralises any leftover coolant remaining in the engine
- Be harmless for all metals
- Safe for rubber and hoses
- Compatible with all coolants

Radiator Stop Leaks

Radiator Stop Leak provides a temporary repair of leaking radiators, heater cores, hoses & joints, weeping head gaskets and welsh plugs. They are designed to be compatible with most coolants. It is important that these type of products are used as a temporary repair until mechanical work can be obtained to permanently fix leaking cooling systems. Failure to fix leaking cooling systems can lead to expensive engine repair work from overheating.

Coolant Test Strips

Coolant Test Strips are disposable test strips for measuring the concentration level and condition of Anti-Freeze Anti-Boil coolants used in all types of combustion engines. They effectively test the coolant's concentration as well as the pH level and alkalinity to determine when service of the coolant is necessary.

Penrite Cooling system products

OTHER COOLING SYSTEM PRODUCTS		
		
Radiator Flush	Radiator Stop Leak	Coolant Test Strips



Further details on these products are available on their respective product information sheets found on the Penrite web site: www.penriteoil.com.au/products.

Penrite recommend **"The Right Oil for the Right Application"**

[Click Here](#) to visit the Penrite Recommendation Guide, which will ensure you receive the correct oil for your application

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