

SCR

Selective Catalytic Reduction

If you are new to the AdBlue® concept then please read through this guide, all of the information provided is free, easy to find and explained in plain English.

If you can't find the information you are looking for then please contact us and we will try our best to answer any questions you might have.

SCR Solutions Ltd
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Information Guide to

Handling AdBlue

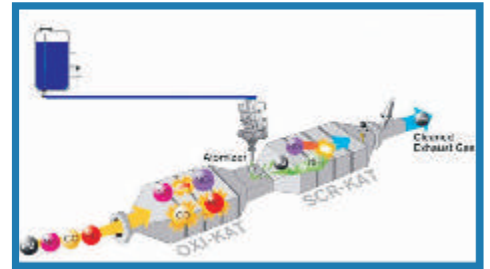


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AdBlue

AdBlue is a solution consisting of extremely high purity urea dissolved in de-ionised water. The ratio of the mix is approximately 32.5% urea and 67.5% de-ionised water.

AdBlue never comes into contact with the fuel and it is a common misconception that it is a fuel additive. AdBlue is carried onboard the vehicle in a separate 60 to 110 litre tank and is injected into the exhaust gases as a post combustion process through an SCR System that breaks down the harmful NO_x (Nitrous Oxide) emissions into mostly Nitrogen and Water Vapour.



SCR systems are extremely sensitive to potential chemical impurities in the urea solution. In order to ensure that the SCR system continues to work effectively, care must be taken to ensure the purity of the catalyst and the reducing agent. Even small amounts of contaminant can severely impact the performance of the SCR system.



There are basically two methods used to manufacture AdBlue. The 'Hot-Melt' Virgin Urea production method is widely accepted across the industry as producing the highest purity grade of AdBlue. This is because it eliminates the risk of contamination during manufacture. The urea is in its 'virgin' liquid state when it is combined with the de-ionised water so there is no chance of contaminants being introduced during manufacture.

The other method of manufacture is by the dissolution of solid urea in de-ionised water. Although this method may meet the ISO and DIN standards set by the VDA there is a strong chance that the solid urea could have contaminants present from the manufacturing process and also from bulk storage and handling in typical open warehouse environments.

Contaminants are the biggest cause of damage to an SCR System and the repair costs are expensive, for example an AdBlue Dosage Pump can be around \$5150.00, a Urea

Injector is approximately \$240.00 and the item most likely to be irreversibly damaged is the Catalyst at around \$9500.00.

Manufacturing quality control for AdBlue solutions are governed by DIN70070 and ISO22241 standards to ensure the correct selection of handling equipment is used and that the chemical specifications are correct. The standards do not govern contamination in the urea so if you want to substantially reduce the risk of damaging the SCR System then NEVER use AdBlue that is manufactured by dissolving solid urea.

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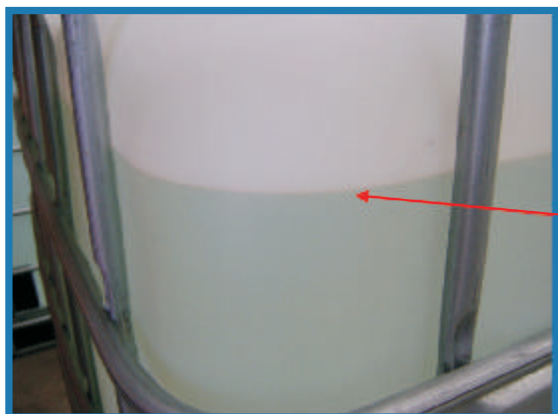
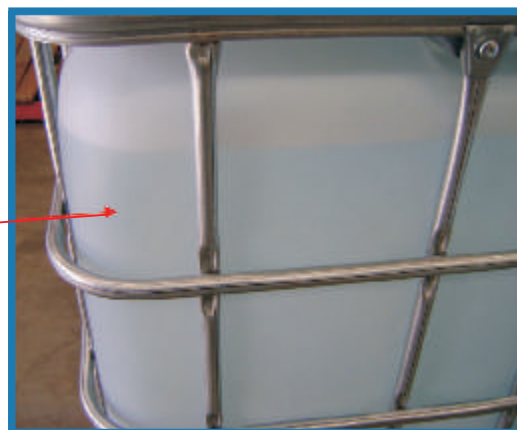
Licensed AdBlue suppliers complete rigorous inspections and audits to be permitted to sell AdBlue. This ensures every litre of AdBlue they sell meets stringent ISO standards. If an AdBlue supplier isn't licensed - then their AdBlue isn't AdBlue. Check they are licensed to save yourself expensive repair bills.



Licensed AdBlue suppliers must have every batch of AdBlue tested and a Certificate of Analyses (CoA) is issued to verify that the product conforms to the ISO and DIN standards.

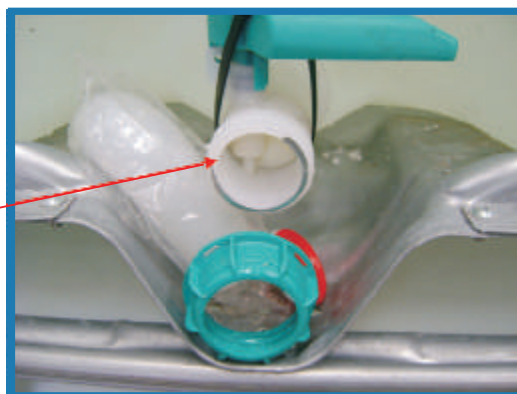
The supplier should be able to produce these certificates on request so if you have any doubt about the product, ask for a copy of the certificate.

When viewed in an IBC AdBlue should be an even colour from top to bottom. It does have a slight colour to it when compared to water and the colour should be consistent.



If there is a film or scum on the surface of the liquid then don't use it. Likewise if the liquid looks cloudy and discoloured. These are signs of contamination and increasing the risk of damaging the SCR System.

If you receive an IBC and it appears to have been tampered with, don't use the product inside. If the Foil Seal is missing from the Valve it is a sure sign that the IBC has been used before, possibly for a product other than AdBlue increasing the risk of contamination.



Demand that your AdBlue be supplied in NEW IBC's.

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Dispensing Equipment Specifications

AdBlue is very susceptible to contamination from both foreign matter and incorrect dispensing material selection. It is imperative that this is considered when deciding which dispensing solution is best for your application. Solid objects or particles entering the dispensing unit are an obvious problem for any transfer application but less evident problems are often overlooked.

One problem which continues to haunt pumps that are not specifically designed for handling AdBlue is that crystals can form and damage internal components. Due to the high crystalline content of the urea solution a chalky abrasive residue builds up when the de-ionised water content evaporates or dries. This can occur anywhere where air can enter or get trapped in the system.

These crystals can cause uneven wear on motor shafts if left to build up on inner pump walls or pump impellers and may drag around the circumference of any seals causing further damage and deterioration of both components. Parts of broken impellers and seals can then pass through to the tank on the vehicle and melt onto the superheated head of the SCR system.



Other than contaminated AdBlue the most common causes of premature SCR failure are typically either a result of the damaged pump parts entering the SCR System or as a result of incorrect material selection. The main influence in this instance is where the de-ionised water element of the solution draws ions from materials it comes into contact with, this changes the chemical composition of the AdBlue and causes salts to form which in turn clog the Ceramic head on the SCR.

Only AdBlue compatible Pumping and Dispensing systems should be used to

handle AdBlue. Materials which are most likely to cause problems are Zinc, Aluminium, Copper, Cast Iron and Brass. Plated and treated materials should also be avoided as the plating can wear away on moving parts or when in contact with AdBlue. Nickel Plated Aluminium regardless of being treated as either a electro-less or electrolytic process should be avoided at all times, this is regrettably a common error with existing systems.

Only use AdBlue compatible dispensing equipment



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AdBlue Hose Specifications

Only AdBlue compatible hose should be used to handle AdBlue. These are highly specific items, available through specialist suppliers.

It is possible to use hoses which are not specifically produced for use with AdBlue but special care must be taken to ensure that the hose material and specification is correct.

Most hoses are plastic or rubber based. The most common problem with incorrect hose material selection is that many hoses are used which contain Zinc and Calcium Carbonate as part of their production. Zinc is often used as a catalyst to cure plastic hoses as they are released from the mould and will leach into the AdBlue solution raising Zinc levels above the critical ISO22241 specification limit of 0.2mg/Kg. Hoses of this nature must NEVER be used as a suction pipe which remains either immersed in AdBlue solution or holds the product for extended periods of time.



Calcium Carbonate is the other common contamination source with hose manufacture. Unlike Zinc, it is not used as part of the hose composition but as a lubricant to ensure that rubber based hoses are released from the mandrel as they are extruded. The Calcium Carbonate coats the inner wall of the hose and similar to Zinc will leach into the AdBlue over time. The upper limit for Calcium in the ISO22241 standard is 0.5mg/kg.

Below is a general information guide in relation to each hose material. Please contact SCR Solutions to obtain all AdBlue compatible Pumping and Dispensing Equipment.

PVC Suitable but offers little flexibility during cold weather. Its production process must not include Zinc if the PVC Hose is to be used in permanent contact with the AdBlue solution.

Viton Expensive but fully compatible. Limited flexibility limits suitability as a delivery hose.

EPDM Only suitable if it is peroxide cured and does not contain Zinc as part of its manufacture.

Teflon Perfect but can prove expensive, it is mainly produced in a corrugated form to offer higher levels of flexibility, it is often stainless over braided to offer protection.

NBR Rarely suitable as it can degrade quickly in this application and often use both Zinc and Calcium carbonate as part of its production process.

PU Lined PVC Must be produced without using either Zinc or Calcium Carbonate as part of its production, offers little flexibility at low temperatures.

FEP lined Expensive but good suitability and best option for hose reel and forecourt applications.

XLDPE Not really suitable for delivery hoses, as with other lined hoses care must be taken to use smooth bore hose tails instead of serrated tails so as to not damage the inner hose wall.

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Dispensing Nozzles for AdBlue

Due to the highly sensitive nature of AdBlue, various manufacturers have developed specific dispensing nozzles in an effort to avoid contamination.

Some distributors have adopted nozzles from other applications, for example nickel plated nozzles which are widely used for handling ethanol based bio fuels are suitable for AdBlue providing minimum dispensing volumes are adhered to.



Tests have proven that long term exposure to nickel plated aluminium will cause a reaction with the AdBlue solution which will severely damage the SCR system.



The level of contamination increases in proportion to the amount of time the AdBlue has been held in the dispensing mechanism. Fortunately the quantity of corrupt AdBlue is only small and if the operator is conducting a fill of at least 70 litres it is possible to dilute the impurities sufficiently.

This aspect should always be considered if you are considering using a nickel plated nozzle to handle your urea solution.

Automatic nozzles operate the same as forecourt fuel nozzles where they will stop dispensing flow if the level of liquid comes into contact with the end of the spout. To ensure that the nozzle will continue to operate it will be necessary to continually clear residual product from the end of the delivery spout.

Manual nozzles do not have an automatic shut off mechanism and subsequently do not require such regular maintenance. Whichever nozzle you decide to use, it will require an external spout diameter not exceeding 19mm in order to fit into the filling aperture on the vehicle. This provision is in place to ensure that diesel fuel nozzles cannot enter the AdBlue tank as they are always larger in diameter.



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Storing and using Adblue

Adblue is an aqueous solution of urea. If it is stored, handled and used according to manufacturers guidelines, it poses a minimal risk to operators and a limited risk to the environment.

It is important that Adblue is stored in containers that are specifically designed and manufactured from materials that are suitable for use with urea. The same applies to all storage ancillary equipment, such as valves, dispensing nozzles and pipe work.

Adblue is soluble in water and should be kept out of surface water drainage systems that discharge to the environment. It will not be removed in an oil separator so it is important to isolate dispensing area drainage from the surface water system to reduce the possibility of spills and drips causing pollution.



Storage Tanks with integral secondary containment are available specifically for Adblue. In many cases AdBlue is stored and dispensed from Intermediate Bulk Containers (IBC's) that are delivered full and then collected when empty. If these IBC's are stored in direct sunlight it is recommended that they be covered to ensure maximum storage life. In New Zealand conditions AdBlue has a shelf life of approximately 18 months when stored correctly. This shelf life can be reduced to 6 months if the product is continuously exposed to direct sunlight.

You should make sure that:

- your container, pipework and dispensing equipment are suitable for use with AdBlue.
- you have secondary containment for the container and ancillary equipment.
- the dispensing area drainage is isolated from surface water drains.
- you have a trigger nozzle to dispense your Adblue. Make sure that the nozzle can not be left in the open position.
- you have a suitable spill kit in case of a spillage. Check what you need with the spill kit provider.
- you have an emergency plan and suitable training for dealing with spillages or other accidents.



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AdBlue®

UREA EXHAUST AFTERTREATMENT

When deciding on an AdBlue supplier ask yourself these questions before you make your decision.

Is the product made by a licensed AdBlue manufacturer?

Y	N
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Is the product guaranteed to meet the ISO 22241
DIN 70070 Standard?

Y	N
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Can your supplier provide a Certificate of Analysis?

Y	N
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Is the AdBlue manufactured using the Hot-Melt
'Virgin Urea' method?

Y	N
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Does the manufacturer supply the product in brand new
IBCs?

Y	N
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Is the provider a specialist AdBlue supplier?

Y	N
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Does the supplier offer a wide range of dispensing
equipment?

Y	N
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If your answer to any of the first five questions is **NO** then the product from that supplier could impact the performance of your SCR System due to contamination.

DON'T TAKE THE RISK

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