

# Did You Know?

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ENGINE GROUP

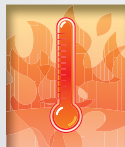
DYK 1 : October 2008

## **Subject: UREA by Many or Any other name is still UREA**

You may hear different names for urea, like DEF [Diesel Exhaust Fluid] or in Europe "AdBlue<sup>®</sup>". The fact is the real name of the mixture is an aqueous urea solution. This is an ammonia based product with very unique properties that the proponents of SCR do not speak of publicly. It is important that you have the facts to share with your customers.

### **Let's examine those very unique characteristics of urea, as it relates to temperature.**

1. While urea is used in many different industrial and agricultural applications, the grade used to reduce NOx in commercial vehicle applications must have a consistent high purity level and a precise concentration of 32.5% urea and 67.5% de-mineralized water.
2. Urea is corrosive to aluminum and must be stored in plastic or stainless steel tanks. Don't spill it on any aluminum components.
3. Urea is very sensitive to temperature. At 86° F, it begins to deteriorate and at 12° F, urea begins to crystallize.



*When ammonia [urea is an ammonia based product] goes above 86° F, it separates and evaporates. That reaction influences the quality and purity of the solution.*



*At 12° F or less, freezing takes place requiring a heating system to assure vehicle operation and product storage.*

4. At normal temperatures, urea is a non-hazardous solution, however, when it reaches 130° F, it becomes hazardous and begins to decompose.

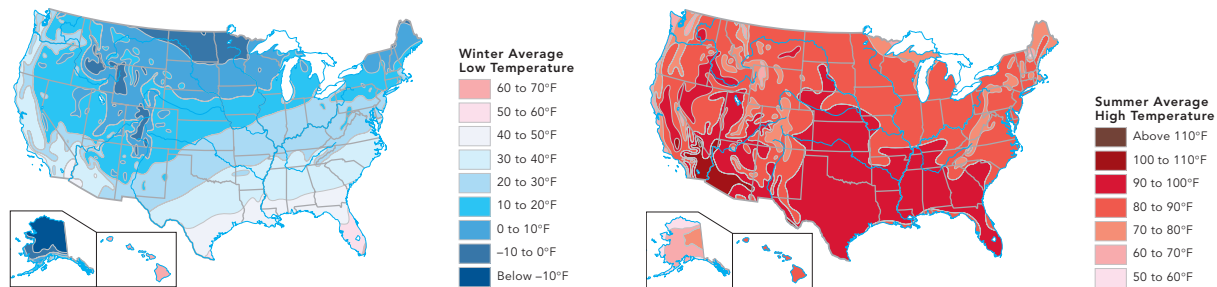
The temperature characteristics of urea will have significant implications for bulk storage and transport of the solution in the United States. Bulk deliveries for fleets also may require heated storage facilities in the North and cooled facilities in the South and West.

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Look at the summer and winter maps for the United States. In the winter, 60% of the nation has average temperatures ranging from 20° F to below -10° F. This exposes urea to the condition that will cause it to freeze. In the summer, the situation is even more crucial, where 90% of the nation will experience average temperatures ranging from 80° F to above 110° F. This is the temperature range that can negatively impact the quality and shelf life of urea.



**Facts: At 86°, urea has a shelf life of about 24 months. As the temperature increases to 95° F, the shelf life is reduced to 10 months. At 104° F, you are down to 4 months shelf life, and finally, if exposed to 140° F, there is only one week of shelf life.**

## Urea virtually becomes a second fuel in 2010.

As we approach the 2010 emissions regulations, there is much talk about SCR vs. EGR. To be clear, SCR is a solution that can reduce NOx with the use of additional after-treatment and the use of an additional fuel, urea. We think of urea as a fuel because without it the vehicle cannot run legally and will eventually lose power if the fluid is not available, rendering the vehicle useless to the customer.

Although not final, EPA Vehicle Compliance requirements indicate Vehicles will have to be equipped with sophisticated sensors to detect NOx in exhaust. If the sensors detect that there is a bad urea solution or no urea is available, there will be four progressive stages of warning and vehicle response.

1. With a low urea level, a warning light will appear which should be augmented by an audible warning.
2. The engine will de-rate and the driver will feel a power loss.
3. As the issue progresses, vehicle speed would be limited well below typical operating levels, say 15 MPH.
4. Finally, when the vehicle is shut down, there will be a no start condition.

The use of SCR shifts emissions compliance from the manufacturer to the customer who must contend with maintaining the new after treatment system and a secondary fuel which has some undesirable characteristics when exposed to cold and heat.

Remember, knowledge is power and we are committed to provide you with the facts so you become the expert with your customer. We will provide you with more facts and information in this "Did You Know" format going forward.

Good selling,  
Navistar Engine Group