

# **Diesel Exhaust Fluid (DEF)**

## **Frequently Asked Questions**

### **What is DEF?**

Diesel Exhaust Fluid (DEF) is one of the key elements involved in the SCR process. It is a nontoxic solution of 67.5% water and 32.5% automotive grade urea. DEF helps to convert NO<sub>x</sub> into nitrogen gas and water vapor. It is stable, colorless, odorless, and meets accepted international standards for purity and composition.

### **What is urea?**

Urea is a compound of nitrogen that turns to ammonia when heated. It is used in a variety of industries, including as a fertilizer in agriculture. Urea is naturally occurring, but is also commonly made from natural gas.

### **Why not use a 100% urea solution?**

DEF provides the highest degree of practical NO<sub>x</sub> reduction in real life automotive conditions. Using DEF at a 32.5% solution in water is cost-effective. Also, it allows the engine to perform at the highest levels of efficiency and at the widest range of climatic temperatures – anything above 12 degrees Fahrenheit.

### **How is DEF quality defined and guaranteed?**

DEF is defined by AUS-32 specifications and the specifications meet or exceed the DIN 70070 August 2005 quality standard, the DIN V 70071 June 2005 analytical standard and the ISO 22141-1 2006 standard. The American Petroleum Institute has developed a quality certification program that ensures North American supplies of DEF will meet these standards at the pump and across the nationwide supply chain, including standards of product manufacturing, handling, quality assurance, safety and environmental protection.

### **What is the chemical process of producing urea and what is the energy balance of this process?**

The production of urea involves the raw materials of ammonia and carbon dioxide. Two principle reactions take place in the formation of urea. The first is an exothermic (heat releasing) reaction in which ammonia + carbon dioxide creates ammonium carbamate. The second reaction is an endothermic (absorbing energy within heat) reaction in which ammonium carbamate is converted into water + urea.

### **How does DEF work within an SCR system?**

The goal of an SCR system is to reduce levels of NO<sub>x</sub> (oxides of nitrogen emitted from engines) that are harmful to our health and the environment. SCR is an aftertreatment technology that treats exhaust gas downstream of the engine. Small quantities of DEF (automotive grade urea solution) are injected into the exhaust stream and when mixed with the NO<sub>x</sub> changes into harmless nitrogen and water.

### **What other industries use urea?**

Urea solutions have a wide range of industrial and agricultural uses. More than 90% of world urea production is destined for use in agriculture as a fertilizer. Other industry uses included:

- Nutrient source in plants.
- Nutrient for effluent wastewater treatment.
- Nutrient for fermentation processes.
- Reducing agent in SCR and SNCR processes.
- Chemical intermediate for the manufacture of derivatives of ammonia, pharmaceuticals, and catalysts.

### **With a freezing level at 12 degrees Fahrenheit, should drivers in very cold temperatures be concerned? Is there anything you could add to the DEF to keep it from freezing?**

While freezing may be one of the biggest concerns with SCR, we have seen no issues with it based on our winter reliability and growth testing in Canada, nor has this been an issue among Northern European fleets in areas like Norway. We know DEF thaws quickly without changing its efficacy, and the EPA sees no problem in allowing for the short time it takes to warm up using the heat of the engine when you start the truck.

### **What is the DEF shelf life and storage?**

When stored between 10 and 90 degrees Fahrenheit, DEF shelf life will be greater than one year. Big bulk dispensers (1,000 gallon) have climate control systems. However, Internal Bulk Container's (IBC) do not have climate control systems. Therefore, in cold temperature regions it is recommended to store DEF-IBC's in a storage unit. In warm temperature regions it is recommended to store DEF-IBC's in a shaded area to avoid potential water evaporation. Information about handling and storing DEF can be found at: [http://tet.terrainindustries.com/pdfs/urea\\_tech\\_manual\\_2006.pdf](http://tet.terrainindustries.com/pdfs/urea_tech_manual_2006.pdf)

### **Is DEF toxic compared to other automotive fluids?**

No. By comparison, other automotive fluids such as diesel fuel, brake fluid, coolant fluid, engine, transmission, and axle lube are more toxic. The Environmental Protection Agency classifies DEF as "non-hazardous." Urea is naturally occurring and is biodegradable.

### **DEF is corrosive to aluminum. What will storage tanks be made of?**

As DEF is corrosive to certain sensitive metals, DEF vehicle tanks, storage tanks, dispensing equipment, etc. will be made of an appropriate, heavy-duty and tamper-free form of durable plastic.

### **Does the trucking industry compete with other industries in purchasing urea?**

If all trucks on the road today would be converted to SCR, they would account for only 10% of the urea consumption world wide. More than 90% of today's urea is used in agricultural applications. Also, when DEF is used for automotive and commercial vehicle use it differs from other urea solutions in purity, liquidity and concentration; therefore, it is not in direct competition with urea solutions as used in other industries.

## **Where and in what volumes can I buy DEF?**

Today you can go and purchase DEF from bulk producers, blenders and distributors like Excelda, Colonial Chemical, Yara, CDI Chemical Distributors, and Brenntag. By the end of 2008, you will also find DEF at SCR car and light truck dealerships. DEF is currently available in 3 different volumes:

- 10 liter emergency jug
- 55 gallon container
- 275 gallon Internal Bulk Container (IBC)

In January 1, 2010, the goal is to have DEF available in bulk at all truck stops. By then, DEF will be available in 1,000 gallon bulk filling stations using new and existing dispensing technologies.

## **Who are the DEF producers and distributors and where are they headquartered?**

(NOTE: Manufacturers are primary producer of Diesel Exhaust Fluids (DEF) – selling chemical in bulk to a distributor. Normally not involved with direct selling to customer, they sell truck or train loads to distributors.)

### **Manufacturers**

#### ***Company:***

#### **Agrium Inc.**

13131 Lake Fraser Drive SE  
Calgary, AB T2J 7E8  
[www.agrium.com](http://www.agrium.com)

#### ***Contact:***

#### **Gerry Kroon**

Manager N.A. Industrial Urea  
Phone: 403-225-7597  
Cell: 403-471-6473  
[gkroon@agrium.com](mailto:gkroon@agrium.com)

#### **CF Industries**

4 Parkway North, Suite 400  
Deerfield, IL 60015-2590  
[www.cfindustries.com](http://www.cfindustries.com)

#### **Richard Sompel**

Director of Business Development  
Phone: 847-405-2456  
Cell: 847-804-1489  
[rsompel@cfindustries.com](mailto:rsompel@cfindustries.com)

Phone: 1-800-732-7534

#### **Dyno Nobel**

2650 Decker Lake Blvd.  
Salt Lake City, UT 84119  
[www.dynonobel.com](http://www.dynonobel.com)

#### **Koch Nitrogen, LLC**

4111 E 27th St N  
Wichita, KS 67201

#### **Brent Novak**

Director, Industrial Marketing  
Office: 316-828-7560  
Fax: 316-828-8878  
[novakb@kochind.com](mailto:novakb@kochind.com)

#### **Potash Corp. – PCS Nitrogen**

La Hwy 30 & 3115  
Geismar, LA 70734  
[www.potashcorp.com](http://www.potashcorp.com)

#### **Sam Robinson**

Manager of National Accounts  
Phone: 847-849-4368  
[swrobinson@potashcorp.com](mailto:swrobinson@potashcorp.com)

## **Manufacturers, continued**

***Company:***

**Terra Environmental Technologies**

P.O. Box 1900  
161 Bickford Line  
Courtright, ON N0N 1H0  
[www.terrainindustries.com](http://www.terrainindustries.com)

***Contact:***

**John Lounsbury**

Business Development  
Phone: 519-867-2739 ext. 1205  
Cell: 519-200-9983  
[jmlounsbury@sympatico.ca](mailto:jmlounsbury@sympatico.ca)

**Yara North America, Inc.**

100 North Tampa Street  
Suite 3200  
Tampa, FL 33602  
[www.yara.us/en/](http://www.yara.us/en/)

**Rolf E. Isberg**

Vice President  
Phone: 813-222-5704  
Cell: 813 766 5873  
[rolf.e.isberg@yara.com](mailto:rolf.e.isberg@yara.com)

**Distributors:** (Note: Distributors purchase bulk quantities from Manufacturers and distributes to customer in desired quantities. They are the normal customer point of contact for quantities smaller than 5,000 gallons, and also handle inexpensive dispensing units (internal use – not legal for trade) for depot fills (intermediate bulk containers – 275 gallons IBC – pumping systems).)

## **Distributors**

***Company:***

**Air Blue Fluids**

471 West Lambert Rd.  
Suite 100  
Brea, CA 92821

***Contact:***

**Alexander K. La Bire**

Phone: 714-321-3106  
[akl@airbluefluids.com](mailto:akl@airbluefluids.com)

**Brenntag North America**

11750 Fruehauf Drive  
Charlotte, NC 28273  
[www.brenntag.com/en/](http://www.brenntag.com/en/)

**Alan Smith**

Business Development/DEF  
Phone: 704-588-1820  
Cell: 248-760-7912  
[asmith@brenntag.com](mailto:asmith@brenntag.com)

**CDI - Cervantes-Delgado, Inc**

471 W. Lambert Road, Suite 100  
Brea, CA 92821  
[www.cervantes-delgado.com](http://www.cervantes-delgado.com)

**Luis Cervantes**

Phone: 714-990-3940  
[idc@cervantes-delgado.com](mailto:idc@cervantes-delgado.com)

**Colonial Chemical Company**

78 Carranza Road  
Tabernacle, NJ 08088  
[www.colonial-chemical.com](http://www.colonial-chemical.com)

**Jim Spooner**

Vice President & General Manager  
Phone: 609-268-1200 ext. 107  
Cell: 609-502-5260  
[j Spooner@colonial-chemical.com](mailto:j Spooner@colonial-chemical.com)

**Cummins Filtration**

2931 Elm Hill Pike  
Nashville, TN 37214  
[Cumminsfiltration.com](http://Cumminsfiltration.com)

**K C Hall**

Director – NA Aftermarket Sales  
Phone: 812-377-3456  
[k.c.hall@cummins.com](mailto:k.c.hall@cummins.com)

## **Distributors, continued**

### ***Company:***

**Excelda**  
12785 Emerson Drive  
Brighton, MI 48116  
[www.excelda.com](http://www.excelda.com)

### ***Contact:***

**Brian Carter**  
Vice President of Sales  
Phone: 248-587-1193  
[bcarter@excelda.com](mailto:bcarter@excelda.com)

**Dispensing Manufacturers:** (Note: Dispensing manufacturers supply legal for trade dispensing equipment. They deal with quantities of 1,000 – 2,000 gallons and normally above ground systems. Systems available for home depots and truck stop islands.)

## **Dispensing Manufacturers**

### ***Company:***

**Benecor**  
P.O. Box 411  
Fenton, MI 48430  
[www.benecor.com](http://www.benecor.com)

### ***Contact:***

**Brendan Foster**  
President  
Phone: 248-379-4014  
[brendan@benecor.com](mailto:brendan@benecor.com)

**Balcrank Products - True Blue DEF Systems**  
Backed by National Service Distributor Network  
115 Reems Creek Road  
Weaverville NC 28787  
[www.balcrank.com](http://www.balcrank.com)

**Don Smith**  
Director of Sales  
Phone: 404-307-5423  
[dsmith@balcrank.com](mailto:dsmith@balcrank.com)

**Colder Products DrumQuik Pro**  
1001 Westgate Drive  
St. Paul, MN 55114  
[www.colder.com](http://www.colder.com)

**Tom Braun**  
Business Manager Chemical Packaging  
Phone: 651-603-2512  
[tom.braun@colder.com](mailto:tom.braun@colder.com)

**EZ Fuel – Blue1USA**  
3883 Rogers Bridge Rd. #205A  
Duluth, GA 30097  
[www.ezfuel.com](http://www.ezfuel.com)

**Dave Polak**  
Phone: 770-232-9090  
Cell: 770-356-5895  
[dpolak@ezfuel.com](mailto:dpolak@ezfuel.com)

**Larson (Dresser Wayne)**  
10100 Dixie Highway  
Clarkston, MI 48348  
[www.larsonco.com](http://www.larsonco.com)

**Charles A. Burns**  
Vice President  
Phone: 248-620-0070 ext. 112  
[cburns@larsonco.com](mailto:cburns@larsonco.com)

**R. W. Mercer (Gilbarco)**  
2322 Brooklyn Rd.  
Jackson, MI 49203  
[www.rwmercero.com](http://www.rwmercero.com)

**Kirk Mercer**  
President  
Phone: 517-787-2960  
[kirk@rwmercero.com](mailto:kirk@rwmercero.com)

**Where can I buy DEF filling equipment and how much does that cost?**

You can purchase a DEF filling equipment through the two current equipment manufacturers, Dresser Wayne and Gilbarco, and Benecor. Dispensers for selling DEF at retail need three certifications: UL certified, weights/measures approved, and point of sale compliant. Filling station equipment that meets these requirements, such as a truck stop, will cost approximately \$33,000. Filling station equipment that is not point of sale compliant, such as dealership supply, will cost substantially less than \$33,000.

**Do DEF producers or distributors lease or sell the dispensing containers and systems?**

DEF producers and chemical distributors often team up with dispenser manufacturers to provide information and offer recommendations and programs on dispensing units. This approach makes implementation easier. Ask for details from your choice of provider.

**What are the major truck stop chains in North America?**

1. Pilot: 358 locations
2. Travel Centers of America (incl. Petro): 238 locations
3. Flying J: 192 locations of which 64 in Canada
4. Love's: 219 locations