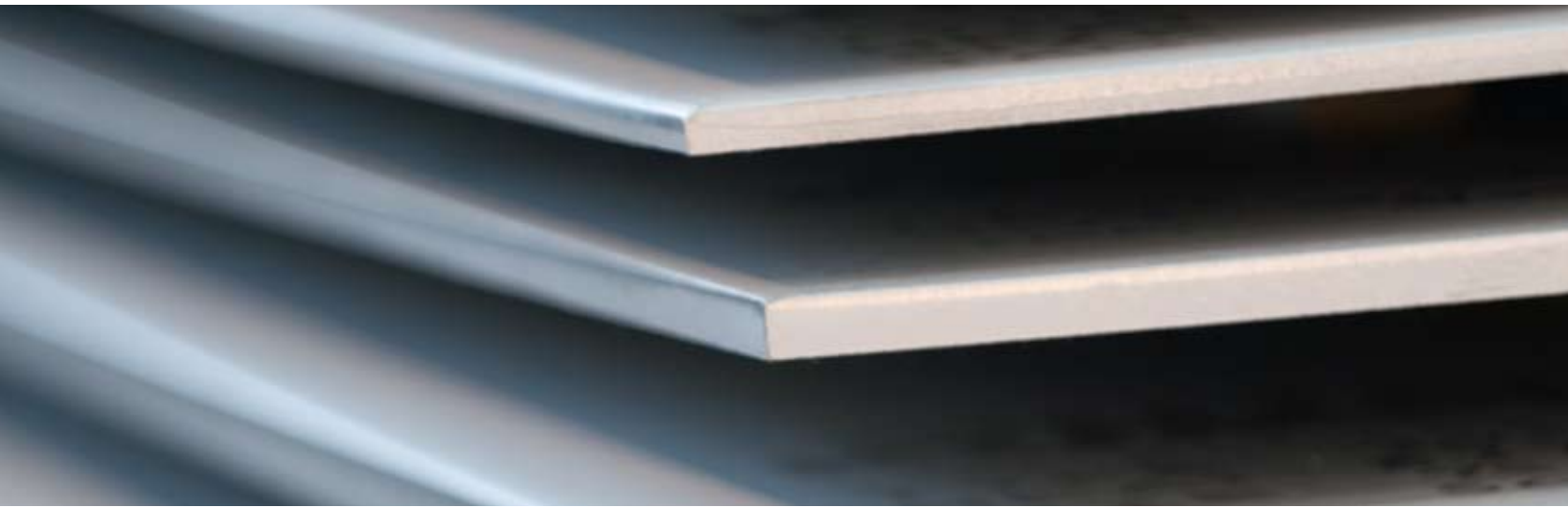




Activating Your Ideas

In Stainless Steel for Diesel Exhaust Fluid Tanks

**OUTO
KUMPU**



Stainless Steel for Diesel Exhaust Fluid Tanks

For high-performance environments—such as in corrosion-resistant storage tanks—stainless steel has proven to be a cost effective, strong, and environmentally sound material.

With new Environmental Protection Agency regulations taking effect on January 1, 2010 mandating reductions in nitrogen oxide from diesel exhaust, stainless steel will continue to be the material of choice for the manufacture of Diesel Exhaust Fluid (DEF) tanks as well as storage and pumping equipment.

With the new EPA regulations, diesel engine designers will be required to substantially reduce the emissions from their vehicles. One popular method that engine designers are adapting is the use of an ultraclean urea SCR (a urea-based selective catalytic reduction) to remove the nitrogen oxide. When the urea is heated by the vehicle's hot exhaust gases the liquid turns into ammonia, which then reacts with the engine's exhaust to produce water and nitrogen—an emission that is harmless to the environment and acceptable to the EPA.

Sensitive Fluids Pose Problems for Tank Fabricators

One problem posed by the urea method: Any contamination from the materials used in the vehicle tank, storage tank, piping, or pumping equipment will inhibit the necessary reaction of the ammonia and the exhaust, causing an unclean emission. Contamination can be caused by leaching of the tank, pump, or piping materials into the liquid contained therein.

In addition, DEF truck tanks, storage tanks, dispersion piping, and pumps need to be “climate controlled”—both heated and cooled—because the DEF freezes at 11°F and begins to degrade when temperatures are above 90°F. This makes the DEF stored in outdoor tanks, piping, and dispensing systems particularly vulnerable.

Typically automotive-related fluids can be contained in storage tanks made of carbon steel, aluminum, copper, lead or zinc. But leaching can occur when urea comes in contact with these mild carbon steel and non-ferrous materials, leaving additive-free polymers and stainless steels as the only real materials of choice for urea storage.

Stainless Steel for DEF Tanks

Tank fabricators can realize a number of benefits by using Outokumpu's stainless steel in their tank construction, including:

- **No leaching or contamination**
- **Corrosion resistance**
- **Resistance to extreme heat and cold**
- **A full range of product forms—plate, coil, bar, pipe, and fittings**
- **Nine grades acceptable for DEF construction—304, 321, 316L, 316Ti, 316LMO, 317L, 904L, LDX 2101[®], and 2205 Code Plus Two[®]**
- **Four grades listed under API 650 standards for tank design—LDX 2101[®], Outokumpu 2304, 2205 Code Plus Two[®], and Outokumpu 2507**
- **New lean duplex, LDX 2101[®], which offers higher mechanical strength that can reduce material cost**



Stainless Steel Prevents DEF Contamination and Leaching

Stainless steel is ideally suited for DEF tank construction. Stainless steel does not corrode or leach. And it can withstand the temperature requirements for DEF. The alloys used to create stainless steel cause an invisible, nano-thin film that naturally covers the stainless. This film is what causes stainless steel to be resistant to stains and corrosion. This film creates the barrier that prohibits the leaching of iron, chromium, and nickel into the liquid contained within a stainless tank, pump, or pipe.

For several years, a major European automaker has been using Outokumpu's proprietary LDX 2101® for construction of their urea truck tanks. LDX 2101, developed by Outokumpu to address the historic price volatility of nickel, contains one-fifth the nickel content of ASTM 316L—while delivering nearly twice the strength and similar pitting corrosion resistance—at lower cost. Like all stainless steels, LDX 2101 is resistant to contamination and leaching.

Outokumpu is one of the world's largest producers of stainless steel and is recognized as a world leader in technical support, research, and new product development. The history of our company goes back to the laboratories in which stainless steel was first invented. The company meets material demand through a network of mills and service centers around the world and in North America including our plate operations in New Castle, Indiana; our bar facility in Richburg, South Carolina; our pipe mill in Wildwood, Florida; and our fittings location in Brockville, Ontario.

Outokumpu produces a complete range of the highest quality stainless steel grades acceptable for DEF tank production and storage, including LDX 2101®, 2205 Code Plus Two®, 304, 321, 316L, 316Ti, 316LMo, 317L, and 904L.

Concerns about leaching and contamination are not new to the tank industry. Fabricators in the oil & gas arena follow the American Petroleum Institute (API) 650 standards (10th edition, Addendum 1 published November 2008, Appendix X) which cover allowable design stresses for construction of terminals and tanks. Four Outokumpu duplex grades are supported by these corrosion standards. These approved grades include:

- Lean duplex LDX 2101®
- Lean duplex Outokumpu 2304
- Duplex 2205 Code Plus Two®
- Super duplex Outokumpu 2507

ISO Standard for Non-Leaching

The technical definition of leaching is: the removal of a soluble matter or other constituents from a solid material by the action of a percolating liquid. Leaching from a DEF container wall occurs when the soluble metal ions or polymer additives from the container wall dissolve by contact with the DEF fluid. One example of leaching is the presence of Bisphenol A (BPA) found in the foods and liquids packaged in plastics containing this chemical additive.

ISO 22241-3 is the standard established to address leaching and contamination issues for DEF. The standard states: "Materials forming compounds as a result of a reaction with ammonia which may negatively interfere with the SCR converter system are carbon steels, zinc-coated carbon steels, mild iron, nonferrous metals and alloys like copper, copper alloys, zinc and lead, solders containing zinc or copper, aluminum, aluminum alloys, magnesium and magnesium alloys and plastics or metals coated with nickel."

LDX 2101, is a trademark of Outokumpu Stainless.

2205 Code Plus Two is a trademark of Outokumpu Stainless, Inc.

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Outokumpu is a global leader in stainless steel. Our vision is to be the undisputed number one in stainless, with success based on operational excellence. Customers in a wide range of industries use our stainless steel and services worldwide. Being fully recyclable, maintenance-free, as well as very strong and durable material, stainless steel is one of the key building blocks for sustainable future.

What makes Outokumpu special is total customer focus – all the way, from R&D to delivery. You have the idea. We offer world-class stainless steel, technical know-how and support. We activate your ideas.



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