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Motiva Expansion Includes Outokumpu's 2205 Code Plus Two® Stainless

When expansion of the Motiva Port Arthur Refinery in Texas is complete in 2012, the facility will include 2,500 tons of stainless pipe from Outokumpu, including the mill's proprietary duplex grade 2205 Code Plus Two®.

Outokumpu—a leading producer of stainless steel—has supplied pipe, plate, coil, fittings, structural hollow sections, and heat exchanger tubing in both standard and proprietary grades for many of the world's refinery construction and/or expansion projects. For the Motiva project (the largest U.S. refinery expansion project in



more than 30 years), over 2,500 tons of pipe in various sizes and grades was supplied from one Outokumpu mill. The pipe order, which included large diameter heavy wall pipe, ranged from 1" to 36" in diameter and was fulfilled by Outokumpu's pipe operations in Wildwood, Florida. "Outokumpu's ability to take the steel from melt to finished pipe and to make the complete size and alloy range required for the project was very important," noted Joe Avento, Outokumpu's Key Account Manager, Pipe.

A number of standard grades of stainless were provided by Outokumpu including 304L, 316L, 321, 347, some nickel alloys and Outokumpu's duplex 2205 Code Plus Two. This duplex grade is particularly effective in refinery applications because of the grade's strength and corrosion characteristics.

Outokumpu's duplex 2205 Code Plus Two demonstrates the producer's commitment to not only meet the requirements of the original 2205 (or UNS S31803) as established in ASTM and ASME, but also to achieve two additional requirements thus transforming the grade to the superior UNS S32205. The two requirements are:

1. Nitrogen levels in the grade are in the 0.14 to 0.20% range to ensure benefits in higher strength, higher corrosion resistance, greater metallurgical stability, and superior properties after welding; and
2. All Outokumpu 2205 Code Plus Two material passes a test for the absence of detrimental inter metallic phases. The tests developed by Outokumpu for this purpose have been formalized as the ASTM A 923 standard test method.

The expansion at the Motiva facility will add 325,000 barrels to the refinery's daily capacity, resulting in a total crude oil throughput capacity of 600,000 barrels per day, making it the largest refinery in the U.S. and approximately the fifth largest in the world.

Four Outokumpu Duplex Grades Now in API 650

The Outokumpu duplex family of stainless steels—consisting of two lean duplex grades LDX 2101® and Outokumpu 2304; one duplex grade 2205 Code Plus Two®, and one superduplex grade Outokumpu 2507—are now supported by the American Petroleum Institute (API) 650 standards, which cover allowable design stresses for construction of terminals and tanks.

“The inclusion of these grades will allow petroleum-related industries to take full advantage of the combination of high strength and corrosion resistance inherent in the duplex grades,” explained Elisabeth Torsner, VP Technology for Outokumpu. Outokumpu provides stainless steel to customers in the oil & gas industry across every continent. “When planning for the construction of terminals and tanks, designers who specify these grades of stainless steel can downgauge tank thicknesses, resulting in material and fabrication savings for their clients,” noted Torsner. This material and cost savings is possible because the duplex grades supported by API 650 are, in most cases, more than twice as strong as other stainless steels. “An additional cost advantage, as well as an environmental improvement, is that the duplex stainless steels are virtually maintenance-free, so they don't have to be continually re-painted, as you would have to do with carbon steels,” she noted. As with all stainless steels, the duplex stainless steels are 100% recyclable.



Outokumpu has begun efforts to include these duplex grades in API 620 for low-pressure storage tanks.

Using LDX 2101® Stainless Saved 200 Tons of Material

For a liquid storage tank construction project in Barcelona, Spain, Outokumpu's lean duplex LDX 2101® in hot-rolled plate was specified by the engineering firm Emypro. The higher mechanical strength of LDX 2101 allowed Emypro to specify thinner plates, hence the project required 200 tons less material than would have been required if 304 stainless had been specified.

Compared with a standard austenitic grade such as 304, Outokumpu's LDX 2101 has at least double the yield strength and significantly higher fatigue strength. The high strength of LDX 2101 allows designers to use thinner gauges compared to other grades with resulting weight and fabrication savings. Designers can also sometimes realize less price volatility when specifying LDX 2101, because of the grade's limited nickel content: only 1.5%. (Stainless steel 304 contains as much as 8% nickel.)



In addition to cost and material savings, LDX 2101 performs well with regard to pitting resistance, corrosion resistance and machinability—all qualities desirable for the oil & gas industry. With regard to pitting resistance, tests have established that LDX 2101 has far superior resistance to 304, and resistance qualities close to those of grade 316. The lean duplex LDX 2101 boasts a superior stress corrosion cracking performance, on par with that of other duplex stainless steels. And LDX 2101 is also very stable in welding, machines exceptionally well,

and requires minimum maintenance during its service life. Standard welding methods can be employed, fewer consumables are required, and post-weld heat treatment is unnecessary.

The first U.S. industrial use of LDX 2101 in storage tank construction was by a major chemical company when faced with the replacement of cracked and corroded austenitic grade storage tanks that had been repainted numerous times. The contents of the 50-foot-high and 60-foot-diameter tanks were only mildly corrosive. But the outside environment was high in chlorides, which made the tanks susceptible to stress corrosion cracking.

In addition to its usefulness in storage tank applications, for the oil & gas industry stainless steel LDX 2101 is a maintenance-free alternative for cable trays, stairs and walkways. And, thanks to its high strength, it is also a candidate for subsea applications. LDX 2101 is available in a broad range of products, including plate, coil and sheet, billet, wire rod and bar, welded tube and pipe, and rectangular hollow sections.

Editor: Maureen Meeker

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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.