

AL-6XN Selected to Wallpaper Six FGD Bypass Ducts at Cinergy's Zimmer Station



Specifications

UNS: N08367 **ASTM:** B 688, A 240, B 675, A 312, B 676, A 249, B 804, B 691, A 479, B 462, A 182, B 564, B 366, B 472
ASME: SB-688, SA-240, SB-6 75, SA-312, SB-276, SA-249, SB-691, SA-479, SB-462, SA-182, SB-564, SB-366 Code Case N-438-3,
 B-31.1 Case 155-1

Chemical Composition, %

	Ni	Cr	Mo	Mn	Cu	Si	C	N	S	P	Fe
MIN	23.5	20.0	6.0	—	—	—	—	0.18	—	—	—
MAX	25.5	22.0	7.0	2.0	0.75	1.0	0.03	0.25	0.03	0.04	balance

Case History

The Cinergy Zimmer Station in Moscow, OH on the Ohio River is one of the largest coal boilers in the United States at 1400 MW. Sulfur dioxide, is one of the combustion products from coal-fired boilers. To comply with clean air regulations the Zimmer station installed a modular system of six wet lime flue gas desulfurization (FGD) units in 1991.

Each of the FGD towers is fitted with a bypass duct. These are round ducts, which can be seen in the photo mounted above the larger rectangular FGD outlet ducts. The chimney stack is visible on the right. Intermittent usage along with back flow from the outlet duct can lead to the condensation of flue gases in portions of the bypass duct. These ducts were originally carbon steel, however, corrosion of the carbon steel necessitated repairs.

In order to protect the duct from further attack, it was decided that the interior of the ducting would be wallpapered with a corrosion resistant alloy liner during the February 2004 outage. After considering a variety of stainless steels and nickel alloys, AL-6XN alloy, which contains 6% molybdenum was selected. AL-6XN was chosen based on its high level of resistance to acid/chloride conditions and its extensive history in FGD service. There were concerns that lower stainless steels like 317L would suffer pitting corrosion in this environment. The corrosion resistance of AL-6XN approaches that of much higher nickel alloys such as C-276, but at a significantly lower cost. An equally important issue in the alloy selection process was the fact that AL-6XN is readily available from Rolled Alloys. The entire 11,000 pounds of 14ga AL-6XN sheet necessary to complete the job was delivered from inventory.

AL-6XN is a 6% molybdenum super austenitic stainless steel with a nitrogen addition. As a result of these additions, AL-6XN offers excellent corrosion resistance in chloride environments including those encountered in FGD systems.

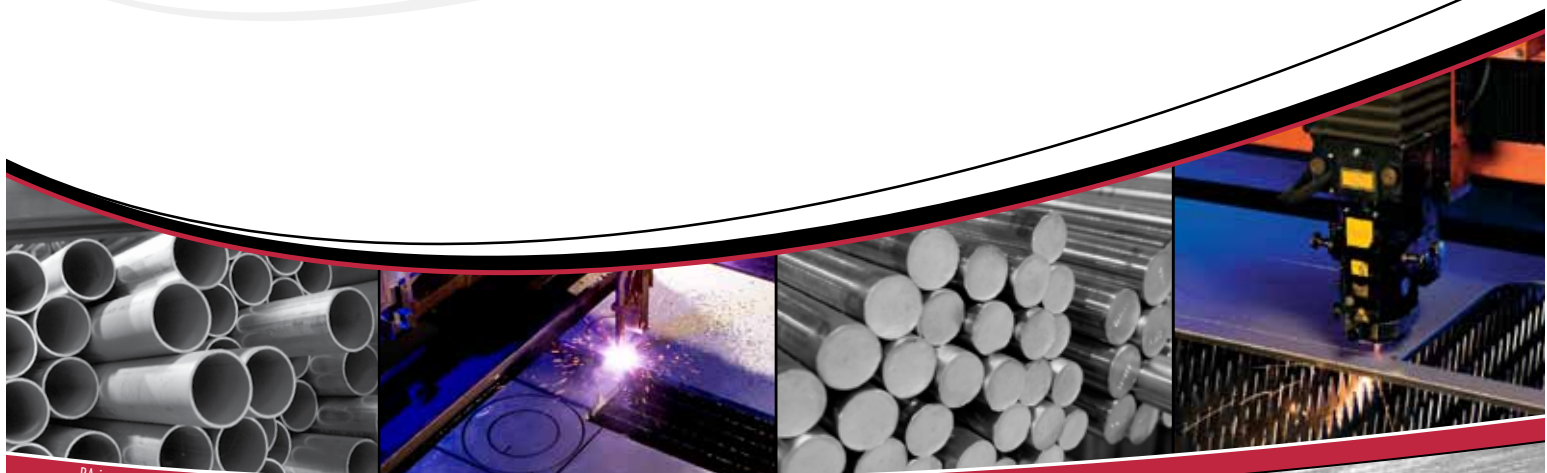
Case History, Continued

The rising steam flash evaporated the excess air and gases from the condensate. The air and gases are released through a vent hood at the top and the heated condensate water drains from the bottom into a holding tank until it is pumped back into the boiler.

The AL-6XN alloy used in this DA Heater involved 11 gage sheet (640 sq. ft.) and 0.250" thick plate (180 sq. ft.). This alloy, with a typical molybdenum content of 6.2%, was selected for both its expected superior pitting, resistance when exposed to a concentration of and for its good resistance to steam impingement which would be unexpected to cause severe cavitation and erosion corrosion of unprotected carbon steel in this DA Heater.

The AL-6XN alloy was welded to itself and to carbon steel using the SMA and GMA processes with alloy 625 filler metal. According to Allan Vig, Welding Engineer at Virginia Power, "AL-6XN has a number of potential applications in our power plants and the welding procedures generated during this replacement project will allow us to make high quality, cost effective weldments."

The AL-6XN alloy is a nitrogen enriched and generally improved version of the AL-6X alloy which has been used extensively, as tubing, in electric power plant seawater cooled steam condensers. That alloy has proved its resistance to both Cl^- ion pitting and to steam impingement attack. It was this heritage of AL-6XN alloy that caused Virginia Power to select AL-6XN for this DA Heater service.



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