Industry Close Up

Nuclear

September 2024

Tony Palermo, VP Commercial for New Castle Stainless Plate recently commented on government spending, new SMR projects in the United States and nuclear byproduct storage. Here's what Tony had to say about the opportunities for stainless steel in the nuclear power industry

Question: Small modular nuclear reactors (SMRs) are the trend in nuclear power. What benefits do SMRs offer?

Answer: SMRs are modular, so they are built off-site and transported to the site location for quick assembly. This makes them a viable energy option for rural, remote communities. SMRs also can be used to provide on-site power to large users of electricity like steel mills and massive data storage facilities. Because of their size and modularity, SMRs have lower up-front costs and can be increased in capacity over time. Because of the self-cooling capability and less reliance on outside systems, SMRs are safer than traditional nuclear technologies.

Q.: Is interest in nuclear power increasing only in the United States?

A.: Because of its sustainability benefits and its relative cost efficiencies, nuclear power acceptance is growing worldwide. Ten percent of the world's power is generated through 450 nuclear reactors around the world. Russia, India, China, and France are leaders in the use of nuclear power. SMRs have already been built in Russia and Canada. Another is under construction in the U.S. (the TerraPower project in Kemmerer, WY).

Q: The U.S. Department of Energy (DOE) wants to triple nuclear power production in the U.S. by 2050. Is there sufficient interest in nuclear to make this happen?

A: The U.S. is lagging other countries in making nuclear energy a larger part of the energy mix. France has had a nuclear-heavy energy mix for quite a while. Eastern European and Asian countries—and our neighbor Canada—are in the process of adding new nuclear SMR capacity in the next few years. The addition of measurable nuclear energy capacity will likely not take place in the U.S. until 2030. But there may be quite a bit of that capacity coming on stream in 2030 to 2040, well in advance of the 2050 targets.

New Castle Stainless Plate, LLC

Learn more at the DOE website.

Stainless steel is ideal for nuclear power projects requiring:

Good corrosion resistance.

Higher carbon content, suitable for applications above 1000°F.

Low cobalt levels offering less propensity for radiation contamination.

Long service life, low life cycle cost.

Reduced maintenance costs in service.

Improved process reliability/up time.

Q: There are several reactor types under consideration in the nuclear sector: water/light water cooled, liquid metal cooled, gas-cooled and molten salt-cooled. 347 grade stainless steel is being specified for molten salt tanks. What are the features/benefits of 347 in this type of application?
A: Grade 347 stainless has excellent high temperature strength and corrosion resistance to store the molten salt. Salt-cooled reactors operate at temperatures above 1000°F, much higher than boiling water reactors. We have been getting a number of inquiries regarding 347 for this application.

Q: Some nuclear reactor components are specified to be 316H stainless. What are the benefits of 316H in these applications?
A: This variation of 316 offers improved corrosion resistance as well as higher carbon content, making this grade suitable for applications with temperatures above 932°F. 316H provides higher strength and, with its low cobalt levels, has less propensity for radiation contamination—making the grade suitable for nuclear reactors.

Q: What type of stainless steel demand has there been in the U.S. nuclear energy market in the recent past?
A: In the past few decades, most stainless steel demand in the nuclear industry has been for stainless steel plate (primarily grade 304) for nuclear waste storage cannisters.

Q: What do you think about the May 2023 agreement between NuScale Power and Nucor Steel which sets in motion the possibility of using SMRs to power Nucor electric arc furnaces (EAFs)?
A: Investing in SMR nuclear technology is a very interesting move. Energy from such an SMR could be used as a baseload to power an EAF mill. This would make a company like Nucor a scrap-based steelmaker and even greener company than they are today.

Advanced Reactor Types

Advanced Small Modular Water-Cooled Reactor (SMR) uses water as a coolant and is smaller than traditional light water reactors (LWR).

Liquid Metal-Cooled Fast Reactor uses metal (sodium or lead) as a coolant instead of water, allowing the coolant to operate at higher temperatures and lower pressures than current reactors.

Gas-Cooled Reactor is cooled by flowing gas and designed to operate at high temperatures.

Molten Salt Reactor uses molten fluoride or chloride salts as a coolant.