Application Brief

Nuclear Industries

Nuclear Stacks

All nuclear reactors maintain a thermal chain reaction producing a steady flow of neutrons generated by the fission of heavy atomic nuclei. However, nuclear reactors are differentiated by their purpose or design:

- Research reactors operate in universities and research facilities for medical diagnostics and therapy, testing materials, and basic research. There are more than 670 research and test reactors worldwide with 227 in the U.S.
- Power reactors are dedicated to generating heat primarily for electrical energy. There are 435 power reactors worldwide with 104 in the U.S. There are a limited number used for district water production and ship power.

The fission that occurs in power reactors causes kinetic energy, which converts to heat energy. The heat energy is stored in water, liquid metal, or as a heated gas, which is then used to generate steam to run a turbine. Residual heat is released into the environment.

The U.S. Nuclear Regulatory Commission (NRC) and European International Electrotechnical Commission (IEC) requires that nuclear facilities are built with a 25- to 40-year reactor lifetime. Kurz satisfies the requirements of:

- NRC Quality Assurance Criteria 10CFR50, Appendix B
- IEC Safety Integrity Level 1 (SIL1) Standard IEC EN61508

Additional nuclear technology includes:

- Nuclear reprocessing, which extract wastes from spent fuel rods and re-uses it in power plants. Although this practice lessens nuclear waste and creates more fuel for nuclear reactors, it is not used in the U.S.
- Breeder reactors that create plutonium from uranium with the nuclear waste being almost 100% fissionable, less dangerous, and having a shorter half-life.

Nuclear Industries

Nuclear Power plant

Nuclear Reprocessing plant

The Kurz Nuclear Obsolescence Assessment (NOA) program reviews the integrity of nuclear equipment 15 years and older for modifications or upgrades. The NOA program supports preventative maintenance activities, including identifying potentially high failure equipment, determining spare parts availability and inventory, and optimizing maintenance intervals.

- Site operators have to upgrade equipment when seeking renewal for extending this lifetime to 60 years.
- Operators find it much more efficient to expand an existing site rather than build a new one; 14 plants in the eastern and southern parts of the U.S. have submitted expansion plans and one plant is in development for Illinois. For the rest of the world (predominantly Asia and Russia), over 45 upgrades are underway that include new reactors and 320 are proposed.
- Decommissioning research reactors must follow the same monitoring guidelines specified for decommissioning power reactors; 193 research sites have been decommissioned since the 1950s, and overall more than 110 reactors are in the processing of being decommissioned.

Kurz continues to offer analog versions, as well as state-of-the-art digital versions, of its product family for the nuclear environment. Kurz analog meters are often specified in site upgrades or expansions because site planners are already familiar with the long-term dependability of Kurz flow meters. Kurz flow meters are also TUV SIL1 certified.

Kurz flow meters are used in a variety of areas outside the direct reactor area. Specific installations have included flow meters used in the following nuclear environments:

- Isokinetic sampling systems for local and remote sites
- Sampling and monitoring radioactive particulate emissions
- Sampling and monitoring drumming and stairwell areas
- Sampling and monitoring plant vents
- Sampling and monitoring stacks in a radiation monitoring system
- Monitoring and controlling process gas sampling lines and sampling systems
- Monitoring emissions samplers
- Measuring forced draft (FD) or induced draft (ID) combustion air
- Measuring air delivery lines
- Measuring HVAC systems
- Monitoring post-accident stack
- Monitoring waste disposal and storage processes

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