NUCLEAR STEAM GENERATOR TUBES & Nuclear Environment Products

BY VALINOX NUCLÉAIRE
Valinox Nucléaire is a wholly owned subsidiary of the Vallourec Group, world leader in premium tubular solutions for industrial applications including power generation. Since 1974 it has been producing U-bent tubes and specialty tubular products made of nickel alloy and stainless steels for nuclear power stations of all technologies. The concern of electricity producers to extend the service life of power stations and optimize their efficiency translates into ever more demanding technical specifications for tubular products. Valinox Nucléaire has the answer: state-of-the-art tools and unique knowhow.

40 years knowhow serving the nuclear industry

Valinox Nucléaire is today the undisputed worldwide leader on the steam generator tube market.

A brief history

1974
Delivery of the 1st steam generator tube bundle.

1978
Commissioning of the second hall of the Long-Length Tubing Shop (TGL 2) and of the vacuum furnace.

1983
• First delivery for South Korea (Ullin 1 & 2).
• Delivery of the 100th tube bundle.

1985
Delivery of the first tube bundle in Alloy 690 (a world première!).

1988
First delivery for China (Daya Bay 1).

1989
• First supply of tubes for CRDM in Alloy 690 (control rod drive mechanisms).
• First order for replacement Steam Generator Tubes in USA (Millstone 2).

1992
First delivery to India of Steam Generator Tubes in Alloy 800 Cold Worked and Shot Peened (Tarapur 3).

1997-2000
Tubes delivered to China for a wide variety of reactor designs: CNP-600 (Qinshan II), Candu (Qinshan III), French 900MW design (Lingao 1&2), CPR1000 (Lingao 3&4).

2004
Delivery of replacement SG tube bundles for the Watts Bar nuclear power station in the USA.

2006
First delivery of Steam Generator Tube in Japan.

2008
Decision to build new mill in Montbard (NARVAL Project). Capacity multiplied by 3.

2009
Delivery of SG Tubes for two EPR units: Flamanville & Taishan. First delivery of C-tube for AP1000 PRHR.

2010
Signature of first order for AP1000 SG tubes. Approval of new mill in China.

2011
Startup of the new mill in France and cornerstone-laying ceremony for the new mill in China.

2012
29 steam generator orders booked, a record high for a year!

2013
400th steam generator bundle delivered. Opening ceremony of the new mill in Guangzhou, China.

Valinox Nucléaire World leader with 2 locations

With 2 sites in France and China, Valinox Nucléaire is today the undisputed worldwide leader on the steam generator tube market.
Valinox Nucléaire’s credo: care and expertise. In-house expertise of cold rolling techniques, the world’s largest capacity vacuum furnace, digitally controlled roller bending for a perfect reproduction of the radii, concern for cleanliness and sustainable development… At Valinox Nucléaire everything is done to ensure that the customer finds the optimal tubular response to his requirements.

Our flagship product

Valinox Nucléaire’s flagship product: nickel alloy steam generator tubes are the sole interface between the primary and secondary loops in power stations using pressurized water. Their main characteristics:
- thin walls (approx. 1 millimeter);
- extreme operating conditions involving high pressure (over 200 bars in internal pressure) and temperature (over 320°C);
- an anticipated life up to 60 years;
- 75 to 200 km of tubes per steam generator (depending on design).

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Technical characteristics

Alloy 690 (at room temperature)
- Ys = 375/475 MPa
- Ts = 585/800 MPa
- E >= 30%

Alloy 800 (at room temperature)
- Ys = 334/471 MPa
- Ts = 569/697 MPa
- E >= 30%

Other grades available:
Alloys 600, 625, ...

Dimensional range:
- From 5/8” to 7/8”
  - From 14 mm to 25 mm
- From 0,5 to 1,3 mm

Specific capacities

4 vacuum heat treatment furnaces allow the stress relief of bent tubes with radii up to 600 mm.

6 bending machines for the production of U-shaped or flat-bottomed sections with a radius from 50 mm to 2 m.

10 German-design cold pilgering mills make it possible to reach the most precise tolerances for the final tube dimensions.

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  - From 14 mm to 25 mm
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Steam Generator Tubes
From billet supply to transportation

> Billet supply
> Billet extrusion
> Cold pilgering
> Degreasing
> Heat treatment
> Straightening
> OD grinding
> Non Destructive examination
> Vacuum heat treatment
> OD Buffing

Production flow sheet for steam generator tubes

> Transportation
> Packing
> Control by internal probe
> Final identification
> Dimensional control
> Visual inspection
> Checking of the bent sections
> Cutting to length
> Hydraulic test
> Vacuum stress relieving
Our customized wood boxes are designed to offer maximum protection during transportation and long-term storage as well as easy use at customer facilities. According to customer needs for space management and logistics, the empty boxes can be shipped back to Valinox Nucléaire after the tubing operation or easily dismantled to recycle the wood at the customer's site.

High-Tech Packages are custom-made to ensure safety and integrity of the product. The package includes reinforced wooden structures, high-density foam between the layers, and plastic spacers, among other features.

Each assembly is packed in a dry atmosphere in a thermo-welded waterproof envelope, in the case of sea transportation.

The highest protection standards customized for each application
They can be divided into different categories:

- tubes for reactor pressure vessel heads;
- sleeves for the repair of steam generator tubes;
- auxiliary heat exchangers;
- piping of the nuclear island (NSSS: nuclear steam supply system);
- bars;
- any specific demand can be studied.

This range of products covers various needs, often in small quantities and with short lead times, requiring the intervention of a wide variety of techniques. These customized tubular products are made of nickel alloy and stainless steel with particularly demanding specifications and a nuclear quality oversight.

Valox Nucléaire brings into the realisation of these non-standard products the technical know how acquired through its nuclear specialization and a network of specialist exclusive sub-contractors.

CRDM

Vallourec provides all kinds of tubes and pipe for nuclear island in a wide range of sizes and grades: carbon steels, alloy and high alloy steels with an outside diameter from 17.2 to 1,500 mm and a wall thickness from 2 to 250 mm.
At Montbard, Valinox Nucléaire has a state-of-the-art integrated laboratory featuring the latest equipment for conducting metallurgical and chemical analysis, mechanical tests and water analysis. The level of knowhow means we are often contracted to do external analyses. Our laboratory is N°1-2164 COFRAC accredited and ISO 17025 certified.

At Nansha, we have a laboratory equipped with the latest testing and measuring equipment to control the production of our tubes and ensure consistent quality is delivered to our customers worldwide.
Safety & environment: better & less

The permanent Valinox Nucléaire commitment to reduce the footprint of its activities is always driven first by the prevention of risks for people and environment. Valinox Nucléaire daily improves its Health, Safety & Environment Management System certified by ISO 14001 and OHSAS 18001 certification in 2009.

Quality - Safety - Environment

Quality

Valinox Nucléaire operates in accordance with a strict quality assurance system regularly updated and audited.

Valinox Nucléaire is the most qualified and experienced specialist of the RCC-M French Building Code and holds the coveted ASME (MM+MS) certifications.

As leading supplier to the Chinese market, Valinox Nucléaire was the first SG Tube maker to obtain the NNSA HAF 604 Approval.

The whole workforce is kept continuously trained to meet the ESPN (France) and EPRI (USA) updated guidelines.

Valinox Nucléaire is committed in a sustainable support to our customer to provides them safe solutions that reduce the level of risk when operating Valinox Nucléaire SG Tubes and nuclear environment products.

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Human resources competency & expertise

Valinox Nucléaire pursues continuous efforts to staff the right competency for the right job. Aware that the training and expertise development issues are the key to improve an operational excellence for our customer’s satisfaction, Valinox Nucléaire maintains competencies management programs based on strong relationships with local schools and universities.

Nuclear safety awareness

Thanks to an ambitious training program, Valinox Nucléaire is committed to help employees develop comprehensive awareness of nuclear safety principles applicable not only to nuclear facilities but also at all steps of the SG Tube manufacturing process.