



#### Alfa Laval in brief

Alfa Laval is a leading global provider of specialized products and engineered solutions.

Our equipment, systems and services are dedicated to helping customers optimize the performance of their processes. Time and time again.

We help our customers to heat, cool, separate and transport products such as oil, water, chemicals, beverages, foodstuffs, starch and pharmaceuticals.

Our worldwide organization works closely with customers in almost 100 countries to help them stay ahead.

#### How to contact Alfa Laval

Up-to-date contact details for all countries are available on our website at [www.alfalaval.com](http://www.alfalaval.com)

## Experience. Efficiency. Equipment

### How Alfa Laval facilitates the nuclear renaissance



# The nuclear renaissance is all about experience. Yours and ours.



“Alfa Laval is a world-class supplier of cooling and cleaning solutions to the nuclear power industry.

No one has more nuclear know-how and experience than Alfa Laval. No one has more efficient heat exchangers. And no one has more products certified for use in nuclear plants.

A rather nice combination, if you ask us”

Alfa Laval's international nuclear team

The nuclear renaissance is underway. New plants are being built, existing ones are being modernized and upgraded. Alfa Laval is ready to help make it happen – with more efficiency, safety and reliability than ever.

### Nuclear partner since 1964

Alfa Laval has more experience of nuclear power than anyone else. One of the world's very first commercial nuclear plants, Heysham in the UK, picked plate heat exchangers from Alfa Laval for its central cooling system in 1964.

This was a breakthrough for plate technology in a very demanding and safety-focused industry. The installation was successful, and over the years, Heysham has extended its use of Alfa Laval heat exchangers to its fuel pond cooling and many other key positions.

### More positions in more plants

Over the years, Alfa Laval has supplied over 2,000 heat exchangers to the nuclear power industry. Today, 140 nuclear plants in 20 countries use Alfa Laval equipment in more than 2,500 process positions – some 2,000 of which inside the Nuclear Island.

Processes supported include spent fuel cooling, residual and emergency cooling, lube oil cooling, pre-heating of feed water, desalination and purification of process water, waste-water treatment and more.

This wide variety of nuclear process applications has given Alfa Laval engineers – in design, manufacturing and maintenance – an unparalleled exposure to and experience of nuclear power technology. They have learned hands-on to understand all the exacting requirements on functionality, safety and reliability placed on all equipment used in a nuclear power plant.

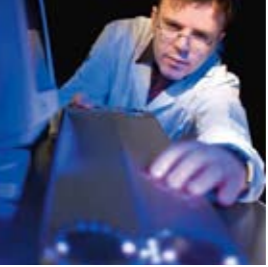
### Non-stop operation

Most of Alfa Laval's plate heat exchangers installed 35-45 years ago are still doing active nuclear duty with virtually no maintenance. Life cycle studies have shown that they have only needed regasketing every 15 years on average.

Powerful, self-cleaning Alfa Laval filters and water-purification equipment virtually eliminate fouling and scaling in the various closed process loops – thus reducing the need (and downtime) for cleaning and maintenance to rare incidents.



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- Alfa Laval equipment operates in the nuclear and turbine islands.
- Compact heat exchangers save space and costs.
- Efficient heat transfer recovers excess heat and generates “free energy”.



### Electricité de France

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# Familiar positions. Unexpected efficiencies.



This chart shows, at a glance, the dozens of positions in the nuclear power generation process where Alfa Laval equipment plays a prominent role – in cooling, heating, filtration and separation duties. Alfa Laval products are found in the nuclear as well as the turbine side of the plant, regardless of reactor type – PWR, BWR or Candu.

The common denominator is cost efficiency, energy efficiency and space efficiency – whether the job is in central cooling, fuel pond cooling or waste-water treatment.

### Efficient heat recovery

Alfa Laval heat exchangers ensure that no excess steam from the turbine is wasted. They recover excess heat through efficient condensing, and generate pre-heated feed water – low-pressure and high-pressure – for further steam production. This arrangement results in considerable amounts of “free” energy, which, if not consumed around the plant, can be fed into a local district-heating network.

### Less is more

Compared to other heat-transfer technologies (notably shell-and-tube), plate heat exchangers are significantly more energy-efficient. This makes them a lot smaller, both in terms of installation footprint and maintenance area. As a result, plant capacity can be upgraded within existing space constraints.

Smaller equipment also means less material is needed to make it. The result is lower costs – especially when really exotic materials, such as titanium, are required. Also, as plate heat exchangers are easy to install and virtually maintenance-free, lifecycle costs decrease even further.

### Many positions, one promise

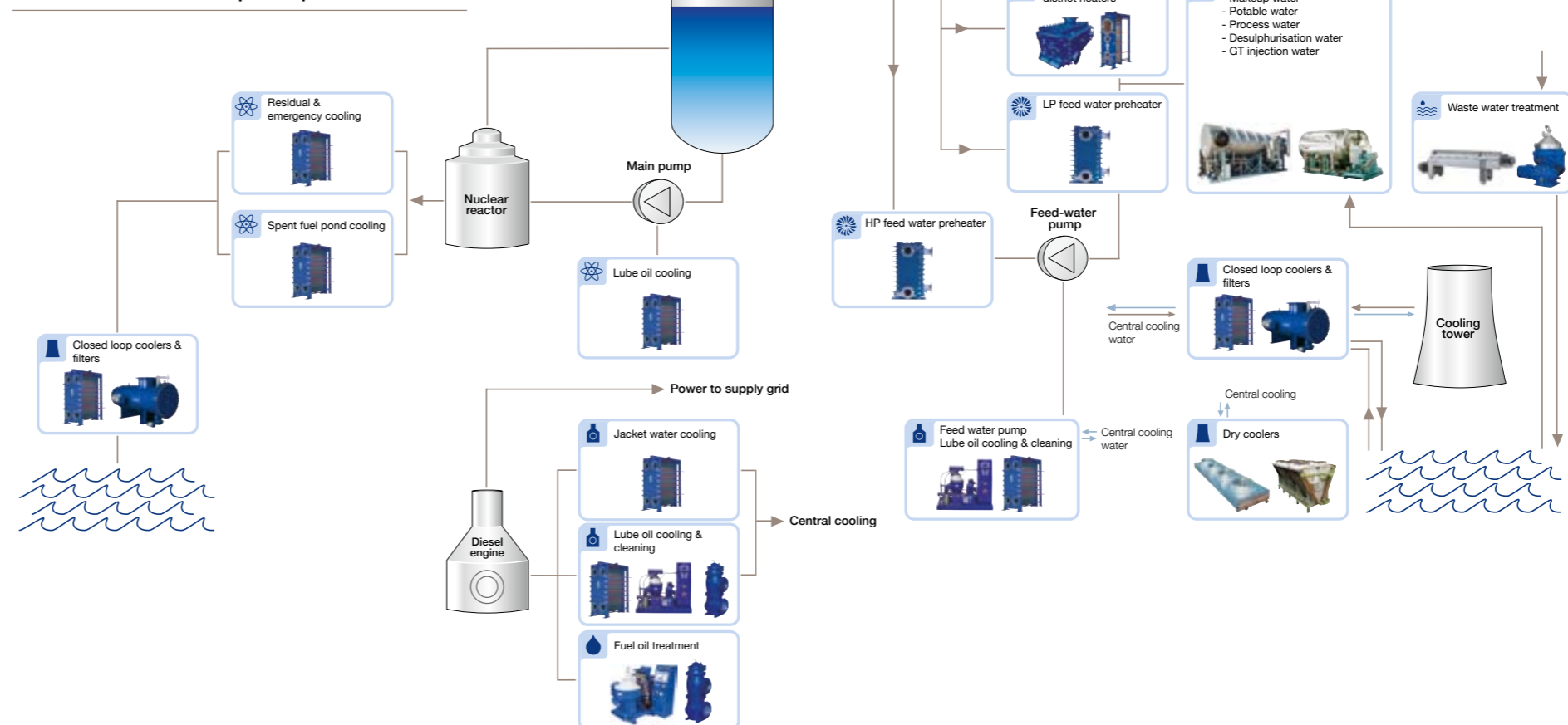
Though process cooling is the predominant nuclear

application for Alfa Laval equipment, it is far from the only one.

Cleaning waste, wash water and lube oils, air conditioning the physical plant space, and producing process water for closed cooling loops are other important duties performed by decanters, separators, air coolers, filters and desalination systems from Alfa Laval.

What they have in common is exceptional quality in every detail, fully documented and certified by national and international regulators.

### Alfa Laval in the nuclear power plant:



### Turbine island systems

Alfa Laval supplies a wide range of solutions designed to boost the efficiency of the cooling, condensing, preheating and cleaning systems used in conjunction with the steam generator and turbine – for example low-pressure steam condensation and feed-water preheating, as well as lube oil cooling and cleaning.

### Nuclear island cooling systems

Alfa Laval is a certified supplier of plate heat exchanger solutions for use in nuclear reactor cooling systems, where safety is a prime concern. Spent fuel cooling and emergency cooling are examples of such positions.

### Diesel generator systems

Alfa Laval provides plate heat exchangers for jacket-water and lube-oil cooling in emergency cooling systems.

### Auxiliary systems

Alfa Laval supplies a comprehensive range of cooling, filtration and cleaning solutions for the many different media used in nuclear power plants – including air, sea water, fresh water and various oils – with exceptional efficiency.

### Desalination systems

Alfa Laval provides cost-effective desalination units that allow nuclear power plants to be self-sufficient in terms of fresh water needed to produce both process water and potable water. These systems employ recovered energy to convert sea water into demineralized fresh water with a low dissolved solids content.

### Nuclear waste water treatment systems

Alfa Laval supplies a wide range of solutions designed to reduce the environmental impact of nuclear power plants. These include decanter centrifuges and high-speed separators for cleaning oils, wash water and other waste before disposing of it.

- Alfa Laval products meet national and international industry standards.
- Extensive testing of materials, components, factories and technicians.
- Full documentation – tests, inspections, quality assurance, material tracing.



#### British Energy – Heysham II

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## Refined technologies. State-of-the-art equipment.



Heat transfer, separation and fluids handling are Alfa Laval's core technologies. For more than 125 years, we have continuously developed and refined these technologies – improving designs, materials and manufacturing methods.

By retrofitting new heat exchangers in hundreds of existing nuclear plants, we have had to understand and apply the regulations as they have evolved. And adapt our products and solutions accordingly.

#### No stone unturned

When it comes to meeting (and even exceeding) the nuclear industry standards, Alfa Laval leaves nothing to chance.

We thoroughly test every component, every material, every seam. We submit every design and manufacturing process to rigorous regulatory inspections. We train and retrain every engineer and technician involved in our nuclear power operation.

The result is arguably the world's best-performing and most reliable products in their respective categories. Now they are ready for nuclear operation anywhere.

#### Certified and documented

The high quality of Alfa Laval products and manufacturing methods is not lost on the nuclear regulatory world. Alfa Laval meets virtually all prevailing national and international industry standards. As a result, our heat exchangers and other products are pre-qualified for installation in most nuclear power plants worldwide.

Their compliance with the various standards and regulations is also fully documented – including tests and inspections, quality assurance, tracing of

materials and components, and more.

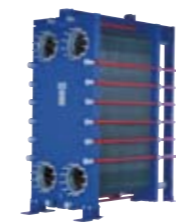
Whether you are retrofitting an existing plant or building a brand new one, Alfa Laval is ready when you are, and can save you considerable time and bother.

#### Industry standards met by Alfa Laval include:

- ASME Section VIII, U1 stamp
- NQA-1
- 10CFR50, Appendix B
- ISO 9001
- 10CFR50 RCC-M
- NPT stamp
- NS stamp
- PED



#### Alfa Laval products for nuclear power production



#### Compact heat exchangers

Gasketed and welded heat exchangers are used in dozens of cooling positions around the nuclear power plant – in the nuclear as well as turbine islands. They are exceptionally efficient, reliable and compact, thus saving energy, operating costs and installation space.



#### High-speed separators

Alfa Laval's lube-oil treatment equipment, for example the OCM oil-cleaning module, quickly and effectively separates oil, water and sludge components in contaminated lubrication and hydraulic oils – all at the same time and regardless of the type or quantity of contaminants.



#### Decanter centrifuges

Decanters are used to treat radioactive wastewater from washing machines, showers and equipment cleaning before it leaves the plant. The centrifuge system removes all undissolved solids from these water streams. The result is high decontamination and considerably lower volumes.



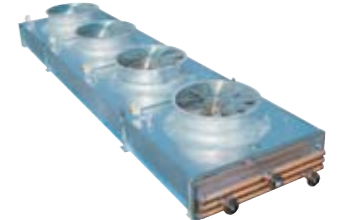
#### Filters

Alfa Laval's high-performance ALF filters remove small particles debris, sand and biological matter from external water flows, prior to using it in various closed-loop cooling duties. This saves heat exchangers and other equipment from fouling and wear. The filters are self-cleaning and virtually maintenance-free.



#### Desalination units

Alfa Laval's desalination systems produce demoralized/fresh water from seawater by evaporation. The water produced is used as process water in various cooling/heating positions. The desalination technologies include Multi-Effect Distillation (MEP), Thermal Vapour Compression (TVC) and Vacuum Vapour Compression (VVC). They all reduce manual operation, maintenance costs and downtime, compared to other technologies.



#### Air coolers

Alfa Laval's wide range of air coolers are used for space cooling in various parts of the turbine island and, increasingly, for liquid cooling duties.

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