Efficient, Reliable and Available

In the Alstom MSR, the moisture is removed by Alstom-designed high-efficiency chevron separating panels. Reheating is carried out by condensing extraction and/or live steam as heating steam inside reheater tubes, while the cycle steam flows in a cross-under flow on the shell side of the tube bundle is superheated. It is equipped with support plates to prevent vibration and allow the tubes to expand freely.

Customer benefits

EFFICIENCY
The Alstom MSR develops a maximum cycle steam reheat temperature with minimum pressure loss. It is also designed for a long lifetime. First-generation Alstom MSRs are still in successful operation today. More recently manufactured MSRs benefit from extensive feedback from installed MSRs.

ADAPTABILITY
The Alstom MSR can be adapted to all existing reactor outputs up to 1,700 MWe. It can meet a wide range of size, arrangement and system design requirements. Alstom offers a choice of horizontal (BWR and PWR) or vertical (BWR and PWR) MSRs.

AVAILABILITY
Thanks to its track record of high reliability and ease of maintenance (and reduced maintenance intervention), it assures maximum availability of power generation. It also offers quick-start operation to accelerate plant availability and reduce start-up losses.

RELIABILITY
The Alstom MSR is today a mature, reliable product family with solid design and robust stainless steel elements. Its extensive installed base has demonstrated 40 years of trouble-free operation and over 200,000 operating hours at 1,550 MWe.

The Moisture Separator Reheater (MSR) has a key function in nuclear power plants to remove moisture and superheat the steam and so avoid erosion corrosion and droplet impingement erosion in the low-pressure turbine. This process improves efficiency, rises performance and extends service life.
Alstom designs and manufactures Moisture Separator Reheaters to fit customers’ specific needs and plant configuration:

- **Horizontal MSR**: this consists of finned U-tubes with a two-chamber steam/condensate box to ensure even distribution of the heating steam by applying calibrated orifice diaphragm at the inlet side. Moreover, U-tube sub-cooling is minimized by the permanently scavenging steam and by the advanced technology of the tubebundle arrangement. Indeed a specific rectangular tubebundle leads to minimize the length of the outer U-tubes, thus to reduce the pressure drop variation of the reheating steam and as well the corresponding sub-cooling which could appear.

- **Vertical MSR**: this version is designed to reduce stress. It has straight finned tubes. Drainage is therefore by gravity. As a consequence, no loss of efficiency caused by the scavenging steam required to avoid U-tube sub-cooling.

- The MSR features two- or four-tube bundle arrangements housed in one or two shells.

**Alstom Power has an extensive offering of products and services for nuclear power plants**, from turbines and turbogenerators to a broad range of auxiliaries. As a result, Alstom Power’s nuclear business teams can handle both the MSR and the steam turbine as a single package, which optimises integration.

**Technical specifications**

**Horizontal or vertical configuration**

Adaptable to all type of reactors output (up to 1700 MW)

Outlet moisture content of 0.5% to 0.3% ensured by the MSR panel

**Scope offering**

**In addition to its conventional vertical and horizontal MSRs**, Alstom also offers high velocity separators such as HVS (High Velocity Separator) around 95% of efficiency, MOPS (MOisture Pre-Separator) and SCRUPS (Special CRoss-Under Pipe Separator). These units can separate 30% to 50% of the condensate leaving the high-pressure turbine. By combining a MOPS and a SCRUPS, a separating effect of 85% to 92% can be achieved.

Alstom also offers an MSR retrofit service to replace damaged or inefficient moisture separators reheaters with state-of-the-art technology and robust equipment. Alstom has an extensive experience worldwide with 177 retrofit and 274 new MSRs.