

Containment Filtered Venting System with Dry Filter Method

Background

In severe accident conditions such as core meltdowns, the containment building may provide the final barrier to a significant release of fission products to the environment. During a severe accident, containment integrity may be jeopardized due to the pressurization from steam formation or non-condensable gas generation or melt through. In such conditions, a containment filtered venting system (CFVS) can relieve pressure and capture radioactive aerosols and iodine at a very high efficiency, thus mitigating the consequences of a severe accident to the environment.

The Westinghouse Solution

The Dry Filter Method (DFM) is based on two different working principles for aerosol filtering and retention of gaseous elemental and organic iodine, respectively. Aerosols are filtered from the venting gas flow using highly efficient metal fiber filters. The filtering principle of the aerosol filter is mechanical filtering of solid or liquid particles by blocking, impaction, interception and Brownian diffusion.

Gaseous elemental and organic iodine species cannot be retained mechanically and are filtered by a special iodine filter. The filter is filled with silver doped zeolite material, a micro porous ceramic material (alumina silicate) with a high inner porosity which adsorbs the gaseous iodine by chemical sorption.

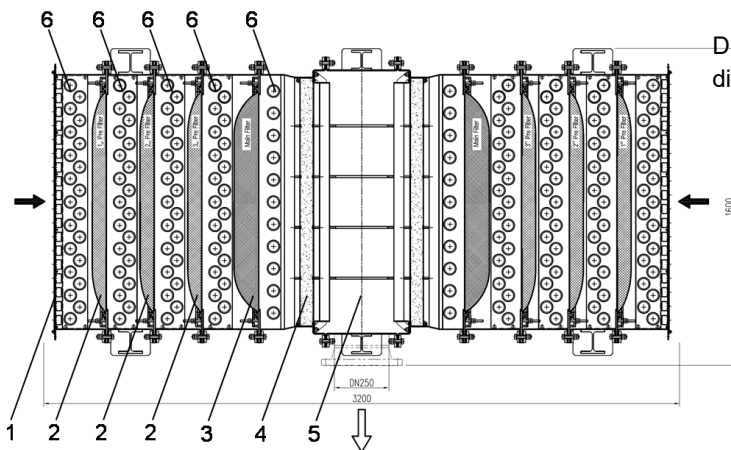
A configuration with combined aerosol and iodine filters can be installed inside the containment. This configuration keeps all filtered fission products in containment enabling access to the auxiliary building following a severe accident.

Customer Benefits

- Application of exclusively passive components (no emergency AC or DC power, no cooling water, no chemical supply necessary)
- Very high removal efficiencies for aerosols (>99.99%), elemental iodine (99.0-99.99%) and organic iodine (90-97.5%), retention capabilities to be designed to balance cost and regulatory requirements
- Elemental and organic iodine permanently retained by chemical sorption
- Low maintenance cost
- Extremely high-temperature and radiation resistance of the filter components
- Low risk of condensation-induced H₂ accumulation during initial venting
- Capability of continuous venting for ultimate depressurization mitigating consequences of melt through

Experience

DFM has been installed worldwide in reactors of different designs - PWR, VVER and Candu.



- 1: droplet separator
- 2: pre-filter stage
- 3: main filter stage
- 4: iodine filter stage
- 5: outlet chamber
- 6: cooling tubes

Top view of a combined aerosol / iodine filter designed for in-containment installation with two filter units in one housing.

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