

Enhanced Organic Iodine Retention – I-CATCH

Efficient Containment Pressure Limitation

Robust Design and Extensive Qualification assure Reliable Filtering and High Decontamination Factors

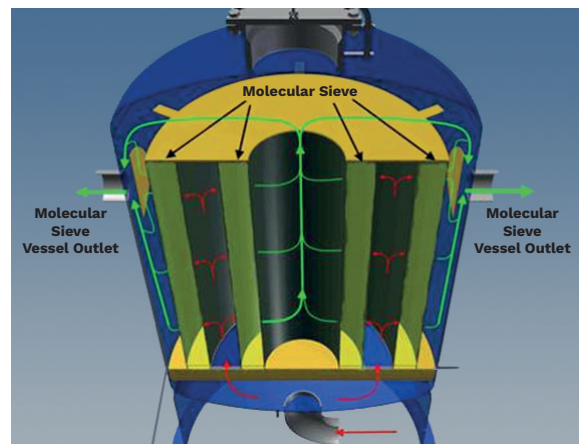
Challenge

Even if a Filtered Containment Venting is installed, a short term evacuation might be required due to organic iodine release.

Also the state-of-the-art on organic iodine formation and behavior has significantly changed in the last decades (compare PHEBUS experiments and others). An efficient and robust retention of those hard to retain organic iodine species, especially methyl iodide is required.

Solution

- The Framatome I-Catch is a supplement retention stage based on the standard filtered venting system technology following the wet and dry retention stages. The sorbents retain the organic and remaining elemental iodine by chemisorption at the large internal surface area of the porous media and formation of chemical stable silver iodide. The retention stage containing the sorbents is called Molecular Sieve (molsieve) Section which is designed to achieve low flow velocity in the sorbents fixed bed for beneficial long residence time.
- After the gas is cleaned and dried in the Venturi and Metal Fiber Filter Section, the gas will be throttled which is generally described as an extensively isenthalpic and adiabatic process. Although the temperature downstream the orifice is decreased, the gas will be superheated. Thus the superheating needed in the Molecular Sieve Section is generated by a completely passive process.



Technical Solution

Customer benefits

- Higher acceptance by population for nuclear power (makes distribution of iodine pills in the vicinity of NPP even in case of accident dispensable)
- Simple to retrofit downstream into already installed FCVS Systems
- Highest NPP safety in order to protect the environment
- Fully passive and reliable system operation



Sample of sorbent material

Your performance
is **our** everyday **commitment**

System Design

- Superheating plus retention time are the key parameters for design of Molsieve Section.
- Volume of sorbent defines the retention time required for a certain decontamination factor
- The Framatome FCVS is operated in the sliding pressure mode and the superheating is created passively by adiabatic-isenthalpic throttling.
- The I-Catch process can be easily retrofit to any FCVS which is operated at elevated pressure. The pressure potential can be beneficially used for generation of superheating.
- For different FCVS technologies the superheating can be provided by alternative means.

Qualification

Scaling effects of the organic iodine retention with sorbent section have been prevented in the FCVS PLUS qualification process especially by sizing of the MS-section of the JAVA PLUS large scale facility.

Licensing is based on the large scale verification tests and no theoretical up-scaling with all uncertainties is necessary.

For more information on Framatome FCVS refer to the FCVS Product Flyer “Filtered Containment Venting System – Efficient Containment Pressure Limitation”



... picture of installed retrofit solution...

Retrofit of organic iodine retention stage to existing FCVS systems

- The DF for elemental iodine increases from >200 to $>>1000$.
- The DF for organic iodine estimated in the 90ies to ~ 5 can now be designed to the required value. Since the DF depends on the volume of the Molsieve stage DFs of >10 ... (usually 25-50) but also up to 1000 are possible based on the large scale verification tests performed at the JAVA PLUS facility.

References

The FCVS PLUS (with additional iodine retention stage) is already applied to **30 reactors** in Europe but also in Asia e.g. Belgium, Spain, Switzerland (retrofit to existing FCVS), Japan, Taiwan

Patent rights reserved

Licensing

- Framatome has broad experience on licensing

Extensive process qualification

- Full scale process section tests (JAVA Plus Test Facility Karlstein)
- Retention tests with gaseous iodine (elemental and organic iodine)
- Seismic Qualification (up to 8g (peak) respectively 5g (rigid body))

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