

Selective Hydrogen-Filters (SH₂F)

Background

The main steam of Boiling Water Reactors (BWR) contains small traces of hydrogen and oxygen that stem from the radiolysis of liquid water in the reactor core. Any accumulation of radiolytic gas within the system must be avoided due to the potential risk of explosion caused by ignition of the oxygen-hydrogen-mixture.

Worldwide unforeseen radiolytic gas reactions and combustion happened in BWRs leading to considerable damages, outages and high costs.

Therefore, the German "Reactor Safety Commission" (RSK) published a recommendation document which describes how to analyze the impact of radiolysis reactions and measures to prevent resulting events.

Numerous preventive actions were taken by the nuclear power stations to mitigate the gas built up within the affected system, such as catalytic recombiners or individual operational measures. Nevertheless, there is still a need for improvement and alternative solutions.

Description

To mitigate the effects of radiolytic gas built up in BWR affected systems, Westinghouse has developed a device that is designed to remove pure hydrogen continuously and effectively, also the hydrogen which could not be converted by catalytic recombination.

Benefits

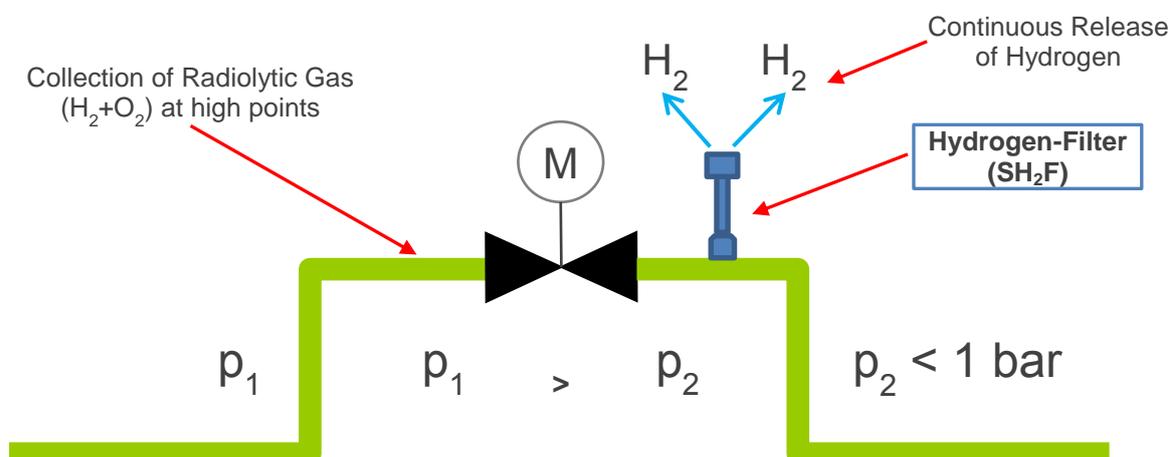
- Continuous release of hydrogen
- Prevention of hydrogen collection
- Prevention of explosions
- Cost savings for precautionary measures:
 - Catalytic recombination
 - Venting
 - Flushing
- Little weight (0.25 kg) and dimensions (H = 100 mm, \varnothing = 30 mm)
- Any positioning on high points possible
- Negligible forces due to earthquake accelerations

Deliverables

The delivery for Hydrogen-Filters is approximately 6 months. Included in the package are:

- An assembly fixture, documents for approval (acc. to KSD 1021/50), qualified procedures, production surveillance and final documentation.

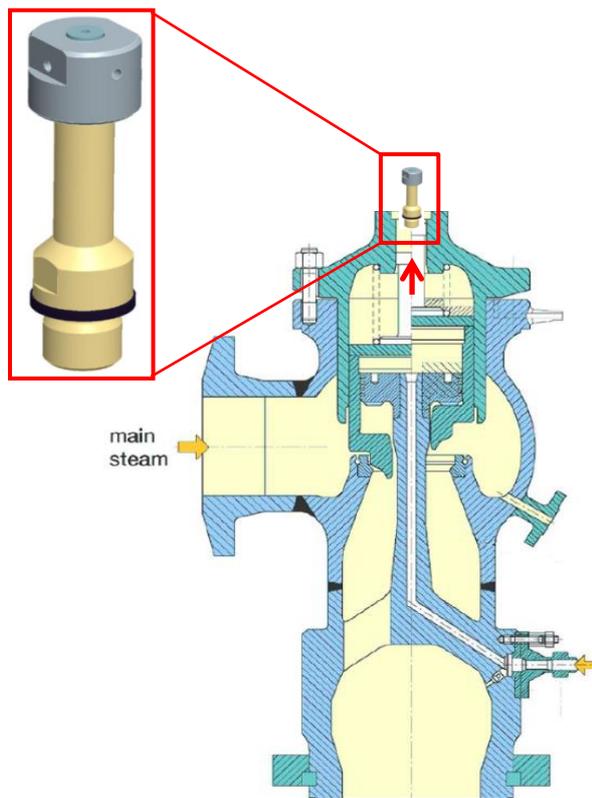
Westinghouse can also provide a test-stand which can be used for check-ups & verification of the SH₂F-Filters venting performance during in-service inspections.



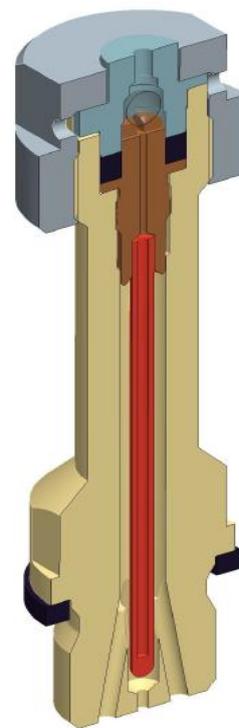
Experience

Westinghouse invested more than 5 years of development and improvement into the design of the Hydrogen-Filter.

To gain practical experience and to confirm the efficiency of the design, the filters were installed at the high points of the depressurization system in a German Nuclear Power Plant. After successful operation all filters were dismantled, inspected and successfully passed the tests on the test-stand as prior to installation. Further installed Hydrogen-Filters are still successfully in operation.



Hydrogen – Filter (SH₂F)
installed on high points of steam relief valves



Cross sectional drawing of a
Hydrogen – Filter (SH₂F)