

## Modular backpressure-independent active hydrogenation station (MBAHS)

Increase your PWR plant efficiency, flexibility and availability

**Framatome's high-pressure hydrogenation solution enables shortened start-up intervals and helps avoid unplanned shut-downs e.g. during load-follow transients by providing fast and controlled hydrogenation via our unique combination of H<sub>2</sub> compressor and injection technology.**

### Challenge

To meet technical and chemical specifications while avoiding corrosion effects during shifting modes of power operation, stable hydrogenation needs to be ensured for the primary coolant.

For a efficient plant start-up process and a brisk regain of plant availability after a H<sub>2</sub> dilution event the required primary coolant H<sub>2</sub> concentration needs to be reestablished as fast as possible.

### Solution

Framatome's MBAHS enables a full scale closed loop primary system hydrogen control, keeping the H<sub>2</sub> level constant during all operational modes.

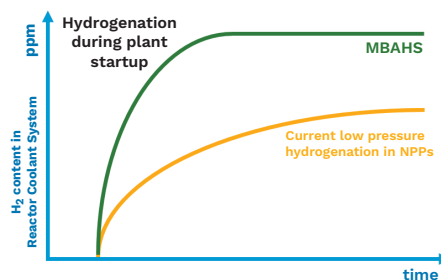
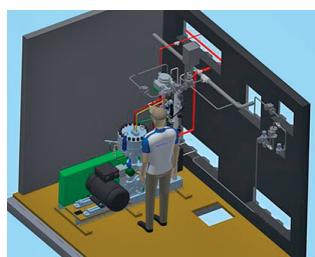
MBAHS has low space requirements (~2 m<sup>3</sup> volume and ~3 m<sup>2</sup> footprint) and a very low H<sub>2</sub> inventory.

MBAHS is designed to be easily retrofitable into any existing PWR.

Taking advantage of a 50 times higher solubility of H<sub>2</sub> via high-pressure (HP) injection MBAHS truly takes your plant to the next level of efficiency.



H<sub>2</sub> injected via nozzle into water at 190 bar



### Technical information

MBAHS consists of a main component (compressor), valves, measurements, I&C and required interfaces incl. injection nozzle.

It offers active and controllable high pressure H<sub>2</sub> injection downstream of the CVCS HP charging pumps.

H<sub>2</sub> will be injected directly into the charging flow at high pressure where its solubility is approx. 50 times higher than for current low pressure hydrogenation solutions.

As successfully demonstrated at Framatome test-rig, MBAHS enables high-efficiency H<sub>2</sub> injection with up to 5 ppm H<sub>2</sub> in HP charging flow.

### Customer benefits

- Increased plant efficiency
- Increased plant availability, avoid unnecessary plant shut-downs
- Simplified active control of H<sub>2</sub> concentration
- Enable even higher levels of H<sub>2</sub> capacity for potential future safety authority requirements
- Improve plant flexibility to provide environmental and social benefits by contributing to optimal grid mix with renewable energies

### Key parameters

Reach **5 ppm** H<sub>2</sub> in primary circuit within 5-6 hours

Small footprint <3 m<sup>2</sup>

**Low overall H<sub>2</sub> content** inside MBAHS system components

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