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## Expansion Vessel for Supercritical Hydrogen in a Spallation Neutron Source Moderator Circuit

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High-energy neutrons are being decelerated by passing through supercritical parahydrogen circulated by pumps in a closed loop. Fluctuations in neutron heat load cause changes of the circuits' local and average temperature and hence significant pressure variations if it is not taken care of the nearly incompressible behavior of hydrogen. Solutions by adding a variable volume in form of a helium gas-backed metal bellow to mitigate pressure deviations are already in use. This paper presents an alternative approach by introducing a vertical storage vessel for supercritical hydrogen in a side arm of the moderator loop, with cold incompressible high density hydrogen at the bottom and warmer compressible lower density hydrogen at the top. The engineering challenge is to keep the temperature profile in the vessel stable under all operating conditions.

**Primary author:** KLAUS, Marcel (Technische Universitaet Dresden)

**Co-authors:** HABERSTROH, Christoph (Technische Universitaet Dresden); QUACK, Hans (Technische Universitaet Dresden); EISENHUT, Sebastian (Technische Universitaet Dresden); BESSLER, Yannick (Forschungszentrum Jülich / ZEA-1)

**Presenter:** KLAUS, Marcel (Technische Universitaet Dresden)

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