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hydroacoustic modeling of the butterfly valves - some industrial applications

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The French PWR units include a large number of control valves which are sometimes at cavitation working for certain operating conditions. The very high excitations which are then created may lead to the cracking of some small lines located nearby. These devices have been tested on laboratory test loops. An hydroacoustic behaviour model has been set up on the basis of very precise identifications obtained from numerous experimental tests. The model obtained describes the acoustic transfers through the valve and the sources generated by turbulence and cavitation in the low frequency domain, according to the main operating parameters: aperture, flow rate, cavitation number, upstream pressure and diameter.

Hydraulic and vibratory measurements were carried out on several Residual Heat Removal circuits for many control configurations. When this circuit is functioning under certain conditions, the two valves which regulate the hot and cold flow rates operate according to a cavitation system. The hydroacoustic valve model is used to simulate of the valves under the hydraulic conditions of measurements. The results are compared at the vibratory levels recorded on site. The model also makes it possible to determine the optimal operating conditions in order to limit the vibrations of the circuit.