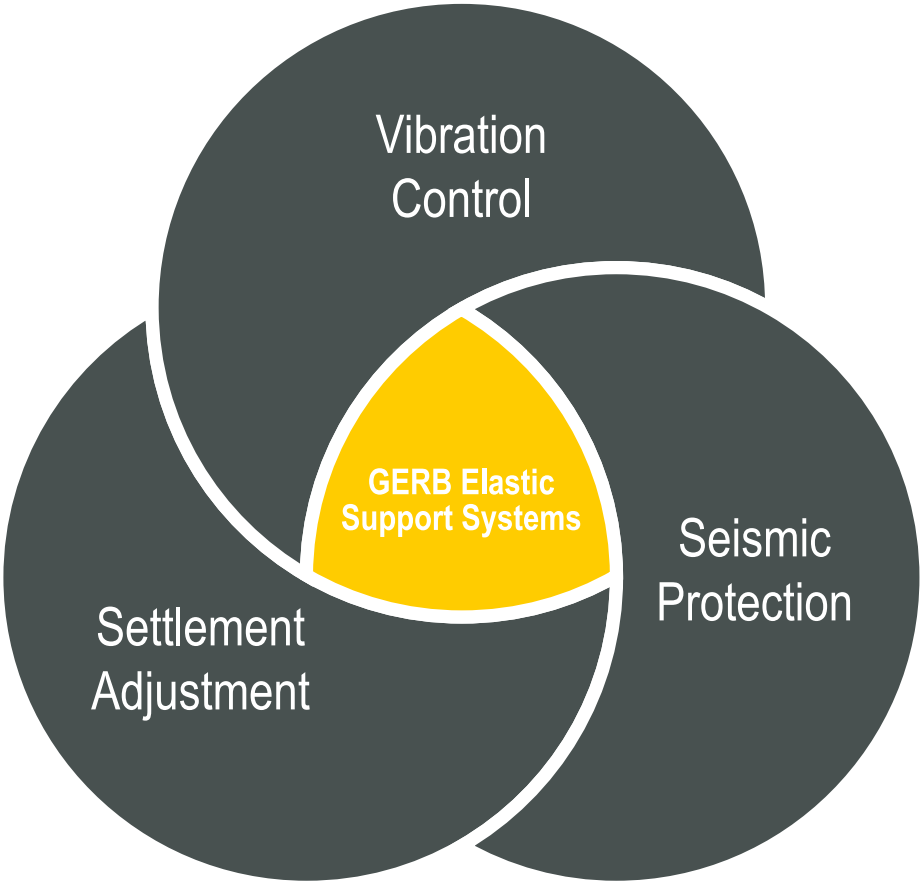
POWER PLANT STRUCTURES, MACHINERY & EQUIPMENT

GERB

PROTECTION OF POWER PLANT STRUCTURES, MACHINERY AND EQUIPMENT FROM VIBRATIONS

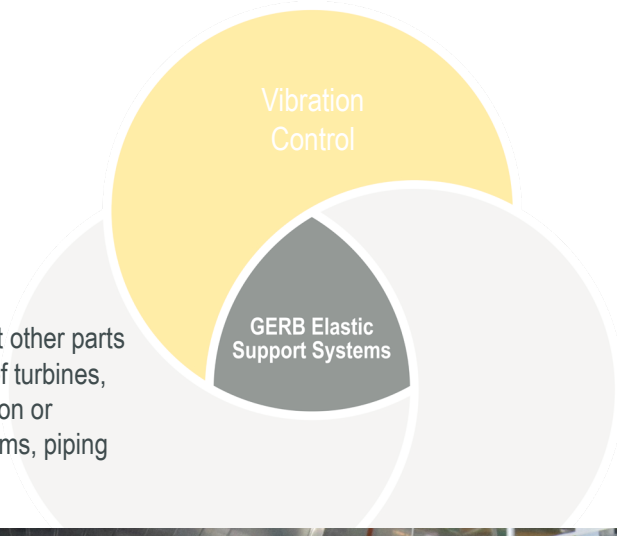
Small modular reactor developments and the new generation of nuclear power plants require smart solutions in regard to the seismic protection of corresponding structures and equipment. To combine the different parts of the plant in a close vicinity also active and passive vibration isolation systems may become necessary. Settlement of the structure, parts of the structure, or even equipment is always a challenge for the civil engineers.

GERB provides a solution for all of these topics. Elastic support systems satisfy these tasks depending on site, structure and performance specific requirements. The focus in each of the projects may be different, but always manageable. Together with all partners specific solutions may be discussed and the elastic support systems can be optimized due to a variety of aspects.



Optimized for the specific power plant

VIBRATION CONTROL



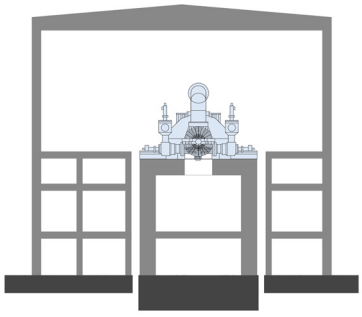
The operation of machinery within the NPP or SMR structure may affect other parts inside. Vibration isolation technologies suppress the disturbing effects of turbines, pumps and other rotating equipment. On the other hand, passive isolation or damping of structures may become necessary, e.g. for main control rooms, piping systems and similar sensitive parts.

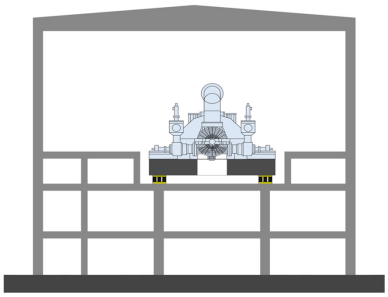

Elastic support of feedwater pump


Dampers for piping system

By spring-supported systems …

- the dynamic operation behavior of machinery in the plant is independent of the substructure and soil conditions
- the vibration isolation efficiency, e.g. for turbines is higher than 98 %
- structure borne noise is suppressed
- the layout of the structure and its components becomes more flexible
- the basics for standardized layouts & economic savings are provided

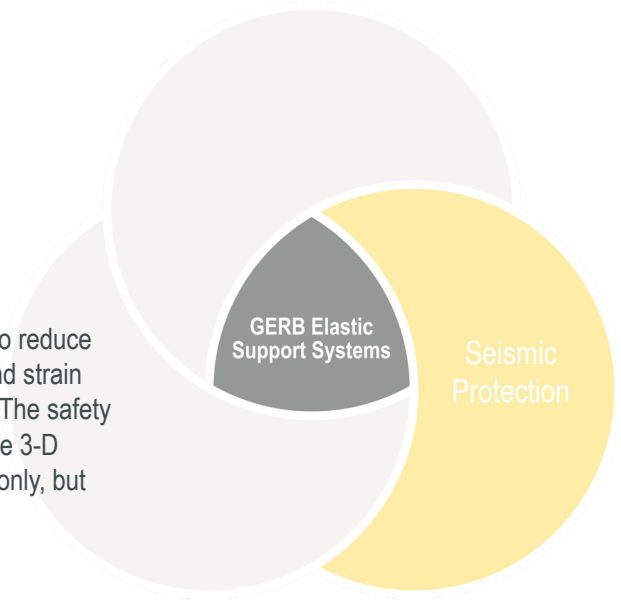

Without spring support


With spring support

Turbine Building:

1) More slender table
2) No expansion / vibration joints
3) Simplification of the structure
4) More slender building
5) Optimization / simplification

SEISMIC PROTECTION



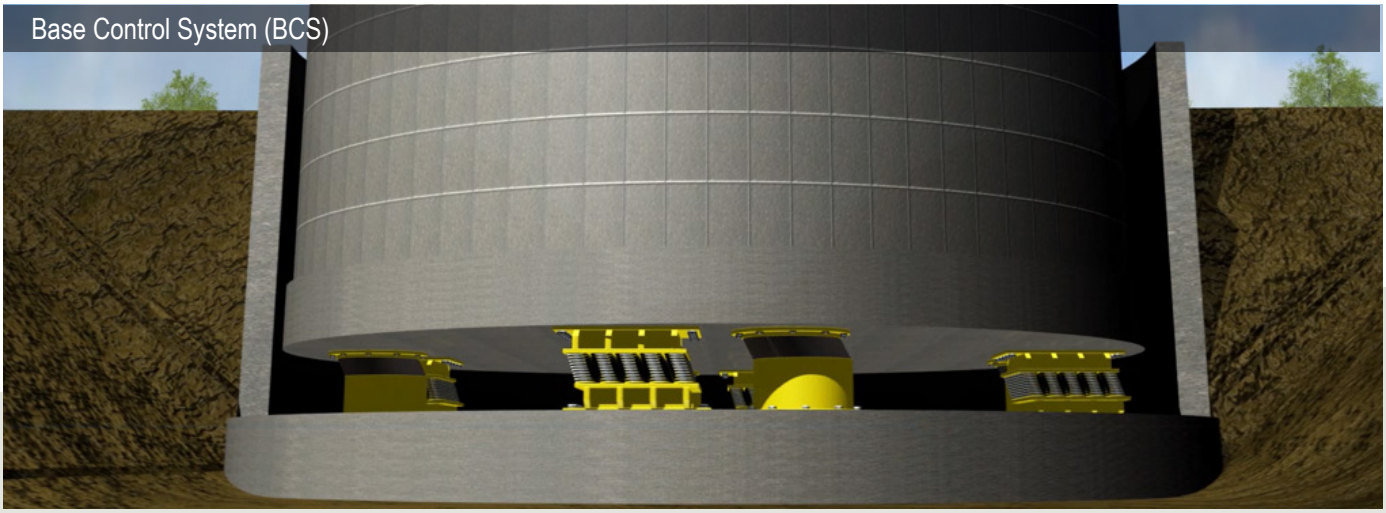
The properties of the elastic support systems may be chosen in a way to reduce effects of seismic events. Induced acceleration levels, internal stress and strain values as well as subsoil reaction forces may be decreased drastically. The safety level of the structure and its components is generally increased. Suitable 3-D isolation systems do not only provide protection from horizontal effects only, but vertical seismic control is also possible.


Spent fuel storage tanks

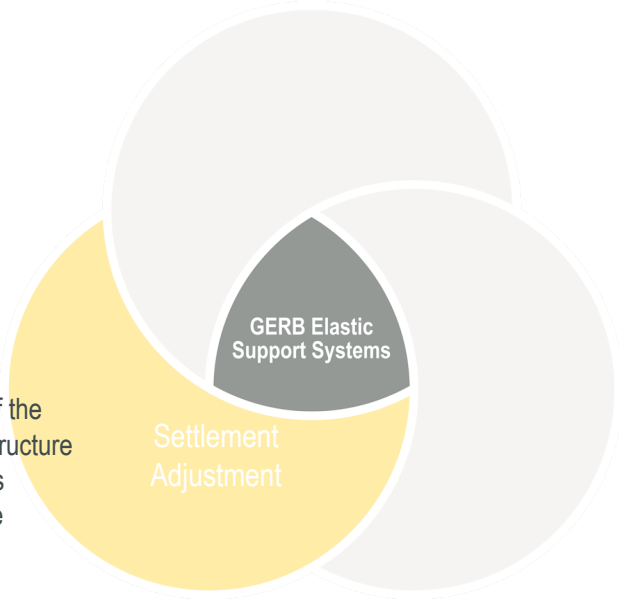

Main control room


Emergency diesel generator

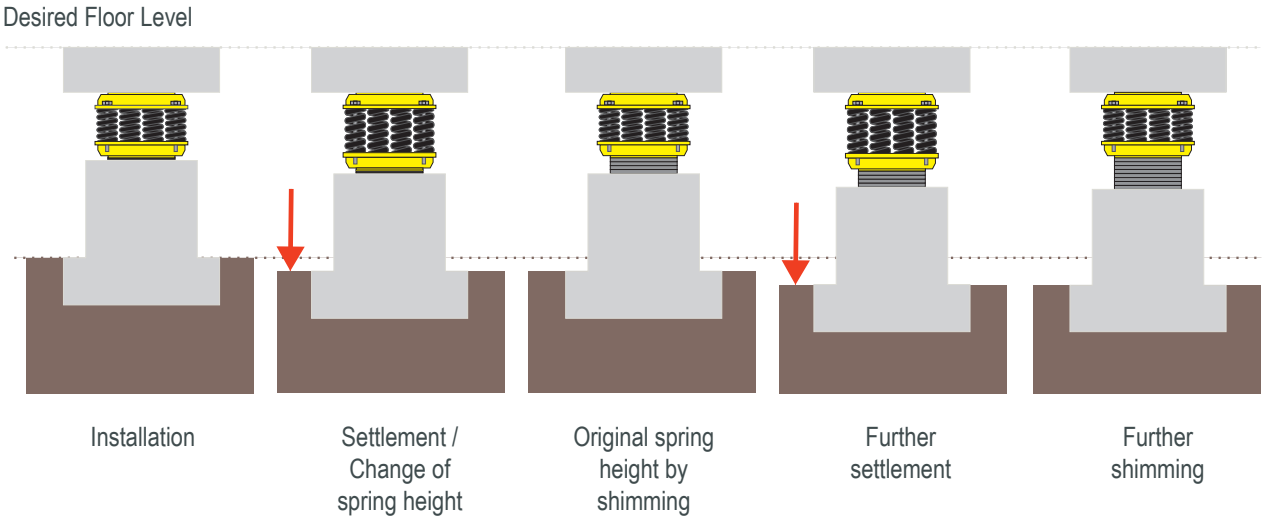
Seismic behavior of turbines, EDGs, MCRs and even spent fuel storage tanks profit from properly chosen support systems, mainly consisting of helical steel springs and dampers. Also entire buildings may be supported by these systems as it is very common in regular Vibration Isolation systems for opera houses, residential buildings and similar structures.


Base Control System (BCS)

SETTLEMENT ADJUSTMENT



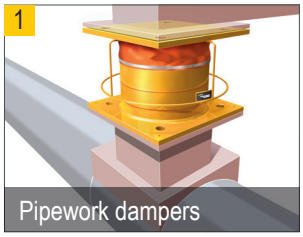
Power plant projects are sensitive to subsoil changes such as even or differential settlement. Elastic support systems with pre-stressable or adjustable spring elements provide the possibility to adjust the height of the elements. By a conventional jacking – shimming process parts of the structure or even the entire structure may be adjusted in height, e.g. lifted. This is extremely important in regions under permafrost conditions in which the sub-soil might get softened by climate change.

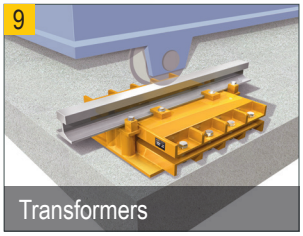


This method may be used for new structures, but also retrofit projects have been executed successfully. When differential settlement occurs, adjustable spring elements provide only minor changes of the support forces due to their elasticity. In contrast, there are massive support effects when the foundation system is executed as “rigid”.


Settlement Adjustment

ELASTIC SUPPORT SYSTEMS IN NUCLEAR POWER PLANTS AND SMALL MODULAR REACTORS





QUALIFICATION AND QUALITY ASSURANCE

To provide solutions that meet project requirements precisely and that are comprehensively documented, our quality insurance department is envolved in every step of the project. This starts with first conceptual ideas and covers all stages from design, manufacturing, installation and periodic inspection plans. Our team of experts engages in the entire process, wherever necessary, so that we can provide the knownledge and experience of more than 100 years to find the best solution and to support the customer‘s engineering team.

All internal processes follow our proven quality management system, certified according to ISO 9001. With the documentation of design and manufacturing, we follow the national codes and standards as required. A high level of nuclear safety culture and the experience from hundreds of projects serve us as the base to be a reliable partner for power plant applications in general and especially in nuclear projects.

GERB nuclear applications in:

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India
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Japan
China
Czech Republic
Finnland
Hungary
...

Nuclear safety culture: “Our organization’s values and behaviors - modeled by its leaders and internalized by its members - that serve to make nuclear safety the overriding priority.”

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VIBRATIONS CAN BE CONTROLLED – WHEREVER THEY OCCUR