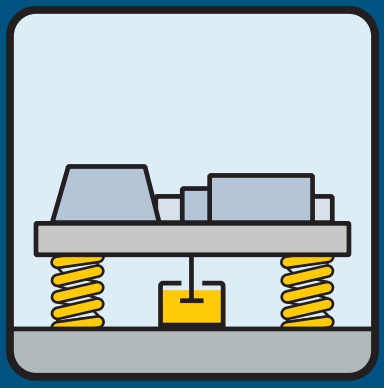
GERB
Vibration Control Systems

Elastic Support of Turbines



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Elastic Support of Turbines

Modern Turbine Houses

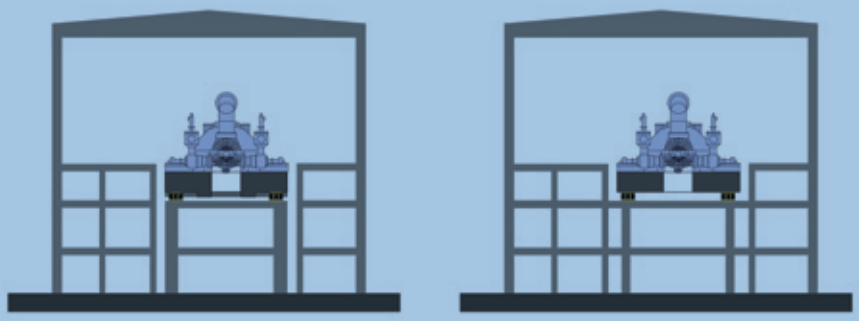


Table foundations for turbines have been an almost universal practice in the past. Thick base mats were required as a dynamic “counter mass” to prevent significant settlement, especially in case of poor subsoil conditions. More than 40 years ago, GERB together with the turbine manufacturers has developed the spring support for smaller size turbines. This system was applied for the first time in a nuclear power plant in 1968, to support a 600 MW turbine.

Today, spring support is used worldwide for turbines of all capacities up to 1700 MW. Many international specifications call for elastically supported foundations. Leading manufacturers of turbines and power plants, using the GERB system, emphasize the following advantages:

- Dynamic uncoupling of the turbine foundation from the substructure consisting of the supporting beams or columns.
- Integration of this substructure into the turbine building.
- Better load distribution due to the spring support.
- Easy adjustment and realignment in the event of settlement. Adjustments can be carried out even without interrupting the operation of the machine.
- Possibility to monitor the operation of the foundation system and to detect settlement using GERB monitoring equipment.
- Protection of the turbine from earthquake damage.
- More space below the turbine for the arrangement of condensers and piping.
- Significantly lower foundation cost by saving the basemat.

Spring elements for elastic support of turbines are manufactured by GERB. High quality coil springs are fitted into rigid steel boxes designed to resist prestressing. GERB spring elements are maintenance free and equipped with a high quality corrosion protection system.

In order to protect the turbine from earthquakes and to avoid resonance amplified vibration amplitudes Viscodampers® — also developed by GERB — are supplied.

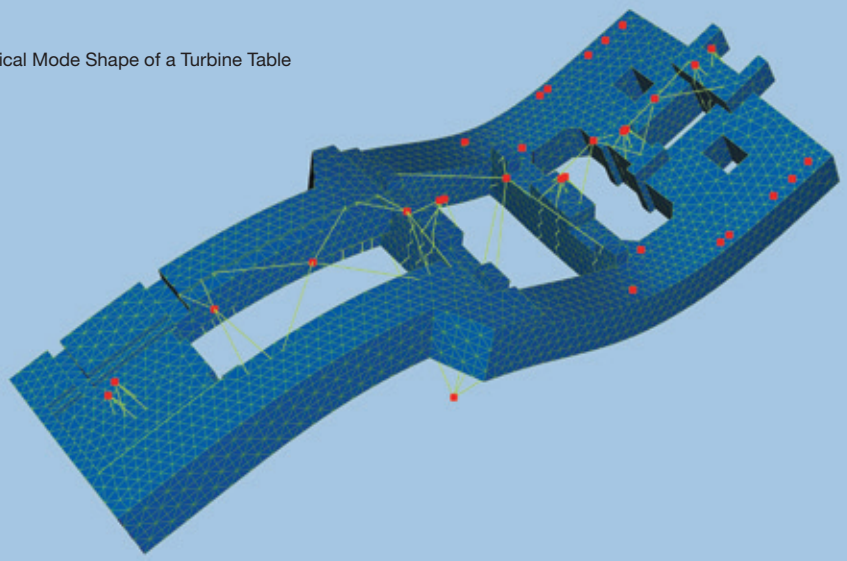
Dampers are either integrated into the spring units or supplied separately.

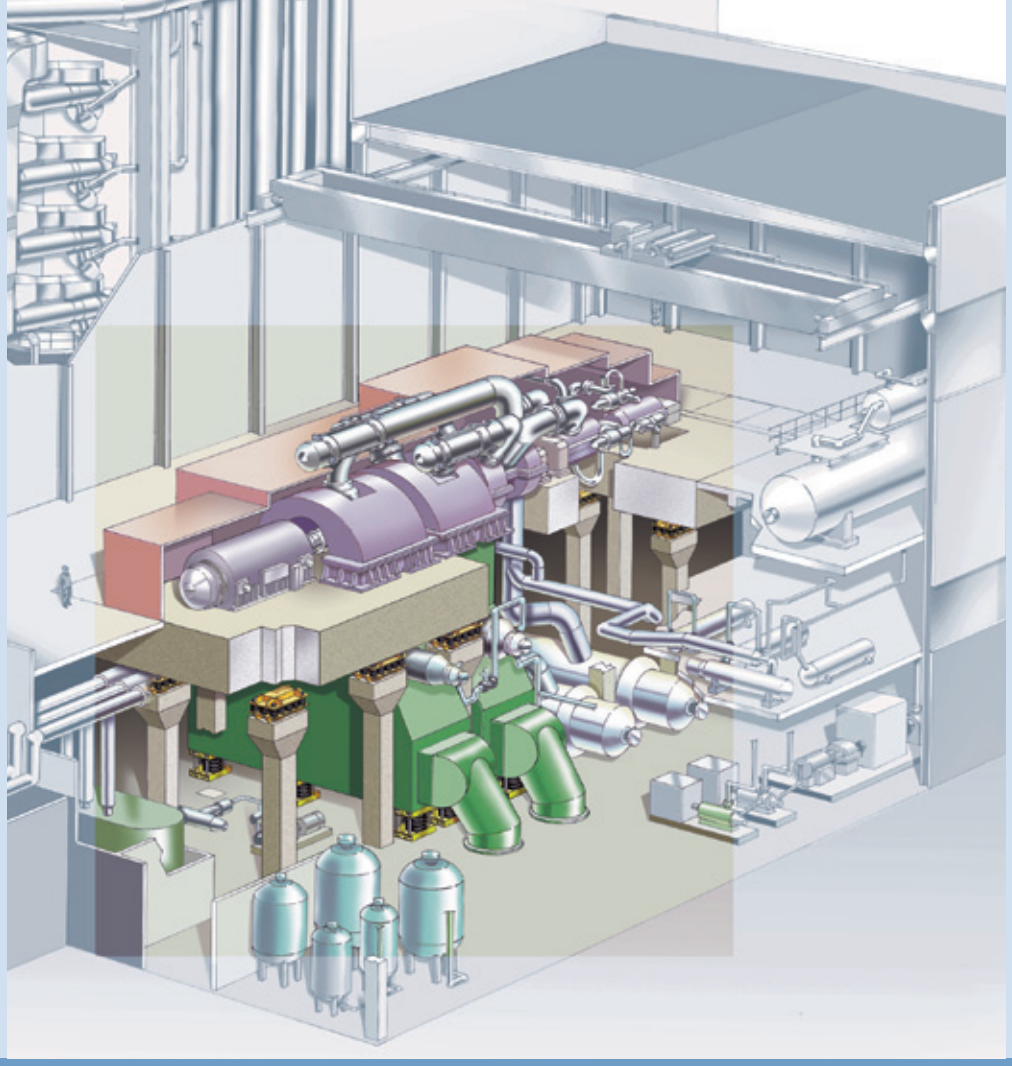
GERB spring units are fastened to the column heads and to the turbine table without bolts by adhesive resilient pads. Height adjustment of the table or lateron required height adjustment is done by using steel shims.

GERB not only offers spring units and Viscodampers® but also complete design and full civil engineering of the turbine foundation including earthquake analysis.

Installation or supervision of installation is part of GERB supply. In case of later foundation settlement due to poor soil conditions GERB mounting engineers can easily readjust the foundation system.

Typical Mode Shape of a Turbine Table





Spring Supported Turbine
and Condenser

Installation and final adjustment of spring elements

Fig. 1, 2 Recesses in the formwork above column heads

Fig. 3 Placing of lower adhesive pads

Fig. 4 Placing of prestressed spring units

Fig. 5 Placing of shims

Fig. 6 Covering of the spring units with a steel plate

Fig. 7 Spring units after removal of formwork

Fig. 8 Leveling of spring units with hydraulic jacks

Fig. 9 Spring unit in final position

LMZ, Tianwan, China

SIEMENS, Niederaussem, Germany

ABB, Hefei, China

Alstom, Flamanville, France

BHEL, Bellary, India

Siemens, Olkiluoto 3, Finland

GERB Vibration Control Systems

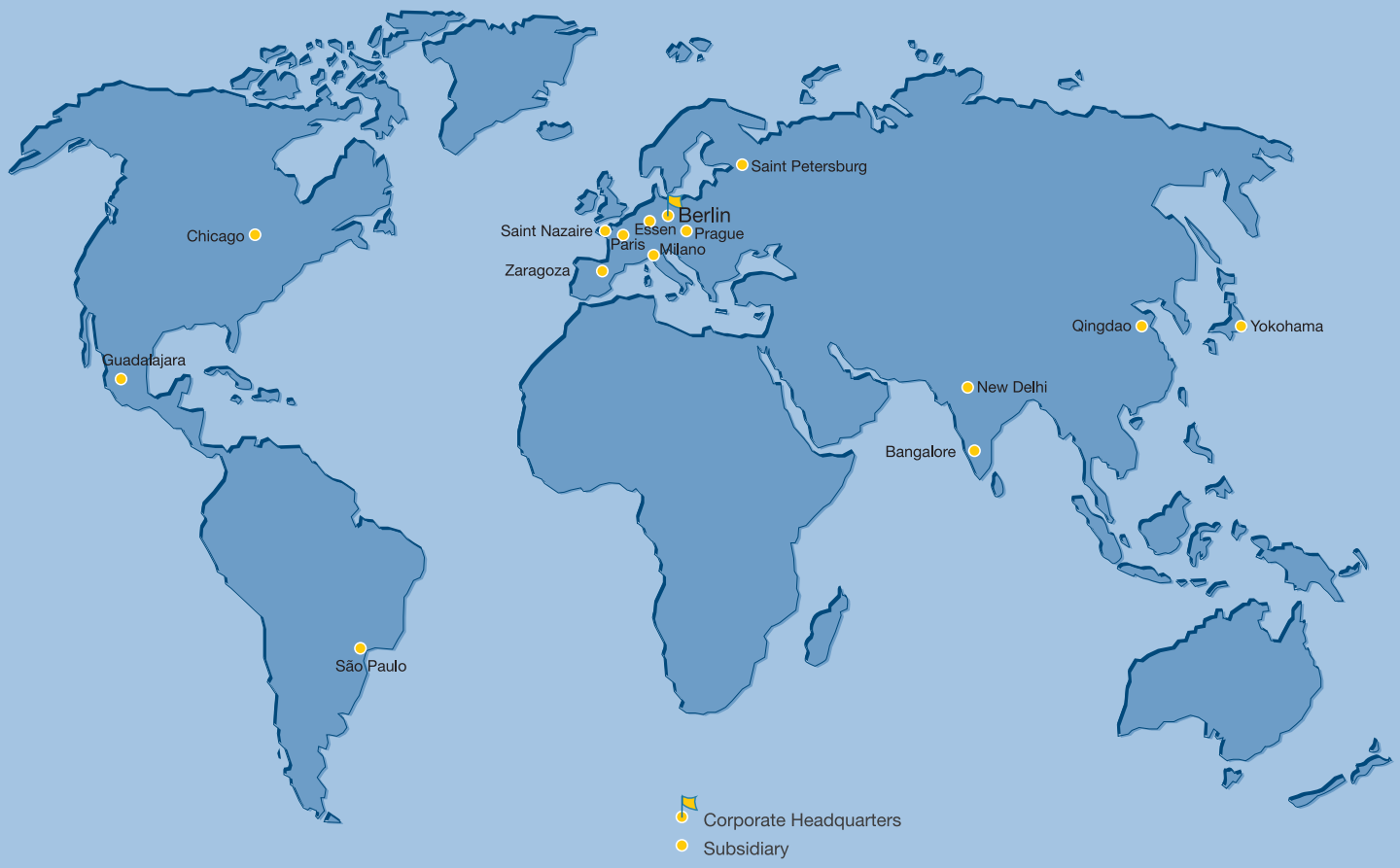
Spring Supported Turbine Foundations

Reference List (Excerpt) – representative for more than 500 installations

Country	Power Plant	Turbine Manufacturer	Capacity (MW)
Steam Turbines in Nuclear Plants			
Argentina	Atucha 2	KWU	745
Austria	Tullnerfeld	KWU	730
Brazil		KWU	2 x 1,300
China	Tianwan Ling Ao	LMZ Alstom	2 x 1,000 2 x 1,000
Finland	Olkiluoto 3	SIEMENS	1,600
France	Belleville Flamanville I, II Flamanville III	Alsthom Alsthom Alstom	2 x 1,300 2 x 1,380 1,650
Germany	Biblis A+B	KWU	1,145 + 1,240
Spain	Trillo	KWU	1,300
Switzerland	Goesgen	KWU	920
Steam Turbines in Conventional Power Plants			
Australia	Loy Yang A+B	KWU, Hitachi	3 x 500 + 500
Austria	Dürnrohr	KWU	405
Belgium	Drogenbos	Alsthom	172
China	Beijing Dabieshan Hefei	ABB Alstom ABB	2 x 190 2 x 600 2 x 350
Denmark	Skaerbaekvaerket	MAN Energie	414
Finland	Meri Pori	ABB	580
France	Refuse Incinerator Rouen	Dresser Rand	32
Germany	Niederaussem Walsum	Siemens-KWU HITACHI	900 750
Great Britain	Elean	ABB Power	48,5
Greece	Komotini	Ansaldo	175
India	Simhadri/NTPC Talcher 1+2, 3 – 6/NTPC	BHEL ABB, BHEL	2 x 500 2 x 500 + 4 x 500
Indonesia	Kota Baja	Siemens	5 x 80
Ireland	Lough Ree Power	Fuji	100
Italy	Pietrafitta	Ansaldo	2 x 75
Japan	Shin Oji	ABB Turbinen	14.7
Korea	Ulsan	BBC Baden	3 x 400
Kuwait	Az Zour Sabiya	Toshiba Mitsubishi	8 x 300 8 x 300
Malaysia	Port Kelang	Mitsubishi; GE	2 x 300 + 500
Netherlands	Hemweg 7+8	ABB	2 x 500
Poland	Tychy	Skoda	40
Russia	St. Petersburg North-West	LMZ	2 x 140
Saudi Arabia	Shoaiba	ABB	3 x 393
Singapore	Tuas South	MHI	2 x 66
Sweden	Malmö Nyköping	Alstom ABB STAL	250 80
Turkey	Baymina	Alstom	320
UAE	Jebel Ali Jebel Ali	ABB Alstom	200 3 x 235
Gas Turbines			
Austria	Leykam/Norske Skog	EGT	57
Belgium	Centrale de Drogenbos	Siemens-KWU	2 x 145
Denmark	Naestved	ABB STAL	25
Finland	Rouvaniemi	ABB STAL	26
France	Papeterie Chevron	EGT	4,5
Germany	HKW Merkenich HKW Munich	Elin GE	72 2 x 150
Great Britain	Blackburn	Alstom Sweden	55
India	Kayamkulam	BHEL	2 x120
Indonesia	Sabah Shipyard	GEC Alsthom	120
Italy	Pietrafitta	Siemens	250
Malaysia	Kulim	Elin	4 x 35
Netherlans	Schoomansmolen Eerbeek	ABB STAL	2 x 25
Philippines	Khanom Barge	Mitsui/Alstom	175
Russia	St. Petersburg South Kaliningrader TEZ-2	ABB LMZ	65 150
Sweden	Helsingborg	ABB STAL	55
USA	University of Texas	Westinghouse	60

Turbine Column Head

GERB
worldwide



For a proposal of a spring supported turbine foundation please provide the following data:

- Manufacturer and type of turbine
- Machine loads (stator, rotor, condenser)
- Speed (rpm)
- Layout drawing of the foundation

Further data for the substructure, subsoil and if applicable seismic loads would help us to optimize our proposal.

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