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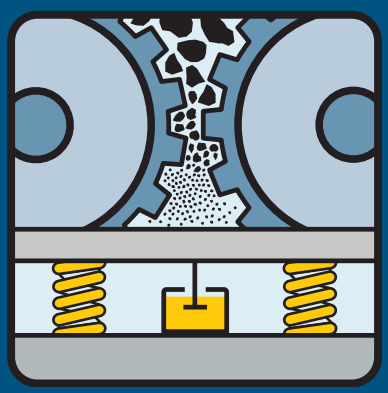
Vibration Control Systems

# Spring Support of Coal Crusher Foundations in Power Plants



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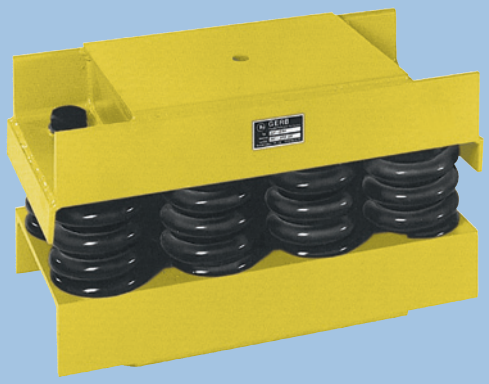


Typical Spring Unit for elastic support of a coal crusher

Coal crushers of all types, such as ring granulators, pulverizers, hammermills, rotary breakers, roll and jaw crushers, can often cause significant and unacceptable vibrations in their supporting structures.

The source of the vibration from a pulverizer or hammermill or a ring granulator is its imbalance, which may result from normal wear and tear or an emergency situation, for example, a broken hammer. Additionally, these machines (with speeds ranging typically from 600 to 720 RPM) pass through resonance speed during startup and shutdown, resulting in large amplitudes in the tall structures that support them.

Imbalance forces in rotary breakers are usually low. However, the crushing process itself and the drive system produce random vibrations over a range of frequencies. Part of the frequency contents can precisely or nearly match the frequencies of the supporting structure resulting in large resonance-amplified deflections.

In several actual cases the supporting structure cracked after experiencing high vibration levels, which ultimately leads to interruption of crusher operation.

Coal crushers in power plants are normally elevated in the structure. A proper conventional foundation design demands a thorough dynamic analysis of the foundation, including the substructure, soil properties and, where applicable, piles.

Such an approach usually produces a design with a concrete slab on tall columns, all supported on a heavy base mat. This design attempts to resist the dynamic effects and minimizes the dangers of soil settlement.

Nevertheless, risks remain as this conventional design is based on some estimation – even if done by an expert.

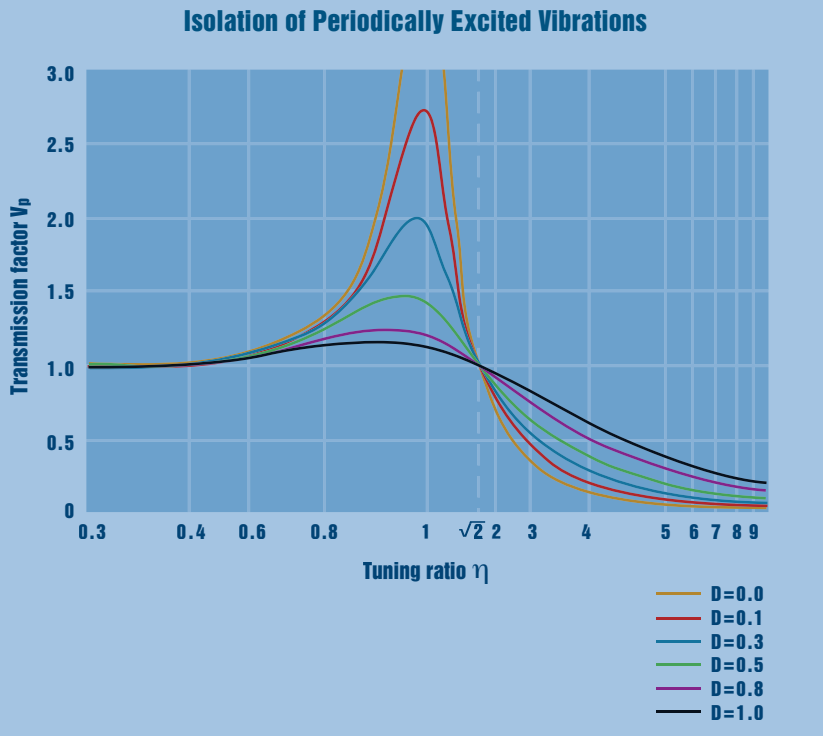
**There is a better way.**

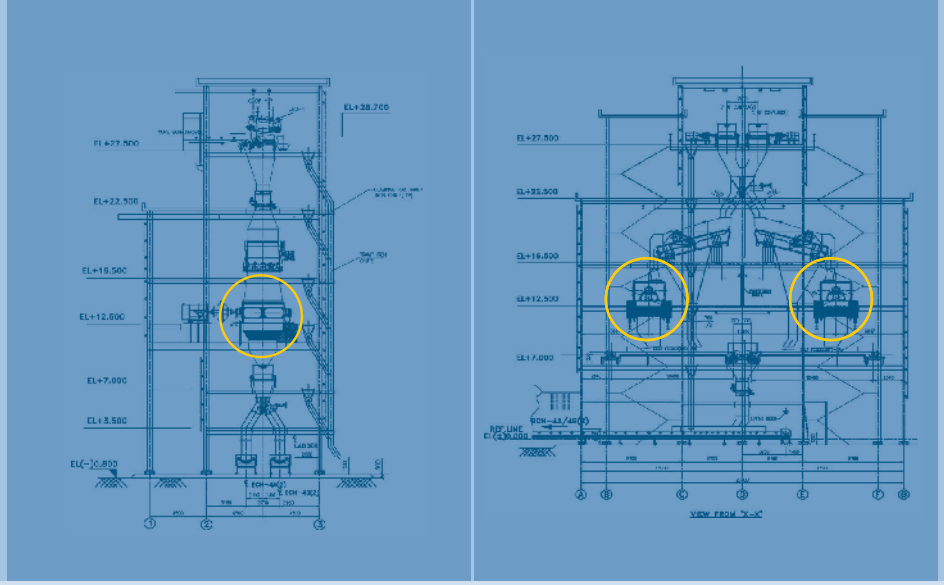
Decades ago GERB introduced a spring supported foundation system for vibration isolation of coal crushers, which is now standard in many parts of the world. The support system consists of spring units equipped with fatigue-resistant helical springs and age-resistant VISCODAMPERS.

Resulting system natural frequencies are typically between 2 and 4 Hz – far below crusher speeds ensuring smooth operation.

The spring system allows transmission of no more than 10 percent of the dynamic loads from the crusher into the supporting structure – keeping it nearly vibration-free.

Velocity-proportional VISCODAMPERS, working with the spring system, absorb vibration energy and eliminate any major amplification when passing system resonance during machine startup and shutdown. VISCODAMPERS also stabilize the system.



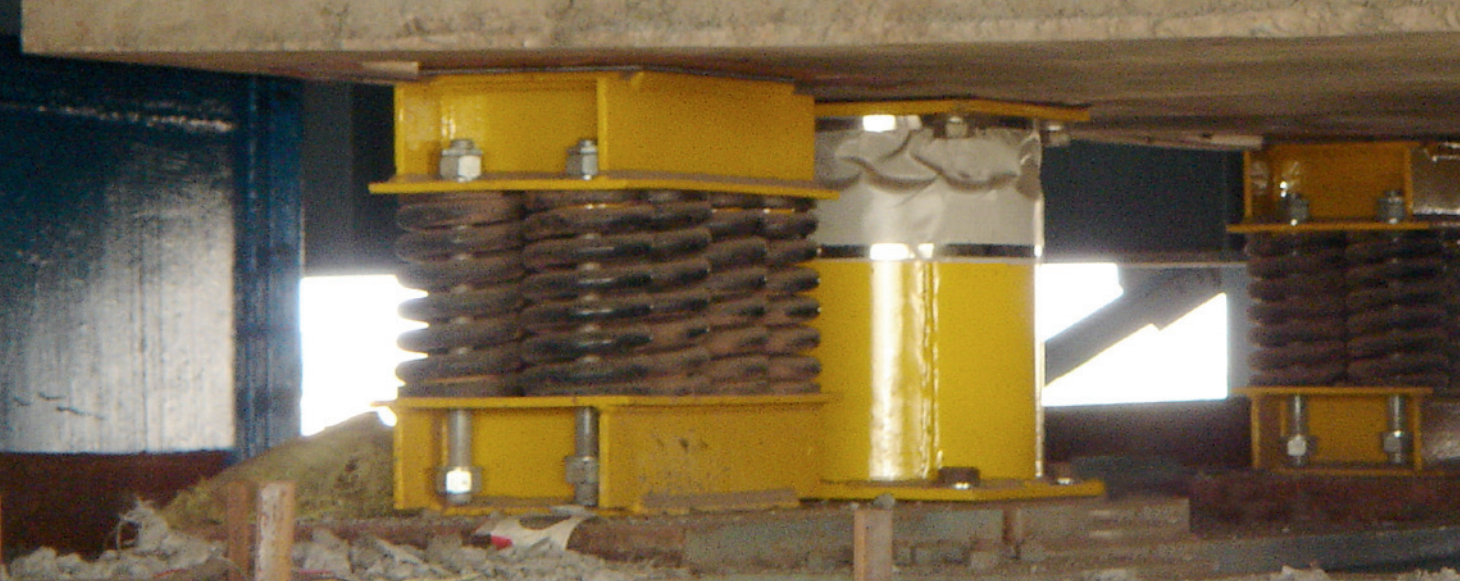


Crusher House with Crushers

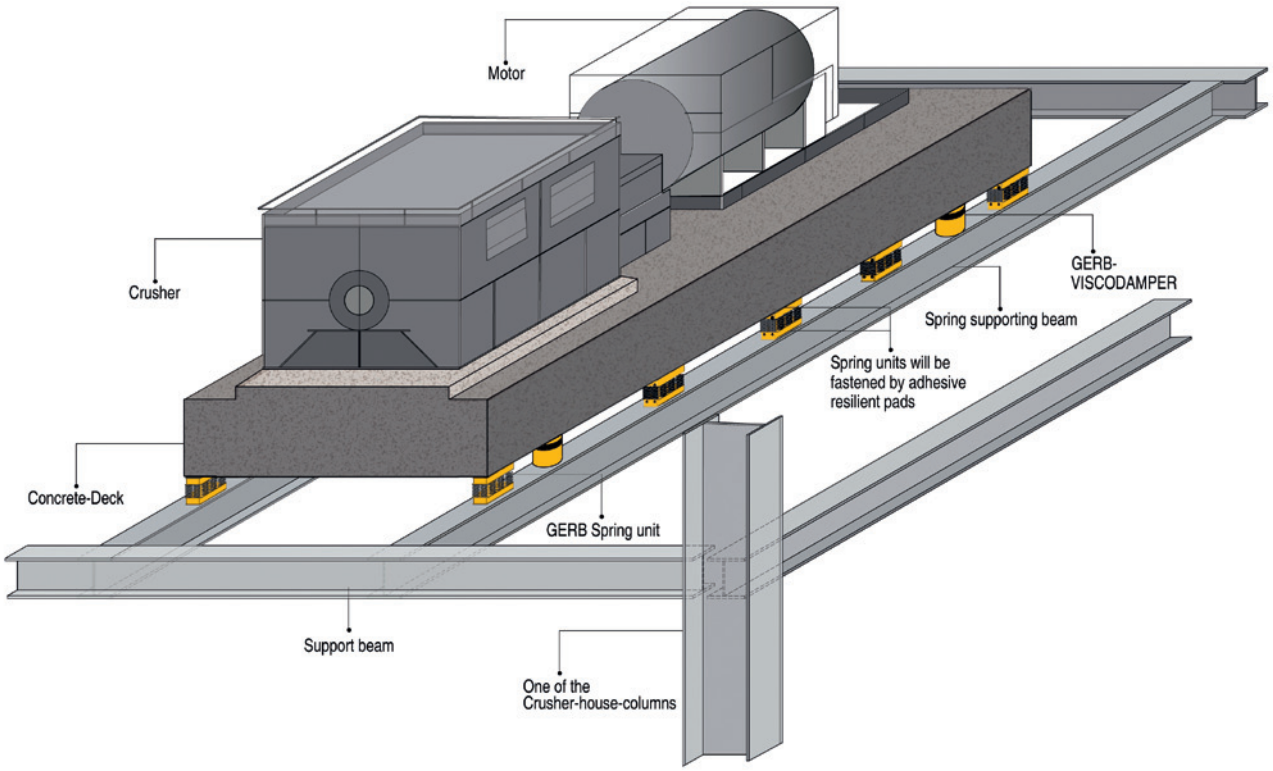
The GERB system not only eliminates vibration problems but offers some very important advantages compared to conventional foundation, such as simplified design and analysis, easy installation and cost savings. Other advantages are:

- The crusher foundation is limited to a concrete deck supported by spring units and VISCODAMPERS. The dynamic behavior of this system can be accurately calculated and predicted.
- Consequently, the design of the supporting structure, RCC or steel, below the spring system can be based on static analysis only. This eliminates the need for base mat and sometimes even the piles, thus saving construction time and material, making the GERB system more economical than conventional crusher foundations.
- With spring support, the crusher and its deck are usually supported on just two beams framed into the nearest building column. Only the dead load of the crusher and deck are added to the column load, as dynamic loads are eliminated by the vibration isolation system. The layout of the structure is thus greatly simplified.
- Separate support columns are no longer necessary, providing more space below the crushers for chutes and other auxiliary equipment. More open space inside the crusher house itself provides a more efficient working environment than in a conventional crusher house with numerous columns and beams obstructing the work space.
- This layout becomes especially attractive when several crushers are housed in one building. Concrete crusher decks can be supported by a common structure integrated into the main building.
- The system provides protection against earthquakes as well as soil settlements.
- The whole system can be conveniently installed in existing crusher structures – RCC or steel – troubled by vibration. Several crushers have been successfully retrofitted with spring support systems.
- The highly flexible spring support results in less stress on the machine itself, which in turn increases the life of the bearings, reduces maintenance and increases crusher availability.
- Crushers used for materials other than coal can also be effectively spring supported in the same way.

Ring Granulator on Steel Substructure



Ring Granulator on Steel Substructure




**Your advantages with GERB vibration isolation :**

- Strict production methods
- continuous quality control
- backed by experience for hundreds of worldwide installations
- proven track records
- lifetime vibration isolation for your power plant

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# References of Coal Crushers Equipped with GERB Systems
## (Selection)

Strict production methods in manufacturing spring units and VISCODAMPERS combined with continuous quality control and obviously backed by the experience for hundreds of similar installations worldwide with a proven track record, ensure that the lifetime of the GERB vibration isolation system corresponds to the lifetime of the power plant.

| Power Plant/ Owner | Type | Make | No. of Machines |
|---|---|---|---|
| Singrauli/ NTPC | Ring Granulator | TRF | 4 |
| Vindhyachal / NTPC | Ring Granulator | Pennsylvania/GRSE | 4 |
| Chandrapur / MSPGCL | Impactor | Larsen & Toubro | 4 |
| Ropar / PSEB | Ring Granulator | Elecon | 2 |
| IB-Valley / OPGC | Ring Granulator | Elecon | 4 |
| Dahanu / Reliance | Ring Granulator | Elecon | 4 |
| Rayalaseema / APGENCO | Ring Granulator | Larsen & Toubro | 4 |
| Kota CHP / RRVUNL | Ring Granulator | Elecon | 3 |
| Bakreshwar / WBPDCL | Ring Granulator | McNally/Elecon | 3 |
| North Madras / TNEB | Ring Granulator | Elecon | 6 |
| Wanakbori / GSECL | Ring Granulator | Elecon | 3 |
| Raichur / KPCL | Rotary Breaker | Elecon | 2 |
| Panipat (Tau Devilal) / HPGCL | Ring Granulator | Thyssenkrupp | 2 |
| Parichha / Reliance | Ring Granulator | TRF | 4 |
| Jindal Power, Raigarh | Ring Granulator | Larsen & Toubro / FFE | 2 |
| Chandrapura / DVC | Ring Granulator | McNally | 4 |
| Amarkantak / LANCO | Ring Granulator | Elecon | 2 |
| Nevyli / NLC | Roll Crusher / Impactor | Elecon / Techpro | 4 |
| Amarkantak / MPSEB | Ring Granulator | TRF | 2 |
| Surat Lignite # 3&4 / GSECL | Impactor | Elecon | 2 |
| Anpara - D / UPRVUNL | Ring Granulator | Larsen & Toubro | 4 |
| Adani Power / PMC | Impactor | Elecon | 2 |
| Mahan / Essar Power | Ring Granulator | Larsen & Toubro | 4 |
| Mutiara Power / Costal Energen | Ring Granulator | Thyssenkrupp | 2 |
| Bongaigaon / NTPC | Ring Granulator / Impactor | McNally | 4 |
| Barh Stage II / NTPC | Ring Granulator | TRF | 4 |

Ring granulator foundation with RCC substructure

# GERB
## worldwide


**For the design and spring support systems of coal crushers, please provide us with the following data:**

- Manufacturer, type and dimensions of coal crusher
- Total weight including coal weight
- Normal speed
- Max. unbalance forces
- Layout drawing

**If further data for the installation are available it would help us to optimize our proposal for the vibration isolation system.**


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