FRS
Fabricated Rubber Spring
Vishwaraj

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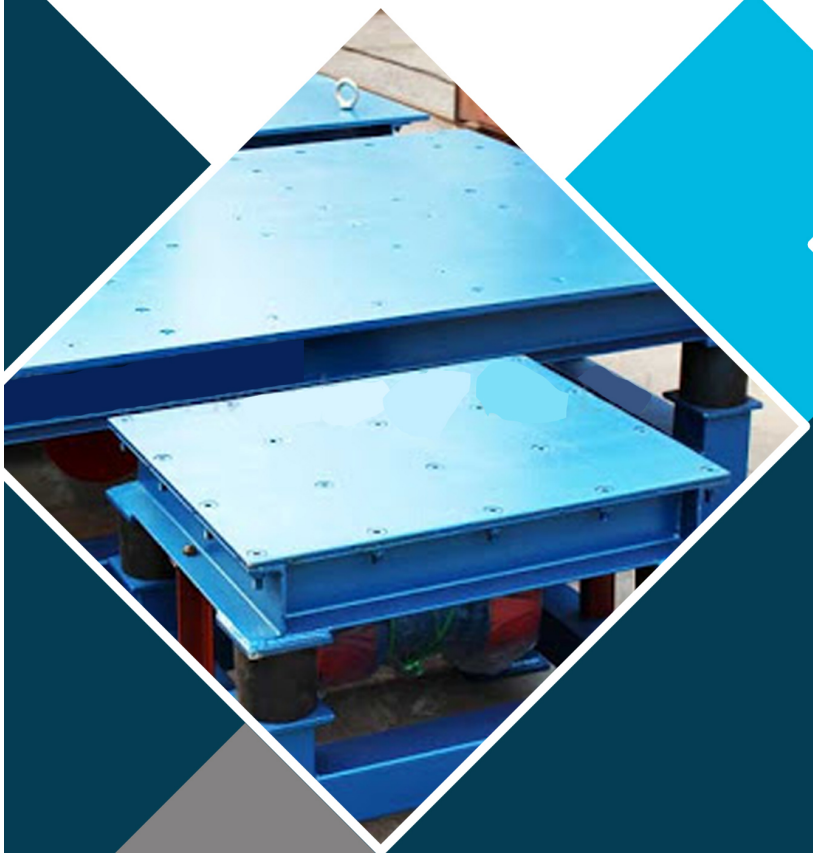

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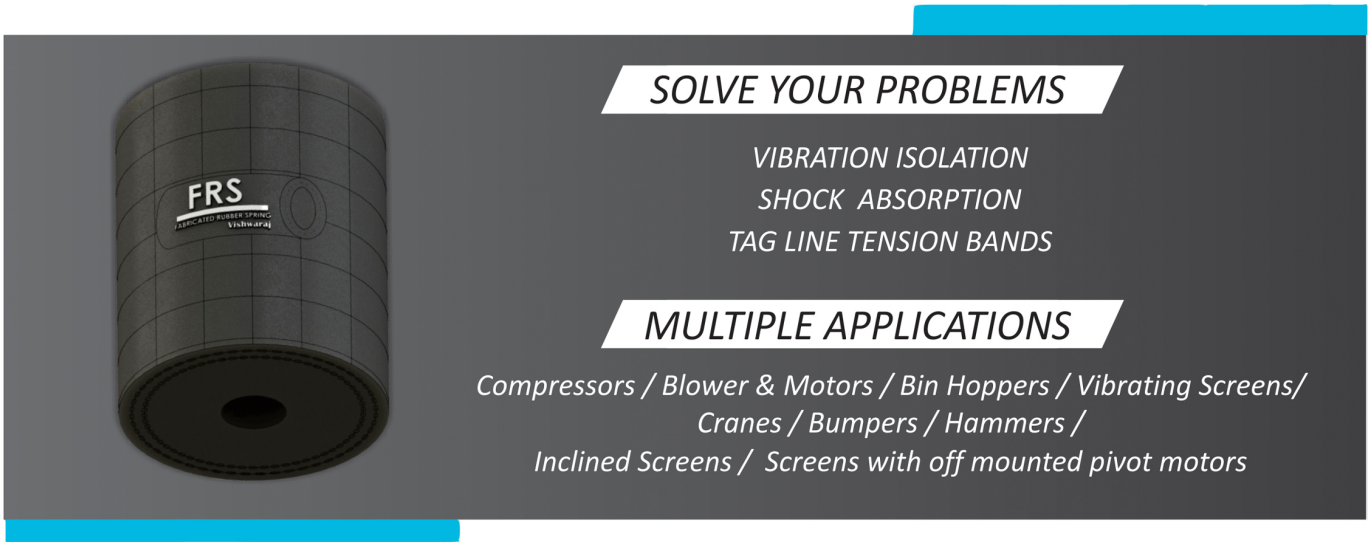
How The FRS WORKS :

Equipments and machinery in industry create vibrations , shock impacts and noise , which cause damages, disturb operations and result in costly down time . The vibrations may be created by moving / vibrating parts of the machine or may be transmitted to the equipment from the floor or the base of the machine. Isolator springs interposed between the equipment and the base absorbs the vibratory energy and releases it gradually as heat.

Shocks are created in some operations , the springs can work as dampers and absorb this shock energy as preplanned. To match specific loads, FRS are designed by varying dimensions and materials as required



Spring Selection :

Following Selection Parameters should be noted against each Spring Part Number No Load Dimension of Spring: Outer and Inner Diameters and Height in (mm / in) Maximum Allowable Stroke Length in (mm / in)
Load Related Information for Minimum Load / Maximum Load :

- Load Value in Lb / kg / kN
- Height after Compression in (mm / in)
- Natural Frequency in CPM/Hz

Conversions :

- Deflection 25.4 mm = 1 in
- Frequency 1 Hz = 60 CPM
- Load 1 kN = 101.94 kg / 1 kg = 2.204 lb

Functions,characteristics,Terminologies

Vibration Isolation

An isolator like a coil spring/rubber fabric spring prevents a vibrating source from affecting the surrounding while the vibration continues. The degree of isolation is the amount of extent of reduction in the transmission of vibration energy from the source to the surrounding . Effective isolators have low natural frequency.

Damping / Shock Absorption:

FRS can be used in shock impact applications. The impact is calculated from data of mass of falling body , its height of free fall , velocity etc. The energy released is then absorbed by the spring and a damping effect occurs. Damping is a change in load as the spring is compressed due to shock and returns to its original height. The energy absorbed is converted to heat and is not returned to source. The technical equivalent of damping is called hysteresis of a spring. The vibration isolation springs are generally of lower

Forced / Free Vibration - Disturbing/ Natural Frequency:

Vibration imposed by a strong external force is forced vibration with a disturbing frequency. When a spring is compressed /pulled and allowed to vibrate freely. It vibrates freely under its own elastic / gravitational forces and that frequency is called Natural Frequency. It is measured in Cycles / Minute - CPM or Cycles / Second - Hertz

Stroke / Strain:

Stroke is the total peak to peak movement of the machine . Strain is the percentage of stroke as compared to free height of the spring Natural Frequency. Its change in FRS has an effect like placing a spring which changes its characteristic as per load and becomes more resistant at higher loads. So the change in Natural Frequency with increasing load is better in FRS as compared to coil spring. FRS gives nearly constant Natural Frequency. This gives consistent vibration isolation.

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Resonance & Amplification Effects in FRS:

Resonance is a condition when the Forced Vibration frequency is identical with Natural Frequency. Under such condition the movement or Amplitude of the body rises uncontrollably. The system becomes unstable. The vibrating motion gets amplified if disturbing frequency is less than 1.4 times the Natural Frequency.

Spring Rate : Force Applied and Resulting Deflection in FRS:

In a metal spring deflection changes linearly with force or load, in FRS deflection or change in spring height reduces with increasing load. The Spring Rate of coil spring remains constant with load but in FRS it increases with load Fabric reinforcement enables greater load carrying capacity as compared to all rubber part.

COMPARATIVE BENIFITS

FRS benifits as compared to rubber or metal springs are highlighted below:

Low Cost : Less springs share the high load resulting in low cost.

Vibration Isolation : Can carry greater load as compared to rubber alone and due to low and nearly constant natural frequency vibration isolation is nearly constant with changing load and is excellent in the forced frequency range of 800 - 1200 cycles / minute.

Stable at Higher Compression Range : Due to fabric reinforced rubber FRS is laterally stable even at 30 - 40 % compression with slight increase in the diameter

Compact Size : FRS is compact as compared to a rubber spring due to greater load capacity.

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Special Features as compared to metalic coil spring :

Isolation of Lateral Vibration : FRS provides better isolation in all directions.

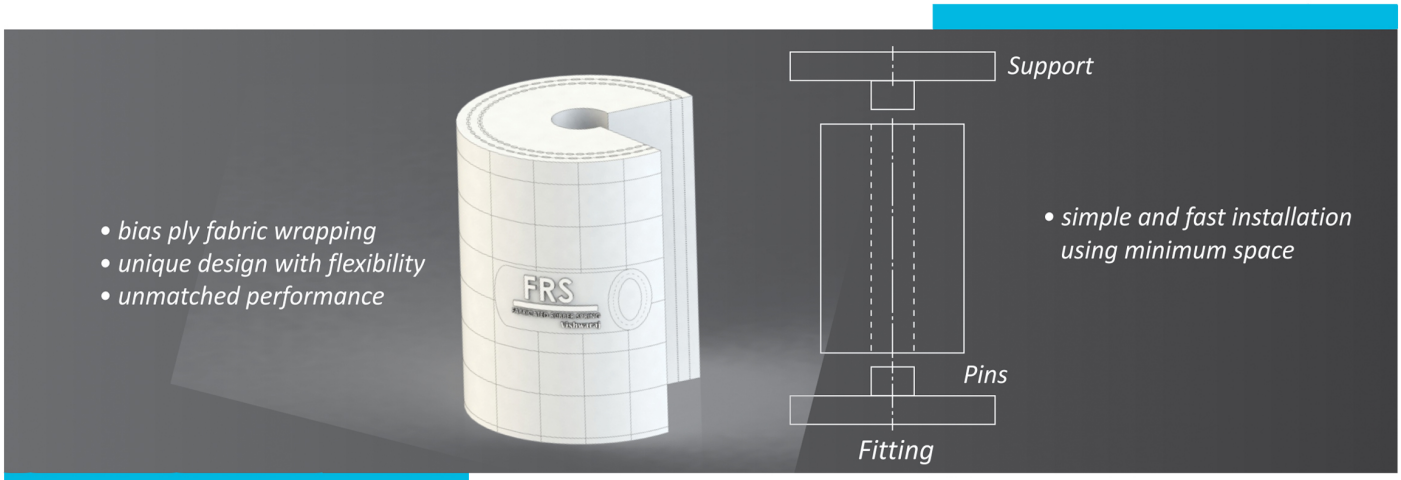
No Downtime / Machine Damage : FRS do not fail like coil spring due to rubber construction.

Maintenance : FRS do not have moving parts hence lubrication / maintenance is not required.

No Bottoming Out : Coil springs are subject to bottoming out under overloads or surge loads this creates large amount of stress in machine parts. This is avoided in FRS.

Corrosion Resistance: FRS can work in damp and corrosive environment

Noise Reduction: Noise caused by machinery vibration is transmitted as chatter in coil springs This is avoided in FRS.



IMPORTANT CONTROL PARAMETERS

Spring Compression Range in % : Please study the Minimum and Maximum Load range and corresponding Compressed Heights as compared to Free Height of the spring from the Selection Chart. The compression range varies but is normally around 15 to 25 %

Strain or Compacting Stroke Effect : Stroke to Free Height Ratio not to exceed 7.5 % Stroke may be known in some applications but can be unknown in others.

Disturbing Frequency: The stroke associated can be low/medium/high.For medium stroke the range is 800 - 1200 CPM (13 - 20 Hz) .
Over heating of FRS is possible with high stroke high forced frequency. In case of low stroke higher forced frequency is possible.

Storage : The FRS should be stored in dark area at room temperature.

Contamination : Exposure to acids, oils and hot metals should be avoided. Oil resistant springs can be provided for special cases.

Outer Cover: An outer cover should be provided during installation with proper clearance to care of increase in the spring diameter with load

Lateral Stability Vs Load : To avoid lateral instability the load capacities should not be exceeded

Temperature: The normal operating range is -40 to 57 deg C. Large deflections and disturbing frequencies can overheat and exceed the limit of permissible rubber temperature. Special springs to withstand up to 100 deg C can also be provided.

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SELECTION GUIDE

METRIC UNITS

	UNLOADED SIZE			MINIMUM SIZE				MAXIMUM SIZE			
						Natural Frequency					
FRS spring Part No	Outside Dia. mm	Inside Dia. mm	Free Height mm	Minimum Loading Kg	Compressed Height mm	CPM	HZ	Maximum Loading Kg	Compressed Height mm	CPM	HZ
FRS - 1	41	16	44	65	38	414	6.9	140	32	304	5.1
FRS - 2	41	16	89	62	76	279	4.7	140	65	253	4.2
FRS - 3	83	32	127	178	108	251	4.2	400	92	186	3.2
FRS - 4	76	25	102	187	86	174	2.9	400	74	161	2.7
FRS - 5	76	25	76	211	65	293	4.9	410	55	162	3.6
FRS - 6	102	51	152	236	130	216	3.6	490	110	165	2.7
FRS - 7	89	25	152	253	130	223	3.7	540	110	165	2.8
FRS - 8	114	51	152	320	130	235	3.9	750	110	156	2.6
FRS - 9	114	25	178	498	151	213	3.6	1130	129	158	2.6
FRS - 10	152	35	203	700	184	206	3.43	1600	163	148	2.45
FRS - 11	152	25	203	990	173	191	3.18	2100	147	144	2.4
FRS - 12	191	89	254	1005	216	176	2.9	2325	184	142	2.3
FRS - 13	140	51	178	700	151	181	3.01	1490	129	175	2.9
FRS - 14	120	50	150	350	130	208	3.5	705	110	160	2.7
FRS - 15	165	76	203	680	173	195	3.25	1490	147	144	2.4
FRS - 16	152	25	152	780	132	220	3.8	1800	110	171	2.8
FRS - 17	152	25	254	1025	216	179	3.8	2050	185	145	2.35
FRS - 18	165	51	203	880	172	186	3.1	1950	147	160	2.7
FRS - 19	191	89	203	1020	172	180	2.97	2290	147	164	2.73
FRS - 20	203	89	305	1200	259	158	2.6	2610	221	116	1.92
FRS - 21	203	51	203	1690	173	181	3.3	3735	147	165	2.75
FRS - 22	229	51	203	2315	173	182	3.3	5065	147	151	2.5
FRS - 23	254	51	356	2445	302	148	2.45	5445	259	110	1.85
FRS - 24	254	51	203	2935	173	199	3.32	6665	147	159	2.65
FRS - 25	279	51	152	3645	130	220	3.65	8890	110	204	3.4
FRS - 26	279	51	203	3690	173	195	3.25	8715	147	138	2.31

DATA BASE

Number of springs and the load on each isolating spring considering the load of machine and location of center of gravity. The compression stroke and compression % to be within desired limits. What is desired isolation %. To ensure that with given disturbing frequency and natural frequency vibration amplification and resonance should not occur.

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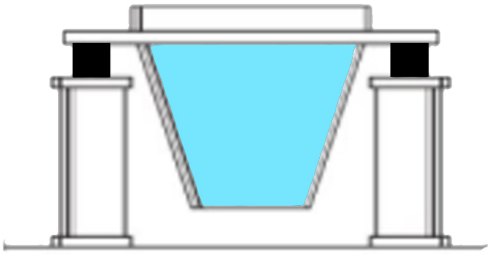
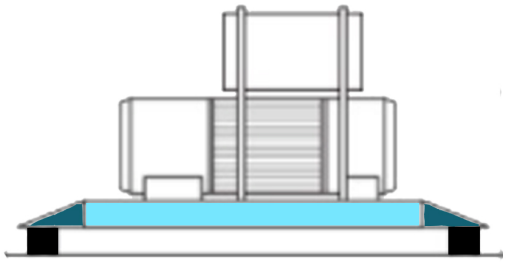
APPLICATION

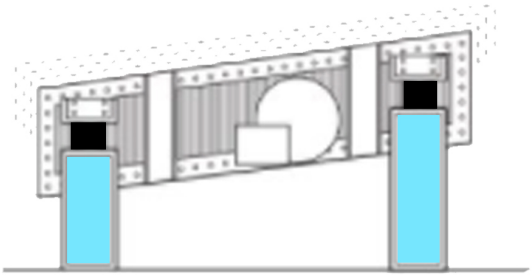
Bin Hopper



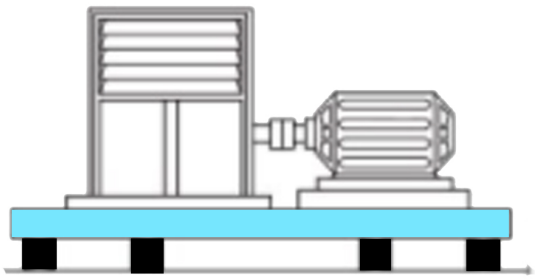
Compressor



Vibrating Screen



Blower and Motor



Our Other Products:

VRi AUTO AIR SPRINGS

VibraSof

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