Roll Grinders

**What are Roll Grinding machines and where are they generally located?**

Roll Grinding Machines or Roll Grinders are high precision machines typically installed in steel, aluminium and paper mills and precision machine shops to grind smooth and textured rolls to very tight tolerances.

On first appearance they look rather like a lathe but in reality they are required to achieve much tighter tolerances as the rolls that are produced by the grinder dictate the accuracy of the metal or paper that will be produced through the rolls in the factory. Rolls can be up to 10 meters in length weighing up to 400 tonnes.

Roll grinders are often required to offer over 97% availability in order to keep the rolling mill production lines in operation but in many cases they need to be installed in environments where there is significant risk of shock and vibration within ground affecting the machine’s performance.

Such disturbances can come from: heavy rolling mill machinery, lathes, turning and milling machines, impact machinery, materials handling equipment such as fork lift trucks and overhead gantry cranes and even heavy items being accidentally dropped onto the ground nearby. Any of these disturbances could lead to a reduction in accuracy or even causing marks and blemishes on the roll.
Precision levelling products for industrial machinery

Having manufactured high quality anti vibration and precision levelling mountings for more than 50 years, Farrat has developed a rich expertise in this field. Our durable and high performance range of machine mounts has been developed over time using a combination of experience, customer feedback and cutting edge innovation we are able to produce solutions to the most bespoke applications. These products include a complete range of anti vibration materials, anti vibration washers and anti vibration and levelling mounts. Our products are used in a wide variety of applications, from power presses to roll grinders and printing presses. These applications often involve large, complex and expensive pieces of capital equipment which are consistently operating at high speeds and require a high level of precision in their output and minimal downtime.

Comprehensive range of solutions
Design Consideration 01:

**Shock and Vibration affecting operating performance**

Disturbance from shock and vibration can lead to a reduction in accuracy or even causing marks and blemishes on the workpiece. How then can you ensure that your very high value investment operates at maximum performance and is protected from damage?

Farrat can assist the design team throughout the planning and installation process so please feel free to contact us to discuss your project requirements right from the start.

We strongly recommend establishing the sources and characteristics of any shock and vibration in the ground where the machine is to be located:

- If the facility is in operation then this can be done by undertaking a vibration survey to establish the amplitudes and frequencies of the vibration over a realistic operating period (e.g. 24 hour log at key locations). It should be noted that the characteristics may differ at ground level and at pile cap / foundation base level.

- If a survey is not possible because the facility is not yet built or changes are anticipated to equipment or operating conditions then it may be possible to make predictions by characterising the shock and vibration levels of planned equipment in the facility, their proximity from the machine and estimating the natural frequency of the ground.

- Farrat can assist with surveys and predictions and our dedicated Isolated Foundation section provides much more information on characterising and mitigating shock and vibration.

Depending on the nature and frequencies of disturbing shock and vibration then this will dictate which solutions are suitable.

**Solution 1.1**

**Isomat Isolated Foundation System**

An Isomat Isolated Foundation System involves the creation of a reinforced concrete foundation pit which is then fully lined with vibration isolation materials. A reinforcement cage is then placed into the pit and it is filled with concrete to create an isolated inertia block onto which the machine can be placed.

**Advantages**

- An Isolated Foundation is generally the most effective way of protecting high value machines and their operating performance from shock and vibration disturbance (Passive Isolation).

- Effective isolation of disturbing frequencies above 12Hz.
Isomat Isolated Foundation System (Cont)

- Effective isolation of horizontal disturbing frequencies above 4Hz
- Can be tuned to avoid resonance with any known disturbing frequencies
- An ideal blend of vibration isolation and damping
- Often used as a precautionary measure in case of unexpected shocks and future facility alterations
- Isomat has a proven track record in a very wide range of industrial applications since 1977

- An economical solution
- Simplified foundation design
- Easy to install
- Long performance lifetime
- Maintenance free

Solution 1.2

Farrat FSL Coil Spring and FV Damper Isolated Foundation System

An Isolated Foundation system generally involves the creation of a reinforced concrete foundation block which is then placed onto Coil Spring Isolators and if necessary FV Viscous Dampers.

Advantages

- An Isolated Foundation is generally the most effective way of protecting high value machines and their operating performance from shock and vibration disturbance (Passive Isolation).
- Effective isolation of disturbing frequencies between 6 and 12Hz
- Equal vertical and lateral performance
- High deflections can be accommodated with pre-compression

Disadvantages

- Risk of low frequency vibration amplification due to resonance
- Viscous dampers will be required if shock disturbance is likely
- Larger, deeper, more complicated and expensive foundations than Isomat systems are generally required
- Tilting of the machine and foundation outside permissible machine limits may occur due to differential loadings and load transfers
- Excessive foundation movement during run up or down due to low natural frequency
- High cost of equipment, foundation design and construction
- Longer isolation equipment delivery lead times and installation time
- Periodic inspection and maintenance is required of the coil springs and dampers

Suggested Farrat Isolator System: Isomat IMNR50-50
Solution 1.3

Isofoam LVI Lateral Vibration Isolation

An Isofoam LVI Laterally Isolated Foundation is created by lining the perimeter walls of a foundation with Farrat Isofoam high performance perimeter isolation material. Different stiffness grades are required depending on depth of foundation assuming the block is to be cast as one single pour.

**Advantages**

- Required where full base isolation system is not feasible due to cost and or foundation stiffness requirements
- Effective attenuation of lateral floor borne disturbing vibration
- An economical solution
- Simplified foundation design
- Easy to install
- Long performance lifetime
- Maintenance free

**Disadvantages**

- Limited effectiveness against vertical disturbing vibration

Solution 1.4

Farrat Squaregrip Anti-vibration / Damping pads between the machine and the floor

**Advantages**

- Cheapest option where the risk of vibration and shock disturbance is deemed to be limited
- Squaregrip's high load capacity, minimal deflection and high damping characteristics have been successfully used for decades to improve machine performance
- Highly effective at damping chatter vibrations within the machine itself

**Disadvantages**

- Limited vibration isolation effectiveness
- Not advisable for modular or long bed machines where alignment and rigid integration with the foundation is critical
Fixing and levelling

The connection between the machine and the floor or foundation is critical to a machine’s performance.

**Farrat Machine Mounts are used to:**
- Provide easy and accurate installation and levelling
- Ensure the machine has a stable and uniform support to maximise machine accuracy and performance and to reduce the risk of degradation from machine bed misalignments, internal stresses and flex
- Overcome irregularities in floor slabs or foundations
- Increase vibration damping of the machine
- Provide layout flexibility

Roll Grinders should generally be rigidly anchored to the foundation or floor. Such a connection is achieved with Bolt-Through (BT) mounts.

**Bolt-Through BT: Bolting down is usually required for:**
- Top heavy machines
- Certain long bed machines
- Machines with high inertia forces
- Machine connection to an isolated or specialist foundation. A rigid connection to a foundation inertia block takes full advantage of the mass damping effect of a machine plus foundation

It should be noted that unless levelling elements such as Farrat Wedge Levelling Elements or Levalators are used there is a risk that bolting the machine down could cause distortions in the machine bed which may affect its performance.
Solution 2.1

Farrat Wedge Levelling Elements

Farrat Wedge Levelling Elements are precision machined screw driven vertical rise wedge adjustment machine mounts ideally suited to stiff, accurate and efficient machine installations and the augmentation of machine performance by:

- Ensuring accurate alignment, rigidity and stability of machine
- Providing high vertical stiffness to prevent machine bed deflections occurring under dynamic load distributions
- Enabling high bolt tensions without bed distortions
- Increasing the vibration damping and bed reinforcing effect of the foundation
- Offering the facility to re-align machines with minimum production loss

Solution 2.2

Levalators

Levalators provide the highest level of equipment support and stiffness for total machine to foundation integration maximising the vibration damping and bed reinforcing effect of the foundation. They improve performance by increasing alignment accuracy, rigidity and stability with the following features;

- Low overall height to ensure a low machine centre of gravity
- The fixing bolt passes right through the centre line of the mount allow high bolt tensions through the centre of the mount without bed distortions
- Accurate precision alignment with micro-meter type height adjustment range of 12mm
- Spherical seating corrects misalignment and complex angles between machine and foundation
- High vertical stiffness to prevent machine bed deflections occurring under dynamic load distributions
- Large contact support area with foundation surface
- Systemised, predictable and economical installation procedures to simplify machine installations including pre-grouted prior to equipment installation
- Offering the facility to re-align machines with minimum production loss
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