

CHAPTER-VIII

Vibration control

Causes of Vibration

- Internal Excitation
 - Mechanisms and Assemblies,
 - Unbalanced mass,
 - Misalignment,
 - Looseness
- External Excitations
 - Motion
 - Forces
 - etc.

CAUSES OF VIBRATION IN MACHINES

- There are various sources of vibration in an industrial environment :
 - (a) Impact processes such as pile driving and blasting.
 - (b) Rotating or reciprocating machinery such as engines, compressors and motors.
 - (c) Transportation vehicles such as trucks, trains and aircraft.
 - (d) Flow of fluids through pipes and without pipes.
 - (e) Natural calamities such as earthquakes.

The harmful effects of vibrations

- (a) Excessive wear of bearings.
- (b) Formation of cracks in machines, buildings and structure, etc.
- (c) Loosening of fasteners in mechanical systems.
- (d) Structural and mechanical failures in machines and buildings.
- (e) Frequent and costly maintenance of machines.
- (f) Electronic malfunctions through failure of solder joints.
- (g) Abrasion of insulation around electric conductors, causing soots.
- (h) The occupational exposure of humans to vibration leads to pain, discomfort and reduction in working efficiency

Vibration Control

- **Vibration reduction at the source**,
 - Tuning: Modification of Inertia
- **Isolation by breaking the path**, and
Available Isolators: - Metal Springs,
 - Air Springs,
 - Elastic Mounts
 - Resilient Pads
- **Vibration elimination at the receiving end**
 - Design of Undamped Dynamic Absorbers

VIBRATION CONTROL

- The vibration can sometimes be eliminated on the basis of theoretical analysis. However, in eliminating the vibration may be too high.
- Therefore, a designer must compromise the manufacturing costs involved between an acceptable amount of vibration and a reasonable manufacturing cost.
- The following steps may be taken to control vibrations

Vibration control

- (a) The first group of methods attempts to reduce the excitation level at the source. The balancing of inertial forces, smoothening of fluid flows and proper lubrication at joints are effective methods and should be applied whenever possible.
- (b) A suitable modification of parameters may also reduce the excitation level. The system parameters namely inertia, stiffness and damping are suitably chosen or modified to reduce the response to a given excitation.
- (c) In this method, transmission of path of