Machine Alignment
For Maintenance Personnel in
Drinking Water and Wastewater Facilities
In-Line is On-Line

- Multiplied by misalignment:
  - Vibration
  - Wear
  - Energy Usage

- Proper Alignment Increases Reliability
Geometry of Alignment

• Parallel,
  – Side to Side

• Elevation,
  – Up & Down

• Axial
  – Face to Face Angle
Geometry of Alignment

Figure 8 Offset and Angular Misalignment
Parallel Misalignment

Parallel Offset, Vertical or Horizontal
Angular Misalignment

Angular Offset, Horizontal or Vertical
Thermal Growth
Special Circumstances of Alignment

- Installation anomalies
- Thermal Growth
- Soft Foot
Installation anomalies

- Foundation Level and Plumb?
- Anchor bolts solid?
- Grout

Figure No. 2 Full Bearing fitting spacer blocks and way base jack bolts
Common Base Design, Up To 500HP
Common Base Design, Up To 500HP

Machined mounting flats

Machined flats mounting flats up to 5° elevation

Elevation

For attachment to existing base in good condition
Common Base Design

Between 500HP & 1000HP

It is more common to see machines attached directly to the flanges of I-Beams mounted cross-frame, Rather than using plate
One type of softfoot is called “short foot” or “parallel softfoot”. This problem is solved by adding shims to the “short foot”.

A second type of softfoot occurs as “angled foot”. It can be solved by adding shims under the foot as shown to the right, but it is better to correct the angle of the foot or making a steel wedge.
Soft Foot Problems

• Interferes with repeatability of positioning during the alignment process

• Flexing of motor or gearbox changes internal clearances
  – Bearing wear
  – Seal wear
Soft Foot
Soft Foot
Special Circumstances of Alignment

- Simple Driver & Machine
  - Motor and pump
Special Circumstances of Alignment

• Offset Mounting Alignment
  – Universal joint drive shafts (Cardan shafts)
Special Circumstances of Alignment

- Equipment Trains
  - Motor, gearbox, driven shaft
Special Circumstances of Alignment

- Deciding which equipment to move.
  - Default is the motor
  - Anything with piping is complicated to move
Special Circumstances of Alignment

• Fans:
  – Long shafts
  – Where is the weight?
Special Circumstances of Alignment
Special Circumstances of Alignment
Alignment Equipment

• Mechanical
  – Dial Indicators
Alignment Equipment

- Mechanical
  - Feeler Gauges
  - Straight Edge
Alignment Equipment

- Laser Alignment
Methods of Alignment

• Face & Rim
Methods of Alignment

Reverse Dial Indicator
The Wrap-Up

- Good Foundation
- Plumb & Level
- Geometry
  - Angular & Parallel
  - Thermal Adjustment
- Soft Foot
- Special Circumstances
- Equipment & Method