

## Phase analysis: Making vibration analysis easier

By Tony DeMatteo, 4X Diagnostics, LLC

Figure 1. Vibration Waveform and Spectrum

Figure 2. Engine tuning using a timing light is phase analysis.

Figure 3. Absolute Phase Measurement

Figure 4. Absolute phase is calculated between the tach signal and vibration waveform.

Figure 5. Relative Phase Measurement

Figure 6. Relative Phase Calculated Between Two Vibration Waveforms

Figure 7. Pruftechnik VibXpert 2-Channel Vibration Analyzer

Figure 8. A phase shift between the foot and mount may indicate soft foot.

Figure 9. Phase identifies in-plane or twisting bearing motion.

Figure 10. Horizontal to Vertical Phase Shift of about 90 Degrees Confirms Unbalance

Figure 11. A phase shift between bolted joints indicates looseness.

Figure 12. Phase Data Indicates Parallel Shaft Misalignment

Figure 13. Shaft Operational Deflection Shape

Figure 14. Vertical Pump Operational Deflection Shape Structure Drawing

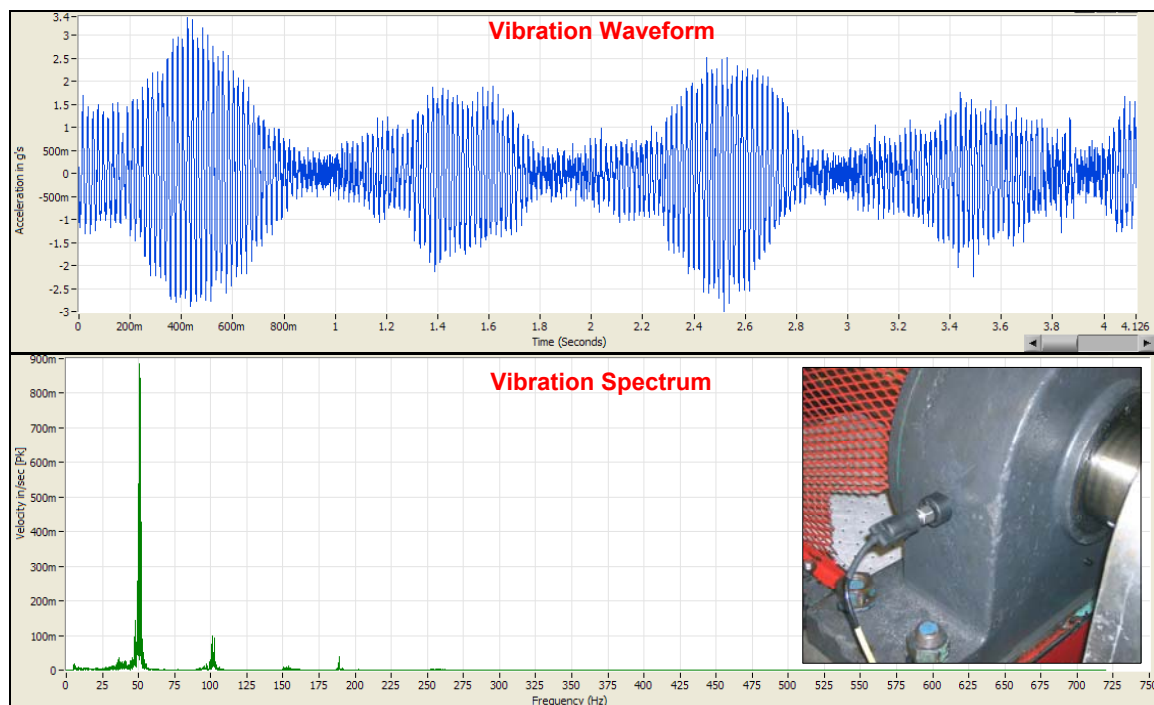


Figure 1. Vibration Waveform and Spectrum

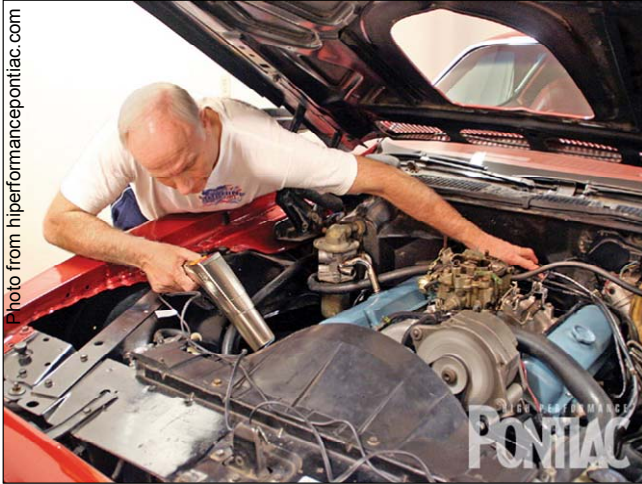


Figure 2. Engine tuning using a timing light is phase analysis.

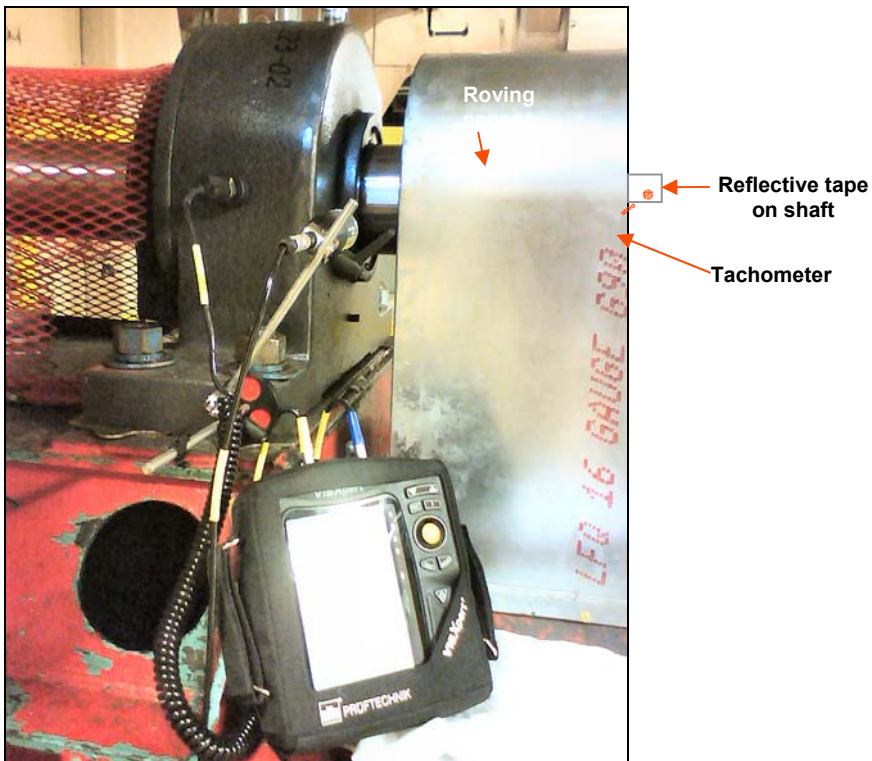


Figure 3. Absolute Phase Measurement

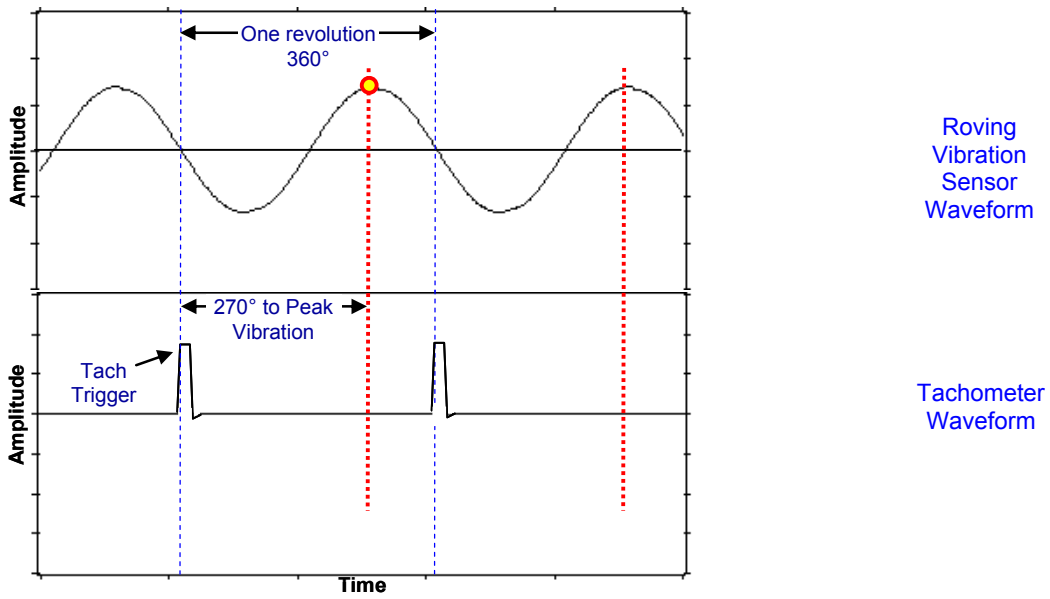


Figure 4. Absolute phase is calculated between the tach signal and vibration waveform.



Figure 5. Relative Phase Measurement

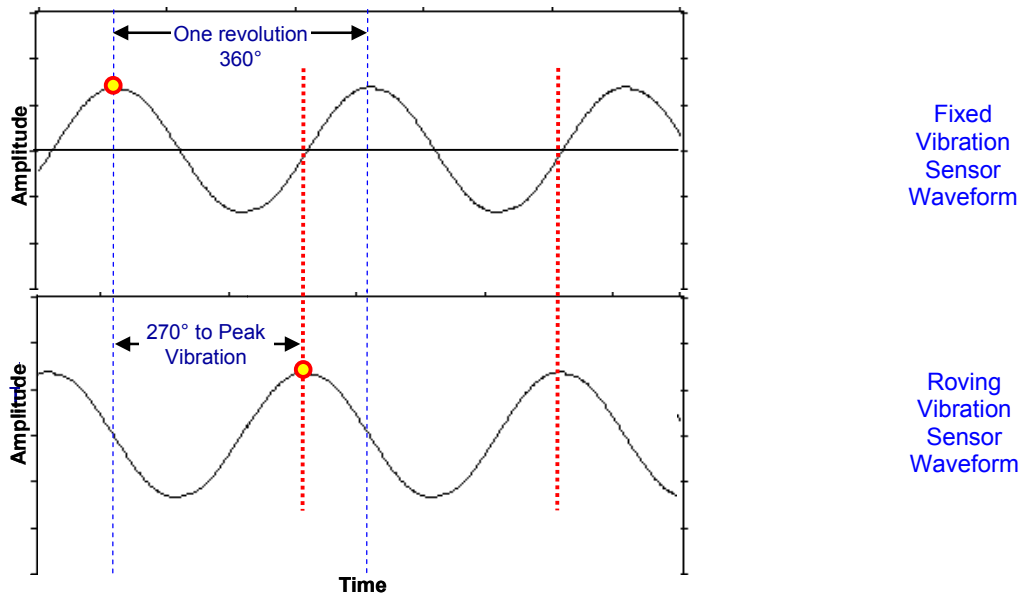


Figure 6. Relative Phase Calculated Between Two Vibration Waveforms



Figure 7. Pruftechnik VibXpert 2-Channel Vibration Analyzer

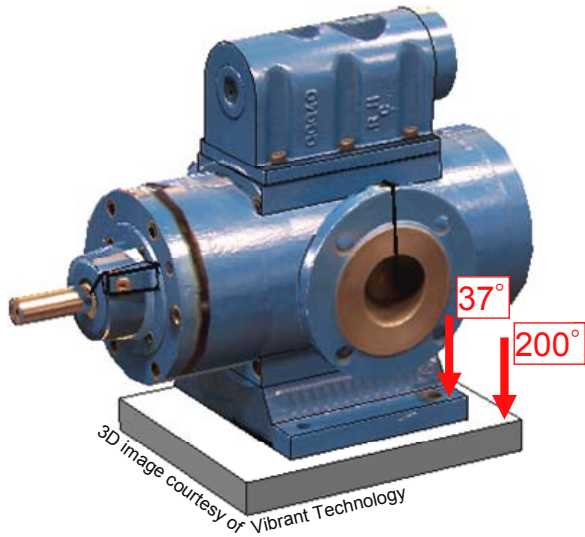


Figure 8. A phase shift between the foot and mount may indicate soft foot.

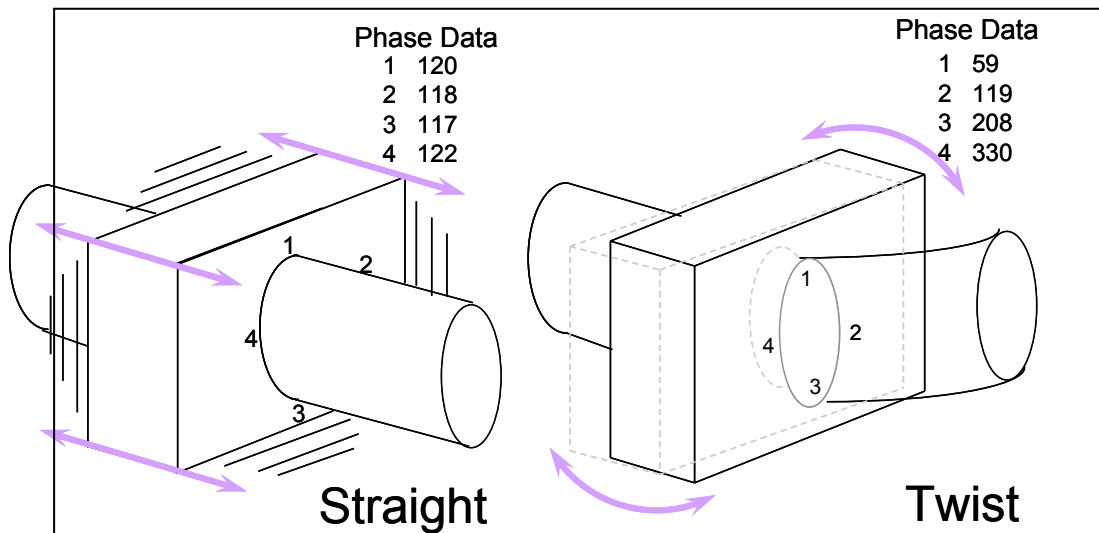


Figure 9. Phase identifies in-plane or twisting bearing motion.

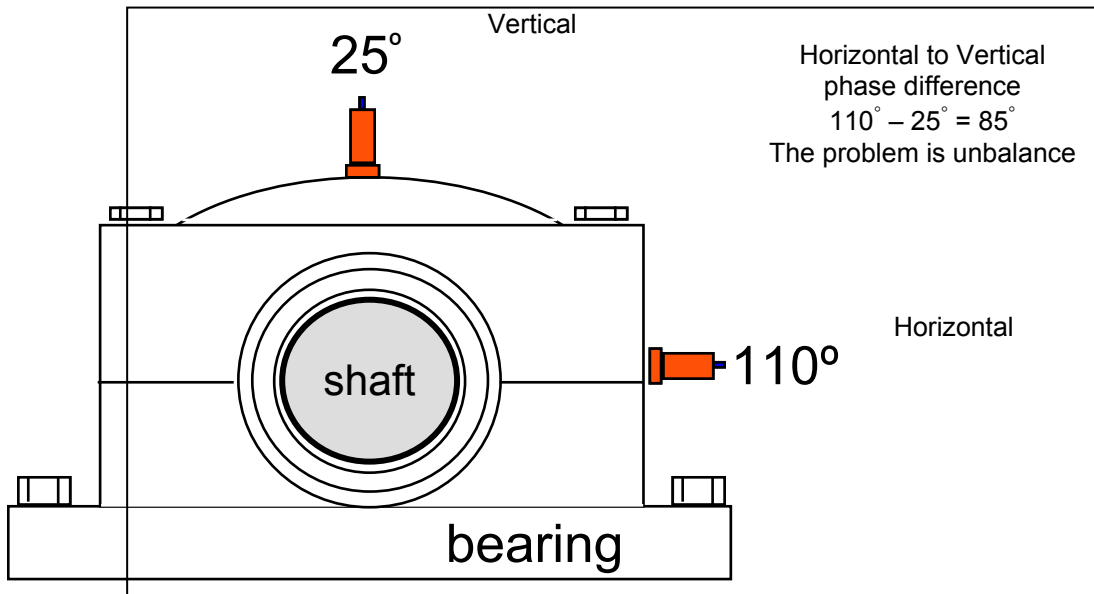


Figure 10. Horizontal to Vertical Phase Shift of about 90 Degrees Confirms Unbalance

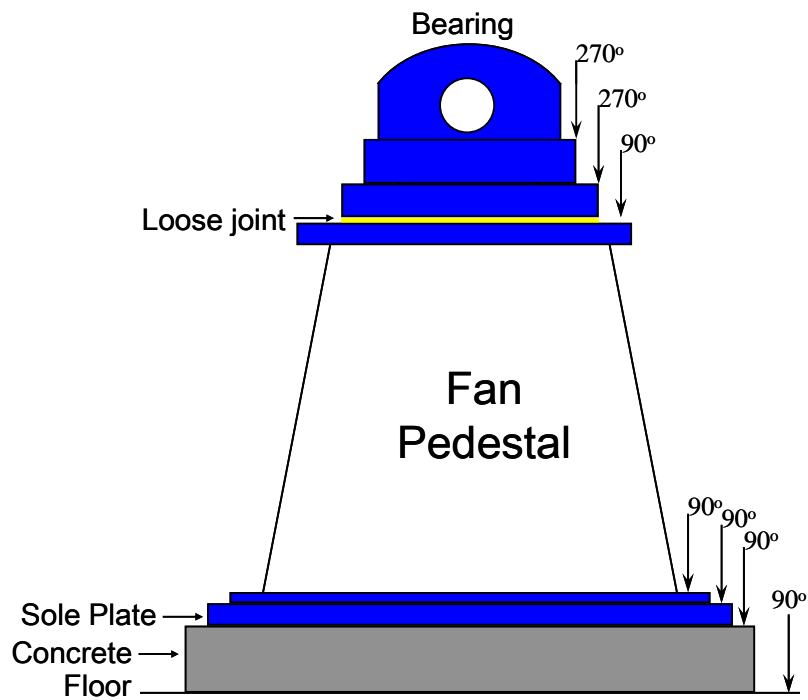


Figure 11. A phase shift between bolted joints indicates looseness.

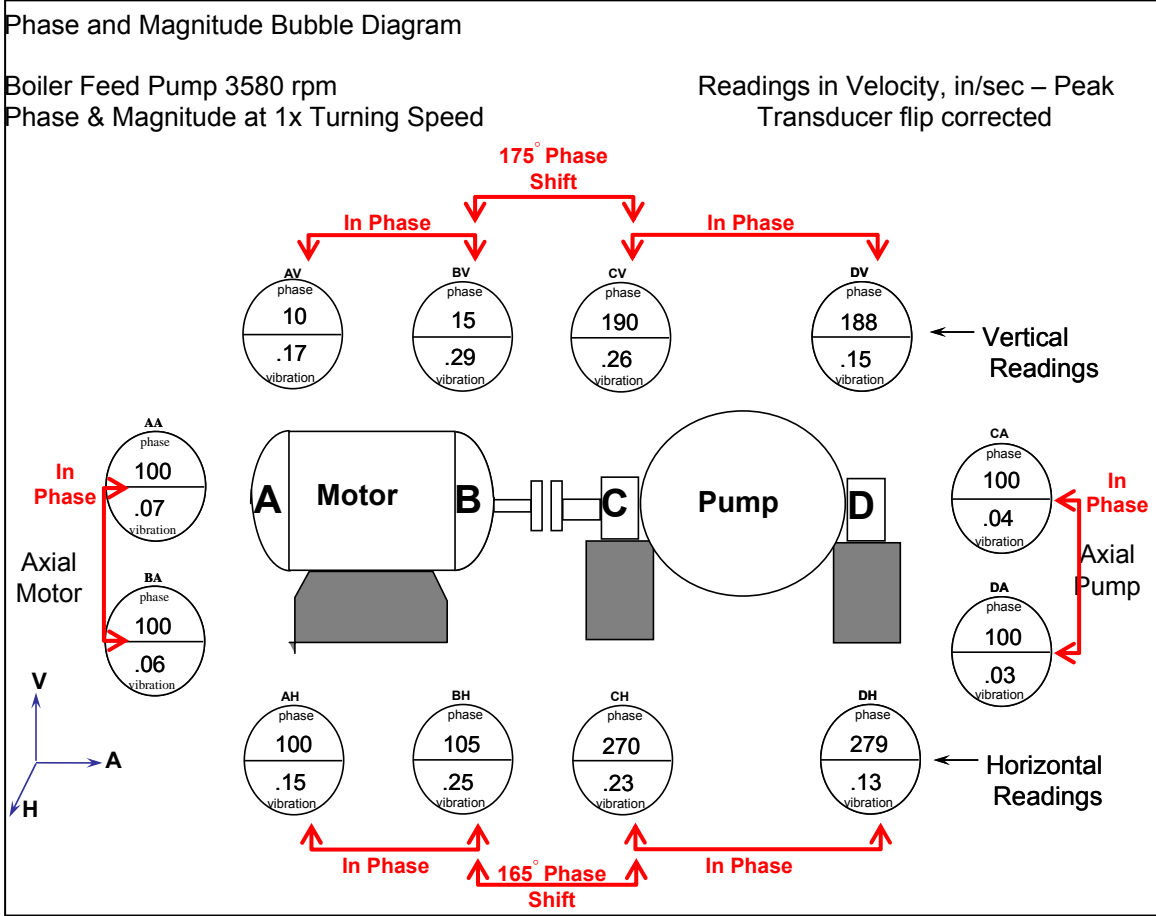


Figure 12. Phase Data Indicates Parallel Shaft Misalignment

| Bearing # & Direction | Displacement (Mils P-P) | Phase (Degrees) |
|-----------------------|-------------------------|-----------------|
| 1X                    | 1.72                    | 355             |
| 1Y                    | 1.17                    | 76              |
| 2X                    | 3.08                    | 255             |
| 2Y                    | 2.51                    | 40              |
| 3X                    | 1.26                    | 42              |
| 3Y                    | 2.56                    | 123             |
| 4X                    | 2.37                    | 305             |
| 4Y                    | 1.36                    | 83              |
| 5X                    | 2.62                    | 355             |
| 5Y                    | 0.93                    | 83              |
| 6X                    | 0.65                    | 63              |
| 6Y                    | 0.85                    | 210             |

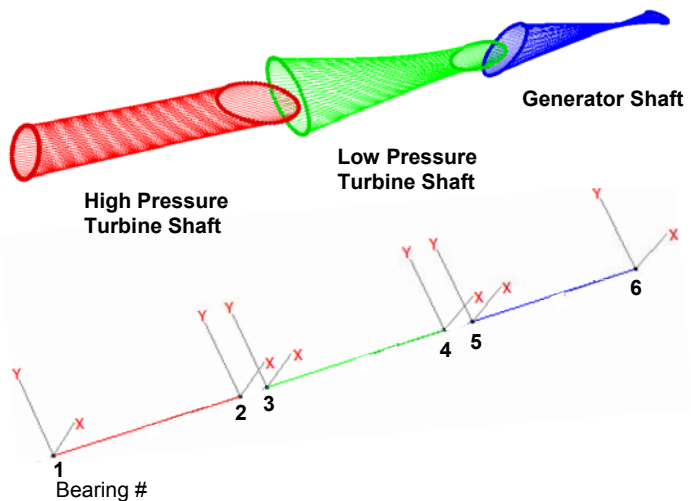
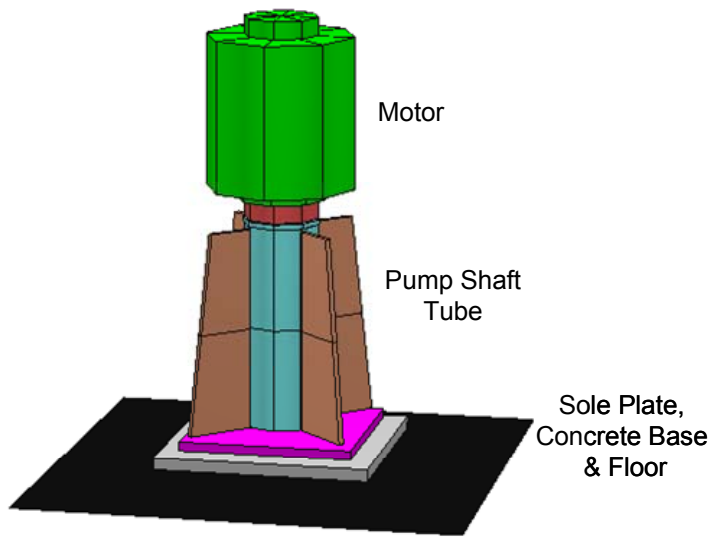


Figure 13. Shaft Operational Deflection Shape



*Figure 14. Vertical Pump Operational Deflection Shape Structure Drawing*