

VIBRATION SOLUTIONS

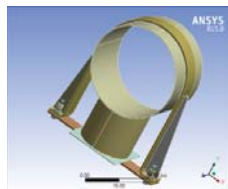
by Piping Technology & Products, Inc.



Source	Potential Issues	PT&P Solutions
Process Changes to Increase Revenue	<ul style="list-style-type: none"> • Increase vibration from flow • Increased temperature leading to poorly managed stress 	<ul style="list-style-type: none"> • Add stiffness via hold-downs • Add vibration dampening to absorb vibration energy • Redo stress engineering
Poorly Managed Pipe Stress	<ul style="list-style-type: none"> • Piping System not properly supported in hot condition 	<ul style="list-style-type: none"> • Redesign system to accommodate thermal growth
Corrosion	<ul style="list-style-type: none"> • Reduction in piping thickness increases piping flexibility 	<ul style="list-style-type: none"> • Add stiffness via hold-downs and vibration dampening • Replace piping



HOLD-DOWNS



VIBRATION DAMPENING MATERIALS



SPRING BASED VIBRATION DAMPENING



Piping Technology & Products, Inc.



U.S. Bellows, Inc.



SWECO Fab. Inc.



Pipe Shields Inc.

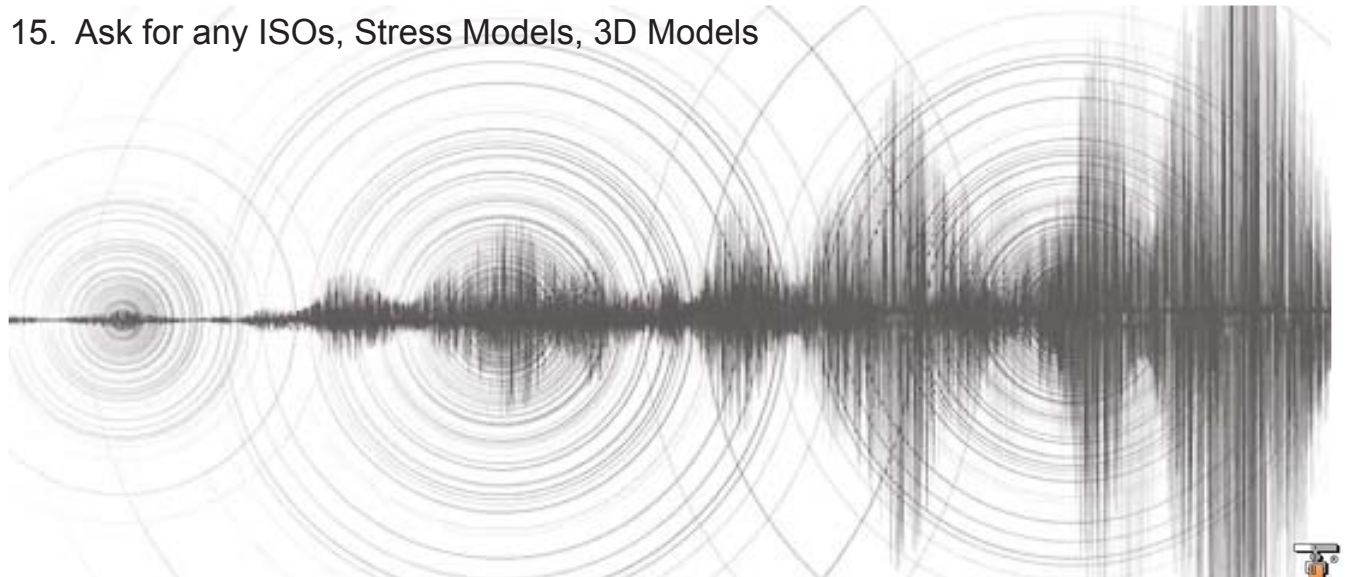


Anchor/Darling Enterprises, Inc.



Vibration Checklist

1. Unit Type
2. Line Type
3. Pipe Specifics – Diameter, Material, Thickness
4. Process Specifics – Media, temperature, pressure, equipment
5. Changes that have been Made to Process – Pressure, Media, Temperature (purpose of changes)
6. Other changes that have been to the line including new equipment, new valves...
7. Pipe Support Spacing – any notable issues with under supported areas
8. Condition of Equipment Supporting structure and tightness of equipment bolting
9. Check Pipe Supports for Clamp Bolting/Nut Tight Fit
10. Piping Deterioration – check issues with reduced pipe thickness and other issues due to corrosion or deformation
11. Estimated Frequency and Amplitude of Vibration at:
 - a. Main Piping Line
 - b. Moving Equipment
 - c. Small Bore Connections
12. Other elements on line that are vibration – equipment, Tanks...
13. Estimate length of line
14. Take as many pictures of overall line as possible
15. Ask for any ISOs, Stress Models, 3D Models



Pipe Stress / Vibration Case Study



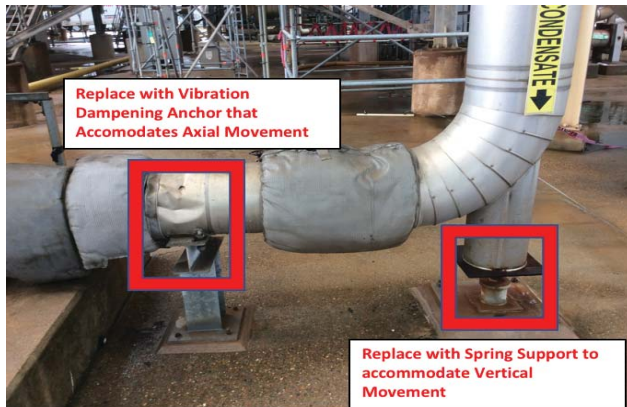
Customer Experience:
Strong Vibration on
Flash Tank



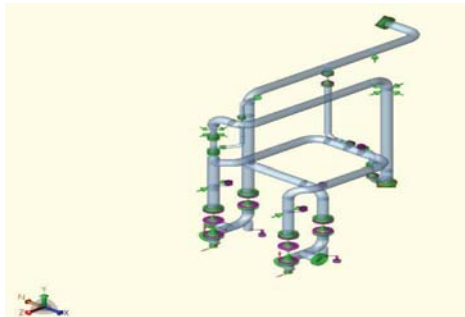
PT&P Assessment Showed Poorly
Managed Thermal Growth Leading
to Insufficient Support of Piping
and Damage to 3 of 6 Concrete
Foundation for Tank Supports



PT&P Recommends Quick Fixes to Control Vibration in Short Term



PT&P Assessment Showed Poorly Managed Thermal Growth Leading
to Insufficient Support of Piping and Damage to 3 of 6 Concrete
Foundation for Tank Supports

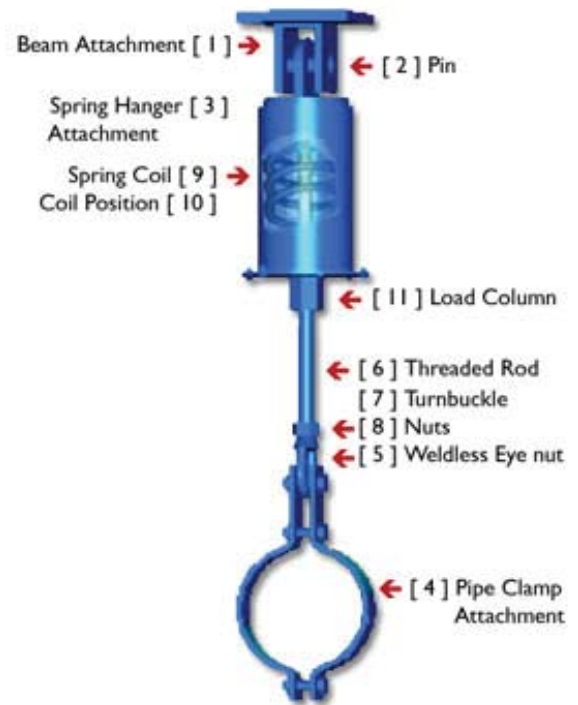


PT&P Recommends Long Term
Fix to Redo Pipe Stress Analysis
and Make Changes Accordingly
(Optional)



10-point operational integrity check list when inspecting spring supports in the field:

- ✓ Beam attachment
- ✓ Beam attachment pin
- ✓ Spring hanger attachment
- ✓ Load flange movement
- ✓ Spring coil corrosion
- ✓ Check load indication for hot load
- ✓ Note load deviations
- ✓ Turnbuckle/locknuts
- ✓ Threaded rod/weldless eye, hex nuts
- ✓ Pipe clamp attachment pin



Contact Field Services: (713) 992-7048

24/7 Emergency: pipingtech.com/emergency

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