



## ENGINEERING SERVICES – ACOUSTICAL ANALYSIS

Tech Transfer has extensive experience in conducting acoustical pulsation analysis for reciprocating compressors and pumps. Our computer analysis results match field data. TTI's pulsation bottle and package designs will insure acceptable field vibration with practical solutions.

<p><b>1. API 618 PULSATION ANALYSIS</b></p> <ul style="list-style-type: none"> <li>• Compressor</li> <li>• Dynamic Model Scrubber</li> <li>• Bottle &amp; Cooler Models</li> <li>• Piping System Model</li> <li>• Dynamic Pulsation Simulation</li> <li>• Multiple Units &amp; Conditions</li> <li>• Evaluation Per API 618</li> <li>• Corrective Recommendations</li> </ul>	<p><b>2. API 618 MECHANICAL ANALYSIS</b></p> <ul style="list-style-type: none"> <li>• Cylinder &amp; Bottle Models</li> <li>• Scrubber &amp; Piping Models</li> <li>• Finite Element Dynamic Analysis</li> <li>• Evaluation Per API 618</li> <li>• Corrective Recommendations</li> </ul>	<p><b>3. PULSATION SHAKING FORCES</b></p> <ul style="list-style-type: none"> <li>• Dynamic Pulsation</li> <li>• Shaking Forces</li> <li>• Reduction</li> <li>• Recommendations</li> <li>• Pipe Support Locations &amp; Design</li> <li>• Scrubber Support Design</li> </ul>
<p><b>4. PRESSURE DROP CALCULATIONS</b></p> <ul style="list-style-type: none"> <li>• Calculate Component Pressure Drops</li> <li>• Evaluation Per API 618 Limits</li> <li>• Evaluate Compressor Performance</li> </ul>	<p><b>5. PULSATION BOTTLE DESIGN</b></p> <ul style="list-style-type: none"> <li>• Preliminary Sizing &amp; Configuration</li> <li>• Pulsation Reduction Performance</li> <li>• Choke Tube &amp; Baffle Designs</li> <li>• Fabrication Recommendations</li> </ul>	<p><b>6. PIPING SYSTEM DESIGN</b></p> <ul style="list-style-type: none"> <li>• Finite Element Model</li> <li>• Pulsation Evaluation Per 618</li> <li>• Shaking Force Calculations</li> <li>• Pipe Support Locations</li> <li>• Pipe Support Design</li> <li>• Recommended Modifications</li> </ul>

Tech Transfer's success rate with pulsation analysis is unparalleled in the reciprocating compressor industry.

Tech Transfer initially developed its pulsation analysis technology to support its field vibration analysis of compressors. Today, Tech Transfer is a world leader in the pulsation and vibration analysis of reciprocating compressors. We perform pulsation analyses in complete compliance with API 618 and all of its options for stress and dynamic analysis.

Mechanical natural frequency analysis is performed with true Finite Element programs and the results match our field readings. Our knowledge of cylinder stiffness, bottle design and pipe support methods were developed from field vibration analysis. On many occasions, Tech Transfer has been given the opportunity to field-verify our pulsation levels and mechanical natural frequencies and our calculations match field readings.

The following analysis plots illustrate that near acceptable pulsations (3.3 psi) can generate excessive shaking forces (580 lbs) at a higher frequency of 10X operating speed. Proper analysis techniques will detect and correct such problems.



Figure .5: Predicted Pulsation

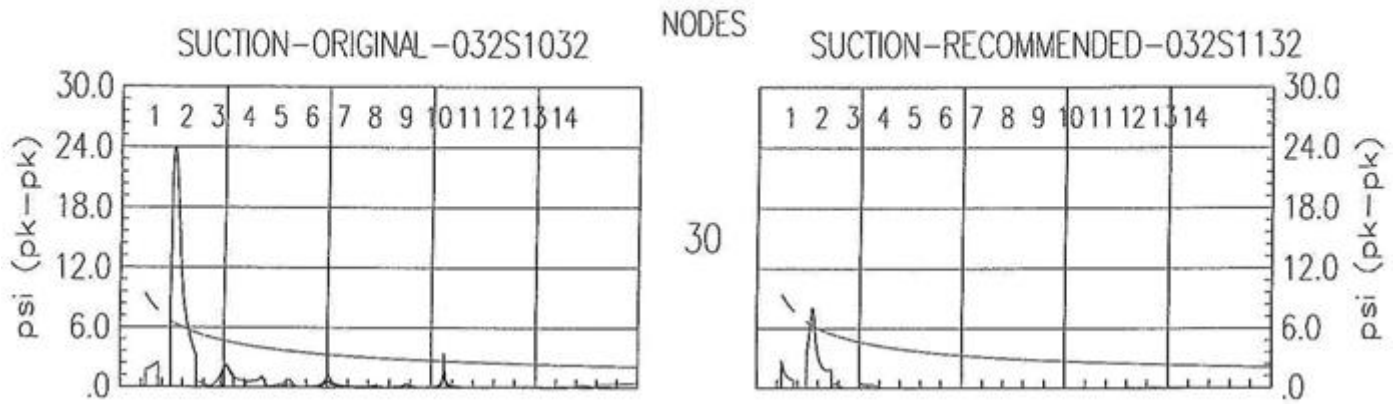


Figure .11: Predicted Shaking Forces

