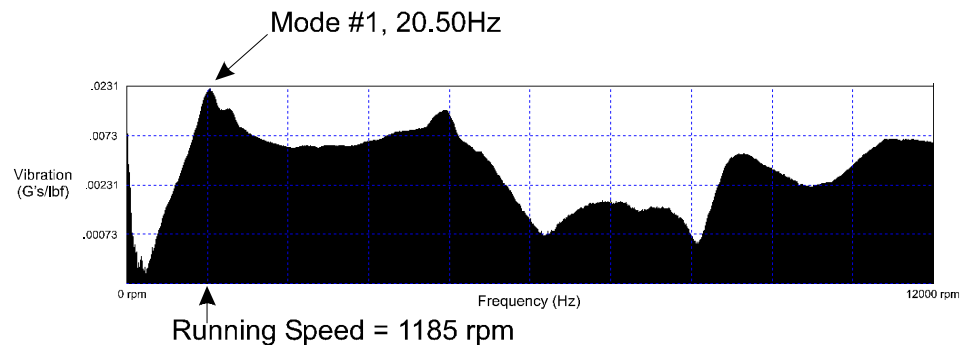


## Case History: Stop Pointing Fingers

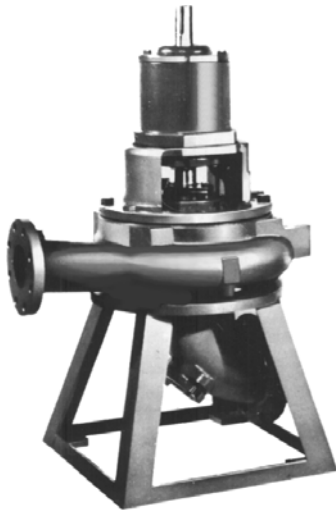
A vertical solids-handling pump in a sewage plant experienced a classical vibration problem. Whenever the pump was running, the pump, the entire pedestal, and nearby piping were shaking. The pump bearings had very limited life, and the mechanical seal would chronically leak. The owner claimed that it was a bad pump, and the OEM said that it was an installation problem.

MSI engineers were contracted as a third party to investigate the problem. The vibration test included impact modal “TAP™” testing, and it showed that a horizontal rocking natural frequency was within 2% of the operating speed of 1185 RPM. The tough part was to determine how to fix the problem, and who should pay the bill. To pictorially show the vibration, MSI created a modal model built solely from the “truth” of the test data. The model included the whole pump/motor assembly, pedestal, and part of the suction and discharge piping.



Vibration Spectrum from TAP™ Test

The model not only showed the mode shape at the problem condition, but our software’s “Structural Dynamics Modification” (SDM) capability was also exercised to show “what if” scenarios. It turned out that the contractor did not support the discharge piping sufficiently, and instead of this accidentally used the pump as a convenient anchor point. Unfortunately, the discharge piping and its support coupled with the “convenient” boundary condition had a natural frequency that was just right to be resonantly excited by the pump operating speed.

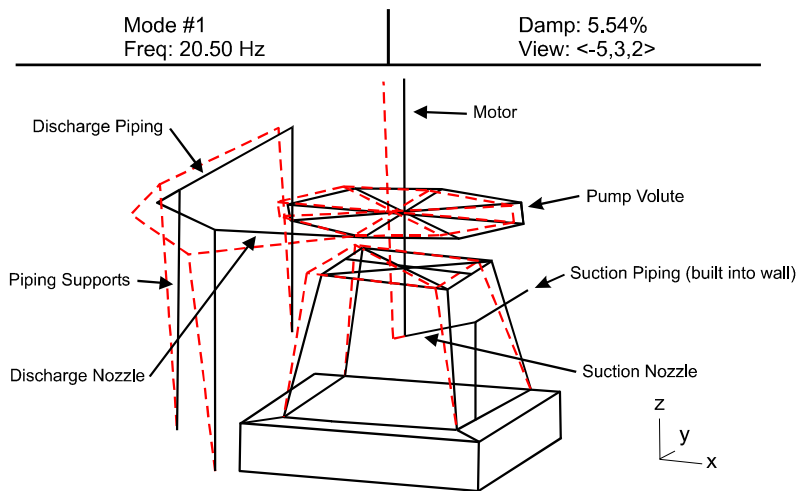


Solids Handling Pump Tested

SDM, or Structural Dynamics Modification, is a feature of MSI's modal software that allows elements such as struts, masses, dampers, and gussets to be added to the test-based model for structural optimization on a "what if" basis.

*TAP™* ("Time Averaged Pulsing") testing is a special technique developed by MSI engineers that can sort out structure or rotor natural frequencies *while the machine is operating*. Two distinct features of the *TAP™* test are 1) it properly accounts for the boundary conditions set up by the condition of service, e.g. impeller annular seal interaction (Lomakin effect), and bearing dynamic stiffness and damping; 2) it is able to identify any problem or potential problem without any downtime of the tested pump or nearby equipment, which can be important in many applications and industries.

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Modal Model of Solids Handling Pump  
(Dashed Lines Represent Vibrating Shape)

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