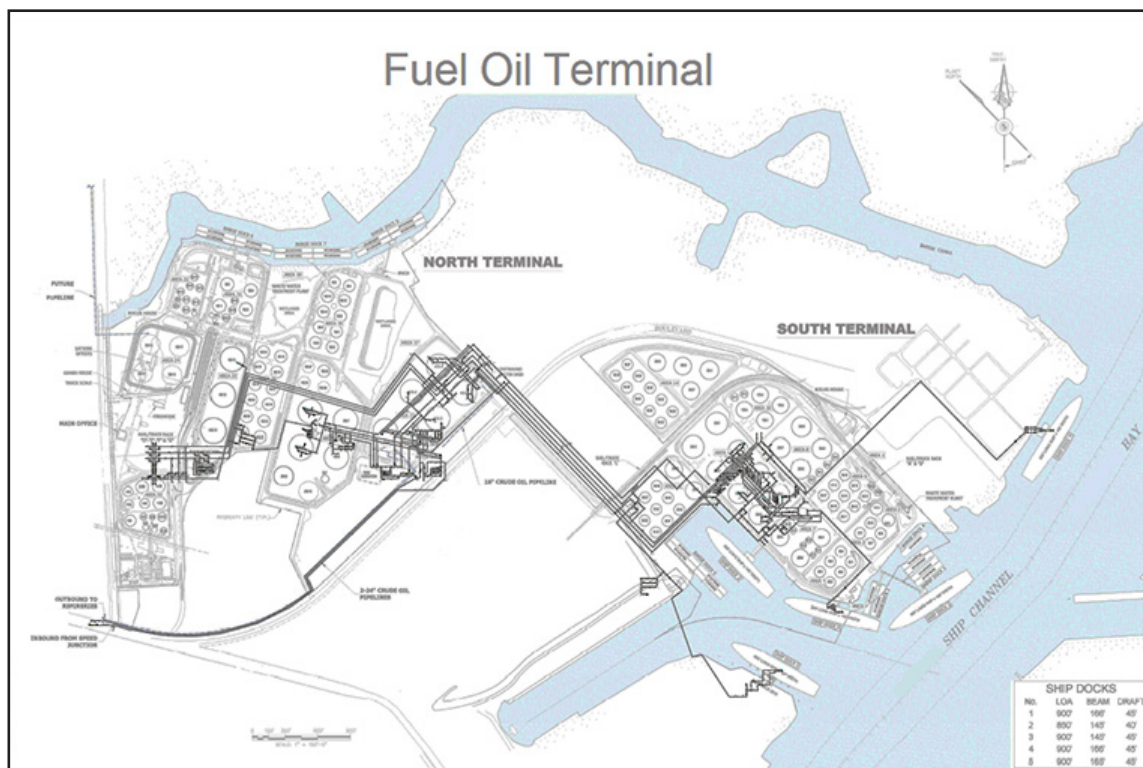


## \$1.25M Savings from Surge Suppression Analysis

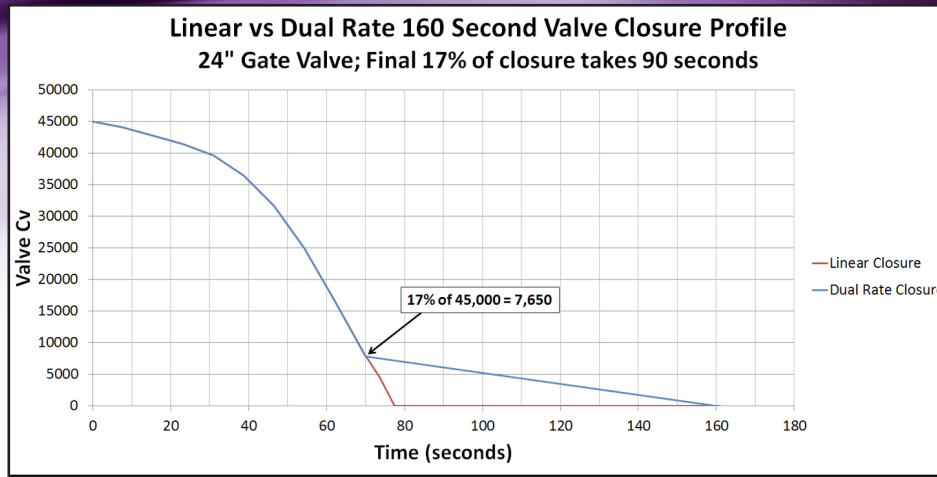
As part of an effort to increase storage and transfer capacity, a fuel oil terminal in Texas is undergoing an expansion. As part of this effort, Purple Mountain Technology Group (PMTG) was contracted to perform a transient surge analysis. This involved sizing and establishing cracking pressures for various surge relief valves, assisting in locating surge relief valves effectively throughout the terminal, and determining automation logic for pump trips and valve closures.



*AFT Impulse Model Layout Image*

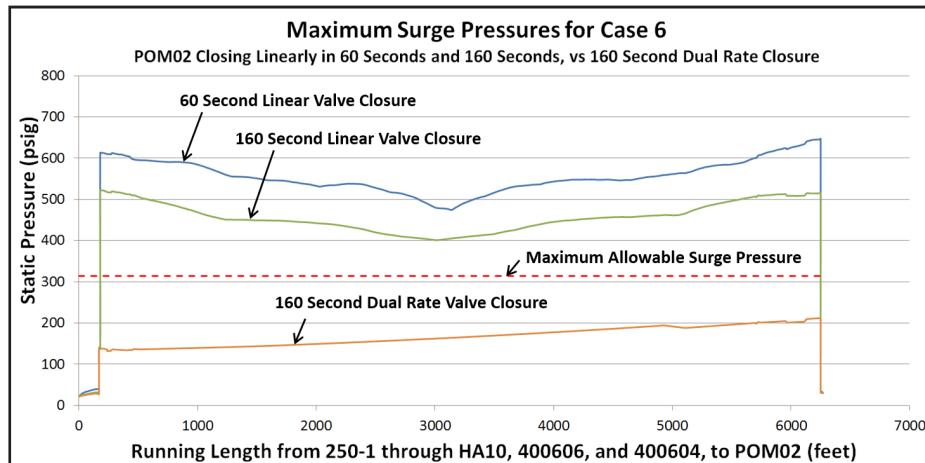
Initial evaluations of the proposed system resulted in design recommendations that satisfied maximum surge pressure limits for most scenarios. However under certain circumstances surge relief valves, slower valve closures, and automated pump trips could not protect the system from allowable overpressurization.

In an effort to resolve these problem scenarios PMTG began brainstorming solutions. They remembered a rule of thumb put forth in Swaffield and Boldy's text "Pressure Surges in Pipe and Duct Systems" that indicates if one closes a valve 80% of the way in the first 20% of the time, one can reduce surge pressures. PMTG proposed this use of a dual rate operator on the valve closures in these scenarios. The client then explored this option, and was able to obtain a valve actuator that allowed them to close the valve 83% of the way in the first 40% of the valve closure time. Then spread the remaining 17% of the closure over the final 60% of the valve closure time.



*Dual Rate Valve Closure vs. Linear Valve Closure*

By simply replacing an existing single rate valve actuator with a dual rate valve actuator, surge pressures were not only kept below the allowable limits of operation, but they were drastically reduced. In fact, the dual rate valve actuator was so effective at reducing maximum surge pressures that it eliminated the need for surge relief valves in the problem scenarios.



*Example of maximum surge pressures based on changing valve closure profiles*

PMTG then re-evaluated the previously considered scenarios using the dual rate valve actuators, and was able to eliminate all but two sets of surge relief valves! All additional scenarios evaluated throughout this analysis considered linear valve closures as well as dual rate valve closures, and several additional surge relief valves were eliminated from the proposed expansion.

The initial design for the expansion of the fuel oil terminal entailed 7 sets of surge relief valves. By strategically locating 2 sets of surge relief valves, and by utilizing dual rate valve closures throughout the facility, 5 of the 7 sets of surge relief valves were eliminated from the design. With each set of surge relief valves costing approximately \$250,000, PMTG was able to save the client \$1.25M!

**Need help with your surge analysis? Contact PMTG for help analyzing the issue.  
[info@pmttechgroup.com](mailto:info@pmttechgroup.com) · Phone: (719) 687-9145**