

# Tank Talk®

Issue 36-2 — Fall 2002

## Storage Tank Engineering Updates for Owners and Operators of Industrial Tanks

### Leak Integrity Testing of Terminal Piping

by John M. Lieb, P.E., Chief Engineer—Industrial [Lieb@TankIndustry.com](mailto:Lieb@TankIndustry.com)

Tank Industry Consultants (TIC) is widely known for our engineering, inspection and maintenance expertise with all types of tanks and vessels. We have recently been given the opportunity to demonstrate equivalent expertise with the piping that is commonly associated with tanks and vessels.

TIC is working with the American Petroleum Institute (API) on a project to develop testing procedures and protocols that will provide practical guidance to tank terminal and pipeline companies for performing and evaluating leak testing of both aboveground and buried piping. It is anticipated that the results of this work will be published in the form of an API Recommended Practice or equivalent document, similar to the current API RP 1110, "Pressure Testing of Liquid Petroleum Pipelines", but with a focus on leak testing rather than structural integrity testing. This project is important because the provisions of the current API RP 1110 are neither intended nor adequate for the testing of piping from a leak-integrity standpoint.

One of the biggest challenges to developing practical procedures that will yield meaningful results when leak testing full-scale piping systems is evaluating and compensating for the effects of temperature changes of the liquid in the pipe. Even very small temperature changes can dramatically affect the pressure in the pipe during the test. Temperature changes during a typical test on aboveground piping result from a number of sources, including direct and reflected atmospheric and extraterrestrial solar radiation, infrared radiation, wind convection effects, and ambient temperature variations.

To meet this challenge, TIC has developed pressure response and heat transfer models in the form of proprietary computer programs that enable the user to quickly

compute the effects of virtually any set of (time-variant) temperature conditions on any size of aboveground or buried pipe for various test liquid media. The computer program solves the basic differential equation wherein the total pipe leak rate is equal to the sum of three terms. The first term is the flow rate of any test liquid added to the pipe during the test. The second term is a pressure response term and the third term is a temperature response term. The second and third terms are functions of a number of variables that define the geometry and materials of the pipe, the physical characteristics of the test liquid, and the time-dependent temperature effects.

The details of TIC's work, too extensive for this brief article, were presented to the API Task Group "Pressure Testing of Terminal Piping" in May, 2002, in a 200 page interim report. The bottom line results of TIC's work to date are that, while it is technically feasible to compensate for the effects of temperature variance during leak testing of aboveground and buried piping, it is unlikely that measurement of the minimum detectable leak rate promulgated by some state regulations will be practically or cost-effectively achievable.

In view of the complex nature of the subject, the work completed to date by TIC is considered by some experts to be "pioneering" in scope, level of detail and clarity of presentation.

The next challenge for TIC and the API Task Group is to "boil down" the vast amount of data made possible by TIC's programs and formulate practical, cost-effective and "user-friendly" guidelines for pipe line owners and operators to implement the principles described in TIC's work.

For more information about this project, please contact John Lieb at [lieb@tankindustry.com](mailto:lieb@tankindustry.com) or (630) 226-0745.

This project will be presented in more detail at the API Storage Tank Management and Technology Conference, November 13 -15, 2002 in New Orleans.



*John Lieb, P.E. is a nationally recognized expert in the design of plate structures including specialty plate structures for petroleum, chemical, and granular industries throughout the world. Mr. Lieb currently chairs the ASME/ANSI Committee on Bulk Solids.*

Published by

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### Ray Penny Named Director of Industrial Sales and Marketing

We are pleased to announce the appointment of Ray Penny to the newly created position of Director of Industrial Sales and Marketing. Tank Industry Consultants is the undisputed leader in providing consulting services for storage tanks in the municipal market. The addition of Ray Penny will accelerate plans to grow its industrial market segment significantly. Ray will be located in the Houston, Texas area, but will be responsible for industrial sales and marketing nationwide.

Ray started his career in the engineering and construction industry with Chicago Bridge and Iron Company (CB&I) as a Field Engineer. He held multiple positions within CB&I during his nearly 27-year tenure. His experience there honed his expertise in design and construction of tanks, managing projects, and strengthening relationships with clients through sales and marketing efforts.

Ray brings a wealth of experience with tanks and with industries that use tanks. He joins other industry notables at TIC including Stephen W. Meier, PE, SE, and John M. Lieb, PE, to allow TIC to offer the broadest, most in-depth engineering services for industrial tanks nationwide. Ray can be reached at 281/367-3511 or penny@tankindustry.com.

### API Special Task Group Update

Several special task groups of the API Subcommittee on Pressure Vessels & Tanks have been working to develop improvements to API Standards 650 and 620. The following task groups are currently scheduled to meet at the API Fall Refining Meeting:

- 620 Stainless Steel Task Group—Add requirements for API 620 tanks constructed of stainless steel.
- Frangible Roof Task Group—Update and clarify requirements for API 650 tank roofs that are designed to be frangible, i.e., to fail before the shell-to-bottom joint in the event of over-pressurization.
- Seismic Task Group—Update seismic design requirements of API 650 and 620 to be consistent with IBC and NEHRP provisions.
- External Pressure Task Group—Incorporate rules in API 650 for the design of tanks that normally operate under external pressure (vacuum) conditions.
- Metrication Task Group—Address metrication issues for 650 and 620.

Task Group meetings are open to anyone registered for the Refining Meetings. You are encouraged to attend if you have an interest in any of these areas.

### Tank Owners, Engineers, and the New SPCC Rule

The new Spill Prevention Control and Countermeasures (SPCC) rule, due out this year, will require tank owners to implement and maintain an SPCC Plan that has been certified by a Registered Professional Engineer. While the new rule does not specifically require that the Professional Engineer be independent of the owner's organization, there are some important advantages to the owner in hiring a qualified independent, or "third-party" engineer to prepare and certify a new plan or modify and certify an existing plan. These advantages are:

- For Owners who do not maintain a professional engineering staff that continuously works with the numerous and ever-changing industry standards, a qualified independent "tank engineer" who does can more cost-effectively develop and certify the necessary plans.
- SPCC plans endorsed or certified by an independent engineer, in accordance with applicable professional engineering laws, tend to be more readily acceptable to regulators and local jurisdictions.
- In the event of an incident that causes the owner to implement the SPCC Plan for a facility, and litigation results from the incident, the Owner's legal position is improved by having an independent endorsement of the SPCC Plan.

Independent professional engineers who agree to simply "rubber stamp" an SPCC Plan developed by others are in violation of professional engineering statutes and should be avoided. Professional engineering regulations require that the engineer be in responsible charge of the work in order to apply his or her seal. A truly qualified independent engineer, working closely with the Owner to develop or maintain an SPCC Plan, can be of great value in meeting the letter and intent of the new SPCC Rule, and in developing a safe, reliable and cost-effective SPCC Plan.

### API Storage Tank Conference

Plan to attend the API Storage Tank Management & Technology Conference, November 13 – 15, 2002 in New Orleans. The conference offers a broad range of subject matter important to anyone involved with storage tank management. Be sure to attend the presentation on "Leak Integrity Testing of Terminal Piping" by TIC's John Lieb. More information about this important conference is available on the API web site [www.api.org](http://www.api.org), or by contacting John at [lieb@tankindustry.com](mailto:lieb@tankindustry.com).

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