



FEATURES:

**THE VALUE OF THE ANCHOR
CUSTOMER IN LNG PROJECTS**

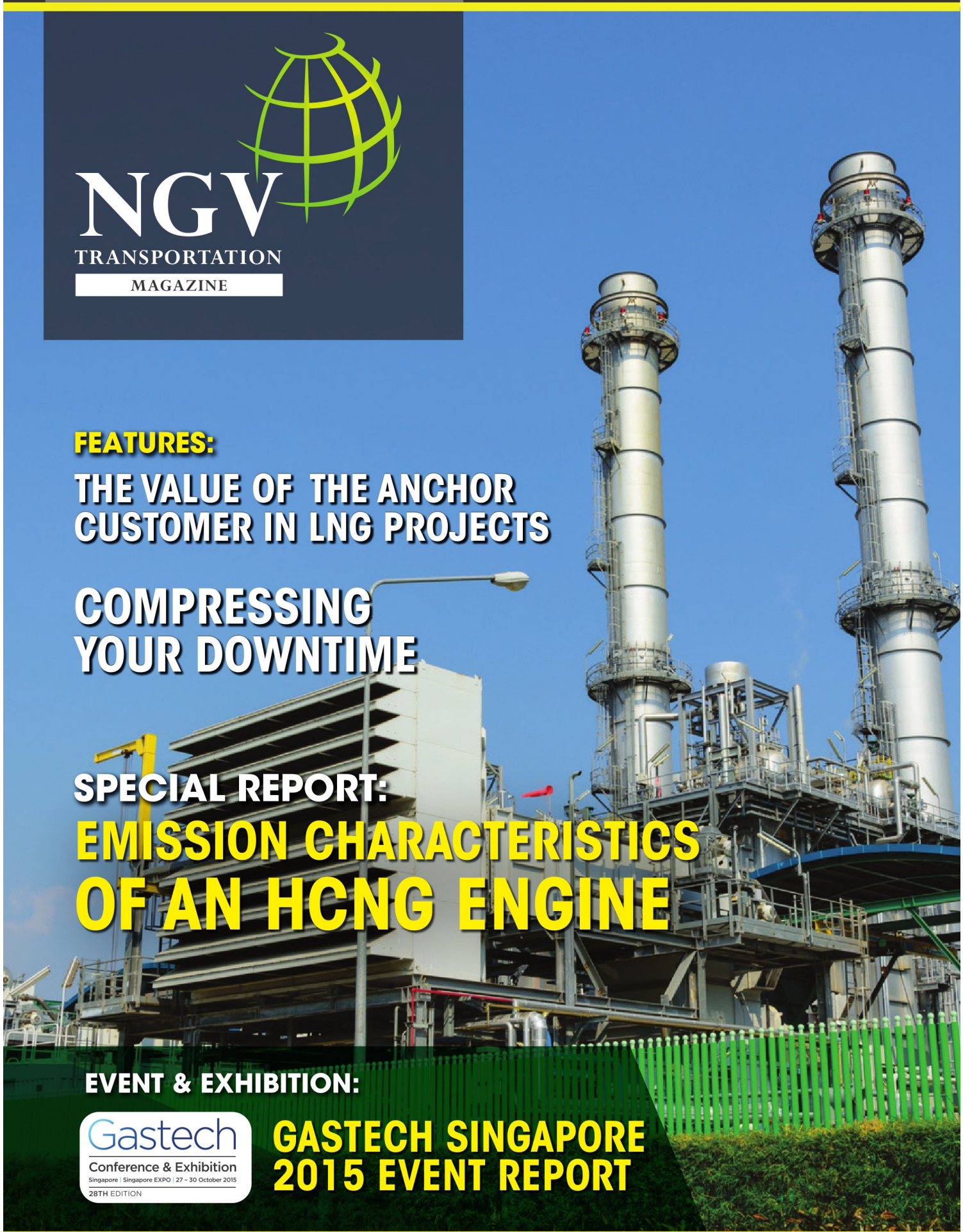
**COMPRESSING
YOUR DOWNTIME**

**SPECIAL REPORT:
EMISSION CHARACTERISTICS
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2015 EVENT REPORT**



COMPRESSING YOUR DOWNTIME

ACOUSTIC EMISSION FOR RECERTIFYING CNG AND INDUSTRIAL GAS TRANSPORT TUBES AND CYLINDERS



In the compressed gas tube industry, it is the general standard that government regulators require that all tubes are retested and/or recertified every 5 years using a hydrostatic test and volumetric expansion test. These testing methods have been the standard globally to ensure that equipment required for gas transport and storage are in tip-top condition. TISEC Inc.

has been working on a game-changing testing method that boasts improvements to this part of the industry that are simply unparalleled to what is currently being used in the industry today. Begin to familiarise yourself with TISEC's Acoustic Emission (AE) Technology.

Joel Hay, President of TISEC Inc. defines Acoustic Emissions as, "The class of phenomena where transient elastic waves are

generated by the rapid release of energy from localized sources within a material, or the transient elastic waves so generated." The technology is one that has been improved by TISEC and has superior advantages over current hydrostatic and volumetric expansion methods. Breaking it down for us, Joel explains to us in simple terms, "One way to describe it, is it's similarity to "micro-seismic testing", where "Seismic testing" is performed on a large structure (The Earth) – with sensors (geophones) installed around the Earth in a geometric array, scientists are able to detect the epicentre of cracks in the Earth's crust. Our "micro seismic testing" is performed on smaller structures – we place sensors on a structure and listen to the structure while it is being "loaded" or "stressed" and if there are any active growing defects during our monitoring, the source of the activity will be revealed, recorded, interpreted and reported."

TISEC is a pioneer in structural integrity monitoring and has more than 40 years of experience in the field. Their expertise lies in inspection and monitoring, materials science, civil and mechanical engineering and risk informed decision making. The company is an arm of Structural Insights group which is an international group of engineering and inspection companies.

TISEC personnel began their research in this game changing testing method in the late 1980s through their previous company,



Tektrend International Inc. The company took on a joint research project to develop an acoustic emission test procedure for recertification of tube mounted trailers that were used to transport compressed gas. Tektrend collaborated with Air Liquide Canada and Air Liquide France, Transport Canada and US DOT for this project.

As a result of this work, permits were granted to Tektrend and subsequently to TISEC Inc. to use AE testing instead of hydrostatic volumetric expansion testing for tube recertification. Two permits were provided to them; one for five years where the proof pressure was 10% over the normal service pressure and another for 10 years where the proof pressure was 5/3 of the normal service pressure. TISEC currently is performing AE testing in Indonesia, Malaysia, Thailand, Australia, New Zealand, Canada, North America, South America, Africa and more

recently, Singapore.

Hydrostatic & Volumetric Testing

Hydrostatic & Volumetric Testing involves the tenuous job of removing each tube from the chassis of the truck or skid to be ready for the test. Another downside is that this test method allows for contamination inside the tube with water. It is essential that the water needs to be removed and the inner tube is completely dried out before being remounted onto the trailer frame. Depending on the number of tubes on a trailer, this could require the trailer to be out of service for 2-3 months!

A standard volumetric hydrostatic test involves a de-valved cylinder being filled with water. The cylinder is then connected to a test jacket sealing apparatus, which is then placed into a test jacket that has been filled with water as well. The Temperature of both the water

inside the cylinder and outside the cylinder needs to be the same to avoid calculation errors. The cylinder will then be pressurized causing the cylinder's size to increase slightly. This expansion value is recorded by taking the difference from the amount of water forced out of the test jacket compared to the amount of water left in the expansion measuring device when the cylinder is depressurized.

Revolutionary Technology

AE testing is carried out following calibration whereby the tubes are loaded to 110% of the maximum operating pressure. During this loading period, any structural flaws present in the cylinder wall will emit high frequency sound waves. These sound waves will travel down the cylinder where they are then picked up by piezoelectric sensors that are located at either end of the



cylinder. The time that it takes for the sound waves to be picked up by the sensors allows for determination of the exact spot at which a structural flaw is present. Structural flaws include cracks and plastic deformation.

AE is also significantly more sensitive compared to conventional ultrasonic methods in finding these structural defects in the pipes. With AE one is allowed to not only determine the precise location of the flaw but also the full extent of it. AE is able to detect defects caused by mechanical loads, pressurization, thermal stresses, magnetic forces and even chemical and microstructural changes. Besides recertification, AE can be used as real time structural integrity monitoring during spot welding, leak detection and machinery health monitoring.

Results of the analysis are generated using TISEC's "System for Tube Testing And Reporting" or STTAR Software. The software tracks test pressure and acoustic events from active flaws in the cylinder wall. Acoustic events detected in the cylinder walls are identified and located for further ultrasonic

testing. The system allows for results from up to 16 tubes to be viewed simultaneously.

In summary, the biggest advantages of using AE testing over hydrostatic and volumetric expansion testing methods for recertification are:

1. There is NO water contamination.
2. There is also NO disassembly

from trailer – the test is performed with the tubes on the trailer.

3. There is an extremely fast turnaround (relative to conventional hydrostatic & volumetric testing) – trailer is only out of service for 1-2 days!
4. AE tests are superior in terms of sensitivity.

The most fascinating aspect of this technology really has to be the turnaround. Conventional testing methods require trailers to have to be shut down for 60 – 90 days while AE can do the same in just 2 days! It is not often that technology is developed that can make such a drastic change to the industry. This is an improvement on efficiency that only takes 60 days with hydrostatic volumetric testing.

 By Ryan Pasupathy



JOEL HAY



Joel Hay began his career as a non-destructive test inspector 30 years ago as an employee at TEKTRON International (now Olympus Group). TEKTRON provided advanced automated inspection systems for US Military applications. In over eight years of training and experience in the U.S. Navy and 16 years at TISEC Inc., Joel Hay has obtained valuable training and experience in mechanical and structural integrity, fabrication, nondestructive testing and overhaul projects. Now holding the position of President of TISEC Inc. (Canada), he is presently leading inspection projects in 19 countries world-wide.

As a nondestructive test inspector for the U.S. Navy, he was certified in accordance with Military Standards, NAVSEA Nuclear standards and the standards set by the American Society for Nondestructive Testing (ASNT) and is currently maintaining ASNT TC-1A AE III. Joel is currently running Southeast Asian operations out of Indonesia. He can be reached at joelhay@structuralinsights.com.