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RAE ENGINEERING
TOTAL ASSET
INTEGRITY
MANAGEMENT

RAENews

this issue

We've Moved!

August proved to be an exciting month for just about everyone who works at RAE Engineering. We got the big move behind us and everyone is settling into the new space.

The main advantage of the new office is that all of the Edmonton staff is under one roof now, with the exception of the Coatings Lab. They haven't moved yet, but will be joining us in a few more months. Everyone is enjoying their new surroundings, and also that communication and interaction on work is more efficient now that we're all closer together.

Our new address is:
4810 – 93rd Street
Edmonton, AB
T6E 5M4

The phone numbers will remain the same.

2010 RAE Engineering Photo Contest

We're issuing an open invitation to all our valuable clients to enter the annual RAE Engineering Photo Contest. This is a fantastic tradition in the RAE Engineering family and we'd like to share it with you.

Many people enjoy the fabulous Canadian scenery. And who hasn't captured a great work picture? Or perhaps you've snapped a photo of magnificent wildlife or caught interesting animal behavior on film.

Some of us may already have these kinds of pictures in our files. For others, it's time to dust off the camera and start shooting! The contest closes on November 19 at 5:00 pm and winners will be decided by a judging panel of RAE Engineering employees. Winners will be announced on December 15, and the photos will be published in the March issue of RAENews.

There are three categories (Canadian scenery, work-related, and wildlife). Each will have a first, second, and third place awarded.

For more information, open the Photo Contest Rules and download the Photo Entry Form.

We look forward to seeing the entries!

COATINGS LAB

As the summer comes to an end, we say goodbye to Elresa Roberts (summer student) and Christina Bailey (Coop student), both of whom are currently enrolled in Materials Engineering at the University of Alberta. These ladies have been a tremendous help in the lab over the busy summer and we wish them luck in their studies this fall.

The lab is currently running a few different custom test programs. Custom test work gives us the chance to design the test program, equipment, conditions and parameters in an attempt to reproduce a client's service conditions and to utilize testing even when a common test method is not available. Due to the unique nature of these tests, the coatings lab is hoping to have some technical papers written over the next year to be presented at upcoming conferences.

Message from the COO

The summer of 2010 has been very productive for RAE Engineering and Inspection as we strive to improve our abilities to provide total asset integrity management for our clients. Over the past three months, we have consolidated most of our Edmonton operations into a new headquarters location. We've also initiated a new IT platform and information system, and worked through the peak vacation season while maintaining a sharp focus on our clients' needs.

Our commitment to continuous improvement has provided the impetus for a review of RAE Engineering's key areas of practice over the past few months. That review has resulted in our pledge to enhance our range of inspection services. We're expanding our NDE capabilities with additional personnel, training, and equipment. Over the summer we have also made significant upgrades to REMS, and are about to release our NDE survey reporting module for that database. Full access to REMS for our inspectors to work in the field via the internet is now operational, allowing us to enter data faster and to extract standardized summary reports for clients as well. Early this fall, a REMS module for proprietary release to end-users will be available for clients who wish to directly manage their own pressure equipment and pipeline integrity database.

RAE's ongoing commitment to the technical community has seen Izak Roux, our technical manager, accepted as a member of the Boiler & Pressure Vessel Technical Council, Alberta under the Safety Codes Council in July. In August Izak was accepted as a voting member of the CSA B51 committee and Rajiv Das, our Integrity Lead for engineering, was accepted as an associate member.

Thinking ahead, we remain focused on providing our clients with total asset integrity management through a full suite of relevant areas of practice. This has been concentrated in six main areas: inspection services, asset integrity management, laboratory services, engineering and consulting services, failure investigations, and training. We believe that holding this laser focus while delivering across all of our areas of practice will provide clients with a unique opportunity to increase their equipment reliability by working with one service expert.

Non-Destructive Testing Basics and Terminology

The world of non-destructive testing (NDT) has many acronyms associated with it, and that sometimes leads to confusion. This article will provide a brief overview of some of the terminology, as well as some basic explanations of the NDT techniques relevant to the work RAE Engineering does.

Non-destructive testing refers to any testing performed on a component that does not alter the component's fitness for service. Destructive testing, however, refers to tests that render a component or part of a component unusable or reduces its capacity to perform the function it was designed for. An example of destructive testing is cutting coupons out of pipeline welds to conduct tensile testing for quality assurance of the remaining welds. Non-destructive testing is commonly referred to as non-destructive examination (NDE). There are some subtle differences in how these terms are used in API and other standards, but in industry the terms NDT and NDE are generally used interchangeably. The use of the term "inspection" in NDE is viewed as inappropriate by most bodies now because the term inspection generally implies visual inspection. API and ASME have clear lines that distinguish NDT from inspection.

NDT has several methods routinely encountered by people in our areas of practice. Below is a list of those most likely encountered by RAE Engineering's staff and clients.

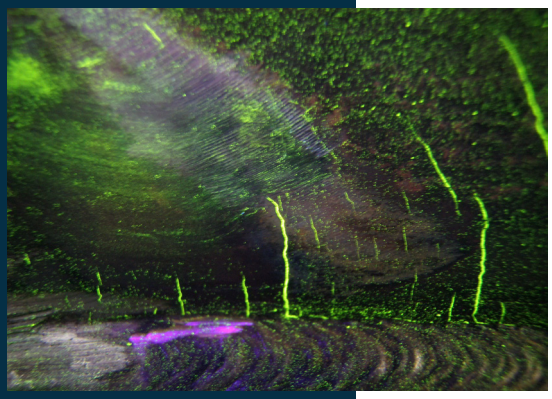
1. Magnetic Particle Testing (MT): Also referred to as "magnetic particle inspection" (MPI), and "mag." This examination consists of magnetizing a component (or part of it) and applying a wet particle suspension or dry powder. The particles are attracted to the locations on the component that have discontinuities (usually cracks) at or near the component's surface. There is also a method that utilizes UV light.

2. Magnetic Flux Leakage (MFL): Also referred to as "floor scan." Similar in concept to MT except that an electronic sensor is used to detect metal loss instead of magnetic particles. RAE Engineering uses this method for scanning tank floors to look for areas of possible underfloor corrosion. While this method will identify possible areas for concern, UT is needed in these areas to determine the extent/severity of the problem.

Black on white visible magnetic particle testing

3. Liquid Penetrant Testing (PT): Also referred to as liquid penetrant inspection" (LPI), and "dye pen." The examination consists of applying a penetrant (usually red) to a component. The penetrant fills any discontinuities (usually cracks or weld porosity). After the component is cleaned, a developer is applied that wicks the penetrant out of the discontinuities to form visible indications on the surface. There is also a method that utilizes UV light.

4. Ultrasonic Testing (UT): This method is actually a group of very different techniques. Some of the techniques you may encounter are listed below (c), but the two of most relevance are "zero degree" (a) and "shear wave" (b). Note that there is also a leak detection method called "ultrasonic leak testing," but it's unrelated to the methods described here.



Wet fluorescent magnetic particle testing

a. Thickness Testing: Also called "zero degree," "doinking," conventional UT and straight beam, among others. This method sends an ultrasonic sound wave through the component, which bounces off the other side, and returns back up to the instrument. The time it takes to pass through the component is then converted by the UT device into material thickness. This is the UT method most familiar to those at RAE Engineering and is the method used for corrosion surveys.

b. Shear wave: Also called "flaw detection," "angle beam" and "weld inspection," among others. Shear wave is actually a type of sound wave that propagates perpendicular to the material particle vibrations (more on this later). The term is used, however, to describe simple pulse-echo ultrasonics (just like thickness testing above), except that the sound waves propagate at an angle from instead of straight through the material. This allows the UT technician to detect discontinuities in front of the transducer instead of underneath it.

c. Other UT methods not explained here include phased array, automated UT, time of flight diffraction, pitch – catch, resonance testing, longitudinal angle beam, and guided wave.

5. Radiographic Testing (RT): Conventional RT does not have the same terminology soup that other methods seem to have developed. Radiography is a simple process of putting film on one side of a component and radiation on the other. The x-ray you get at the dentist and doctor are essentially identical the process used for industrial radiography, but with two key differences. Firstly, medical x-rays use a cathode ray tube to generate the radiation (x-rays), while industrial radiography usually (but not always) uses a radioactive pellet to produce radiation (gamma rays). The second key difference is that the radiation used for industrial radiography is far more dangerous than medical applications. If severe enough, exposure to the radiation levels produced by industrial radiography can be fatal within days. Extreme caution is required while working around radiographers on-site. Always stay far away from barricades and ask the radiographers if you're unsure where you should or shouldn't go. Like UT, RT has a variety of new terminology and methods. These include digital RT, real-time RT, and small containment area radiography (SCAR).

There is ample material available online for inquisitive minds, but please feel free to contact Brent Drader (brent.drader@raeengineering.com) should you have any questions about any of the acronyms or testing methods discussed in this article.

EMPLOYMENT OPPORTUNITIES

RAE Engineering and Inspection Ltd. is always looking for trained and certified personnel to join our dynamic team. Applicants should be highly motivated individuals with strong interpersonal skills and who enjoy traveling.

We're hiring for the following positions:

Senior Materials Engineer

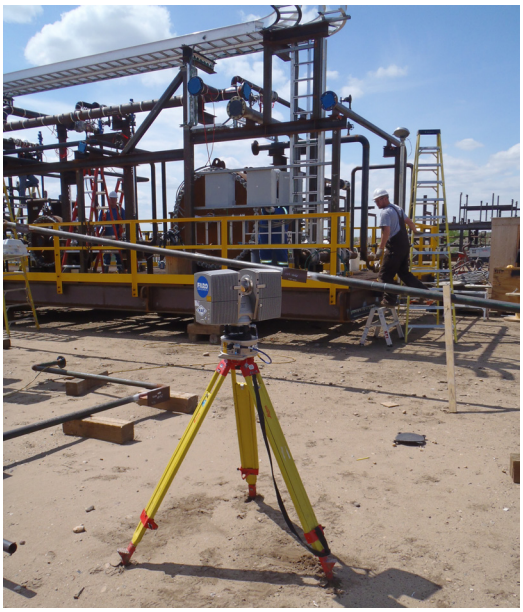
Administrative Assistant (Database)

Check out our website for more information.

3D Laser Scanning

Background Information

3D laser scanning involves creating virtual models of any kind of equipment, including entire production plants or other assets. CAD plant models are often used only in a plant's initial design. Over time, engineered CAD models become obsolete because "as-designed" models often deviate from "as-built" models. With older facilities, original models or drawings are often lost or damaged, and sometimes no drawings existed from the beginning.



With a scanned 3D model created from laser scans, discrepancies in P&IDs can be identified and corrected at a fraction of the on-site time, labour, and cost involved in traditional methods. An important safety benefit is that it reduces staff exposure to operating plants. Working with highly accurate measurements and models increases efficiency dramatically. There are no costly mistakes – if the scan is done correctly, data is accurate, precise, and secure. (See Figure 1.)

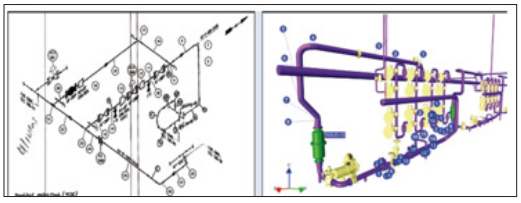


Figure 1 - Piping network created from scans to update old P&IDs

Up-to-date 3D models of plants and equipment are useful because it could assist a company with asset management, planning, and updating CAD models and drawings to as-built status. 3D models can also help with maintenance, execution of projects, locating equipment, and inspection.

If a 3D model of a plant does not exist, it's as easy as scanning the plant (a process similar to normal on-site plant surveying) and then using modeling software to combine the scans into a coherent as-built model or point-cloud. The end result is a visual, navigable, and multi-perspective 3D virtual model that accurately and precisely reflects the actual facility.

The point-cloud model can also be imported into modeling software to quickly recreate a solid model. (See Figure 2) This software has automatic feature recognition to recreate piping, I-beams, or other stock components like flanges. The files are compatible with most modeling software, e.g. SolidWorks.

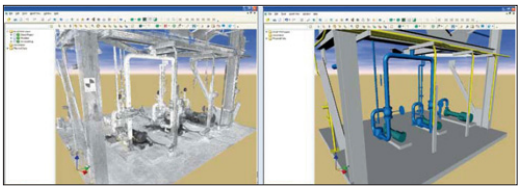


Figure 2 - Point-cloud model and recreated solid model

Benefits

Introducing 3D laser scanning broadens a company's ability in the continuous improvement process of striving for total asset integrity management. Scanned models can aid in the inspection and surveying process. They can also help in off-site planning and training for plants.

Tags can be added to the 3D models created, e.g. inspection points or tags linking to other information systems like IGOR or REMS. Scanning and creating models of equipment or plants can aid considerably in FEA analysis in SolidWorks or CEASAR II simulations by providing as-built models to analyze under design conditions.

Creating 3D asset models for our clients helps them with expansion, shutdowns, maintenance, and plant

NEWSLETTER FEEDBACK

Send your questions, comments, and ideas to news@raeengineering.ca

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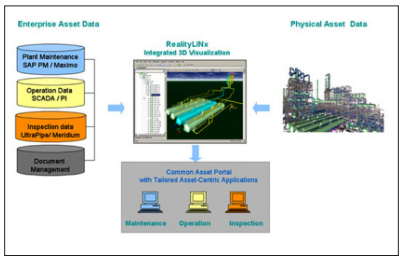
surveys. RAE Engineering can also provide as-built information to clients with updated P&ID and detailed drawings. Figure 3 shows how a program like INOVx PlantLINx can create 3D virtualizations of scanned data and aid in integrating all information into a more complete total asset management system.

Figure 3 - Integration of models into a database



3D Laser scanning is useful in the following areas:

- Tanks – level surveys, volume calculation, damage and repair assessments
- Pipelines – direct assessment, schedule, and dimensions of pipelines
- Plants – as-built drawing, maintenance, modification, inspection planning
- Boilers – repair planning, modifications, e.g. new spool and pipe racks
- Shop inspections – construction documentation, final as-built QC, comparison to drawings
- Various failure investigations and FEA analysis

Conclusions

3D laser scanning is a valuable addition to the services RAE Engineering provides to clients. A 3D laser-scanned model will aid in asset management for our clients and will reduce downtime when it comes to planning maintenance, replacing equipment, or managing change.

Scanning plants will lessen staff time in dangerous areas as it gathers more information in less time. It can also cut down on time spent on-site for planning and reduce time spent trying to find equipment.

It will aid in failure investigation because equipment can be scanned and saved in a database for later review. FEA analysis can then be conducted easily to investigate the dynamics of a failure.

Finally, laser scanning provides a lot of additional information for FEA and modeling work, which would aid in analyzing real-world scenarios on as-built models.

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Head Office
4810 – 93rd Street
Edmonton, AB T6E 5M4

Tel. 780-469-2401
Fax 780-468-2422

Calgary Office
Suite 300, #816 – 7 Avenue SW
Calgary, AB T2P 1A1

Tel. 403-210-3305
Fax 403-262-3305

www.raeengineering.ca