

Aptech Updates

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APTECH Helps Client Win \$387.4 Million Jury Verdict

On November 6, 2006, a Cook County (Illinois) jury awarded Citgo Petroleum Corporation a \$387.4 million judgment. A supplier had supplied a defective 8-inch 45° elbow which was used in a vacuum tower bottoms (VTB) line at the Citgo refinery in Lamont, Illinois. The elbow ruptured approximately 19 years after installation, spilling some 2,000 gallons of VTBs which ignited, burned, and destroyed some 60% of the plant.

The elbow failed prematurely due to sulphidic corrosion. Its failure was premature because it was an incorrect alloy composition, 1% Cr rather than 5% Cr. This 1% Cr elbow was not discovered during the piping erection because it was mislabeled 5% Cr. Consequently, it corroded three times faster than the rest of the VTB line, which was 5% Cr material. When the elbow wall thinned beyond its maximum corrosion allowance, it ruptured under normal process pressure and temperature.

APTECH provided technical assistance to two law firms: a Chicago firm, representing Citgo's insurance carrier, and a Houston firm, representing Citgo.

APTECH provided technical assistance in the areas of fire origin and cause, corrosion metallurgy, and inspection and quality assurance. The supplier's counsel mounted a vigorous defense. They attempted to prove that the initial VTB line rupture was somewhere other than the off-spec 1% Cr elbow. They also attacked Citgo's construction

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Power Generation News

New Product (Patented) Prevents Slagging and Fouling in Coal-Fired Boilers

What Is It?

APTECH has patented an innovative technology to prevent or minimize slagging and fouling in the upper furnace, superheater, and reheater. The technology begins by extracting a controlled amount of flue gas from the exhaust gas duct downstream of the precipitator or bag house. This provides clean flue gas at the lowest possible temperature but still above the acid corrosion dew point. It is then introduced into the upper furnace at key locations using

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Petrochemical Service News

APTECH's Canadian Office Kick's Off

APTECH's Petrochemical Group opened the APTECH Engineering (Alberta), Ltd. office in Edmonton, Canada in February 2006. The



office has a number of proposals under consideration by key clients and has already completed numerous projects, including Fitness for Service (FFS) studies for PetroCanada and ATCO, RBI implementation studies at Nova, and root cause evaluations at TransAlta. For further information please contact APTECH at aptechalberta@aptechtexas.com.

Forensic Engineering News

Accidental Sprinkler Activation

Fire protection sprinklers are installed in the ceilings of thousands of commercial and industrial spaces. They hover above our furnishings, expensive artwork, bamboo floors, wooden paneling, machines, and electronic equipment. The electronics include desktop computers, servers, phones, and other equipment, none of which can tolerate being doused by water. Because of this, the accidental activation of a sprinkler head can cause enormous property damage in a very short time. Fortunately, sprinkler heads are very reliable. Loss records of Factory Mutual Research indicate

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materials alloy verification procedure and their in-service piping wall thickness monitoring procedures. In the end, APTECH was able to rebut these alternative theories and hypotheses and keep the focus appropriately on the off-spec elbow.

APTECH staff who contributed to the effort were Philip Lindsay, Eric Sullivan, Sherry Cook, Clayton Lee, Marvin Cohn, Stephen Kohan, Geoffrey Egan, and Kimble Clark. Dr. Egan and Dr. Clark provided expert testimony at the trial at the Cook County Courthouse in downtown Chicago.

Petrochemical Service News

A First in Egypt

The APTECH Petrochemical group implemented the first RBI study in Egypt. In June 2006 Sidi Krir Petrochemicals (SIDPEC), Egypt's largest producer of ethylene and polyethylene, purchased APTECH's RDMIP software. After a week of training at APTECH's Houston offices, the facility, based in Alexandria, began RBI implementation. To date 500 vessels and piping segments have been evaluated in the program. The software has proved invaluable for turnaround planning and will be used extensively by SIDPEC for their 2007 shutdown.



Steve Anderson,
 Mohammad Moaz,
 Ezzat Amer, Yasser Eid



APTECH Assists Petrotrin, Trinidad with Storage Tank Problems

The APTECH Petrochemical group conducted specialized storage tank inspections and advanced Fitness for Service evaluations on large gasoline storage tanks at Petrotrin facilities in Port Lisas, Trinidad. The evaluations allowed for continued operation of the tanks and recommended prioritized inspection schedules for future operations saving the facility considerable time and money.



Forensic Engineering News

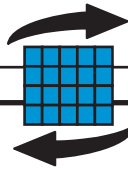
Don't Accept Pre-Assembled Equipment on Faith

APTECH has recently been involved with two projects that have resulted in "lessons learned" for both customers. In each case, pre-assembled equipment, a steam turbine in one and a generator in the other, were shipped to the customer's site several years ago. After operating for a period of time, this equipment required opening due to operational problems. Upon opening the equipment, unexpected conditions given the age and service duty were found. The steam path surface condition on the turbine and an abnormal amount of surface erosion on the generator field led to a question of whether these conditions were "pre-existing". Since no visual inspection of the internals by the buyer prior to assembly, shipment, or operation occurred, the question of a "pre-existing" condition could not be resolved.

Based on these two cases, we recommend considering the following actions when buying pre-assembled equipment:

- Perform a visual inspection of the equipment at the factory prior to assembly and shipment.
- Compile photographic evidence of the equipment condition prior to assembly.
- Review shipping and storage preparation paying particular attention to the conditions along the shipping route and conditions at the site during storage.
- Visually inspect and document the condition of the equipment upon arrival at the site noting any evidence of damage or exterior environmental effects (i.e., water damage, salt deposits, corrosion, etc.). Prepare photographic documentation of the equipment.
- If possible, inspect the internal components of the equipment using fiber optic devices prior to operation.

While taking these steps may not fully resolve all future questions regarding the condition of the equipment prior to service, it may, in some cases, provide the necessary documentation.



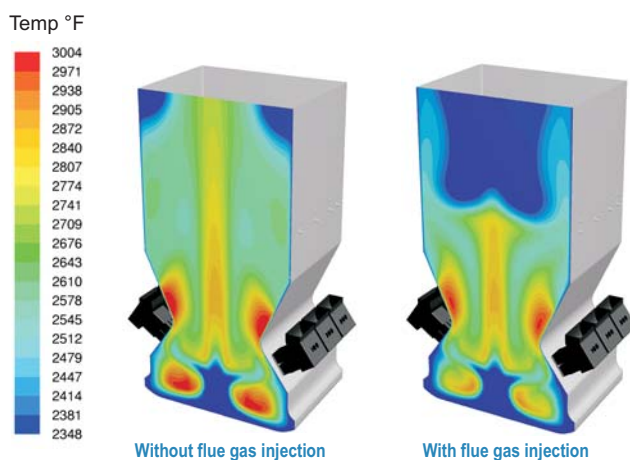
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[New Product \(Patented\)](#)
[Prevent Slagging and Fouling in Coal Fired Boilers](#)

Venturi registers specially designed for thorough mixing. The Furnace Exit Gas Temperature (FEGT) is controlled and reduced below the critical ash fusion temperature and slagging is prevented or reduced dramatically.

What Can It Achieve?

- Computational Fluid Dynamic (CFD) Models have confirmed reductions in FEGT up to 500°F. (See below)
- Prevent or greatly reduce slagging.
- Expand the flexibility of blending coals
- Expand the capability to use or increase use of low sulfur PRB coal which could reduce or eliminate scrubbers.
- Smooth the gas profile in the convective section to minimize hot spots.
- Reduce maintenance and damage caused by sootblower and water cannons.
- Increase reliability.
- Eliminate need to size furnace for different coals.
- Increase safety and reliability by minimizing slag fall and related damage.

For more information please contact Steve Torbov at 408.636.5394 or Terry Rettig at 408.636.5400.



[CFD Model Showing the Power of APTECH's Patent to Reduce the FEGT, Control the Temperature Profile, and Prevent Slagging.](#)

SO₂ and NO_x Compliance Puts Smaller Plants at Risk - Patented APTECH Technologies Could Ease the Burden

More than 300 operating coal units between 100 and 300 MW in the US are at risk of shutting down because of the enormous capital required for emissions control equipment. Large non-utility plants no longer protected by the regulatory regime for capital cost recovery will also find such outlays painful, perhaps mortally, to the bottom line.

Our new patented (and patent pending) technologies are designed to reduce SO_x and NO_x for a fraction of the cost of scrubbers and selective catalytic reduction (SCR) units. They can be installed separately or in combination. Computer modeling and other work suggests to us that 50% reduction in SO_x and NO_x is easily achievable and reductions in the range of 70-75% are possible.

The price to engineer, purchase hardware, and install equipment for both SO_x and NO_x on a 300 MW unit is estimated to be about \$8 million. The leverage for emission reductions per dollar spent is enormous considering a scrubber and SCR just for one unit will probably be 20 times this amount. Application of this process would be a profitable alternative to purchasing credits, or for accumulating credits.

Additionally, the power to operate a Scrubber and SCR is about 1.5% of the plant output. Since our system requires far less parasitic power, sales on the grid are correspondingly higher and CO₂ credits may be obtained because the unit is that much more efficient.

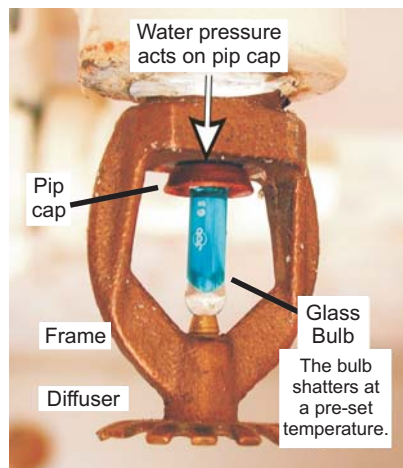
Objective: These technologies are new and have not been installed on a unit. Therefore, APTECH is seeking a partner and/or host power producer to help fund what we estimate would be a \$50,000 pilot test with multiple types of coal(s) and quantify the SO_x and NO_x reduction potential. Western Research Institute (WRI), for one, believes our technology has merit and has offered its pilot unit to run tests. WRI has a DOE contract and funding stream for part of the testing. We believe it is wiser to partner early with an owner/operator who could potentially leverage our system across multiple units. APTECH is willing to be creative in how we share the benefits of this technology, and downstream revenue. Let's face it – \$50K is a small price to pay to see if capital costs for emissions control can be reduced by at least an order of magnitude.



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[Accidental Sprinkler Activation](#)

that the probability of a standard response spray sprinkler discharging accidentally due to a manufacturing defect is only 1 in 16,000,000 sprinklers per year in service.

These sterling statistics make it all the more strange that APTECH has investigated four such instances in the last 2 years and all of them just in the San Francisco Bay Area. The flood locations included an office (\$10k in damages), a hotel sauna (\$75k), a fitness center (\$100k), and a computer server room (\$1 million).



Inconveniently for the investigator, the key evidence - the glass bulb itself - disintegrates during activation. The remaining metal frames sometimes contain clues. For example, in the absence of a manufacturing defect, the bulb may have

been damaged during or after installation. A scrape - was it used as a coat hanger hook? A bent diffuser - was it dropped during installation? A colored smear - was it contacted by a paint roller or drywall tool? Further forensic tests on such indications may shed some light on their cause. Then the leap must be made to show that a prior impact on the bulb caused latent damage, which then grew to failure. Sometimes such an extrapolation is not possible, and the cause goes undetermined.

Owners of, say, server rooms can go a long way to prevent such floods by installing a double interlock, pre-action system rather than a standard wet pipe system. Pre-action systems require a positive fire signal (such as from a smoke detector or temperature indicator) as well and a flow or pressure signal to open a deluge valve. So, an accidental glass bulb breakage without a fire will not automatically lead to a frantic call to the liability carrier.

Power Generation News

Boiler Tube Failure Prevention Program Produces Bottom Line Results

APTECH manages the Boiler Tube Failure Reduction Program for large national power producer to achieve impressive gains over the past 18 months. In 2005, the coal-fired units in their system had experienced 3.9 million megawatt-hours of lost generation due to boiler tube failures. In late 2005, the utility asked APTECH to support them in establishing a Boiler Tube Failure Reduction Program for their coal-fired fleet. APTECH helped them set up inspection and reporting guidelines, supported their outages, supported prioritization of their budgets, and provided technical support for their program.

The program has shown immediate gains and exceeded the clients expectation. In the first full year, 2006, the number of boiler tube failures decreased by 25 events and the client improved their lost generation from boiler tube failures by 33%. The expectations are for additional improvements over the next several years as APTECH continues to work with the plants and corporate on their program. APTECH helped them establish the target goals and how to achieve them for each facility for 2007 and meeting these goals will result in further reductions in tube failures.

In their most recent earnings report, the client cited improved reliability of their coal-fired fleet as a major reason for their improved financial results.

Please contact Mr. Terry Rettig in our Sunnyvale, California office to learn how APTECH can help you establish your Boiler Tube Failure Reduction Program.

APTECH

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