

# Aptech Update

July 2007

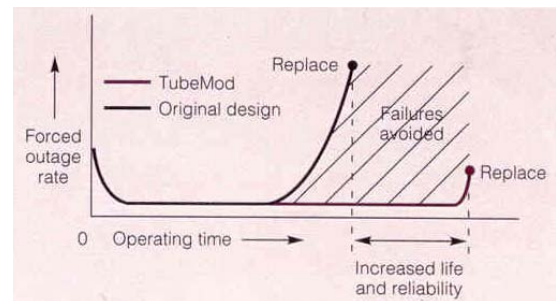
ENGINEERING ■ SCIENCE ■ TECHNOLOGY

Volume III, Issue II

## TubeMod® Hits New Milestone

APTECH is proud to announce that our TubeMod technology has hit a couple of major new milestones. TubeMod has been helping our clients enhance life and reliability of their existing superheaters and reheaters and avoid unnecessary capital spending for over 17 years. Our recent installations in Texas in a 30-year old unit, for both the superheater and reheater section marks the 20 installation.

Over the years, TubeMod has accumulated over 180 unit years of operating experience. The oldest unit in operation has over 17 years of additional service since the installation of TubeMod. TubeMod has been applied to units that had on average over 162,000 operating hours at the time of the implementation. These units include coal, gas, and oil from every major OEM. TubeMod has now achieved more than one million additional operating hours of life enhancement and reliability improvement to existing units and still going strong. Owners have saved millions of dollars in avoided forced outages and major capital expenditures. For several of the plants, heat rates were



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## Forensic Engineering News

### New Vice President for Forensic Engineering Group

SATISH ALMAULA has joined APTECH as Vice President of the Forensic Engineering Group

As Vice President of the Forensic Engineering Group based in APTECH's Sunnyvale,



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## Petrochemical Service News

### Storage Tank Evaluation

Three months after construction, an Asphalt Storage tank, being filled on a refinery, had its roof collapse. The owners were concerned about safety, the possibility of tank collapse as well as strategies for emptying the tank in order to conduct a root cause investigation. The tank was insulated, had limited access, contained \$4 million worth of hot product (300°F) and immediate emptying and drainage was not an option. These restrictions posed a

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## Power Generation News

### Cost of Cycling Thermal and Combined Cycle Plants

Cycling operations that include startup/shutdown operations, load following from near unit capacity to minimum load levels, and high frequency MW changes for automatic generation control (AGC) can be very damaging to power generation equipment that is not specifically designed for and carefully operated during these demand changes. A clear conclusion from analysis of

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TubeMod—Continued from Page 1

improved by recapturing lost capacity due to self-imposed temperature limits to avoid failures.

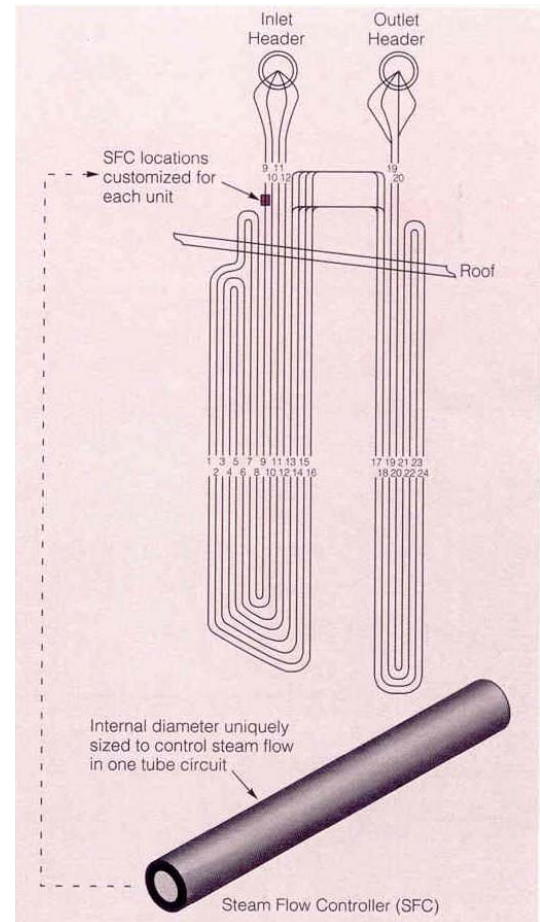
For the cost of one superheater or reheater replacement on a 500 MW unit to improve reliability for that one unit, TubeMod can improve the reliability on 10 units.

### WHAT IS TUBEMOD?

APTECH's patented TubeMod process is straightforward. First, we do a thorough assessment of the current damage and remaining life of the superheater or reheater, pinpointing where and when trouble is expected. Then, our TubeMod software uses the data to search for optimum temperature profiles to maximize future life and reliability. Steam flow controllers are sized to achieve these results; then, they are made part of the circuits to redistribute steam flow from the cold tubes to the hottest tubes to obtain the optimum profile.

To find out how TubeMod can solve your tube failure or temperature distribution problems and avoid expensive replacement, please contact Kevin Hara at 408.636.5333 or Tom Burnett at 281.345.5707.

Additional information on TubeMod can be found on our website at [www.aptecheng.com](http://www.aptecheng.com).

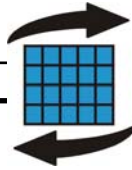


### Petrochemical Service News

## NPRA

APTECH attended the NPRA Reliability and Maintenance Conference held at the George R. Brown Convention Center, downtown Houston in May. Conference presentations included talks on industry codes and standards, RBI, Asset Management, Reliability and Turnaround Planning. A summary of the latest additions to the ASME and API codes and standards is available on APTECH's website at [www.aptechtexas.com](http://www.aptechtexas.com).





## Forensic Engineering News

### Residential Washer/Dryer Fire

APTECH recently completed the investigation of an incident involving a clothes washer/dryer which caught fire. Events started with a fire breaking out at 2 a.m. in a Sunnyvale residence. Local fire department investigators and an investigator for the property insurance carrier quickly traced the origin of the fire to a stacked clothes washer/dryer located in a hallway. The only real combustion damage to the structure (e.g., charred wall two by four joists) occurred in the immediate vicinity of the washer/dryer so there was little doubt that the washer/dryer was the fire origin, but exactly why it caught fire became the key argument of a lawsuit.

The washer/dryer was the new generation of solid-state controlled, high-efficiency design, with lots of light-weight plastic parts. Initial investigators agreed the original fire started inside the unit and was electrical in nature. Based on this information, the property insurance carrier filed suit against the appliance manufacturer. When the appliance manufacturer hired independent experts to rebut the allegation their washer/dryer was at fault, the property carrier hired APTECH to complete a follow-up fire root cause investigation. By the time APTECH was hired, the accident was over two years old and the washer/dryer was in storage in Sunnyvale.

APTECH conducted a detailed inspection and metallurgical investigation of the burned out washer/dryer and found evidence of short-circuits in the wiring in the washer. We also found that this particular washer/dryer had been the subject of a class-action lawsuit based on the experiences of dozens of owners who claimed a wide variety of cycle control and overheating problems, all associated with the solid-state control system. Based on our investigation and other site evidence, we agreed that the facts supported the opinion of the original onsite investigators that the fire origin was electrical and inside the washer.

The defense expert postulated an alternate theory in which the spontaneous combustion of rags and/or

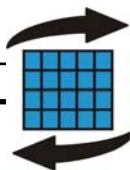
soiled clothing stacked on the floor outside the washer but next to it was the fire origin and cause. They came up with this theory because they noted the residence was being painted at the time. They said that either painter's clothing saturated with paint or clean up rags were piled in a way that would promote low temperature decomposition leading to heat generation in the fabrics and eventual spontaneous combustion.

Beside the fact that there was no evidence of partially burned fabric at the scene, our literature research showed that only oil-based stains can possibly cause spontaneous combustion. There was no evidence of stain having been used by the painter, and the owner testified in deposition that no painting had been done for many weeks before the fire. The defense response to this was to allege that the owner was lying.

We concluded that the defense's theory was only wild conjecture of junk science with no foundation. We submitted several declarations stating our opinions in this regard.

In the end, the expenses of lawyers and experts on both sides were mounting and approaching a significant fraction of the value of the fire loss, so both sides agreed to settle for an undisclosed amount.





New Vice President—Continued from Page 1

California office, Satish will lead and consult across APTECH's practices in industrial processing, manufacturing energy, petrochemical, and allied sectors including litigation support services.

Satish brings over 35 years' industry and consulting experience in the US, Asia, Australia, New Zealand, Europe, Central America, and Canada. He specializes in technical and management consulting services to industrial processing, manufacturing, and allied sectors. He assists clients in problem solving. He is experienced in and provides litigation support including testimony for deposition, mediation, arbitration, and trial.

He has managed and consults in multimillion-dollar turnkey, EPC, and other design build projects for production plants. His experience includes project management, cost estimating and control, process and plant engineering, operations, maintenance and safety management.

Previously, Satish held line and staff management positions with Exponent, Woodward Clyde Consultants (now URS), UK-based Imperial Chemical Industries, Stauffer Chemical Company, Bechtel Corporation, and Union Carbide Corporation.

Satish has worked and consulted in petroleum and refining; petrochemical; chemical; bio/pharmaceutical; energy and power; manufacturing; semiconductor and electronic; and air, water, and solid waste pollution management.

Satish received a MS in Fuel Technology (Chemical Engineering Emphasis) from The Pennsylvania State University and a M.Sc. in Chemistry from Poona University in India.

## Petrochemical Service News

### **OSHA National Emphasis Program**

The U.S. Department of Labor's Occupational Safety and Health Administration (OSHA) has published a new Directive for implementing a National Emphasis Program. It is a rigorous enforcement program to help reduce workplace hazards associated with the release of Highly Hazardous Chemicals at petroleum refineries.

OSHA will conduct 81 inspections over the next two years with nearly 300 federal safety inspectors spreading out to refineries across the country. Two to four federal inspectors will visit a refinery and remain on site for several weeks examining compliance with federal process safety rules put in place in 1992.

OSHA has found that employers have extensive written procedures for Process Safety Management (PSM) but the implementation of these PSM procedures has been lacking.

The new National Emphasis Program is just one of multiple enforcement projects in the oil, gas and refining industries on which OSHA is working. If you require assistance with your current program or would like a pre-audit evaluation, please contact APTECH at [www.aptechtexas.com](http://www.aptechtexas.com) or [gbarrera@aptechtexas.com](mailto:gbarrera@aptechtexas.com).

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## Petrochemical Service News

### **New Metallurgical Engineer in Houston**

APTECH would like to welcome its newest employee, Velu Palaniyandi. Velu is a Metallurgical Engineer and has a Masters Degree in both Metallurgy (University of Alabama) and Materials Science (Oregon State University). He will be working out of APTECH's Petrochemical office and will provide RBI, Mechanical Integrity and failure analysis support to both the Houston and Canadian offices.



## Power Generation News

### CONCERNED ABOUT FLOW ACCELERATED CORROSION (FAC) OR OTHER SIGNIFICANT WALL LOSS DAMAGE?

Don't you wish you could examine your condensate and feedwater piping, feedwater heater shells, and tanks through the insulation? Even better, that you could perform the examination with the unit online before the outage?

#### NOW YOU CAN!!!

APTECH is pleased to provide a real-time method for non-intrusive wall thickness measurements through insulation using pulsed eddy current (PEC). This patented technology has been used successfully world wide. The system is especially attractive to many power plants because it can be used:

- While the plant is online or offline
- Without removing insulation or lagging
- For pipe temperatures up to 950°F
- For insulation thicknesses up to 4 inches
- Wall thicknesses up to 2.5 inches



The APTECH approach to detect wall loss, erosion-corrosion, and other general wall loss damage mechanisms includes:

- Computer software to identify and rank inspection locations
- PEC non-intrusive examination
- Engineering analysis
- Report documenting locations and results

APTECH has completed more than 150 PEC projects for fossil, nuclear power, and chemical plants.

Flow Accelerated Corrosion (FAC) and other wall loss mechanisms can have serious consequences and have resulted in fatalities on several occasions. A catastrophic pipe failure occurred recently in the attemperator line of a power plant in the U.S. resulting in the deaths of two workers. APTECH was contracted to be on site several days after the failure and tasked by the owners with the engineering selection and examination of critical locations of all applicable piping systems on some of their units that could be subject to general wall loss.

APTECH's examination capabilities, experience and technical knowledge can simplify your toughest engineering decisions.

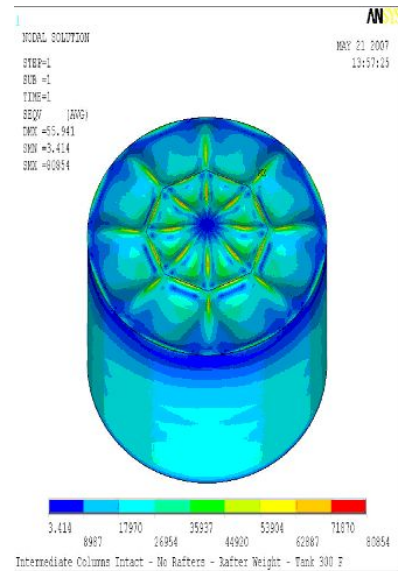
Finally, a cost-effective alternative!



Storage Tank—Continued from Page 1

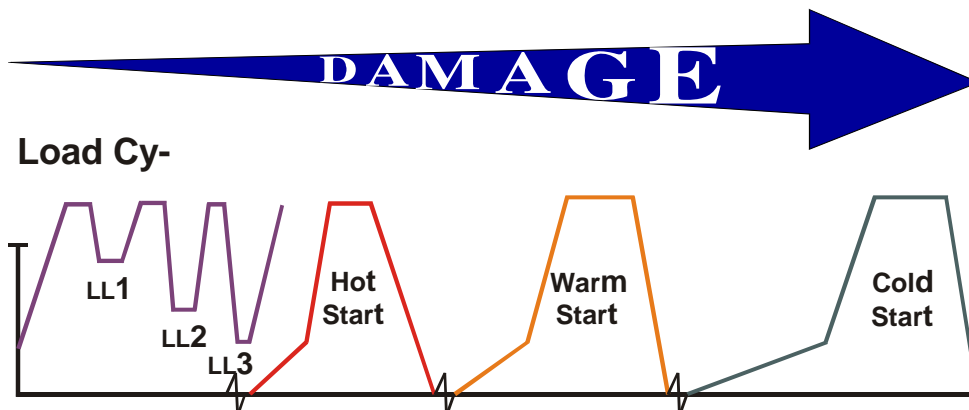
serious challenge to investigating the safety and root cause failure of the roof collapse.

APTECH used construction drawings, photographic reconstruction to develop a finite element model of the tank (as built). The tank was then scanned using state of the art laser telemetry to determine current (collapsed roof dimensions). The finite element model was then run using different failure models to see which one most closely matched the scanned dimensions. With this information APTECH was able to determine the most likely cause of the roof collapse, determine tank safety in the filled and emptied condition as well as determine a safe strategy for emptying the vessel so a final root cause investigation could be conducted.



Cost of Cycling—Continued from Page 1

more than 300 steam and combined cycle units and more than 150 coal units is that the financial costs associated with cycling operation are very high for most thermal power plants and that these costs are usually poorly understood and not fully accounted for in making system dispatch and trading decisions. Some carefully analyzed and selected older coal and oil/gas fired plants have been found to be more rugged and cost effective to cycle than the newest combined cycle units. This factor and relatively low fuel prices are advantages of some coal units. However making the decision to cycle any power plant should not be taken lightly as there are numerous long-term effects, component damage, and significant financial costs that need to be calculated and accounted for.





## Forensic Engineering News

### APTECH Defends Engineer on Owner Caused Delays on Multimillion-Dollar Engineer, Procure, Construct (EPC) Project

Developing and building multi-million dollar production plants is by no means new to Owners, Engineers, and Constructors. However, time and again we encounter complaints of project cost overruns, delays in project completion, and bad performance. Often the complaints result in disputes between Owners and Design-Build firms and lead to lawsuits. Factors such as unproven technology, deficient definition of the work to be performed, unrealistic cost estimates and expectations, unrealistic completion schedule mandates, poor project management by both the Owner and the Design-Build firm, poor communications and, bad and untimely decision-making are often the root causes of the problems. This article presents one such case example.

APTECH and co-consultants were retained by a Law Firm in defense of a major US Engineering Construction Company (Engineer) to analyze and testify on a dispute between an Owner and the Engineer in an EPC (Engineer, Procure, Construct) contract for performing detailed design, procurement, and construction of an urea fertilizer production plant. The technology for the project was acquired by the Owner under a licensing agreement from a petroleum operating company (Licensor), who supplied the basic information and definition of the process from which the Engineer had to do the detailed design, procurement, and construction.

The chemistry of the process involved producing and purifying hydrogen and carbon dioxide gases from petroleum coke (coke gasification). Separately, nitrogen and oxygen were separated from air and the nitrogen was reacted with the pure hydrogen to produce ammonia gas. The ammonia was then reacted with the pure carbon dioxide gas to produce urea fertilizer.

Besides making numerous changes required by the Owner and correcting the deficient information from the Licensor, the Engineer added certain improvements to make the plant work right. Due to delays caused primarily by the Owner and Licensor's information deficiencies, the plant was completed 2 months late. The Engineer incurred an additional cost of about 3% of the total contract value and made a Request for Equitable Adjustment (REA). The Owner turned around and sued the Engineer for delays, engineering deficiencies, and deficient project management.

The analysis performed by the APTECH/Co-consultant team concluded that:

- The project was flawed from the start in its conception and expectations.
- The technology for gasifying petroleum coke was not adequately proven on a commercial scale.
- During initial cost and economic evaluation, the Owner made the Engineer cut project costs to meet the Owner's budgets.
- The Engineer accepted the cost cuts assuming in "good faith" that the Owners would pay for unanticipated extras.
- The Engineer's upper management wanted to design and build this first of a kind plant regardless of risks.
- The Owner and Engineer's upper management had unrealistic expectations of the project's success and over committed the Engineer's project team and mandated that the team complete the project to the Owner's expectations.
- The Licensor and Owner separately agreed to use old, abandoned equipment for the new plant located on the West Coast and



APTECH Defends Engineer—Continued from Page 7

shipped it to the new plant location in the Midwest over 2,000 miles away.

- Moreover, the old plant equipment was dismantled, cut in pieces and completely modified without regard to the material's age, code requirements, and requirements of the new plant. The equipment was not adequately cleaned by the Owner's contractor retained for dismantling, cleaning, and transporting.
- The Licensor's basic design information was deficient and required numerous changes during detailed engineering and design, which caused delays in detailed design and subsequent activities. However, the Owner did not hold the Licensor responsible for his deficiencies.
- The Owner and Licensor conducted Hazards and Operability Studies (HAZOPs) late during the detailed design phase and caused numerous nagging and lingering process changes, which in turn delayed the project.

- The Owner's side of project management was highly deficient and the Owner failed to make timely decisions and mandated late design and management changes.
- In spite of timely submission of formal and written change orders by the Engineer, the Owner refused to formally approve them and asked the Engineer to proceed rapidly on verbal approvals. The Engineer proceeded in "good faith" to meet upper management's mandates.
- As the project progressed, the communications and decision making from the Owner to the Engineer deteriorated and the project working relationship suffered.

The matter did not settle in mediation but later settled out of court.

APTECH's staff included Kimble Clark, Stephen Kohan, Michael Cronin, Richard Schreiber, and Satish Almaula.

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