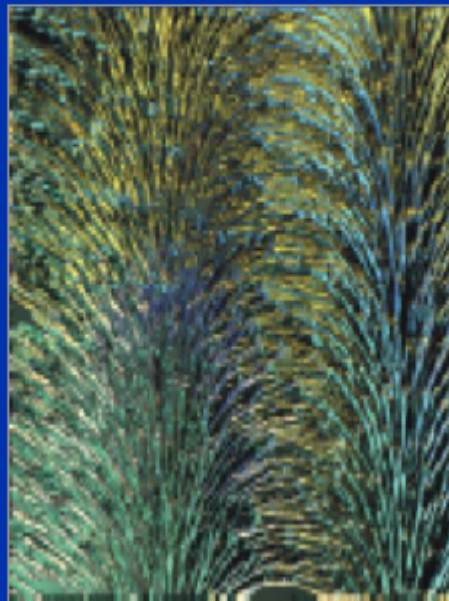
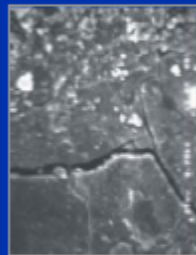


APTECH Engineering Services, Inc. Petrochemical Group

Metallurgy & Failure Analysis Services for Oil, Gas, and Petrochemical Industries

Aptech Engineering Services, Inc. (APTECH) is an internationally recognized, high technology engineering consulting firm dedicated to the support of industrial systems and to the prediction, prevention, investigation, and analysis of failures. APTECH specializes in the development of reliability-based strategies employing proprietary engineering techniques as well as conducting corrosion studies and failure investigations for a broad range of industries.

APTECH



Metallurgy & Failure Analysis

APTECH's Metallurgy and Failure Analysis (M&FA) Group is committed to providing you with the specialized expertise needed to simultaneously reduce equipment failures and operating, maintenance, or capital expenditure costs. We pride ourselves on applying the best available technologies to solve your difficult materials-related problems.

Pump Shaft
Fatigue Failure.



Services

- ◆ Failure Analysis
- ◆ Fractography & Microstructural Evaluation
- ◆ Corrosion Control & Analysis
- ◆ Welding & Joining Process Evaluation
- ◆ Materials Selection
- ◆ Incident Investigation
- ◆ Fitness-for-Service Evaluation
- ◆ Risk Based Inspection

Collapsed Storage
Tank.



Benefits

Failures of systems and components often result in costly downtime and can cause pollution, secondary damage, or injury. At such critical times, APTECH's skillful accident investigation and reconstruction will uncover the circumstances leading to the event. Our material experts have many years of industry experience and use sophisticated failure analysis techniques to identify the active damage mechanism(s) and the root cause(s) of failure. This translates into long-term and cost savings benefits, as well as improved safety and reliability.



Internal wall thinning in a pipe subject to
flow accelerated corrosion.

Related Experience

Failure Analysis for Plant Equipment in Following Industries

- ◆ Fossil Power (including fluidized bed boilers, gas turbines, and HRSGs)
- ◆ Nuclear Power
- ◆ Insurance and Legal
- ◆ Aerospace
- ◆ Pulp and Paper
- ◆ Petrochemical

Material Selection

Specialized Mechanical Testing

- ◆ Strain Gaging
- ◆ Fatigue Testing
- ◆ Fracture Arrest Testing
- ◆ Stress Rupture Testing
- ◆ Custom Testing

Boiler Tube and Equipment Failure Reduction Programs

Weld Procedure Specification Reviews

- ◆ ASME Section IX
- ◆ AWS D1.1
- ◆ Custom Procedures
- ◆ Radiograph Interpretation

Remaining Life Assessment

- ◆ Materials Modelling (e.g., creep cracking, fatigue, stress corrosion, corrosion fatigue, creep-fatigue, corrosion)

Risk Based Inspection

- ◆ RDMIP™ Software
- ◆ Analysis of Degradation Mechanisms
- ◆ Inspection Plans

Laboratory Facilities

APTECH has a fully equipped metallurgical laboratory utilizing scanning electron microscopes, electron microscope analyzers, routine metallurgical laboratory equipment, and advanced analytical equipment. To meet the need for more accurate inspection information when conducting condition evaluations of equipment, APTECH has developed state-of-the-art digital imaging systems, which are available for image enhancement services. APTECH has pioneered many techniques in surface metallography and has an extensive database covering numerous types of materials. Additionally, APTECH utilizes a wide variety of field equipment, such as color videoprobes, etching and polishing equipment, and fuel sampling devices.

Metallurgical analysis procedures and metallurgical specimens are frequently needed as a part of the Remaining Useful Life (RUL®) assessment program, involving the use of APTECH's Materials Laboratory. Services routinely provided by the laboratory include the following:

- ◆ Metallography
- ◆ Hardness Testing
- ◆ Fractography
- ◆ Materials Analysis
- ◆ Electron Microscopy
- ◆ Radiography, Ultrasonic, and Eddy Current Testing
- ◆ Image Enhancement

Photography

- ◆ Digital and Film Photo Documentation
- ◆ Video Recording

Scanning Electron Microscopy

- ◆ JEOL JSM-35CF Electron Microscope
- ◆ Energy Dispersive X-Ray Chemical Analysis

Optical Microscopy

- ◆ Stereo Zoom Microscopes
- ◆ Reichert-Jung MeF3 Research Metallograph
- ◆ Sample Preparation and Etching

Hardness Testing

- ◆ Wilson-Rockwell Hardness
- ◆ Shimadzu Microhardness
- ◆ Equotip Portable Hardness Tester

Mechanical Testing

- ◆ MTS810 Tensile, Fatigue, and Fracture Toughness Testing
- ◆ Creep and Stress Rupture Testing
- ◆ Strain Gaging and Data Acquisition

Inspection Equipment

- ◆ Color Videoprobe with Recording
- ◆ Magnetic particle Testing
- ◆ Ultrasonic Testing
- ◆ Penetrant Testing
- ◆ Acoustic Emission Testing
- ◆ Eddy Current Testing
- ◆ Barkhausen Noise Analysis
- ◆ Crack Depth Gage
- ◆ Surface Replication and Replica Evaluation
- ◆ Alloy Analysis

A PTECH's strength is in the quality and expertise of its staff. Our engineers have extensive industrial experience in their technical specialities. Our staff has a broad range of related materials experience in the nuclear, fossil, geothermal, petrochemical, and chemical industries.

Partial Client List

- ◆ Abu Dhabi Gas Industries (GASCO)
- ◆ Apache Nitrogen Products Inc.
- ◆ Arco Chemical Company
- ◆ Bechtel Corporation
- ◆ BP Exploration Co.
- ◆ Caltex Chemical Company, US
- ◆ China General Plastic Corporation
- ◆ Cargill Fertilizer
- ◆ CONDEA Vista Chemical Company
- ◆ Eastman Chemical Company
- ◆ Engen – A Division of Engen Petroleum
- ◆ Firestone Polymer
- ◆ Fluor Daniel, Inc.
- ◆ FMC Corporation
- ◆ Hampshire Chemical Corporation
- ◆ H.B. Fuller Company
- ◆ Huntsman Chemical
- ◆ Lion Oil Company
- ◆ Louisiana Pigment Company, LP
- ◆ Marathon Oil Company
- ◆ Montell USA, Inc.
- ◆ Occidental Chemical
- ◆ Oman Oil Company
- ◆ PREMCOR Refining Group, Inc.
- ◆ Quantum Chemical Company
- ◆ Rohm & Haas
- ◆ Samsung Chemicals
- ◆ Seadrift Coke
- ◆ SGS Industrial Services
- ◆ SK Chemicals
- ◆ Sunkyong Industries (formerly Yukong, Ltd.)
- ◆ Syncrude Canada, Ltd.
- ◆ Sunoco (formerly Aristech Chemical Co.)
- ◆ Taiwan Vinyl Chloride Monomers Plant, CGPC
- ◆ Tesoro Petroleum (formerly BHP Petroleum)
- ◆ Valero Energy Company

For More Information, Contact APTECH's Houston Office.

Aptech Engineering Services, Inc.

16100 Cairnway Drive, Ste 310, Houston, Texas 77084

Phone: 832.593.0550, Fax: 832.593.0551

E-Mail: aptechtexas@aptecheng.com

Website: www.aptechtexas.com



Aptech Engineering Services, Inc.

139, 11215 Jasper Avenue, Edmonton, Alberta, CANADA, T5L 0L5

Phone: 780.669.2869, Fax: 780.669.2509

E-Mail: aptechalberta@aptechtexas.com

Website: www.aptechtexas.com

Corporate Headquarters

601 West California Avenue, Sunnyvale, CA 94086-4831

Phone: 408.745.7000; Fax: 408.734.0445