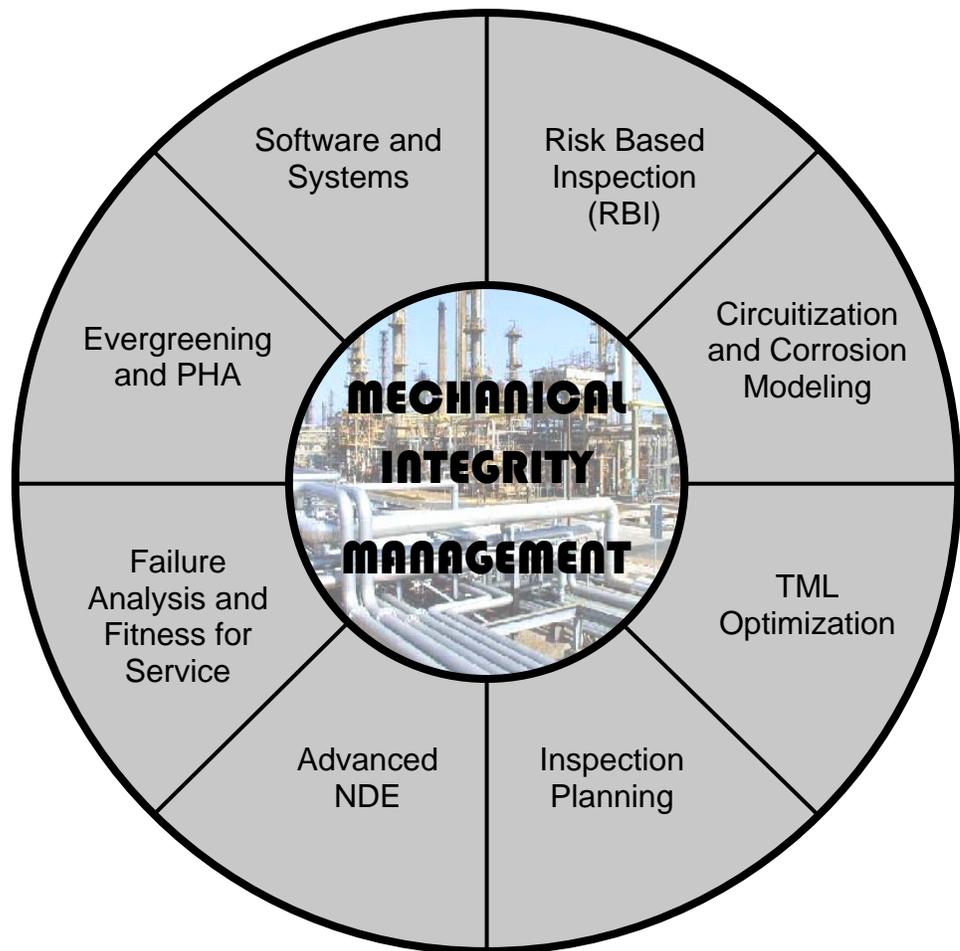


APTECH Engineering Services, Inc. Petrochemical Group

Providing Innovative & Cost-Effective Solutions
for Mechanical Integrity Management



Aptech Engineering Services, Inc. (APTECH) is one of the industry leaders in providing asset management solutions for your facility and equipment. Let APTECH show you how our integrated approach to systems and techniques can reduce your failure and downtime risks, while simultaneously lowering your maintenance and operating costs.

Mechanical Integrity Management

APTECH is a full service engineering consulting company specializing in the life management of infrastructure, facilities, and equipment. The APTECH Petrochemical Group, a division of APTECH, is located in Houston, Texas and provides a direct focus on Mechanical Integrity Management solutions to the process industries.

Aptech specializes in understanding, developing, and supporting the latest technology in mechanical integrity (MI) systems and programs, and applying those advances to our clients' facilities and existing programs. At APTECH our overriding focus is understanding your current mechanical integrity programs and systems and working with you to implement new methodologies or technology into the existing programs and workflows, so as to maximize return while minimizing the need to alter the end user's workload.

Our services range from complete implementation for facilities with no existing program, to assisting with implementation of specific technology, such as risk based inspection (RBI) or thickness monitoring location (TML) optimization, to an already established system. In each situation, APTECH's approach to total mechanical integrity management will provide the owner with a complete solution for the implementation and integration of the latest technical advances in the industry. APTECH has helped dozens of facilities to realize three primary advantages:

- ◆ Increased compliance with industry codes and standards
- ◆ Documented reductions in the levels of risk throughout the facility
- ◆ Reduced inspection and maintenance costs throughout the life of the facility

Through its services, APTECH will ensure the facility's MI program is leveraging the best practices adopted throughout the industry and surpassing the standards currently set by industry leaders.

APTECH's staff includes specialists in all areas of MI management. This includes design, repair, inspection and maintenance, operational and process support, corrosion, metallurgy, and risk analysis. The APTECH Petrochemical Group provides mechanical integrity management services to the following industries:

- ◆ Refineries and Gas Processing
- ◆ Petrochemical
- ◆ Specialty Chemical
- ◆ Offshore and Shipping
- ◆ Pipelines
- ◆ LNG and LPG



Integration

The goal of any MI program is to effectively manage corporate assets in order to gain maximum value from those assets while effectively safeguarding personnel, the community, and the environment. A true Mechanical Integrity Management program incorporates design, maintenance, inspection, process, operations, and management concepts, since all of these disciplines impact the integrity of infrastructure and equipment.

One of the key ingredients in APTECH's approach to the implementation of Mechanical Integrity Management solutions is *integration*. By focusing on the end result – the implementation of current technology into the facility's existing systems and work flows – we ensure the technology implemented is completely utilized by the owner, and not left sitting in a report requiring further efforts to extract value.

Key Services

The following key services are offered:

Software and Systems Implementation

The current industry best practices utilize various software tools to manage the planning, execution, data storage, and analysis of inspections and their results. At APTECH, our personnel have extensive experience in a majority of third-party packages, as well as some of the key in-house packages utilized throughout the industry. APTECH's focus as a service company includes no ties to one software package that can limit our ability to provide complete services. Whether you are in the decision-making process and would like some objective input as to how various tools could fit your staff and work flow, or have already identified the tool of choice and would like experienced consultants to assist in its application, APTECH can help. APTECH personnel have implemented programs in all of the following Inspection Data Management System (IDMS) packages:

- ◆ UltraPIPE
- ◆ PCMS
- ◆ Meridium
- ◆ EMPRV (Shell)
- ◆ IDM3 (ExxonMobil)
- ◆ DMAPS

Software is only one piece of the equation. The key to complete implementation is the effective management of the surrounding efforts, such as gathering baseline equipment information, inspection isometric generation, TML population, performing baseline inspections, etc. All of these can be provided by APTECH, ensuring your complete program is up and running.

Risk Based Inspection Implementation

Over the past decade, the industry has moved from a prescriptive inspection methodology (i.e., API 510, 570, 653, etc.) to a more engineered approach to the application of modern inspection technology. The vehicle most prevalent in the industry for this is RBI. Governed by API 580, RBI outlines the process by which inspection techniques, timing, and locations are identified. APTECH was one of the first companies in the industry to develop an RBI strategy and associated software. Since then, our staff has implemented RBI programs using virtually every major RBI software package on the market. Our proven strategies and methodologies for RBI implementation are second to none in maximizing the effectiveness of the project while minimizing the requirements on owner personnel. As with inspection software, our focus as a service company allows us to remain objective about which software to utilize and to focus on providing the best value for your investment. In addition, our RBI projects do not conclude at a project report. We will implement the results into whatever inspection planning and scheduling software you utilize. This ensures that when the project is completed, owner personnel continue to manage inspections utilizing the same systems, with the updated information (technique and schedule) already included. APTECH personnel have implemented programs in all of the following RBI packages:

Likelihood Category	Consequence Category					
	A	B	C	D	E	
5	12	1	2	6		21
4	2	11		7	2	22
3	1	3	1	5	1	11
2	1	6	9	5	1	22
1	28	38	15	49	19	149
	44	59	27	72	23	

- ◆ API RBI
- ◆ RDMIP®
- ◆ Capstone®/Meridium®
- ◆ TOCA® (Tischuk)
- ◆ SRBI (Shell)
- ◆ RiskWise® (TWI)

Piping Circuitization and Corrosion Modeling

In order to manage the inspection of piping, identifying piping systems and/or circuits is critical. Typically, this is performed at the outset of any MI program. However, as modifications to the facility are constructed, sections of piping may be missed. In addition, process changes due to those upgrades are frequently not taken into account in the alignment of process streams. In order to ensure all piping is effectively managed, APTECH can assist in the circuitization of piping. APTECH's standards and procedures for circuitization ensure circuits are identified effectively so as to facilitate the implementation of various inspection techniques. As older units are "recircuitized," the effort typically includes the redefining of TMLs, as well as migration of data between old and new circuits. In more complex units, Corrosion Models can be constructed to identify potential damage mechanisms and their locations. These corrosion models are also critical to the RBI and TML optimization efforts in an integrated package. APTECH offers the following services:

- ◆ Unit corrosion description and identification of damage mechanisms
- ◆ Identification of corrosion loops or circuits
- ◆ System descriptions and identification of key operating parameters (operational integrity windows)
- ◆ Corrosion monitoring recommendations.

Thickness Monitoring Location Optimization

Many facilities in the industry are plagued with an excessive amount of TMLs in locations that provide little or no useful data. Although the term “optimization” has historically been used to imply reduction, APTECH utilizes proprietary methodologies, engaging corrosion models, RBI results, and statistical analysis to truly optimize the inspection of TMLs. APTECH personnel have implemented our optimization strategies at facilities that saw a 60% reduction in on-stream efforts, while exceeding the requirements of API 570 and reducing the overall risk to the facility.



Inspection Planning and Scheduling (Including Turnaround Planning)



Regardless of the facility’s approach to defining inspection requirements—corporate best practices, industry standards, jurisdictional requirements, RBI, or in-house owner expertise—the exercise of building inspection plans can be extremely cumbersome. Utilizing any or all of the tools identified, our staff can outline a complete inspection plan for the next 10 years at your facility. We can also construct detailed turnaround inspection plans, including non-pressure boundary requirements, such as tray inspection, structural, or fouling concerns. As an added benefit, our planning efforts will ensure all applicable aspects of the plan are implemented into the IDMS utilized at the facility.

Advanced Nondestructive Testing Application and Analysis

In recent history, the technology in nondestructive examination (NDE) has grown substantially. Today there are over 75 different forms of inspection utilized regularly in the inspection of stationary equipment in the refining and petrochemical businesses. At APTECH, we utilize our expertise in these techniques to help our clients make strategic decisions regarding the condition of equipment and the application of an advanced technique in lieu of a traditional internal inspection, including shutdowns. In addition to being skilled at the application and analysis of dozens of advanced techniques, APTECH owns or licenses the technology to implement some of these methods. When coupled with



an effective RBI and inspection planning effort, APTECH can effectively extend turnaround intervals while increasing the likelihood of locating likely damage mechanisms. In addition to the standard inspection techniques (VT, UT, PT, WFMT), the following inspection technologies can be implemented by APTECH personnel:

- ◆ INCOTEST® (Pulsed Eddy Current)
- ◆ Acoustic emission
- ◆ Angle beam mechanized shear wave (Time of Flight Diffraction – TOFD)
- ◆ Straight beam mechanized (automated corrosion mapping)
- ◆ Flange seal inspection

The analysis of the data resulting from these tests is conducted by our experts utilizing anything from RBI reviews to failure analysis and fitness for service. For example, the RBI process may eliminate the need to do intrusive or costly automated UT inspections if piping can be adequately evaluated using INCOTEST.

Failure Analysis and Fitness for Service

Regardless of the quality of a MI program, degradation or damage eventually occurs in virtually every facility. When it does, personnel need to understand what has caused the damage and whether the equipment can remain in operation, be repaired, or be replaced. APTECH has conducted many failure analyses in the industry, as well as hundreds of fitness-for-service analyses. These projects range from Level I corrosion assessments to Level III fire damage assessments. For any equipment, APTECH can provide a detailed assessment of its condition and assist in strategizing on how to maximize remaining useful life.



Evergreening and Process Hazards Analysis Support

One of the key aspects of establishing a complete Mechanical Integrity Management program at a facility is implementing the correct procedures and workflows to ensure the data upon which the analyses are conducted remain accurate. The Occupational Safety and Health Administration (OSHA) requires facilities maintain an effective Management of Change (MOC) process and conduct Process Hazards Analyses (PHAs) on a regular basis. APTECH works with owner personnel to identify existing workflows around these initiatives and to integrate new MI systems and technology into the process. Regardless of what systems or programs are in place, APTECH can perform a complete “evergreening” project to update and validate critical systems data. Furthermore, by facilitating the review of process parameters and corrosion models within the PHAs, or other detailed process reviews, facilities can effectively evergreen their RBI and other analyses, virtually eliminating the need for consultants or added internal efforts. APTECH can assist in extracting key information from existing systems, preparing the data for review, and evaluating the key components within a PHA. Finally, our staff maintains the expertise to facilitate PHAs or HAZOPs, if needed.

Where to Start

If your facility is in the process of evaluating changes to its MI program, or if you have already begun an exercise such as IDMS or RBI implementation and would like to evaluate some other options, allow us to offer some new perspective. APTECH looks at each engagement as a chance to bring more value to our clients and the industry. If you would like to gather information on the condition of various aspects of your MI program, APTECH regularly performs assessments or audits and provides detailed reports as to the status of various systems versus industry benchmarks. In some cases, this service is offered free of charge. If your facility requires some refresher training, APTECH can structure a course focusing on the systems currently in your facility and on the integration of efforts between them.



Partial Mechanical Integrity Client List

- ◆ Abdel Hadi Abdullah Al-Qahtani & Sons (Saudi Chevron Phillips)
- ◆ Abu Dhabi Gas Industries (Gasco)
- ◆ Allan F. Dow & Associates
- ◆ Apache Nitrogen Products, Inc.
- ◆ ARCO Chemical Company
- ◆ Bariven, S.A., PDVSA Services, Inc.
- ◆ BP Amoco (Alaska)
- ◆ Caltex Oil (SA) (Pty) Limited
- ◆ Cargill Fertilizer Company
- ◆ Chemical Manufacturers Association
- ◆ China General Plastics Corporation
- ◆ China Plastics Services Corporation
- ◆ ENGEN – A Division of Engen Petroleum
- ◆ Firestone Polymer
- ◆ Fluor Daniel, Inc.
- ◆ FMC Corporation
- ◆ Hampshire Chemical Corporation
- ◆ H.B. Fuller Company
- ◆ Hoechst Celanese
- ◆ Huntsman Chemical Company
- ◆ Huntsman Chemical Corporation Australia PTY Ltd.
- ◆ IIR Holdings Limited
- ◆ Industrial Technology Research Institute
- ◆ Lion Oil Company
- ◆ Louisiana Pigment Company, LP
- ◆ Montell USA, Inc.
- ◆ Premcor Refining Group Inc. (Formerly Williams Refining LLC)
- ◆ Rohm & Haas
- ◆ Rohm & Haas Texas, Inc.
- ◆ SC Johnson & Son, Inc.
- ◆ Seadrift Coke
- ◆ SGS Industrial Services
- ◆ Star Enterprises, Inc.
- ◆ Sun Company, Inc.
- ◆ Sunoco - Aristech Neal Plant (Aristech Chemical Corporation)
- ◆ Tesoro Petroleum Hawaii
- ◆ TTS
- ◆ Valero Refining Company

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