

REALISTIC ASSESSMENT OF DAMAGE AND

EQUIPMENT INTEGRITY IN

CHEMICAL PLANTS AND REFINERIES

SUBJECT TO FIRES, EXPLOSIONS, AND OTHER CATASTROPHIC EVENTS

THIELSCH ENGINEERING, INC. has developed a unique position in the process industry in the assessment of damage to equipment, piping, pressure vessels, and other components in chemical plants, refineries and other process plants that have been subject to fires, explosions, earthquakes, bombings and other "catastrophic" occurrences.

This experience has been gained as a result of over 40 years of experience by the Professional Engineering staff. In addition to the assessment and determination of the extent and significance of the damage of the "altered" plant units or equipment, our expertise includes extensive repair and other rehabilitation services.

In the assessment or evaluation of damage to plants, a broad range of professional expertise is utilized, including metallurgical, mechanical, structural, and corrosion engineers, equipment designers, stress and finite element analysis engineers, nondestructive testing experts, and others, as needed. Also available are specialized welding engineers with "hands-on" experience in the performance of repairs to critical equipment. These experiences have included the repairs of all types of pressure vessels, compressors, turbines, structures, crank shafts, boilers, fans and other difficult-to-weld equipment and materials. The procedures developed and utilized by these welding engineers are designed to result in minimum distortion of the component and reductions in the residual stresses inherent to welding. These repairs utilize, where applicable, highly specialized heat treating techniques to further reduce distortion and residual stresses.

The personnel in our organization have inspected over 10,000 piping systems, pressure vessels, compressors and other equipment in various types of industrial plants, including a large number of refineries and chemical plants. We have thus developed a very extensive library of information on these materials, their metallurgical characteristics and mechanical properties and their performance, including the effects of overheating, fires, explosions, shock loading, or other incidents. The data available are enough to write several

handbook volumes. This knowledge, of course, would prepare us for almost any type of project. Some of this information is also presented in the three-day seminars presented under sponsorship of the Boiler and Pressure Vessel Committee of the American Society of Mechanical Engineers on the subject "Failures, Failure Prevention, Maintenance and Repairs of Pressure Vessels, Piping, Boilers and Rotating Machinery, and Life-Extension Considerations."

In the past, we have assisted in evaluations of plants that have been subject to localized fires resulting in potential damage to the equipment exposed, or in more severe cases, to the complete plant installation. With our assistance, these plants have been returned successfully to service in far less time than had originally been anticipated by insurance underwriters, adjusters, representatives of original equipment manufacturers, and other personnel.

In certain cases, pressure vessels exposed to fires, that had been marked for replacement, after careful evaluation by THIELSCH ENGINEERING, INC. engineering personnel utilizing various metallurgical, mechanical and nondestructive testing techniques, confirmed that the equipment, with minimum efforts, could be utilized in the as-fire-exposed condition, or could be restored to an entirely reliable level of safety fully complying with applicable specification and standards by minor welding and/or heat treating operations.

Therefore, as a result of our activities, the costs of equipment replacement to either the owner/operator or the insurer has been, and can be substantially reduced.

In addition, far greater cost benefits have been realized as a result of the significant reduction in business interruption losses by returning the plant and equipment involved far more rapidly to a safe and reliable operating condition.

Most of our evaluations or condition assessments by THIELSCH ENGINEERING, INC. personnel are supported by detailed engineering reports which cover all aspects such as Codes and Standards, local regulatory and safety requirements, total condition assessments, repair considerations; essentially involving all aspects necessary to return a plant to service in a timely and cost-effective manner, while still maintaining the operating integrity, i.e., safety, of the plant.

THIELSCH ENGINEERING, INC. can also provide supervisory, engineering, and related personnel to manage, supervise, expedite, cost analyze, or perform the actual repair,

modification, and installation operations, where applicable and/or desirable.

Additional information of explosion types of failures and fires and the types of analyses performed is available as to cause and origin.

TYPICAL PROJECTS INVOLVING
EXPLOSIONS, FIRES, BOMBINGS
AND OTHER CATASTROPHIC EVENTS ON
WHICH THIELSCH ENGINEERING, INC. PROVIDED
VARIOUS ENGINEERING, MAINTENANCE AND REPAIR SERVICES

Sabah Gas Industries	Labuan, Malaysia
Hoechst-Celanese	Pampa, Texas
Exxon Refinery	Bayway Refining
Valero Chemical	Corpus Christi, Texas
Pacific Engineering	Henderson, Nevada
United Refining	Warren, Pennsylvania
Pemex	Cactus Chiapas, Mexico
Maraven	Punto Fijo, Venezuela
Lagoven Refining	Amuay, Venezuela
New Zealand Synfuels	new Plymouth, New Zealand
Ecopetrol	Cartagena, Colombia
Citizens Gas and Coke Co.	Indianapolis, Indiana
Ocelot Ammonia Company	Kitimat, British Columbia, Canada

SPECIFIC SERVICES PERFORMED
BY THIELSCH ENGINEERING, INC.
ON INDUSTRIAL PLANT PROJECTS SUBJECT TO
FIRES, EXPLOSIONS AND OTHER CATASTROPHIC EVENTS

Cause and Origin Analysis

Failure Analysis of Specific Components

Condition Assessment

Plant Site Metallurgical Fire and Mechanical Damage Assessment

Quantum Determination

Repair Scope Planning

Project Management

Repair Supervision

Budgeting and Costing

Repair, Replacement, Improvement, and Upgrading Determinations

Expediting

Design Analysis

Code Compliance Reviews

QA/QC Performance Determinations

Vendor Auditing and Expediting