

# VCEDamage Mechanisms Software V3.01

## Your guide through the maze of refinery damage mechanisms

With a technical basis in API RP 571 and WRC 489, VCEDamage Mechanisms™ software is a quick reference guide for identifying and understanding the potential damage mechanisms that can cause costly fixed equipment failure.

Designed for inspection and maintenance personnel, this easy-to-use software provides:

- Guidance through the damage mechanism selection process
- Help in selecting the best inspection method for each type of damage
- Simplified Process Flow Diagrams (PFDs) that show where damage is likely to occur in a process unit

VCEDamage Mechanisms software encapsulates years of experience of corrosion and materials expertise. Used in refineries worldwide, it is the only software created specifically to help operations, reliability and project managers streamline the process of pinpointing damage mechanisms and potential areas of risk.

A demo version of the software can be downloaded from [www.equityeng.com](http://www.equityeng.com). Both corporate and individual licenses are available.



## Software analysis capabilities

### NEW Materials Tab

A comprehensive materials reference including:

- Specifications - A database of ASTM/ASME Specifications, Mechanical Properties, TS, YS, heat treat condition, thickness, impact curve listing for all materials in ASME B31.1, B31.3, B31.4, Section VIII, Div 1 & Div 2, API 650 and API 530
- Chemistry - Chemical compositions and UNS numbers of typical refinery alloys
- Hardness - Hardness conversion for carbon and alloy steels, tensile strength
- Fired Heater Limits - API 530 fired heater tube temperature limits
- Pump Materials - API 610 centrifugal pump materials designations
- Weld Materials - Weld filler metal selection chart

### Text Browser Tab

Displays the WRC 489 document *Damage Mechanisms in the Refining Industry* (February 2004)

### Solver Tab with NEW Quick Search Feature

This new feature allows the user to quickly search the entire document, and sort and filter all damage mechanisms based on:

- Process unit
- Material of construction
- Operating temperature
- Damage source
- Damage morphology
- Consideration of mechanical damage

### NEW Look-ups and Conversions Tab

- Pipe - Pipe schedule & wall thickness
- Tube wall - Heat exchanger tube wall thickness
- Steam table - Saturated steam tables

### Calculators Tab

Includes four easy-to-use tools:

- **NEW** HTHA - Plots data directly on API 941 Figure 1, showing operating limits versus susceptibility to High Temperature Hydrogen Attack; includes printing capability
- Sulfidation - Calculates the corrosion rate of several alloys due to sulfidation based on modified McConomy Curves - the only sulfidation graphing/calculating software on the market today
- H<sub>2</sub>/H<sub>2</sub>S Corrosion - Calculates the corrosion rate of several alloys due to H<sub>2</sub>/H<sub>2</sub>S based on the Couper-Gorman Curves
- Oxidation - Calculates the loss in thickness of several alloys resulting from oxidation in air

### PFD Browser Tab

Presents Process Flow Diagrams (PFD's) with hyperlinked buttons for the following:

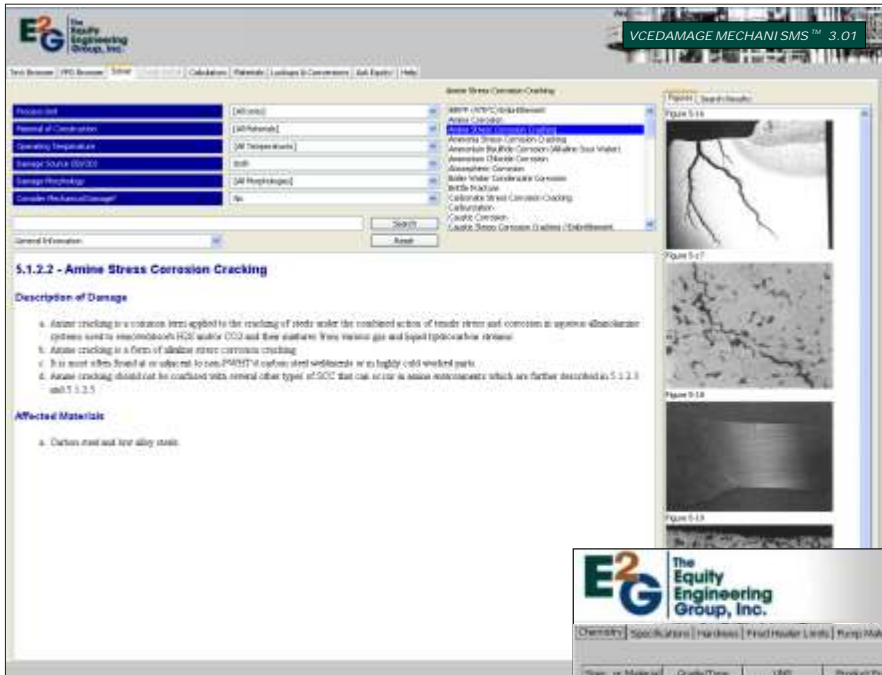
- Crude unit / vacuum
- Delayer coker
- Fluid catalytic cracker
- FCC light ends recovery
- Catalytic reforming - CCR
- Catalytic reforming - fixed bed
- Hydroprocessing units - hydrotreating, hydrocracking
- Sulfuric acid alkylation
- HF alkylation
- Amine treating
- Sulfur recovery
- Sour water stripper
- Isomerization
- Hydrogen reforming

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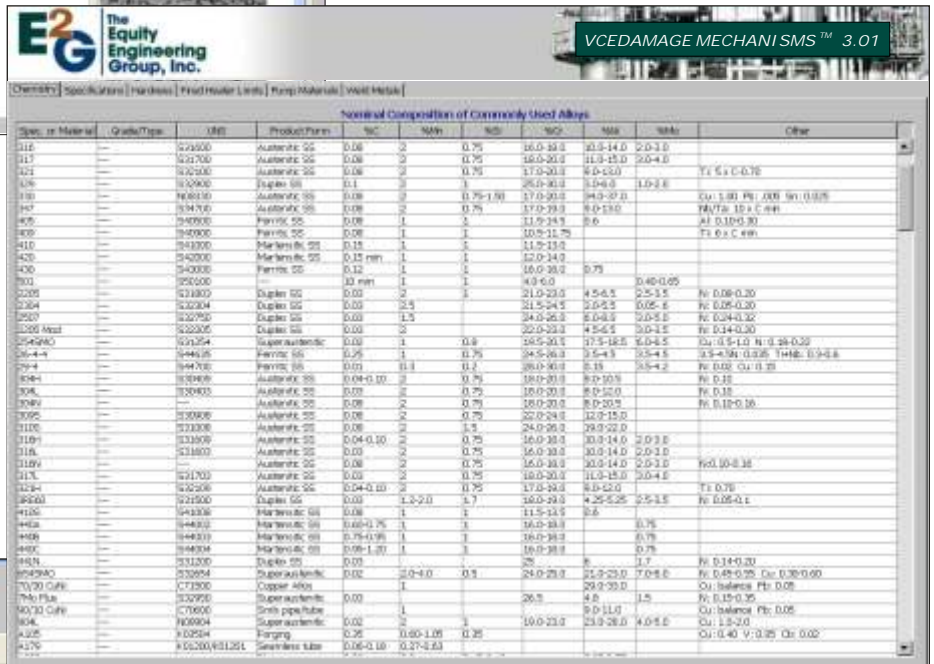


\* VCEDamage Mechanisms is the trademark of The Equity Engineering Group, Inc.



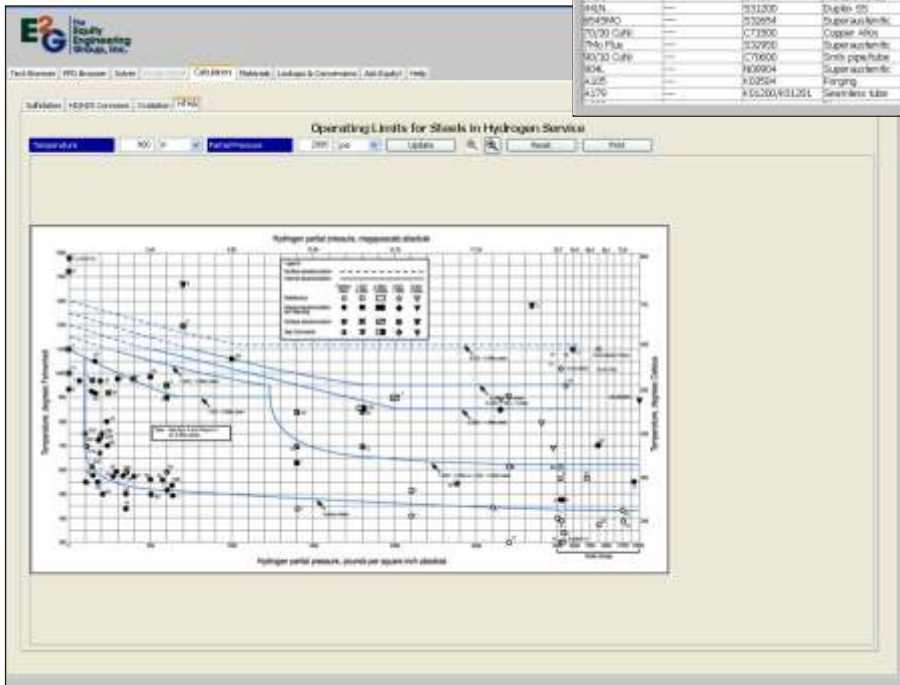
### Solver Tab with NEW Search Feature

- Allows a rapid search of the entire Damage Mechanisms document
- Easily identify and learn active and potential damage mechanisms
- Quickly view critical factors affecting damage
- Filter damage mechanisms by metallurgy, temperature and process unit
- Hundreds of helpful pictures and tables



### NEW Chemistry Tab

- Easy-to-use reference for common refinery materials
- Quick guide for chemical composition, ASTM, grade, UNS number
- Completely sortable
- Carbon & alloy steels, stainless steels, duplex alloys, nickel, copper & titanium alloys



### NEW HTHA Tab

- High resolution API 941 Figure 1 curve illustrating when HTHA occurs
- Electronically plot 'what if' tick marks to illustrate susceptibility
- Changeable magnification to focus in and out of the Figure
- Print results for reports and future review
- View in English or Metric units