

# DAMAGE PLUS™ SOFTWARE

With a technical basis in API RP 571 and WRC 489, DamagePlus software is a quick reference guide for identifying and understanding the potential Damage Mechanisms (DMs) that can cause costly fixed equipment failure.



## YOUR GUIDE THROUGH THE MAZE OF REFINERY DAMAGE MECHANISMS

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

- Guidance through the DM 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

DamagePlus software encapsulates years 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 DMs and potential areas of risk.

## INCLUDES NEW VERSION OF API RP 571

DamagePlus includes the newest edition of API RP 571, *Damage Mechanisms Affecting Fixed Equipment in the Refining Industry*, Second Edition, April 2011. It also includes the complete edition, and a full text search facility is provided.

### DAMAGEPLUS FEATURES

- Quick Solver for sorting and filtering DMs based on user-specified criteria
- Easy-to-use tools for calculating sulfidation, H<sub>2</sub>/H<sub>2</sub>S corrosion, and oxidation corrosion rates and determining the susceptibility of steels for HTHA damage based on API RP 941
- Materials database with filterable and searchable material data
- Many lookups and conversions with helpful charts, tables, and unit conversion factors
- Suite of generic PFDs illustrating common refining processes and associated DMs
- Ability to add custom PFDs

## LOOKUPS AND CONVERSIONS FINDER

- Common unit conversions for temperature, pressure, volume, corrosion rate, length, mass, impact energy, and welding
- Standard pipe and tube sizes
- Saturated steam tables

### Corporate Headquarters

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### For More Information:

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## MATERIALS REFERENCE

DamagePlus provides the most comprehensive materials reference on the market today.

### CHEMISTRY

Chemical compositions of commonly used alloys along with their Unified Numbering System (UNS) designation

### HARDNESS CONVERTER

Hardness conversion table for carbon and alloy steels and related tensile strengths

### FIRED HEATER LIMITS

API RP 530 fired heater tube temperature limits colored cells have tool tip notes that can be viewed by holding the cursor in the cell and reading the pop-up text

### WELD METALS

Weld filler metal selection chart

### PUMP MATERIAL

API 610 Centrifugal Pump Materials

### SPECIFICATIONS

A database of ASTM/ASME specifications; mechanical properties; Tensile Strength (TS); Yield Strength (YS); heat treat condition; thickness; and impact curve listing for materials in ASME B31.1, B31.3, B31.4, B31.8, S1, Section VIII Division I and Division II, API 620, API 650, API 653, and API RP 530

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## QUICK SOLVER DAMAGE REVIEW

The quick solver tab provides a view of the critical factors affecting damage, helping users to easily identify and learn active and potential DMs. It filters DMs by metallurgy, temperature, and process unit and includes hundreds of helpful diagrams and photographic examples. Quick solver provides access to detailed DM data using simple, user-specific criteria:

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

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## CALCULATOR TOOLS

### HTHA

Plots high resolution data directly on API 941 Figure 1, showing operating limits versus susceptibility to HTHA; maps out “what if” tick marks to illustrate susceptibility under specific conditions; prints results with comments for reports and future review

### SULFIDATION

Calculates the corrosion rate of several alloys due to sulfidation based on the modified McConomy curves – the only sulfidation graphing/calculation 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 corrosion based on the Couper-Gorman Curves

### OXIDATION

Calculates the loss in thickness of several alloys as a result of oxidation in air

## PFD BROWSER

DamagePlus provides a suite of generic PFDs that can be customized and illustrate common refining processes and associated DMs:

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

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