

# API 571

## Damage Mechanisms Affecting Fixed Equipment in the Refining Industry

Identifying and Understanding The Relevant Damage Mechanism

26<sup>th</sup> February - 01<sup>st</sup> March 2024 at Kuala Lumpur, Malaysia | 12<sup>th</sup> - 16<sup>th</sup> August 2024 at Kuala Lumpur, Malaysia



**Petrosync Lecturer**

**Chintamani M. Khade**  
International Certified Trainer

Case Studies,  
Discussion, and many  
Practical exercises!

### Summary of Professional Achievement:

- ▶ API 571 - Specialist Materials & Damamge Mechanisms - Certificate #50420
- ▶ API 653 - Authorised Aboveground Storage Tank Inspector - Certificate #27295
- ▶ API 510 - Authorised Pressure Vessel Inspector - Certificate #36311
- ▶ API 570 - Authorised Process Piping Inspector - Certificate #38775
- ▶ API 580 - Specialist Risk Based Inspection - Certificate #50552
- ▶ API SIRE - Authorised Source Inspector Rotary Equipments - Certificate #63572
- ▶ NDE Level III (ASNT) (UT, MT, RT, PT, VT, LT, ET & IR) - Certificate #126348
- ▶ Level 3 (EN 473 /ISO 9712) (UT, MT, PT, RT & VT) - Cert. No 07-502-04964
- ▶ Welding Inspector (TWI) (CSWIP 3.1) - Certificate #58523

### Masterclass Objectives

- ▶ Key parameters in each damage mechanism like material selection, design, fabrication, process control, etc.
- ▶ Critical factors involved in damage mechanism, their prevention / mitigation and monitoring methods.
- ▶ Assessment of various damage mechanism during Fitness for Service assesments (FFS), Remaining Life Assessments (RLA) or Risk Based Inspection Studies (RBI).
- ▶ Selection between various tests and examinations (or combination) to identify, locate and assess damage mechanisms.
- ▶ Mitigation methods and techniques.
- ▶ Similarities and differences in different damage mechanisms.

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### Masterclass Overview

This course is based on damage mechanisms in refining, petrochemical and other process industries.

It focuses not only on different materials properties and process fluid characteristics but also on different processes environment parameters which leads to damage mechanisms. They can be interdependent and cause damage mechanisms to initiate, propagate individually or simultaneously.

The course also contains the useful information like material selection, design considerations, operations, necessary to determine the causes of damages/ deterioration present and probable inspection. Various examination and testing methods, other techniques for determining the type size and location of damage mechanisms, monitoring or mitigation techniques for each damage mechanism also will be explained with case studies.

### Audience

This course is specifically beneficial for personnel involved in and responsible for determining cause for damage(s) / deterioration(s) observed or anticipated and for probability and degree of further damage that might occur in future during FFS assessments RLA, Risk based inspection studies etc.

It also assists inspectors and examiners to perform their tasks effectively during in service Inspection of pressure vessels, piping and tanks.

It is beneficial for engineers, supervisors and managers who are responsible for decision making during assessment of mechanical integrity or equipment reliability.

Process and plant designers can add value during material selection and design by knowing causes of damage mechanisms at those stages. Operations personnel can understand various parameters affecting the damage mechanisms. Personnel involved in mitigation / monitoring of damage mechanisms shall have knowledge of various examination and testing techniques.

Each attendee must bring a **Laptop computer** with Microsoft Operating System.

### PROGRAM SCHEDULE

08:00	Registration (Day1)
08:10 – 10:00	Session I
10:00 – 10:15	1 <sup>st</sup> Tea Break
10:15 – 12:30	Session II
12:30 – 13:30	Lunch Break
13:30 – 15:00	Session III
15:00 – 15:15	2 <sup>nd</sup> Tea Break
15:15 – 16:00	Session IV
16:00	End of Day

*\*Schedule may vary for each training*

### Petrosync Quality

#### Limited Attendees

The course has limited seats to ensure maximum learning and experience for all delegates.

#### Certificate of Attendance

You will receive a Certificate of Attendance bearing the signatures of the Trainer upon successful completion of the course. This certificate is proof of your continuing professional development.

#### Interactive Training

You will be attending training designed to share both the latest knowledge and practical experience through interactive sessions. This will provide you with a deeper and more long-term understanding of your current issues.

#### High Quality Course Materials

Printed course manual will provide you with working materials throughout the course and will be an invaluable source of reference for you and your colleagues afterward. You can follow course progress on your laptop with soft copies provided.

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### Course Agenda

#### Day 1

- Introduction of Trainer & Participants
- Bench Mark Quiz & Discussions on the same
- Introduction and Review Of Basic Metallurgy
- Mechanical and Metallurgical Failure Mechanisms
  - ▶ Graphitization
  - ▶ Softening (Spheroidization)
  - ▶ Temper Embrittlement
  - ▶ Strain Aging
  - ▶ 885°F (475°C) Embrittlement
  - ▶ Sigma Phase Embrittlement
  - ▶ Brittle Fracture
  - ▶ Creep and Stress Rupture
  - ▶ Thermal Fatigue
  - ▶ Short Term Overheating - Stress Rupture
  - ▶ Steam Blanketing
  - ▶ Dissimilar Metal Weld (DMW) Cracking
  - ▶ Thermal Shock
- Punch Points
- Quiz & Discussions

#### Day 2

- Erosion/Erosion – Corrosion
- Cavitation
- Mechanical Fatigue
- Vibration-Induced Fatigue
- Refractory Degradation
- Reheat Cracking
- Gaseous Oxygen-Enhanced Ignition and Combustion
- Introduction to Corrosion
- Uniform or Localized Loss of Thickness
  - ▶ Galvanic Corrosion
  - ▶ Atmospheric Corrosion
  - ▶ Corrosion under Insulation (CUI)
  - ▶ Cooling Water Corrosion
  - ▶ Boiler Water Condensate Corrosion
- Punch Points
- Quiz & Discussions

#### Day 3

- Net Positive Suction Head and Cavitation
- Flue-Gas Dew-Point Corrosion
- Microbiologically Induced Corrosion (MIC)
- Soil Corrosion
- Caustic Corrosion
- Dealloying
- Graphitic Corrosion
- High Temperature Corrosion [ $>400^{\circ}\text{F}$  ( $204^{\circ}\text{C}$ )]
  - ▶ Oxidation
  - ▶ Sulfidation
  - ▶ Carburization
  - ▶ Decarburization
  - ▶ Metal Dusting
  - ▶ Fuel Ash Corrosion
  - ▶ Nitriding
- Punch Points
- Quiz & Discussions

#### Day 4

- Environment - Assisted Cracking
  - ▶ Chloride Stress Cracking (CI-SCC)
  - ▶ Corrosion Fatigue
  - ▶ Caustic Stress Corrosion Cracking (Caustic Embrittlement)
  - ▶ Ammonia Stress Corrosion Cracking
  - ▶ Liquid Metal Embrittlement (LME)
  - ▶ Hydrogen Embrittlement (HE)
  - ▶ Ethanol Stress Corrosion Cracking (SCC)
  - ▶ Sulfate Stress Corrosion Cracking
- Refining Industry Damage Mechanisms
  - ▶ Uniform or Localized Loss in Thickness Phenomena
  - ▶ Amine Corrosion
  - ▶ Ammonium Bisulfide Corrosion (Alkaline Sour Water)
  - ▶ Ammonium Chloride Corrosion
  - ▶ Hydrochloric Acid (HCl) Corrosion
  - ▶ High Temp H<sub>2</sub>/H<sub>2</sub>S Corrosion
  - ▶ Naphtenic Acid Corrosion (NAC)
  - ▶ Phenol (Carbolic Acid) Corrosion
  - ▶ Phosphoric Acid Corrosion
- Punch Points
- Quiz & Discussions

### IN-HOUSE SOLUTIONS

SAVE COST • IMPROVE PERFORMANCE • REDUCE RISK

PetroSync understands that in current economic climate, getting an excellent return on your training investment is critical for all our clients. This excellent training can be conducted exclusively for your organization. The training can be tailored to meet your specific needs at your preferred location and time. We will meet you anywhere around the globe.

If you like to know more about this excellent program, please contact on +65 3159 0800 or email [general@petrosync.com](mailto:general@petrosync.com)

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### Course Agenda

#### Day 5

- Sour Water Corrosion (Acidic)
- Sulfuric Acid Corrosion
- Aqueous Organic Acid Corrosion
- Environment-Assisted Cracking
  - Polythionic Acid Stress Corrosion Cracking (PASCC)
  - Amine Stress Corrosion Cracking
  - Wet H<sub>2</sub>S Damage (Blistering/HIC/SOHIC/SSC)
  - Hydrogen Stress Cracking - HF
  - Carbonate Stress Corrosion Cracking (ACSCC)
- Other Mechanisms
  - High Temperature Hydrogen Attack (HTHA)
  - Titanium Hydriding
- Punch Points
- Quiz & Discussions
- Final Examinations & Feedback



### WHY YOU SHOULD ATTEND PETROSYNC'S EVENTS

- To ensure that all objectives of the course matches yours, all PetroSync programs are developed after intensive and extensive research within the industry
- PetroSync programs focus on your immediate working issues to ensure that you are able to apply and deliver immediate results in real work situations
- Application and implementation of industry knowledge and experience are the drivers for our course design, not theoretical academic lectures
- PetroSync training focuses on practical interactive learning tools and techniques including case studies, group discussions, scenarios, simulations, practical exercises and knowledge assessments during the course. Invest a small amount of your time to prepare before attending the course to ensure maximum learning
- PetroSync follows a rigorous selection process to ensure that all expert trainers have first-hand, up-to-date and practical knowledge and are leaders of their respective industrial discipline

### HYBRID TRAINING SOLUTIONS

#### FOCUS TRAINING • REDUCE COST • ENHANCED RESULTS

Over the years, there has been a growing demand for hybrid training programs. It is an excellent option to maximize your training dollar for your specific training needs. We make it possible to run a training program that is customized totally to your training needs at a fraction of an in-house budget!

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**Petrosync Lecturer**  
**Chintamani M. Khade**  
 International Certified Trainer

Chintamani M. Khade is a specialist on Materials & Damage Mechanisms. He has more than 19 years experience as Department Head of NDT, Welding Inspection, In Service Inspection in India, Middle East, Southeast Asia & Africa. Currently, he is the technical director of Empirical Technocrats.

He conducted training for various API Certification Preparatory, NDE methods, ASNT & ISNT Level III, advanced NDT Methods, welding inspection, Construction codes, ASME Sections II, Section IX, Section V, ASME Sec. VIII div. 1, ASME B31.1, ASME B31.3, AWS D1.1, UT, MT, PT, VT, RT & Basic for ISO 9712 level 2 & level 3.

He has been a team leader of 100+ multidiscipline NDT technicians, metallurgists & Welding inspectors during various shutdown jobs in Qatar Petroleum, Massaid refinery, Qatar in March – June 2005, March - April 2009 & October November 2009. Executed in service inspection of nearly 800 pressure vessels, Static & rotary equipments, Plant process piping & storage tanks as shutdown coordinator.

### → Summary of Professional Achievement:

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### → Partial Client List:

- |   |   |
|---|---|
| ▶ RIL - Reliance Industries Limited             | ▶ McNally Bharat Engg. Co. Ltd.,                    |
| ▶ GASCO   | ▶ Ravi Industries                                   |
| ▶ Bangchak Petrochemicals                       | ▶ Pune & Sprklet Engineering, Mumbai                |
| ▶ Bharat Oman Refinery Limited                  | ▶ Pudmjee Paper mills, Ltd.,                        |
| ▶ Standard Rolling Mills                        | ▶ Thermax Ltd., Pune                                |
| ▶ Dacon Inspection Services, Thailand           | ▶ Walchandnagar Industries Ltd.,                    |
| ▶ Cryeng Australia                              | ▶ TEMA Exchangers India Ltd., Gujrat                |
| ▶ ZADCO   | ▶ Century Enka Ltd., Pune                           |
| ▶ Qatar Petroleum, Massaid Refinery             | ▶ Rajashri Polyfils Gujrat                          |
| ▶ Ras Gas                                       | ▶ Garware Polyestrstrs Ltd, Aurangabad              |
| ▶ QAFCO   | ▶ Larson & Toubro Ltd. Gujrat                       |
| ▶ Oman LNG                                      | ▶ Essar Oil Ltd., Gujrat                            |
| ▶ Shell   | ▶ Intervalve (I) Ltd, Pune                          |
| ▶ ExxonMobil                                    | ▶ Oman Methanol Co., Sohar, Oman                    |
| ▶ Total   | ▶ Emirates Industrial Laboratory, Dubai, UAE        |
| ▶ Chevron                                       | ▶ Olayan Descon Engg. Co., Jubail & Yanbu works KSA |
| ▶ EQUATE  | ▶ HEMRL, ISRO                                       |
| ▶ GASCO   | ▶ TPT petrochemical Thailand                        |
| ▶ ATB Caldereria sPa.,Italy                     | ▶ Polyprima-Indorama, Indonesia                     |
| ▶ Hindustan Lever Ltd.                          | ▶ Numaligarh Refineries Ltd. Assam.                 |
| ▶ Tororo Cement Industries Ltd., Tororo, Uganda | ▶ Sparklet Engineers                                |
| ▶ Qatar Fuel Additives CO.                      | ▶ Al Shabia, Dubai                                  |
| ▶ ADGAS, DAS ISLAND, Abudhabi - UAE             | ▶ TUV SuD, Jubail                                   |
| ▶ L&T Hazira                                    | ▶ KSA   |
| ▶ Ranoli  | ▶ Yantrik Engineers                                 |
| ▶ Tata projects Ltd.,                           | ▶ NLNG  |
| ▶ JP Industries Ltd.,                           | ▶ NNPL  |
| ▶ Premier Ltd.                                  | ▶ Injo technical Services                           |

## INVESTMENT PACKAGES

Please checklist the package that you are attending!

	API 571 - Damage Mechanisms Affecting Fixed Equipment in the Refining Industry Schedules	LOCATION	PRICE
<input type="checkbox"/>	26 <sup>th</sup> February - 01 <sup>st</sup> March 2024	Kuala Lumpur, Malaysia	USD 3,250
<input type="checkbox"/>	12 <sup>th</sup> - 16 <sup>th</sup> August 2024	Kuala Lumpur, Malaysia	USD 3,250

\* All prices are subject to change without notice and are not guaranteed, except that prices for an order that have been accepted by PetroSync is not subject to change after acceptance

\* Price is nett excluding Withholding Tax if any and will be quoted separately. Please send us the withholding tax payment receipt.

\* We can help to register API exam certification which incur **USD 100** administration fee per application.

\* For API Exam late application, there will be additional **USD 150** borne by the participant

## DELEGATE DETAILS

1st Delegate Name \_\_\_\_\_ Mr ☐ Mrs ☐ Ms ☐ Dr ☐ Others ☐

Direct Line Number: \_\_\_\_\_ Email: \_\_\_\_\_

Mobile Number: \_\_\_\_\_ Job Title: \_\_\_\_\_

Department: \_\_\_\_\_ Head of Department: \_\_\_\_\_

2nd Delegate Name \_\_\_\_\_ Mr ☐ Mrs ☐ Ms ☐ Dr ☐ Others ☐

Direct Line Number: \_\_\_\_\_ Email: \_\_\_\_\_

Mobile Number: \_\_\_\_\_ Job Title: \_\_\_\_\_

Department: \_\_\_\_\_ Head of Department: \_\_\_\_\_

3rd Delegate Name \_\_\_\_\_ Mr ☐ Mrs ☐ Ms ☐ Dr ☐ Others ☐

Direct Line Number: \_\_\_\_\_ Email: \_\_\_\_\_

Mobile Number: \_\_\_\_\_ Job Title: \_\_\_\_\_

Department: \_\_\_\_\_ Head of Department: \_\_\_\_\_

4th Delegate Name \_\_\_\_\_ Mr ☐ Mrs ☐ Ms ☐ Dr ☐ Others ☐

Direct Line Number: \_\_\_\_\_ Email: \_\_\_\_\_

Mobile Number: \_\_\_\_\_ Job Title: \_\_\_\_\_

Department: \_\_\_\_\_ Head of Department: \_\_\_\_\_

\*Please fill all the details including mobile number. This help us to contact participant if they are late in class or if there is any urgent update (through whatsapp/call)

## INVOICE DETAILS

Attention Invoice to: \_\_\_\_\_

Direct Line Number: \_\_\_\_\_ Fax: \_\_\_\_\_

Company: \_\_\_\_\_ Industry: \_\_\_\_\_

Address: \_\_\_\_\_ Postcode: \_\_\_\_\_

Country: \_\_\_\_\_ Email: \_\_\_\_\_

Please note:

- Indicate if you have already registered by Phone ☐ Fax ☐ Email ☐ Web ☐

- If you have not received an acknowledgement before the training, please call us to confirm your booking.

## PAYMENT METHODS

☐ By Credit Card

☐ By Direct Transfer : Please quote invoice number(s) on remittance advice

PetroSync Global Pte Ltd Bank details:

Account Name : PetroSync Global Pte Ltd

Bank Name : DBS Bank Ltd

Bank Code : 7171 • Bank Swift Code : DBSSSGSGXXX • Branch code : 288

Account No : 0288-002682-01-6-022 (USD)

Bank Address : 12 Marina Boulevard, Level 3. Marina Bay Financial Centre Tower 3. Singapore 018982

All bank charges to be borne by payer. Please ensure that PetroSync Global Pte Ltd receives the full invoiced amount.

## Confirmation

I agree to PetroSync's payment terms and cancellation policy.

Signature : \_\_\_\_\_  
Date : \_\_\_\_\_

PAYMENT TERMS : Payment is due in full at the time of registration. Full payment is mandatory for event attendance.

## PROGRAMME CONSULTANT

Contact : Cay Aagen

Email : registration@petrosync.com

Phone : +65 3159 0800

## TERMS AND CONDITIONS

### DISCLAIMER

Please note that trainers and topics were confirmed at the time of publishing; however, PetroSync may necessitate substitutions, alterations or cancellations of the trainers or topics or location (classroom / Virtual). As such, PetroSync reserves the right to change or cancel any part of its published programme due to unforeseen circumstances. Any substitutions or alterations will be updated on our web page as soon as possible.

### DATA PROTECTION

The information you provide will be safeguarded by PetroSync that may be used to keep you informed of relevant products and services. As an international group we may transfer your data on a global basis for the purpose indicated above. If you do not want us to share your information with other reputable companies, please tick this box ☐

### CANCELLATION POLICY

Delegates who cancel after the training is officially confirmed run by email, are liable to pay the full course fee and no refunds will be granted. You may substitute delegates at any time as long as reasonable advance notice is given to PetroSync.

In the event that PetroSync cancels or postpones or change the trainer or change the training location (classroom / virtual) of an event for any reason and that the delegate is unable or unwilling to attend in on the rescheduled date, you will receive a credit voucher for 100% of the contract fee paid. You may use this credit voucher for another PetroSync to be mutually agreed with PetroSync, which must occur within a year from the date of postponement.

PetroSync is not responsible for any loss or damage as a result of the cancellation policy. PetroSync will assume no liability whatsoever in the event this event is cancelled, rescheduled or postponed due to any Act of God, fire, act of government or state, war, civil commotion, insurrection, embargo, industrial action, or any other reason beyond management control.

### CERTIFICATE OF ATTENDANCE

80% attendance is required for PetroSync's Certificate of Attendance.

## DETAILS

Please accept our apologies for mail or email that is incorrectly addressed.

Please email us at registration@petrosync.com and inform us of any incorrect details. We will amend them accordingly.

### Find us on Social Media:

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## CHARGES & FEE(S)

- For Payment by Direct Telegraphic Transfer, client has to bear both local and overseas bank charges.

- For credit card payment, there is additional 4% credit card processing fee.