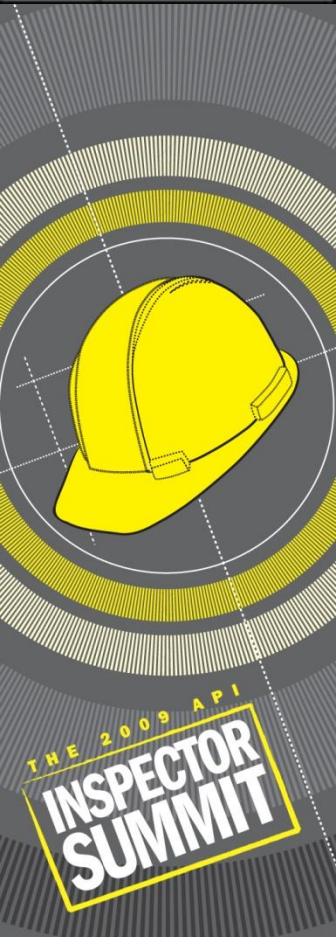


**Guidelines & Application
Procedures
for
API-RP-578 Positive Material
Identification (PMI)
Using
XRF/OES Technologies
by
Don Mears**



Presenter-Don Mears

- ❑ President of Analytical Training Consultants, Inc. and coordinates the sales, marketing and training program for XRF/OES Technologies.
- ❑ This involves the analyzers operation and training in radiation safety that meets local, State, Federal and International registration requirements. This includes certified report generation for proper material verification programs with the owners/users in the petrochemical, oil and gas industry.
- ❑ Mr. Mears has worked in the oil, gas and refining industry for 30 plus years. He held positions which included preparation and delivery of training presentations and has taught numerous industry courses explaining and applying API standards and recommended practices.
- ❑ This included involvement in two API work groups for revision of API *Manual of Petroleum Measurement Standards Chapter 3-Tank Gauging Section 1B-"Standard Practice for Level Measurement of Liquid Hydrocarbons in Stationary Tanks by Automatic Tank Gauging"* and API 2350 *Overfill Protection for Storage Tank in Petroleum Facilities*.
- ❑ Mr. Mears is the Author of the API RP 578 PMI Certification Course and is a certified API Training Provider.



Setting the Tone

- **Why a “Certified API RP-578 PMI Training Course” should be given ?**
 - **OSHA’s Programs of-Regulation & Enforcement**
 - **Process Safety Management-(PSM)-1910-119**
 - **National Emphasis Program-(NEP)-CPL 03-00-004**
 - **Chemical Safety Board-BP Texas City Refinery Fire**
 - **API Standards: 570,510, &653- Mechanical Integrity**
 - **All the Reported & Unreported “Near Misses” the Oil & Gas Industry has experienced, but because of:**
 - **Luck**
 - **Proper PMI, Inspection**
 - **Training**
 - **(RAGAGEP) / API RP 578**



Regulations and Enforcements

- Process Safety Management-(PSM)-1910-119-Highly Hazardous Chemicals-(HHC)-**February 24, 1992**

- [Regulation](#)

- National Emphasis Program-(NEP)-CPL 03-00-004-**June 7, 2007**

- [Enforcement](#)

- Understand & Apply API Recommended Practice 578 Positive Material Identification (PMI) Guidelines- [September 17, 2007](#)
[2nd Edition Approved](#)

- Applying "[Recognized and Generally Accepted Good Engineering Practices](#)"([RAGAGEP](#)) for Inspection of Material, Both in the Warehouse & Field Through Positive Material Identification (PMI) Using XRF/OES Analysis



Understand OSHA's Definition for Process Safety Management PSM

- To understand PSM and its requirements, both employers and employees need to understand how OSHA uses the term "Process" in PSM.
- Process means any activity involving a highly hazardous chemical including using, storing, manufacturing, handling, or moving such chemicals at the site, or any combination of these activities.
- For purposes of this definition, any group of vessels that are interconnected, and separate vessels located in a way that could involve a highly hazardous chemical in a potential release, are considered a single process.

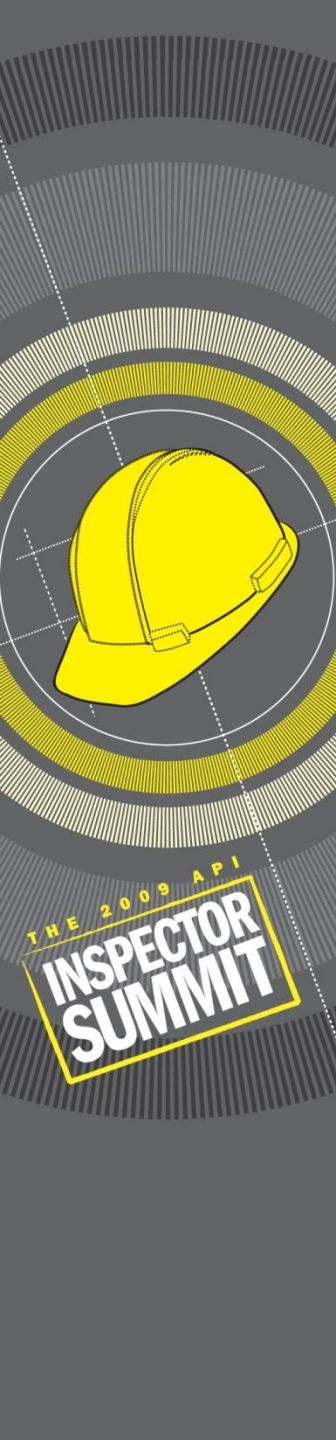
OSHA Requires Information on the Equipment in the Process

➤ Materials of construction, (PMI)

- Piping and instrument diagrams (P&IDs),
- Electrical classification,
- Relief system design and design basis,
- Ventilation system design,
- Design codes and standards employed,
- Material and energy balances for processes built after May 26, 1992, and
- Safety systems (e.g., interlocks, detection, or suppression systems).
- Employer shall document Equipment complies with:



■ RAGAGEP



Inspection Scheduling by OSHA-NEP All Refineries

Covered in the next 2 years

40% in the First year

60% in the Second Year

All 143 USA Refineries

OSHA
Has Expanded
this to the
Petrochemical
Industry Also !!



OSHA INSTRUCTION

U.S. DEPARTMENT OF LABOR

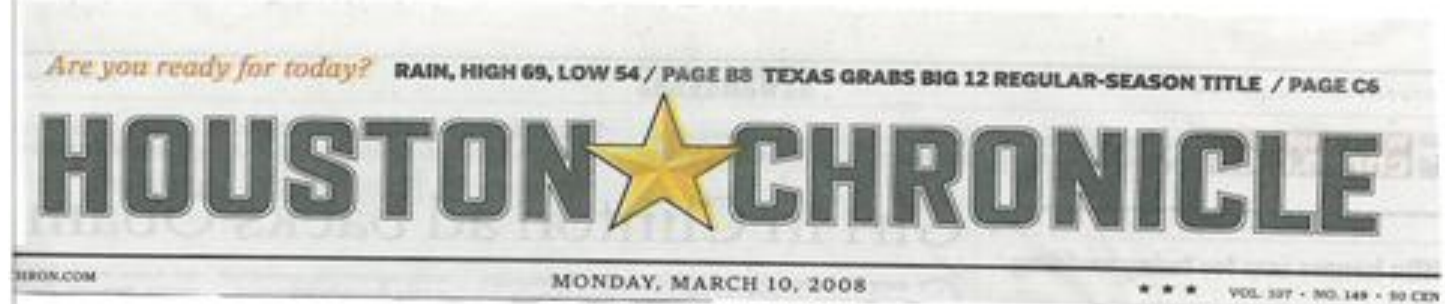
Occupational Safety and Health Administration

THE 2009 API
**INSPECTOR
SUMMIT**

Houston Chronicle / OSHA Interview March 10, 2008

Regulation and Enforcement found Slew of Violations

[Houston Chronical -OSHA NEP-3-10-08.pdf](#)



Why Did OSHA Establish an NEP ?

➤ According to OSHA'S Data Base;

- Since May 1992 (36) Fatality/Catastrophe (FAT/CAT) incidents related to HHC have Occurred
- Incidents include 52 Employee Deaths and 250 Employee Injuries, 98 required Hospitalization
- The number of "Refinery" Incidents Surpasses the Combined Total of the next 3 highest Industries over the same period
 - ❑ Chemical Manufacturing-12 FAT/CAT
 - ❑ Industrial Organic Chemical Manufacturing-12 FAT/CAT
 - ❑ Explosive Manufacturing-11 FAT/CAT



NEP Reasons Why

➤ According to OSHA'S Data Base : (Examples Used)

- BP Texas City Texas, March 23,2005 had:

Killed-15 people

Injured-170 people

- Kern Oil, Bakersfield, California, January 19,2005

Killed -1 person

Injured- Multiple

- Giant Industries Ciniza Refinery, Gallup, New Mexico, April 8,2004

Killed – None

Injured-6 people

Hospitalized-4

- ☐ **The above Reasons to Practice: RAGAGEP**



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OSHA INSTRUCTION

Occupational Safety and Health Administration



OSHA'S NEP PROGRAM

WHY THE URGENCY?

- Safety Bulletin from U.S. Chemical Safety and Hazard Investigation Board (CSB)—BP Texas City, Texas Refinery Fire!!!!
- [RHUBulletin-BP Texas City.pdf](#)



American Petroleum Institute API



▶ Standard-API-570-Piping Inspection Code

▶ Standard-API-510-Pressure Vessel Inspection Code

▶ Standard-API-653-Storage Tank Inspection Code

▶ Recommended Practice-API-RP-578-Material Verification Program-MVP/PMI

RAGAGEP

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Occupational Safety and Health Act OSHA

- **Process Safety Management-(PSM)-1910-119-
Highly Hazardous Chemicals-(HHC)**
 - **NDT Inspection Companies-Mechanical
Integrity**

- **National Emphasis Program-(NEP)-CPL 03-00-
004**
 - **Explanation As it Applies to PMI**



Mechanical Integrity Needs in Oil & Gas Industry

- **Understanding HOW, WHY, & APPLYING:**
 - ✓ **ATC –API578 PMI Certification Training Course**

**Guidelines & Application Procedures
For
Positive Material Identification (PMI)
with**

XRF & OES

Technologies



Introduction

- ▶ What is the Purpose of this Course ?
 - Purpose of the Course is to certify and re-certify any API 570 & 510 inspectors for PMI Inspection requirements, and any QA/QC, Reliability Inspectors, Maintenance & Warehouse personnel.
 - Instruction for understanding and applying API RP 578 through an approved API Training Course, that will qualify personnel in proper Guideline and Application procedures utilizing XRF and OES technologies for PMI.

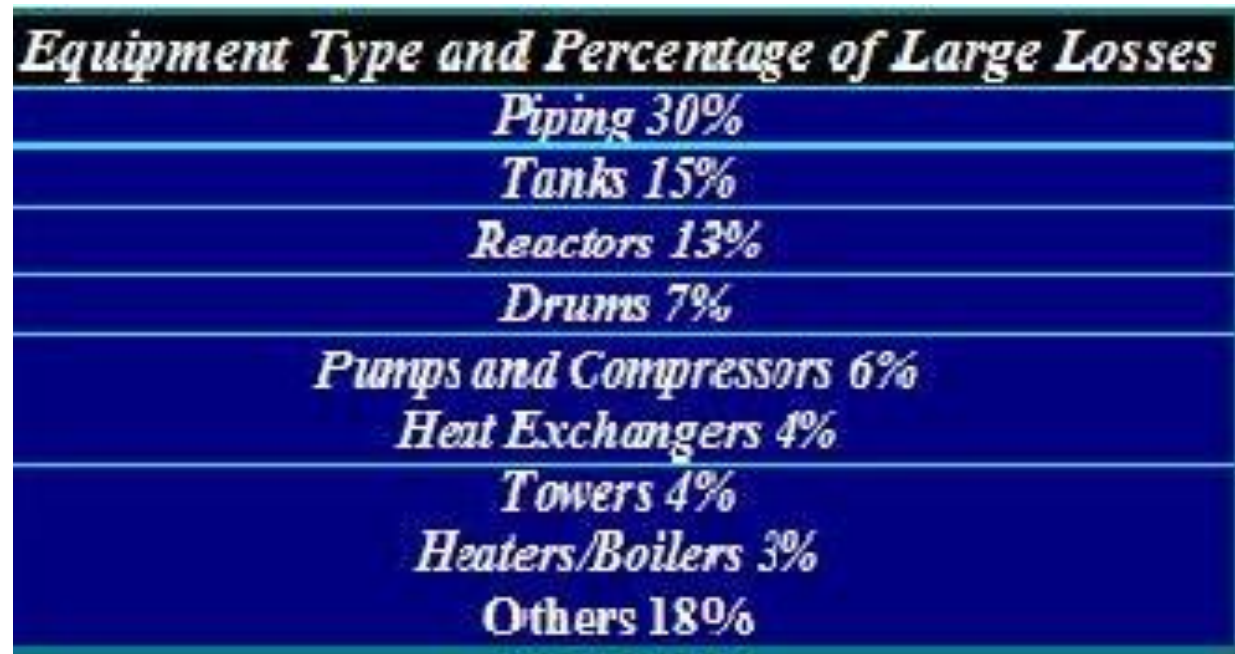
- ▶ The course is covered in 2 day sessions and instruction on both classroom theory and field testing procedures.
 - Through Understanding API RP 578 Guidelines
 - Through Application of proper PMI testing procedures

- ▶ The need and now requirement for Positive Material Identification (PMI) has dramatically grown in the past few years in refinery and petrochemical plant operations to 100% alloy material verification in today's risk-based QC environment.



Why do PMI?

Explains How OSHA Instruction-CLP 03-00-004 Nation Emphasis Program (NEP) Applies to The Refining Industry



Source: Marsh and McLennan (property protection and risk consultants)

PMI Can Prevent The Largest Losses

Process Safety Management (PSM)
29CFR1910.119 With Proper Material Verification
Program and Training

*"41% of the 170 largest losses
in the hydrocarbon process
industry resulted from failures
of piping systems..."*

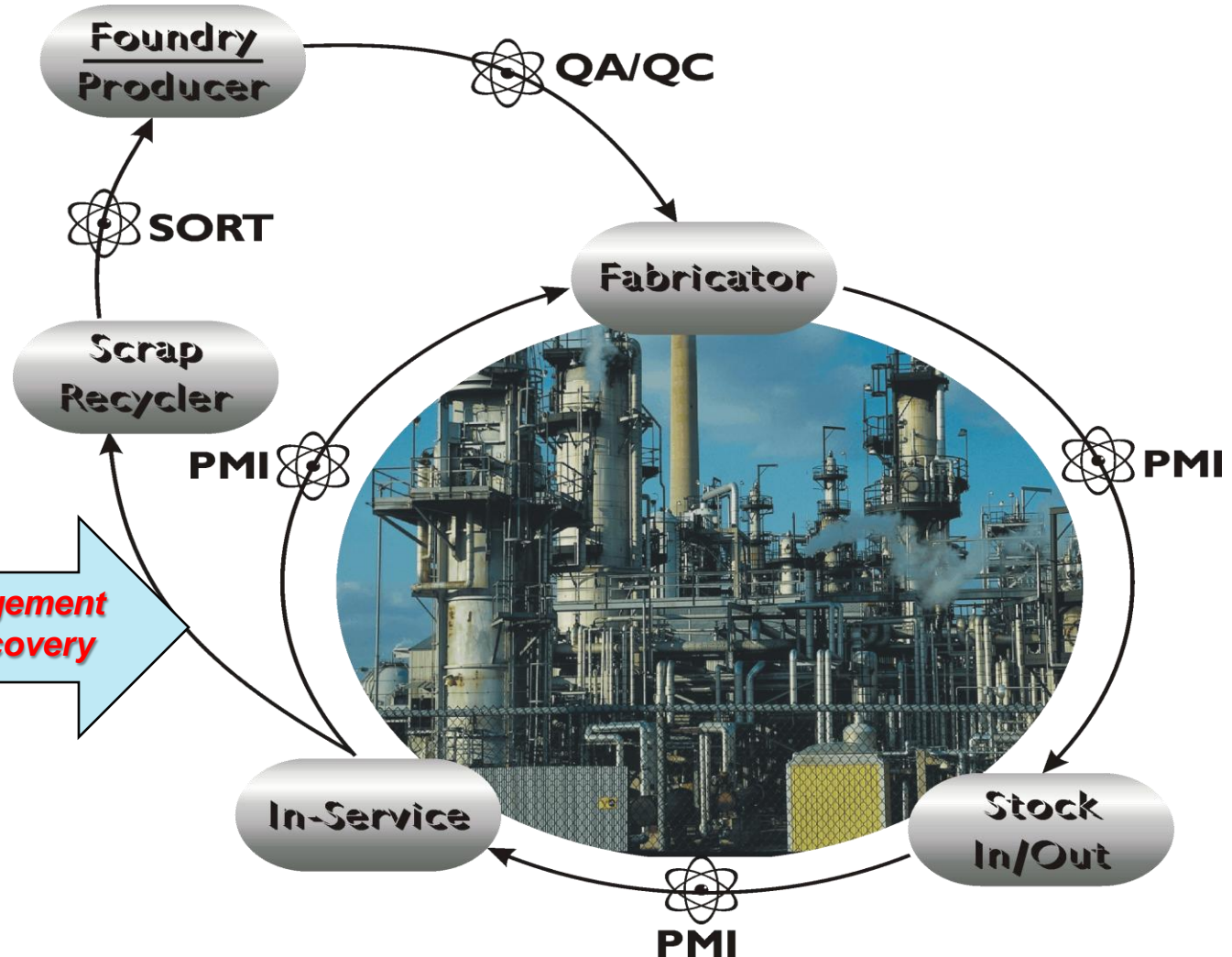
Second International Symposium on the Mechanical Integrity of Process Piping
January 1996, Houston, TX, USA

**Understand & Apply API Recommended Practice 578
Positive Material Identification (PMI) Guidelines**



PMI Cycle Overview

Applying **"Recognized and Generally Accepted Good Engineering Practices" (RAGAGEP)** for Inspection of Material, Through Positive Material Identification (PMI) Using XRF/OES Analysis



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**Asset Management
& Asset Recovery**

Reasons Why You Should Follow API RP 578



“Recognized And Generally Accepted Good Engineering Practice” (RAGAGEP) – are engineering, operation, or maintenance activities based on established codes, standards, published technical reports or recommended practices (RP) or a similar document. RAGAGEPs detail generally approved ways to perform specific engineering, inspection or mechanical integrity activities, such as fabricating a vessel, inspecting a storage tank, or servicing a relief valve (See CCPS [Ref. 33]).

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Inspection Scheduling by OSHA All Refineries

Important information is found in [APPENDIX A regarding the “Static List of” Inspection Priority Items \(IPI\)](#) and contains questions that the Compliance Safety and Health Officer (CSHO)’s are to address in their compliance evaluation of an employer’s refinery “Process Safety Management” (PSM) program.

It should be noted that both [PMI](#) and proper [OPERATOR TRAINING](#) programs are QUESTIONS that the (CSHO) will address to the Owner/Operator as to compliance with their Process Safety Management (PSM) program.



Inspection Scheduling by OSHA All Refineries Section E-10

Positive Material Identification (PMI)

Does the employer ensure that replacement piping is suitable for its process application?

Yes, No, N/A

If no, possible violations include:

The employer did **not follow RAGAGEP** when it failed to conduct positive material identification (PMI) testing to ensure that construction materials of replacement/repaired piping were adequate for process conditions (**An example RAGAGEP for PMI testing for existing piping systems includes but is not limited to, API RP 578, Material Verification Program for New and Existing Alloy Piping Systems, Section 4.3**), and CSB, Safety Bulletin – Positive Material Verification: Prevent Errors During Alloy Steel Systems Maintenance, BP Texas City, TX Refinery Fire);



Inspection Scheduling by OSHA All Refineries Section K

Proper Operator Training

Have operating employees been trained on the procedures they are expected to perform? **If NO**, Possible Violations Include:

The employer did not provide **initial operator training** on each specific procedure operators are expected to perform; or

- 1) The employer did **not document the training,**
- 2) The employer did **not document the means used to verify the training, or**
- 3) The employer did **not verify that the operator understand the training.**

Inspection Scheduling by OSHA

All Refineries

Section K

Proper Operator Training

Based on the employer's explanation of their management of operator refresher training (See document request in Section X.E.3.o.), have the five randomly selected operating employees received, completed, and understood the refresher training (See document request in Section X.E.3.n.)? For each employee who operates a process, has the employer ensured that the employee understands and adheres to the current operating procedures and that the refresher training is provided at least every three years-- more often if necessary?

YES, NO, N/A



Inspection Scheduling by OSHA All Refineries Section K

Proper Operator Refresher Training

If no, possible violations include:

- 1) The employer did not provide operator refresher training at least every three years or more often, if necessary (e.g., on a frequency consistent with that determined through consultation with employees); or
- 2) The employer did not document the training;
- 3) The employer did not determine that the operator understood the training it received; or
- 4) The employer did not document how it verified the training



Inspection Scheduling by OSHA All Refineries

Incident Investigation Report

- The CSHO must document in the INCIDENT INVESTIGATION REPORT the number of **"Actual"** and a **"Near-Miss"** incident which has occurred in your plant. A very important part of this is the **"Factors that contributed to the incident"**. In section Q of Appendix A OSHA list **examples and PMI and Training** are a part of this list:
- Examples of **"Factors that contributed to the incident"/"causal factors"** can include, but are not limited to:



Inspection Scheduling by OSHA All Refineries

Incident Investigation Report

- Examples of "Factors that contributed to the incident"/"causal factors" can include, but are not limited to:
 - The employer did not design, operate, maintain, inspect, or change (MOC) equipment or equipment systems per RAGAGEP;
 - The employer did not train its employees in its procedure for transferring product from the Chemical X intermediate tank to Reactor 23;
 - The 3-inch reactor transfer line was replaced without conducting a PMI, as a result, the replaced piping that was constructed of an off-specification material failed in a short period of time.



Conclusion

"Reasons Why! This Course should be given ! "

- **OSHA's Programs of-Regulation & Enforcement**
 - **Process Safety Management-(PSM)-1910-119**
 - **National Emphasis Program-(NEP)-CPL 03-00-004**
- **Chemical Safety Board-BP Texas City Refinery Fire**
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 - **(RAGAGEP) / API RP 578**



Guidelines and Application Procedures for API-RP 578

Positive Material Identification (PMI) Using XRF and OES Technologies

➤ Because of the previously discussed information and my experience with both selling XRF Analyzers and training personnel in the Petrochemical and Refining Oil and Gas business,

➤ **"Analytical Training Consultants, Inc." has produced the API 578 PMI Certification Training Course:**



Questions

Don Mears, President

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