Training Course Explained on API RP 578

By Don Mears
Analytical Training Consultants
October 2-6, 2011
Presenter Profile: Don Mears

- President of Analytical Training Consultants (ATC)
- 30+ years of Oil and Gas industry experience
- Heavy involvement in API work groups
- Author of the API RP 578 2nd Edition PMI Certification Course
- Certified API Training Provider Certification TPCP # 0118
- Oil & Gas Industry Consultant for Thermo Fisher Scientific
Training Class for API RP 578

Guidelines & Application Procedures
For
Positive Material Identification (PMI)
with
XRF & OES
Technologies

By
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Analytical Training Consultants
Training Class for API RP 578
Why Course Should be Given?

- Introduction
- OSHA NEP-Directive CPL 03-00-004 for Refineries
- OSHA NEP-Notice CPL 02-00-148 for Chemical Plants
- OSHA Oil & Gas Industry “Process Safety Management” PSM Background
- Program Procedures
- Inspection Scheduling
- Proper Training and Refresher Training
- Compliance Guidance
- Enforcement Inspection- Penalties and Results
- Conclusion
Introduction

What is the Purpose of this API 578 PMI Certification Course?

- Purpose of the Course is to certify and re-certify API inspectors, in 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.
According to OSHA's refinery database:

- **36 fatality/catastrophe (FAT/CAT) incidents**
  - Related to Highly Hazardous Chemicals (HHC) since May 1992

- **52 employee deaths**
  - Includes 250 employee injuries, 98 with hospitalization

- **# of incidents surpass the combined total of the next 3 highest industries**
  - Chemical Manufacturing-12 FAT/CAT
  - Industrial Organic Chemical Manufacturing-12 FAT/CAT
  - Explosive Manufacturing-11 FAT/CAT
OSHA Regional List of 151 Refineries

Distribution of U.S. Refineries by Region

Number of Region Refineries

Regions

0 6 8 7 16 69 3 18 17 7

R1 R2 R3 R4 R5 R6 R7 R8 R9 R10
US Refinery’s By Region

Regional & Area Offices

Click on your region of interest

Region 1
Region 2
Region 3
Region 4
Region 5
Region 6
Region 7
Region 8
Region 9
Region 10
## Hazards Identified: Total Violations Rise;

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</thead>
<tbody>
<tr>
<td>Total Violations</td>
<td>83,539</td>
<td>86,708</td>
<td>85,307</td>
<td>83,913</td>
<td>88,846</td>
<td>6.4%</td>
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<tr>
<td>Total Serious Violations</td>
<td>59,861</td>
<td>61,666</td>
<td>61,018</td>
<td>61,337</td>
<td>67,176</td>
<td>12.2%</td>
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<tr>
<td>Total Willful Violations</td>
<td>404</td>
<td>462</td>
<td>747</td>
<td>479</td>
<td>415</td>
<td>2.7</td>
</tr>
<tr>
<td>Total Repeat Violations</td>
<td>2,147</td>
<td>2,360</td>
<td>2,350</td>
<td>2,551</td>
<td>2,714</td>
<td>26.4%</td>
</tr>
<tr>
<td>Total Other-than-Serious</td>
<td>20,552</td>
<td>16,705</td>
<td>20,819</td>
<td>19,246</td>
<td>18,331</td>
<td>-10.8%</td>
</tr>
</tbody>
</table>

BP Texas City, Texas Fined $30.7 Million For 439 willful Violations On 10/30/09
Chemical Safety Board (CSB)--Findings

- Chemical Safety Board (CSB) Report-BP Texas City Texas
- NY Times report on BP Texas City Fines
  - Safety Bulletin-BP Texas City.pdf
  - BP Faces Record Fine NY Times-10-30-09.pdf
- Safety Bulletin from U.S. Chemical Safety and Hazard Investigation Board (CSB)-Chlorine Transfer Hose Failure due to improper material braid construction (i.e., 316L and not the recommended braid of Hastelloy C-276). On August 14, 2002, a 1-inch transfer line ruptured during a railcar offloading operation at DPC Enterprises in Festus, Missouri and released 48,000 pounds of Chlorine into neighboring areas
  - SafetyBulletin-ChlorineShutdown.pdf
OSHA’S Directive Notice for Chemical Plants

- Chemical Plant NEP effective on July 27, 2009
- Extended through end of 2010
- Outlines a different approach for inspecting PSM covered chemical facilities
- NOT comprehensive
- LESS resource intensive for both OSHA and Chemical Plants
Regions 1, 7, & 10 Inspections for 5-10 facilities as Pilot Program
In response to increasing industry safety demands, Analytical Training Consultants has produced the API 578 PMI Certification Training Course.

www.ATC578.com
Why Should this Course be Given?

“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]).
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.
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);
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*. 
Proper Operator Training

Based on the employer’s explanation of their management of operator refresh 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 refresh training is provided at least every three years-- more often if necessary?

YES, NO, N/A
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.
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:
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;
Refinery NEP

- Originally launched 6/7/07
- Updated 8/18/09 to extend timeframe for completion
  - Region VI only region with inspections still to open (4)
  - Completion by end FY2011
- The approach/content of the inspections has not changed
- Combines “static” and “dynamic” question lists with guidance for compliance officers (CSHOs)
Reﬁnery NEP

- Comprehensive
- Average 1,000 OSHA hours per inspection
- Typically use full statutory 6 months available
- Also resource intensive for employers
- Compliance found to be highly uneven
- Substantial issues identiﬁed
- Average penalties/inspection ~$166,000
- Average penalty/violation ~$9,560
- Average violations/inspection ~17.4
<table>
<thead>
<tr>
<th>Element</th>
<th>Description</th>
<th>% of Citations</th>
<th>Cumulative %</th>
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</thead>
<tbody>
<tr>
<td>j</td>
<td>Mechanical Integrity</td>
<td>19.4%</td>
<td>19.4%</td>
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<tr>
<td>d</td>
<td>Process Safety Information</td>
<td>17.5%</td>
<td>36.9%</td>
</tr>
<tr>
<td>f</td>
<td>Operating Procedures</td>
<td>17.1%</td>
<td>53.9%</td>
</tr>
<tr>
<td>e</td>
<td>Process Hazard Analysis</td>
<td>17.0%</td>
<td>70.9%</td>
</tr>
<tr>
<td>l</td>
<td>Management of Change</td>
<td>8.2%</td>
<td>79.1%</td>
</tr>
<tr>
<td>m</td>
<td>Incident Investigation</td>
<td>6.7%</td>
<td>85.8%</td>
</tr>
<tr>
<td>o</td>
<td>Compliance Audits</td>
<td>3.8%</td>
<td>89.6%</td>
</tr>
<tr>
<td>h</td>
<td>Contractors</td>
<td>2.8%</td>
<td>92.5%</td>
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<tr>
<td>g</td>
<td>Training</td>
<td>2.7%</td>
<td>95.2%</td>
</tr>
<tr>
<td>n</td>
<td>Emergency Planning &amp; Response</td>
<td>1.5%</td>
<td>96.7%</td>
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<tr>
<td>c</td>
<td>Employee Participation</td>
<td>1.4%</td>
<td>98.1%</td>
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<tr>
<td>i</td>
<td>Pre-startup Review</td>
<td>1.1%</td>
<td>99.2%</td>
</tr>
<tr>
<td>k</td>
<td>Hot Work Permit</td>
<td>0.8%</td>
<td>100.0%</td>
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Chemical Plant NEP

- Chemical Plant NEP effective July 27, 2009
- Extended through end of FY2010
- Outlines a different approach for inspecting PSM covered chemical facilities
- Not comprehensive
- Less resource intensive for both OSHA and employers
One year pilot program for planned inspections in 3 OSHA Regions:

- Region I – CT, MA, ME, NH, RI
- Region VII – Nebraska, Kansas, Missouri
- Region X – Idaho

State Plans urged to participate voluntarily

- Some states are doing Chemical NEPs
As you know, Voluntary Participation Program (VPP) sites are not subject to programmed inspections. However, the NEP applies OSHA-wide for un-programmed PSM related inspections:

- Accidents
- Complaints
- Referrals
- Catastrophes
Chemical Plant NEP Facility Selection (Programmed Inspections Only)

- Selected from list of:
  - EPA Risk Management Program (RMP) Program 3 facilities
  - OSHA database (previous PSM citations)
  - Explosives Manufacturing
  - Facilities identified by local (Area and Regional Office) knowledge
As of August, 2010, 112 inspections opened
- 38 Unprogrammed (34%)
- 74 Programmed (66%)
- 9 resulted in no inspection occurring because there was no PSM covered process

62 inspections have issued citations
- Average 9.0 citations per inspection
- Average $3,500 per citation
- Over 60 different standards cited
- 44% of all citations were other than PSM
# Chemical Plant NEP Citations by PSM Element

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<td>44.0%</td>
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<td>63.0%</td>
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<td>76.9%</td>
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API 578 PMI Certification Course

Training Course Explained on

API RP-578

By
Don Mears
Analytical Training Consultants
THROUGH UNDERSTANDING API RP 578 GUIDELINES (DAY 1)

- Scope of the Course
- General
- Alloy Substitutions in Carbon Steel Systems
- Roles and Responsibilities
- Industry References
- Terms and Definitions
- Extent of Material Verification Program
  - Explain use of Material Verification Program Test Methods
  - Field Evaluation of PMI Test result procedures
  - Proper Marking and Record Keeping
- Review and Testing on Academic Material of API-RP-578
Guidelines and Application Procedures for API-RP 578
Positive Material Identification (PMI)
Using XRF and OES Technologies

- THROUGH APPLICATION OF PROPER PMI TESTING PROCEDURES (DAY 2)
- Using XRF Technology - (Hands-on Application/Demonstration)
- Review of XRF Technology
- Who should use it?
- What is XRF – Technology Explained
- When should XRF be used?
- Where should XRF be used—Types of Alloys
- How should XRF be used—PMI methods and Procedure Guidelines
- Why should XRF be used—Percent of PMI needed?
Guidelines and Application Procedures for API-RP 578
Positive Material Identification (PMI)
Using XRF and OES Technologies

- **THROUGH APPLICATION OF PROPER PMI TESTING PROCEDURES (DAY 2)**
- **Using OES Technology**-(Hands on application/Demonstration)
- Review of OES Technology
- Who should use it?
- What is OES-Technology Explained?
- When should OES be used?
- Where should OES be used—Types of Alloys
- How should OES be used—PMI Methods and Procedure Guidelines
- Why should OES be used--Percent of PMI needed?
Guidelines and Application Procedures for API-RP 578
Positive Material Identification (PMI)
Using XRF and OES Technologies

Summary Comments for Presentation:

- “Reasons Why! This Course should be given !”
- OSHA INSTRUCTION for Both Refining and Chemical Plants Uses Examples:
  - API RP 578
  - Operation Training and Refresher Training
- Safety Bulletin from U.S. Chemical Safety and Hazard Investigation Board (CSB)—BP Texas City
- Safety Bulletin from U.S. Chemical Safety and Hazard Investigation Board (CSB)---Chlorine Transfer Hose Failure
- All the Reported and Unreported “Near Misses” the Oil and Gas Industry has experienced.
- This is true with all Global Oil & Gas Petro Chemical Companies!

- Joint US and Mexico Efforts to Ensure Safe and Healthful Working Conditions for Workers from Mexico and other Latin American Countries. True also with North America, Europe & China

http://www.osha.gov/international/index.html
Guidelines and Application Procedures for API-RP 578
Positive Material Identification (PMI)
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Questions?