Continuing Education Course #096
Building Mechanical Integrity Programs
Into New Plants

1. Mechanical Integrity of equipment should be viewed as only an inspection program.
- a. True
- b. False

2. OSHA 1910.119 requires Mechanical Integrity Programs be implemented
- a. Before a plant is commissioned
- b. When a plant is commissioned.
- c. Within 1 year after commissioning.
- d. Never. OSHA 1910.119 does not require implementation.

3. OSHA 1910.119 describes
- a. Requirement for an MI program, but not the procedures to be used
- b. Requirement for an MI program, and regulated inspection methods
- c. Requirement for an MI program, and regulated inspection intervals
- d. Recommendations for an MI program
- e. All of the above

4. Plant personnel memory of specific incidents is sufficient for an MI program.
- a. True
- b. False

5. Knowing the history of inspections and maintenance of equipment allows
- a. Informed and correct repair decisions when problems are found
- b. Faster response time when problems are found
- c. Predictions of when serious defects may require repair or replacement
- d. All of the above.

6. Standard vendor and construction documentation is sufficient for an MI program
- a. True
- b. False

7. An “Indication” to an inspector may be
- a. An original weld or base metal defect
- b. A propagating crack
- c. A design error
- d. All of the above
- e. a &b

8. “Safety” in Mechanical Integrity is concerned with

- ○ a. Site personnel safe access
- ○ b. Site personnel releases of toxic chemicals
- ○ c. Nearby areas releases of toxic chemicals
- ○ d. Fires
- ○ e. All of the above

9. Including Mechanical Integrity requirements in the detailed design phase
- ○ a. May effect the type of contract for the design engineering firm
- ○ b. May effect the requirements of equipment suppliers
- ○ c. Requires open dialog between the design engineering teams and the Owner's Maintenance and Operations teams
- ○ d. All of the above

10. A Mechanical Integrity Program is usually
- ○ a. The same for all pieces of equipment in a plant
- ○ b. Customized for every system in a plant
- ○ c. Customized for every major piece of equipment in a plant
- ○ d. An optional plant program
- ○ e. b & c only

11. Mechanical Integrity should
- ○ a. Have a major impact on equipment specifications and selection
- ○ b. Be considered during conceptual design
- ○ c. Be driven partially by Owner operational & maintenance expectations
- ○ d. a & b only
- ○ e. All of the above

12. Risk / Consequence Diagrams
- ○ a. Relate the risk of failure to the consequence of the failure
- ○ b. Have value only when evaluating the results of an inspection
- ○ c. Are helpful in deciding which items should be designed to higher standards
- ○ d. All of the above
- ○ e. a & c only

13. Refer to Figure 5.1 Risk / Consequence Diagram. For items that are a 3 Risk, and 4 Consequence, it implies
- ○ a. There are expected and known failure modes, and if a failure occurs, at least one fatality is possible
- ○ b. There are expected and known failure modes, and a first aid case is the likely worst case consequence
- ○ c. Failure is expected at some time if no intervention is taken, and personnel would possibly have to be hospitalized
- ○ d. Failure modes are highly unlikely, but if a failure occurs, there may be fatalities

14. Which of the following statements are true about Risk / Consequence Diagrams?
- ○ a. The Risk and Consequence may change based on design details
- ○ b. The Risk and Consequence may change based on unusual operational conditions
- ○ c. The Risk and Consequence is unchanged once it has been evaluated in the Conceptual Design
- ○ d. The Risk and Consequence may change based on quality of fabrication and erection
- ○ e. a & b only.
- ○ f. a, b & d only

15. Equipment vendors can assist in the Mechanical Integrity program by
- ○ a. Reporting requested baseline data
- ○ b. Detailed reporting of any repairs made during manufacturing

- ○ c. Formatting data to allow easy integration into databases
- ○ d. Allowing access for Owner designated inspectors to record data
- ○ e. All of the above

16. To lower the Risk of Failure, which of the following options should be considered?
- ○ a. Change materials
- ○ b. Increase conservatism in design, such as thicker material
- ○ c. Assure critical components can be observed and inspected
- ○ d. Provide limited personnel clearance
- ○ e. a, b & c only
- ○ f. All of the above

17. To reduce the Consequence of Failure, which of the following options should be considered?
- ○ a. Reduce the need for personnel to be in an area
- ○ b. Provide personnel barriers around the equipment
- ○ c. Modify the process to limit the toxicity of any releases
- ○ d. Modify the equipment to make it thicker
- ○ e. All of the above
- ○ f. a, b & c only

18. “Inspectability” refers to
- ○ a. The arrangement of the equipment to be inspected after commissioning
- ○ b. The accessibility of the equipment to be inspected after commissioning
- ○ c. The visibility of the equipment to be inspected after commissioning
- ○ d. All of the above
- ○ e. a & c only

19. If wall thinning is a concern
- ○ a. Baseline thickness data is needed to estimate remaining life
- ○ b. Exact location of baseline thickness data is needed to make accurate remaining life estimates
- ○ c. Thinning may occur from the exterior or interior of the equipment
- ○ d. There are different measurement techniques that may be used
- ○ e. All of the above

20. At the time of plant Commissioning and Transition to Owner
- ○ a. Mechanical Integrity documents must be provided to the Owner
- ○ b. Mechanical Integrity program officially starts
- ○ c. It can be assumed all equipment is in exact condition as specified
- ○ d. Equipment is warranted to the first planned inspection cycle

21. If an inspector finds an “Indication”, options include
- ○ a. Repair or replace equipment
- ○ b. Modify operating maintenance or inspection procedures
- ○ c. Leave as is and document
- ○ d. Judge Indication is original flaw and does not need to be documented
- ○ e. All of the above
- ○ f. a, b & c only

22. In developing a Mechanical Integrity Program, resources may include

- ○ a. API Recommended Practices
- ○ b. Design Codes
- ○ c. Equipment Vendors
- ○ d. Plant operations and maintenance staff
- ○ e. Engineering and Inspector Consultants
- ○ f. All of the above

23. Only one Risk / Consequence Diagram is sufficient for each piece of equipment
- ○ a. True
- ○ b. False

24. A Risk / Mitigation Analysis provides a set of proposed changes to reduce the risk of failure and reduce the consequences of a failure.
- ○ a. True
- ○ b. False

25. Which of the following are Driving Factors to implement a Mechanical Integrity Program?
- ○ a. Plant safety
- ○ b. Plant availability
- ○ c. Legal requirements
- ○ d. Reduced insurance rates
- ○ e. All of the above