




# Inspection of Refrigerated Storage Tanks

Presented by

**Jesus Esquivel Alvarado**



Jesus Esquivel is a Coordinator of mechanical integrity department of COMIMSA, he has more than 15 years in the design, inspection, failure analysis, repair and fitness for service for the oil industry in Mexico.

He is member of the Subcommittee of Inspection of CRE of the American Petroleum Institute.

He is an ASME Global International Instructor in the areas of Pressure Vessels, Fitness for Service and RBI.

He has created and review guidelines for the Mexican Government in the areas of Pressure Vessels.

Now, he conduct the RBI Studies at the Refineries and petrochemical plants of PEMEX in Mexico.

**About Jesus Esquivel**

# OBJECTIVES

- Brief Introduction
- Why inspection? Internal?, External?
- Examples of Catastrophic Damage
- Common Internal Inspection
- Results
- POF for RBI



# Introduction

1. Design based on API 620 mostly, Appendix R.
2. A Refrigerated Tank may be a single or a double wall tank.
3. Double wall tank consist of an inner tank for the storing the refrigerated liquid and an outer that encloses an insulation space (which usually has a lower gas pressure) around the inner tank.
4. Apply to DMT from + 40°F to - 60°F
5. Mostly inspection requirements based on API 653
6. In Repairs requirement follow guide of API 620 Appendix R on Impact Test.



# Why Inspection?

1. Determine the actual integrity condition, specially with internal inspection.
2. Prevent damage in the start up based on the condition of the RST.
3. Increase o decrease the interval time for the next internal inspection.
4. Information about behavior of the RST with the same operating conditions.
5. Tools enough to prepare for the next inspection based on Risk and Integrity.

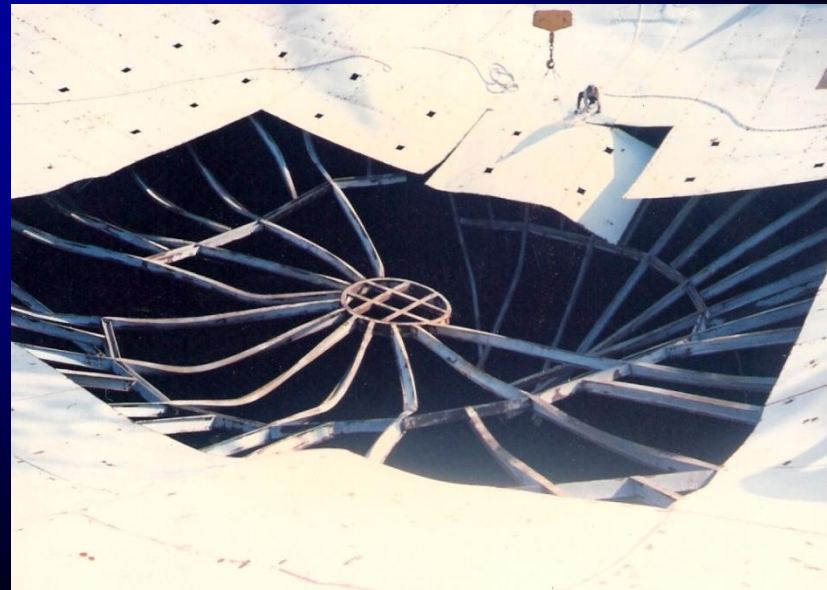


# Examples Catastrophic Damage



Structural roof collapsed caused by a failure of an expansion Joint

Damage in roof caused by appurtenances



# Examples Catastrophic Damage



Damage in floor by wrong in operating conditions



# Internal Inspection

The internal inspection is the recommended to be made every 10 years to know the condition of the refrigerated storage tank.

The main components included are:

- ❖ Shell Courses
- ❖ Bottom plates
- ❖ Structural Roof Integrity
- ❖ Pearlite (Insulation)
- ❖ Ring sections
- ❖ In and out product Nozzles



# Internal Inspection

Inspection of the  
annular plate and  
welding joints



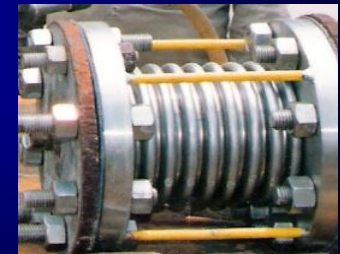
Inspection of the  
structural of the  
inner tank



# Inspection of Accesories



Main components to inspect



# Results

In Ammonia Refrigerated Storage Tanks.

## CRACKS

However, normally the grow depends of the cycles, site of the cracks and stresses to permit to grow parallel or through the weld.



# Inspection Results



Undercuts in  
welds



Lack of  
complete  
structure

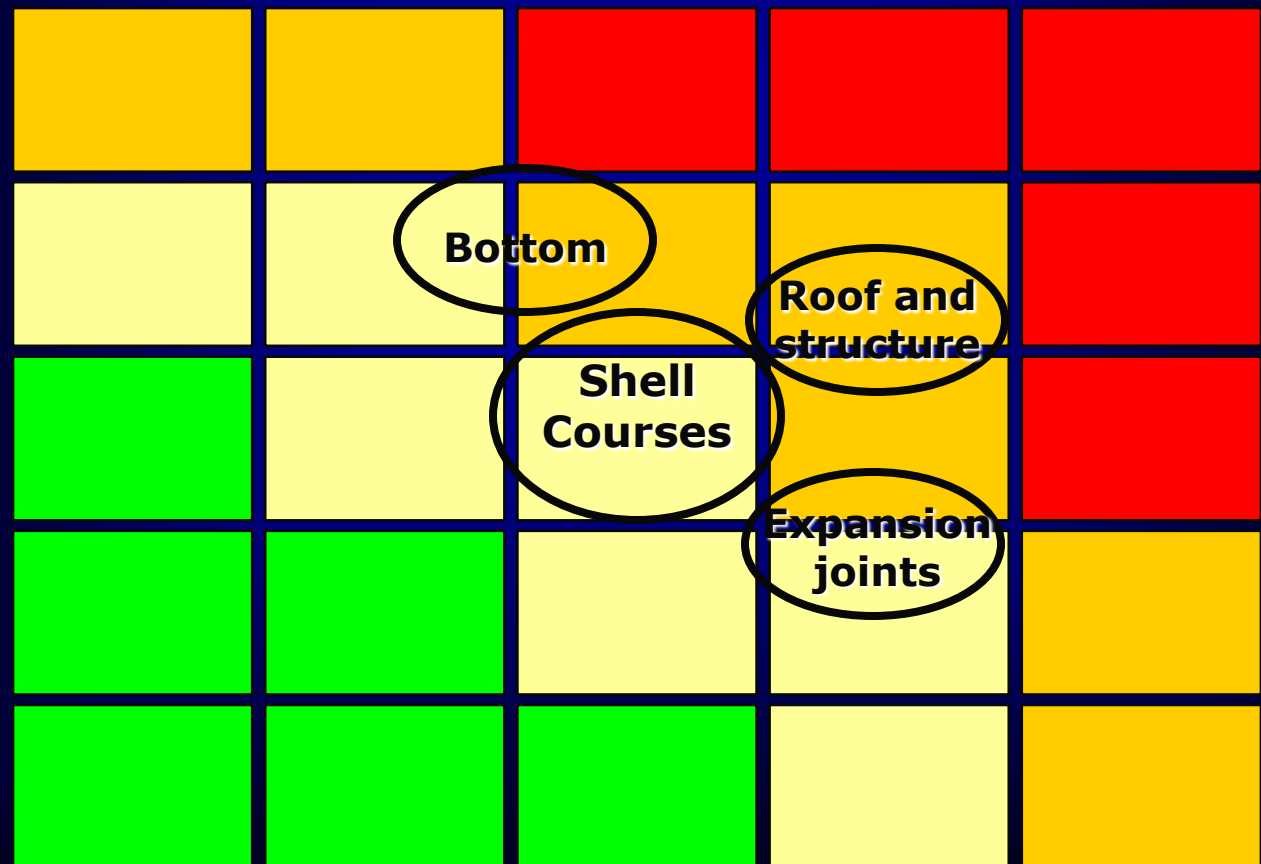


Corrosion in  
welds



# RBI in RST

The results in RBI for the Refrigerated Storage Tanks with more than 25 years in operation and 14 years without internal inspection.



# Conclusions.

- ❖ Internal inspection is necessary specially to determine the physical condition of the main components including expansion bellows
- ❖ The next interval time must include the behavior and condition of the accessories (expansion joints)
- ❖ The RBI include condition of the expansion joints in to determine the next interval time
- ❖ The maximum period must be 20 years, otherwise the Authorized inspector consider alternative interval time



# Questions ???

Jesus G. Esquivel Alvarado  
Consulting and CMID COMIMSA  
jesquivel@comimsa.com  
Phone: (01152-833) 2740756

