



We put you first.  
And keep you ahead.

# Maintenance of Equipment

Tuan Do – FMC Technologies



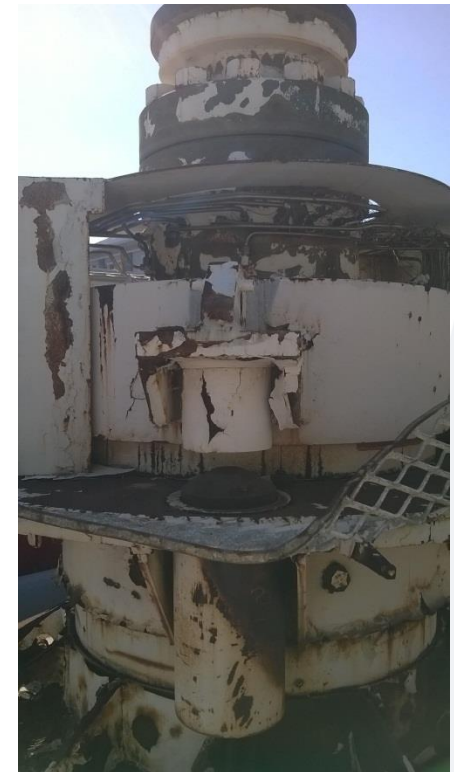
# The Need for Proper Maintenance



- Subsea Equipment is Great in the Water
  - No UV Exposure
  - Consistent Environment
  - Several standards for ensuring equipment will work effectively in the subsea environment

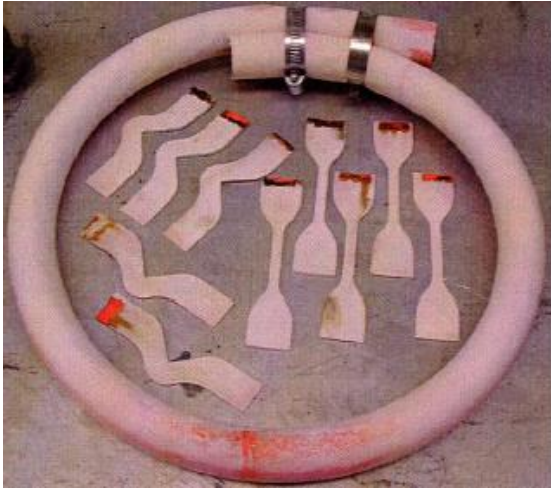
- But What About on Land?
  - UV Exposure
  - Humid Environment
  - Temperature Fluctuations
  - Standards for storage?

Oxidation/Corrosion is the most common type of damage while in storage

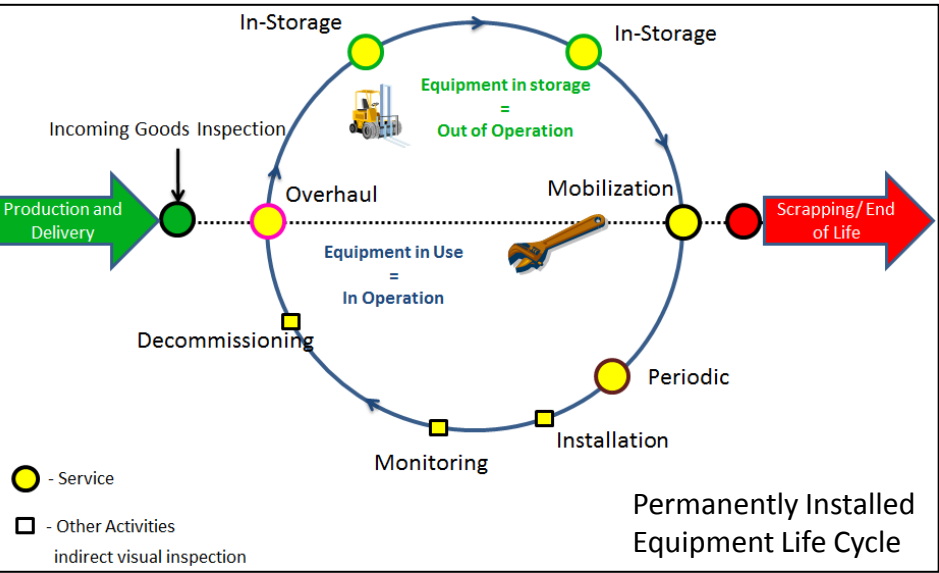
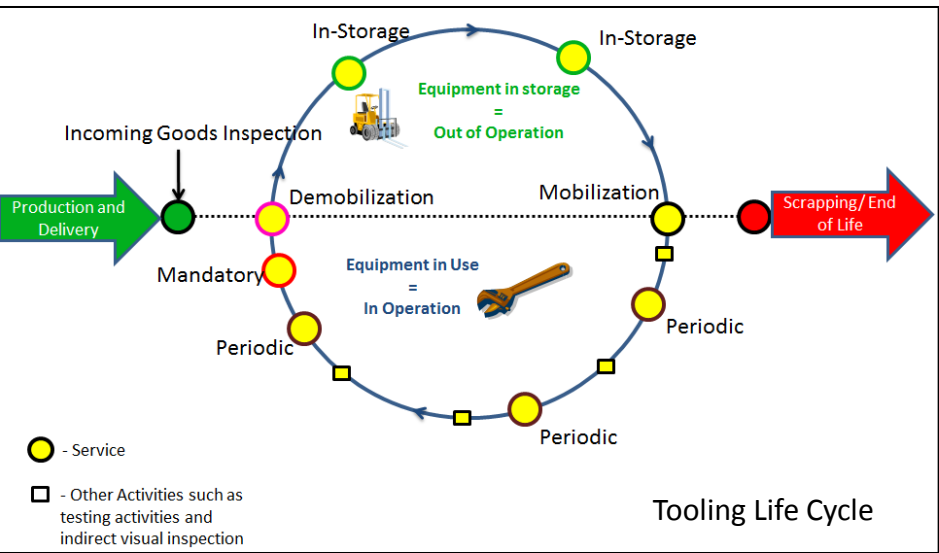




# Damage Seen during from Storage



# Equipment Lifecycle is more than just installation



Service Type	Definition
Mobilization	Onshore checks and test in preparation for operational use
Demobilization	Onshore preventative maintenance evaluation of the equipment and replacement of damaged parts. The check will determine whether the equipment requires further maintenance before prepping the item for storage
Periodic Maintenance	Preventative maintenance while the item is in operations. Performed to assure operational functionality of equipment and prevent degradation of the equipment's physical/functional condition
In-Storage Maintenance	Time based preventative maintenance to check the physical status and condition of equipment in storage.
Mandatory Maintenance (aka Overhaul)	Preventative maintenance to uphold, maintain, or regain integrity of equipment's functionality. Compulsory maintenance in accordance with a predefined frequency, calendar bases, or condition based related to number of usage

# So what is done during each stage?

Exterior Activities	MOB	DMB	PER	INS	MAN
Degrease and Clean	X	X	X	X	X
Pressure Wash and De-salt		X	X		X
Visual Inspections	X	X	X	X	X
Check Lifting Certificates	X	X	X	X	
Recertify Lifting Equipment	X				X

Testing Activities	MOB	DMB	PER	INS	MAN
Fill and Flush Hydraulic Lines	X	X			X
Function Test	X	X			X
Hydrostatic and Control Circuit Test	X	X			X
Gas Testing					X
Electrical Testing	X	X			X
Critical Dimensional Checks					X
NDE of Major Features					X

Restorative Activities	MOB	DMB	PER	INS	MAN
Touch Up Coating	X	X			
Blast and Re-Coat					X
Replace missing or damaged parts	X	X	X		X
Replace internal wear items					X

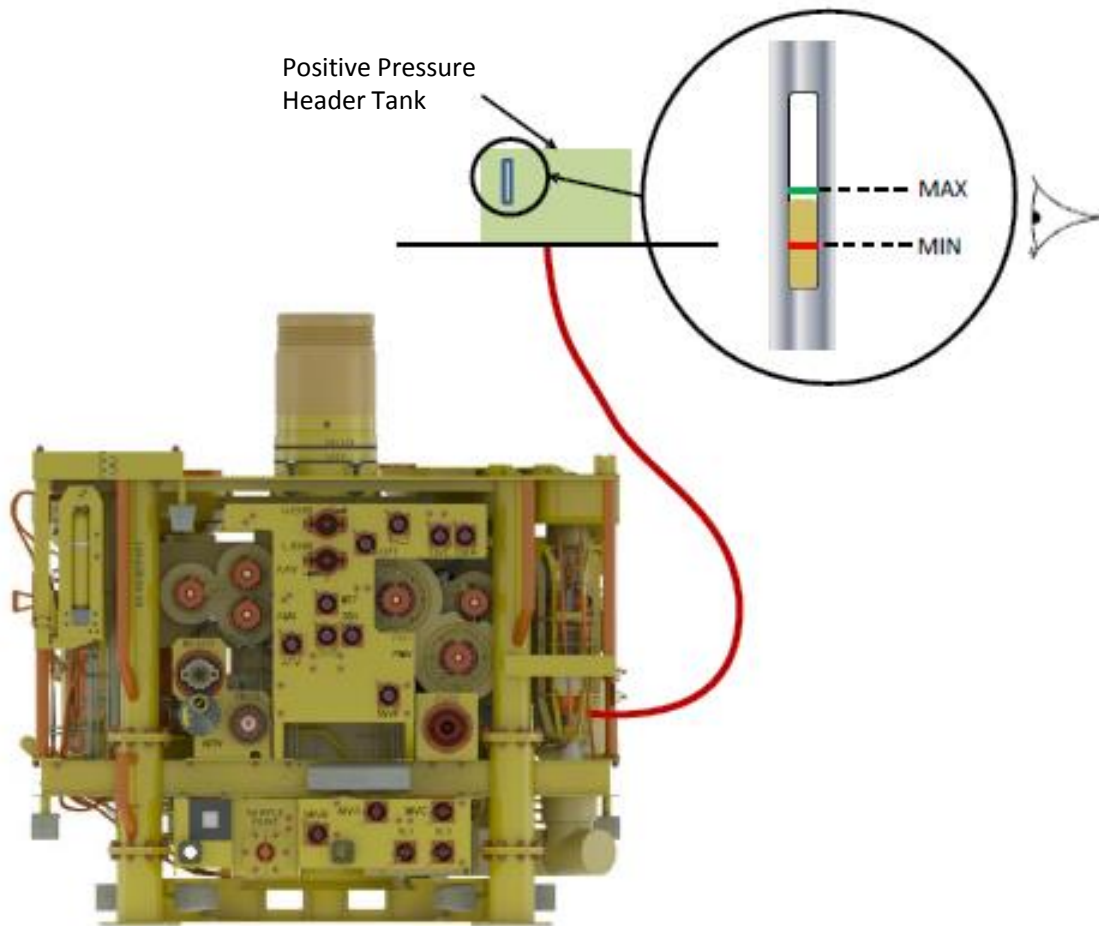
Preservation Activities	MOB	DMB	PER	INS	MAN
Lubricate Seal Areas	X	X	X	X	X
Grease Threads	X	X	X	X	X
Apply Corrosion Inhibitors (Internal & External)		X	X	X	
Apply UV Protection/Wraps/Tarp/Crate		X		X	

Equally important is the storage condition

- Outside?
- Under shade?
- Climate Control?

This is the portion most often overlooked

# Positive Pressure to Control Evaporation



- Used on more delicate and complex hydraulic circuits (e.g. actuator chambers)
- Positive Pressure in the system helps to minimize evaporation of fluid during storage
- Header Tank provides a reservoir to compensate for any potential fluid loss



# Example Items Being Prepped for Long Term Storage



1. Items are cleaned



2. Corrosion Inhibiting Grease applied



3. Items are wrapped and labeled



4. Items are stored

# Larger items being stored and protected using tarpaulins





Questions?