



human energy®

MEG for Terminals

Walter Sonne

Team Manager – Offshore and Marine Engineering

OCIMF North America Regional Marine Forum

Stamford, Connecticut

March 15, 2018



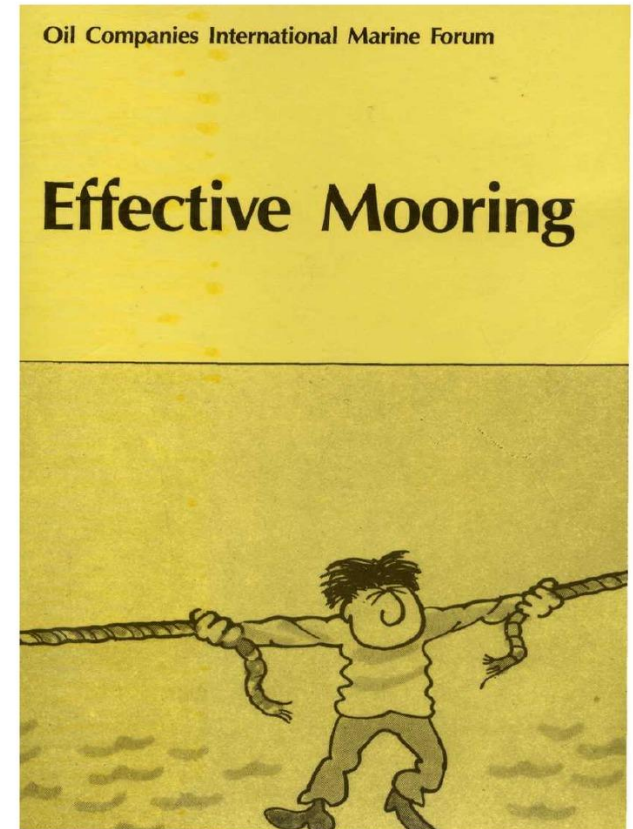
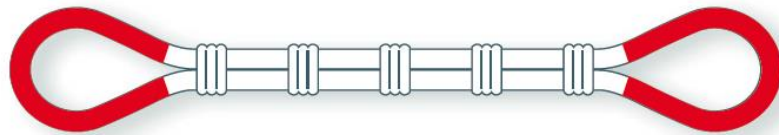
Mooring – Simple Approach



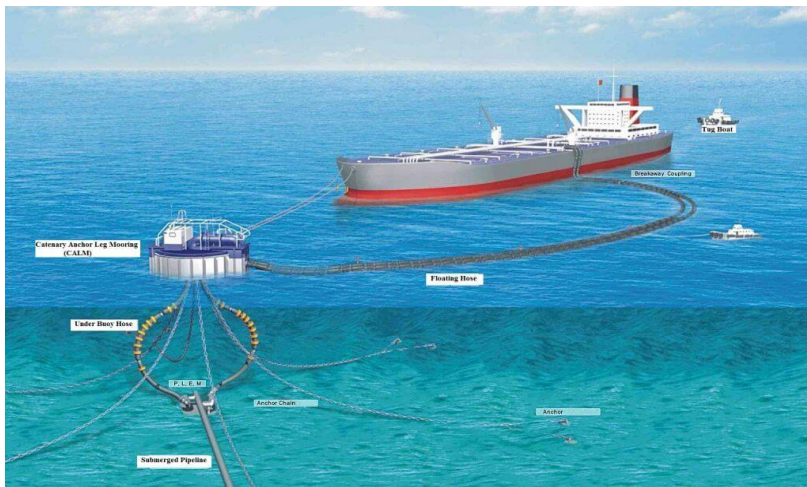
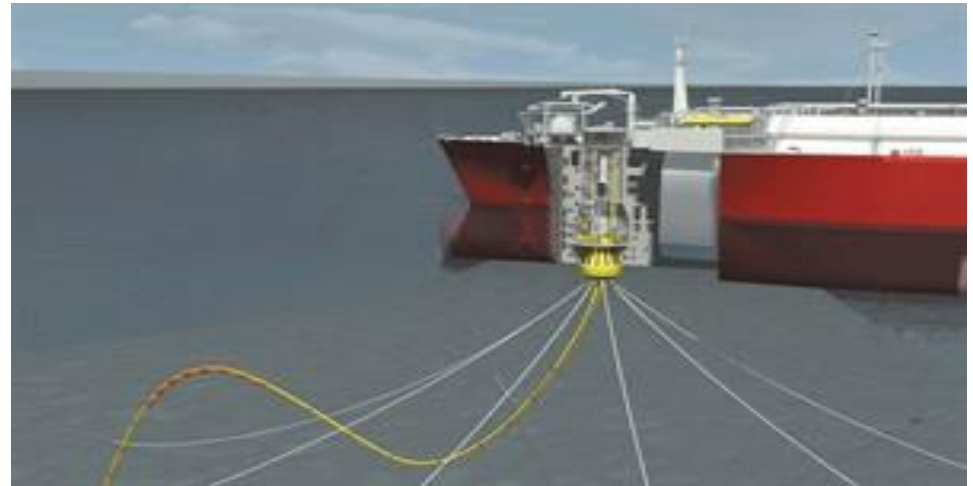
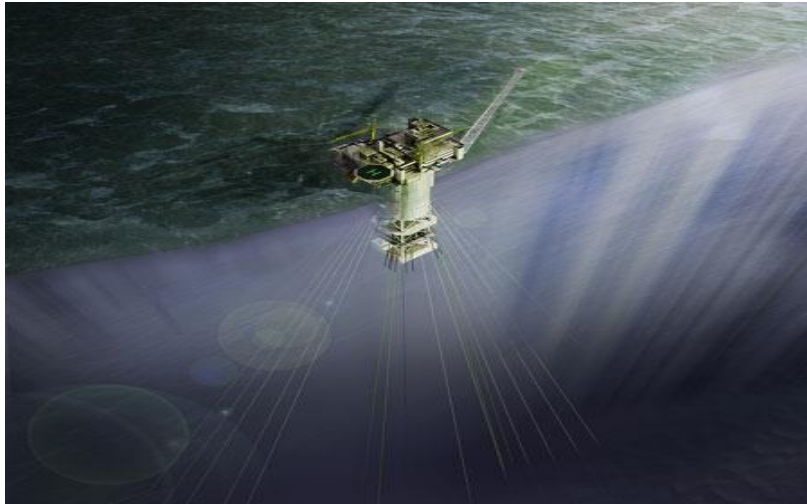
Rope:

One end on vessel – Naval Architecture

One end on structure – Civil Engineering



Types of Moorings



Marine Terminals – Quayside Mooring



Oil

Refined Products

Chemicals

Liquefied Natural Gas (LNG)

Liquefied Petroleum Gas (LPG)

Condensate



Marine Terminal Characteristics

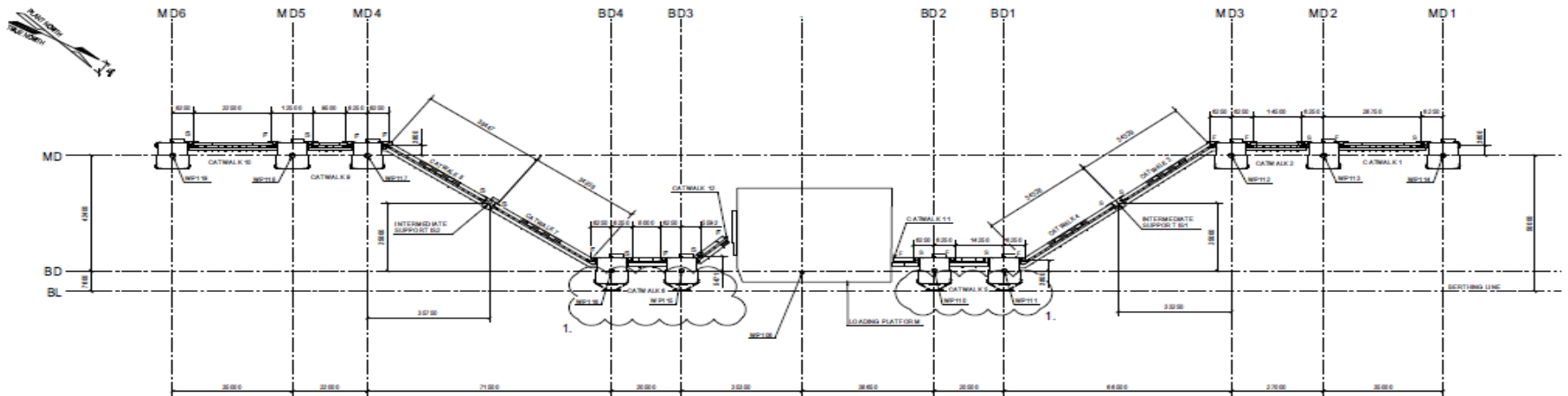


Liquid Products Berths

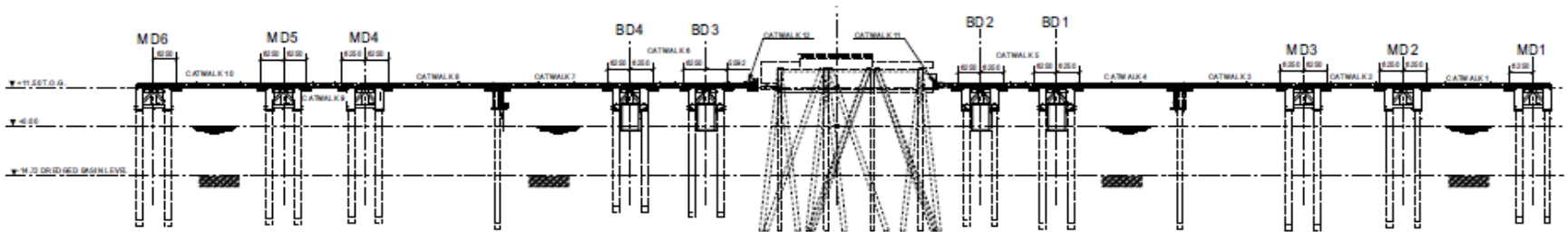
- Shallow water (< 25 m or draft to depth ratios ≈ 0.90)
- Marginal Wharf
- Sea Island
- Breasting Dolphins
- Mooring Dolphins
- Loading or Unloading Platform
- Gangway
- Loading Arms
- Hoses
- Quick Release Hooks
- Berthing Aid System
- Berth Monitoring System



Typical Marginal Wharf Arrangement



PLAN ON DOLPHINS AND CATWALKS



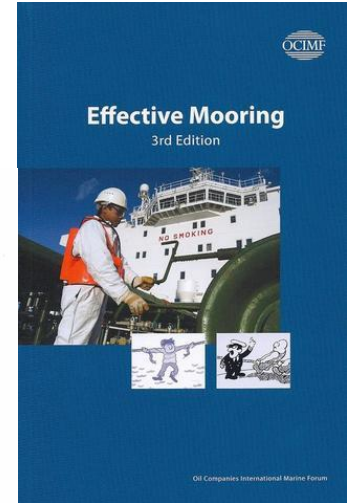
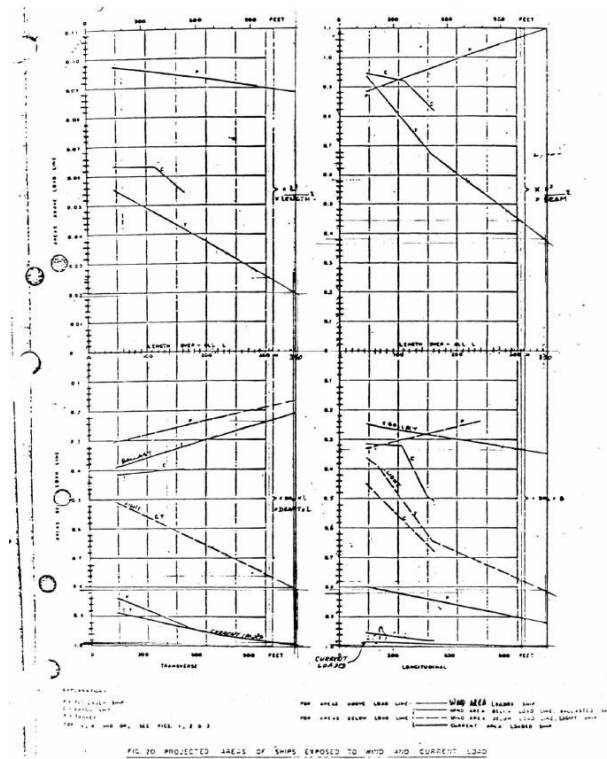
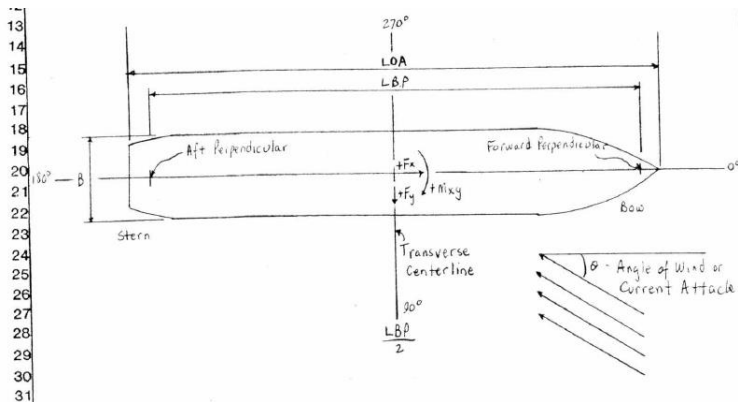
ELEVATION ON DOLPHINS AND CATWALKS

1970's & 1980's



Prediction of Wind and Current Loads on VLCC's – 1977

Effective Mooring - 1989



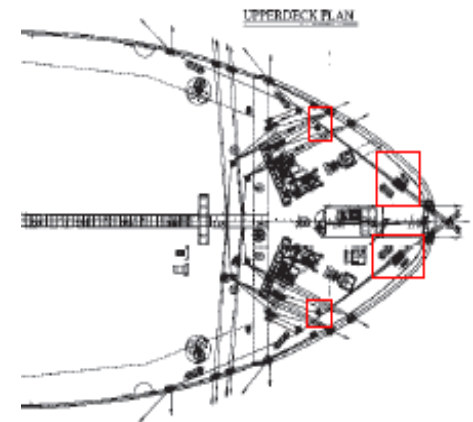
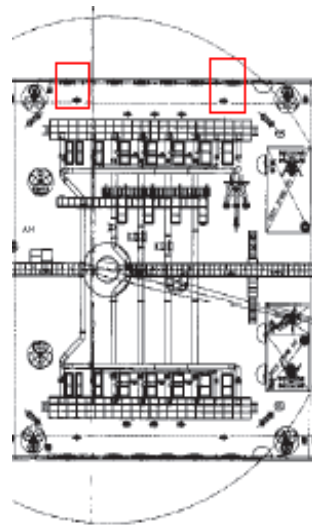
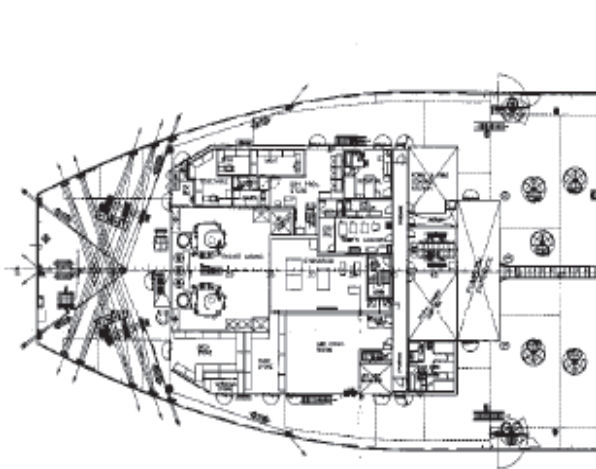
Very limited collaboration between vessel operations and marine civil engineering

1990's and 2000's



Mooring Equipment Guidelines First Edition – 1992

Ship General Arrangements – winches, fairleads, chocks



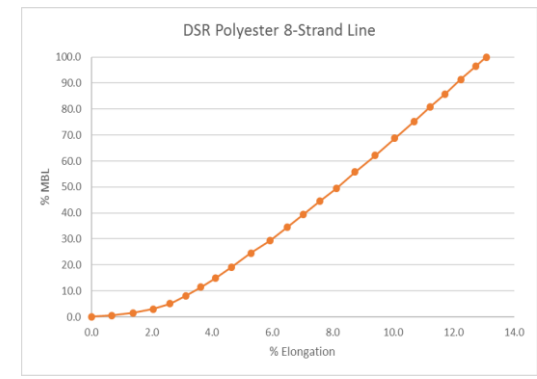
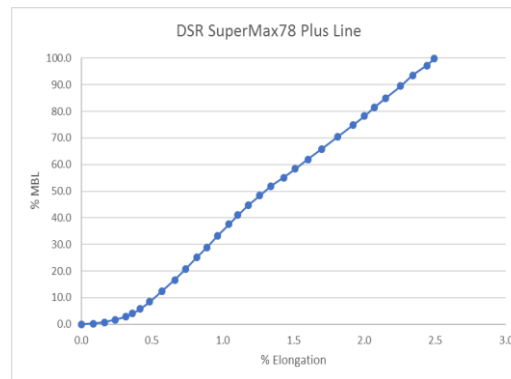
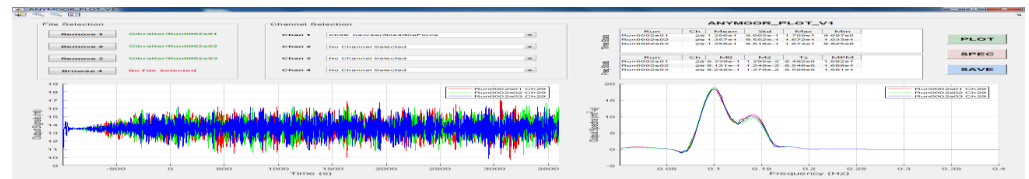
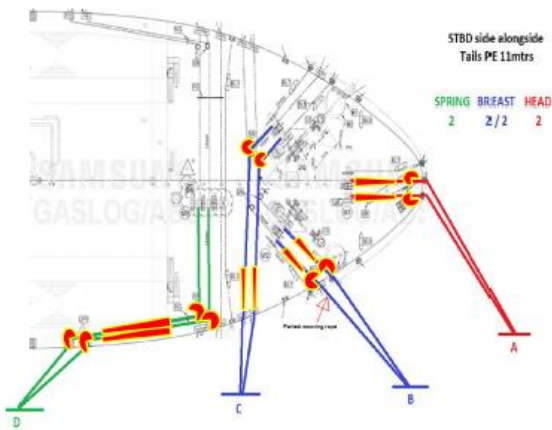
Increasing collaboration and understanding



Mooring Equipment Guidelines Fourth Edition – 2018

Recommendations for the Design and Assessment of Marine Oil and Petrochemical Terminals (PIANC 153) - 2016

The Importance of Rope Characteristics and Line Tension Monitoring



Collaboration is Key



Shipping and Engineering

- Full interaction and collaboration
- Vessel Selection
- Vessel information – general arrangement, deck equipment, and mooring lines
- Metocean Conditions
- Hydrographic Surveys
- Dynamic Mooring Analysis
- Vessel Motion Analysis
- Terminal Equipment Selection
- Mooring line and tail selection



Other Opportunities



- Compatibility – vetting of tankers and carriers
- Calibrate design based on measurements taken at site
- Incident Response
- Passing Ships
- Define Loading Arm Envelope
- Define Gangway Envelope
- Statement of Terminal Operating Limits



Questions

