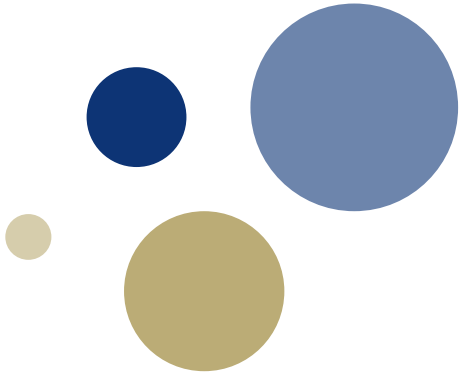
NTNU – Trondheim
Norwegian University of
Science and Technology



Self-introduction and PhD plan

Aibo Zhang

03.11.2017

CONTENT

1. Self-Introduction
2. Previous work
3. PhD plan

Introduction

Name: Aibo Zhang

张爱波

Hometown:

Shandong，China

山东，中国

Education

中国石油大学（北京）
China University of Petroleum - Beijing (CUPB)

Master's degree Institution:

China University of Petroleum-Beijing

College：

Mechanical and Transportation Engineering

Major:

Safety Science and Engineering

CONTENT

1. Self-Introduction
2. Previous work
3. PhD plan

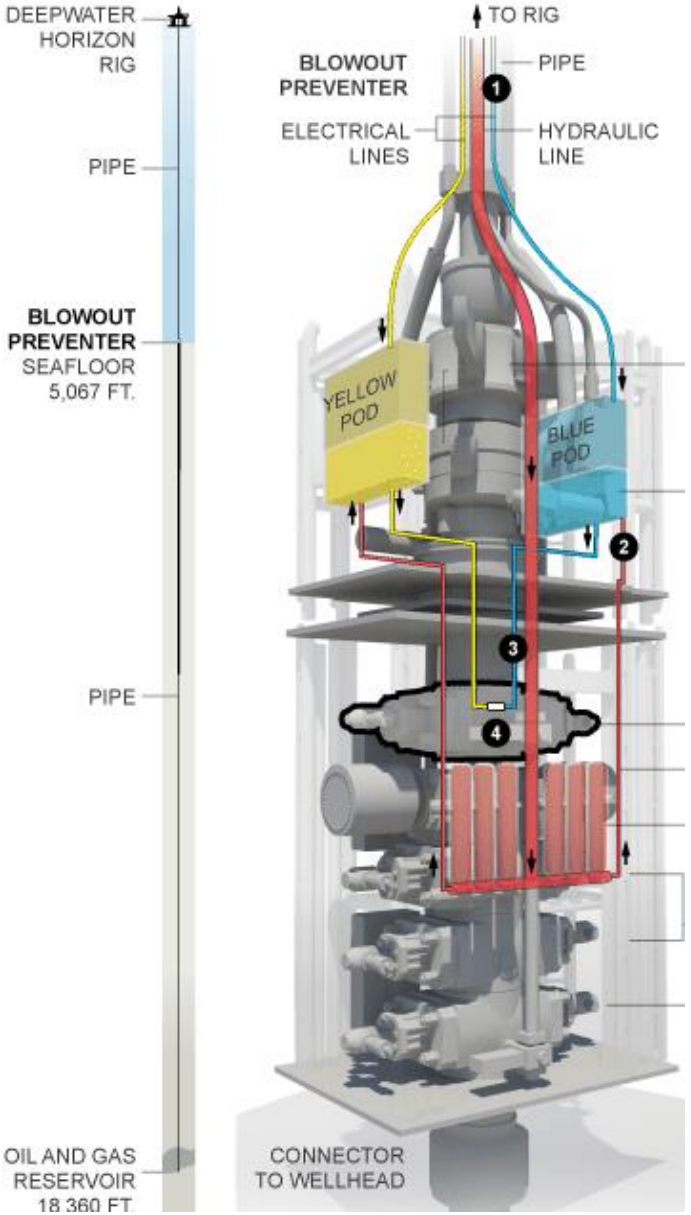
Previous work

Research Focus:

Offshore well control equipment reliability and integrity assessment

Master's thesis topic：

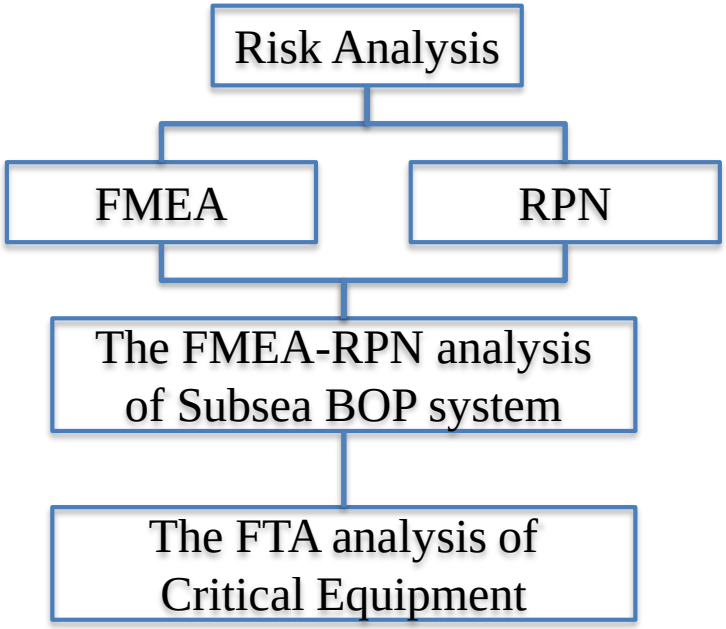
Evaluation Method of Offshore Blowout Preventer Integrity Assessment Based on Risk Assessment



Research experience

1. **Project Title:** Risk Control of Deepwater Gas Field Drilling and Completion Options

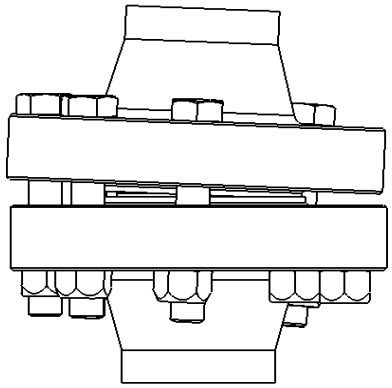
Brief: Researching on the evaluation of BOP reliability



Safety Evaluation of Subsea BOP

FMEA
FTA
BOP
Failures of BOP
Damage
Erosion
Seal condition

Inner cavity erosion of RAM BOP

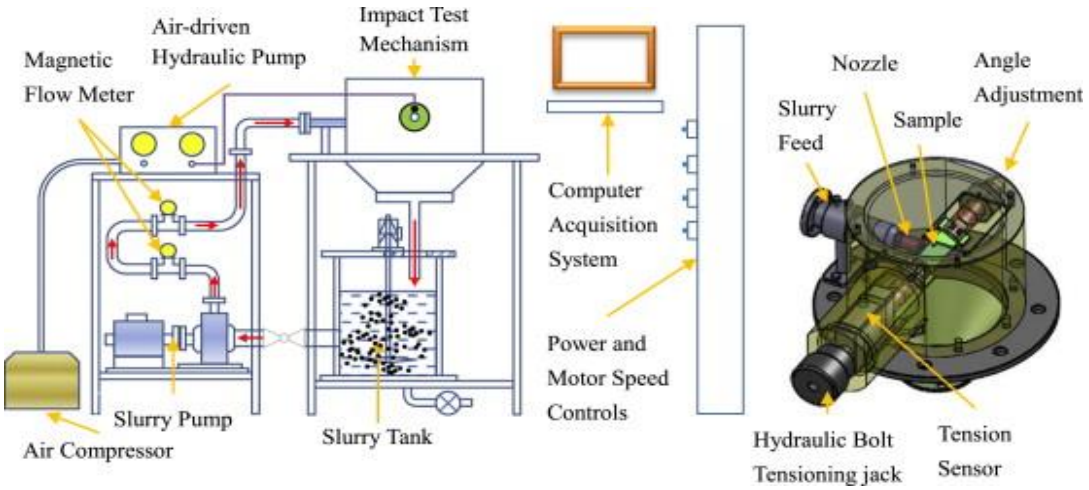


The flange under the non-uniform bolts pre-tightening

2. Project Title: Non-metallic materials and safety monitoring technology

Brief: Researching the corrosion and erosion mechanism of high pressure manifold key components;

Researching the main influence factors of the mechanism of corrosion and erosion.



Schematic diagram of the erosive wear testing system

Testing method:

Metal magnetic memory

Main influence factors:

- Impacting Velocity
- Tensile Stress
- Impacting angles
- Materials

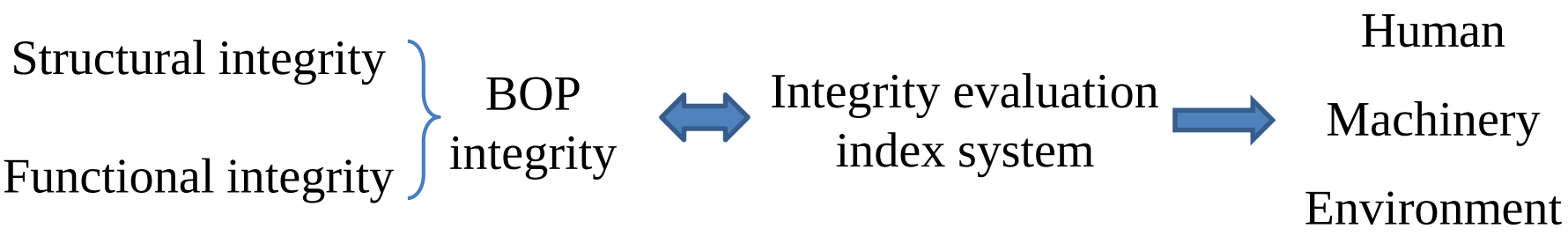
Research experience

3.**Project Title:** Assessment Technology Research of Well Control Equipment

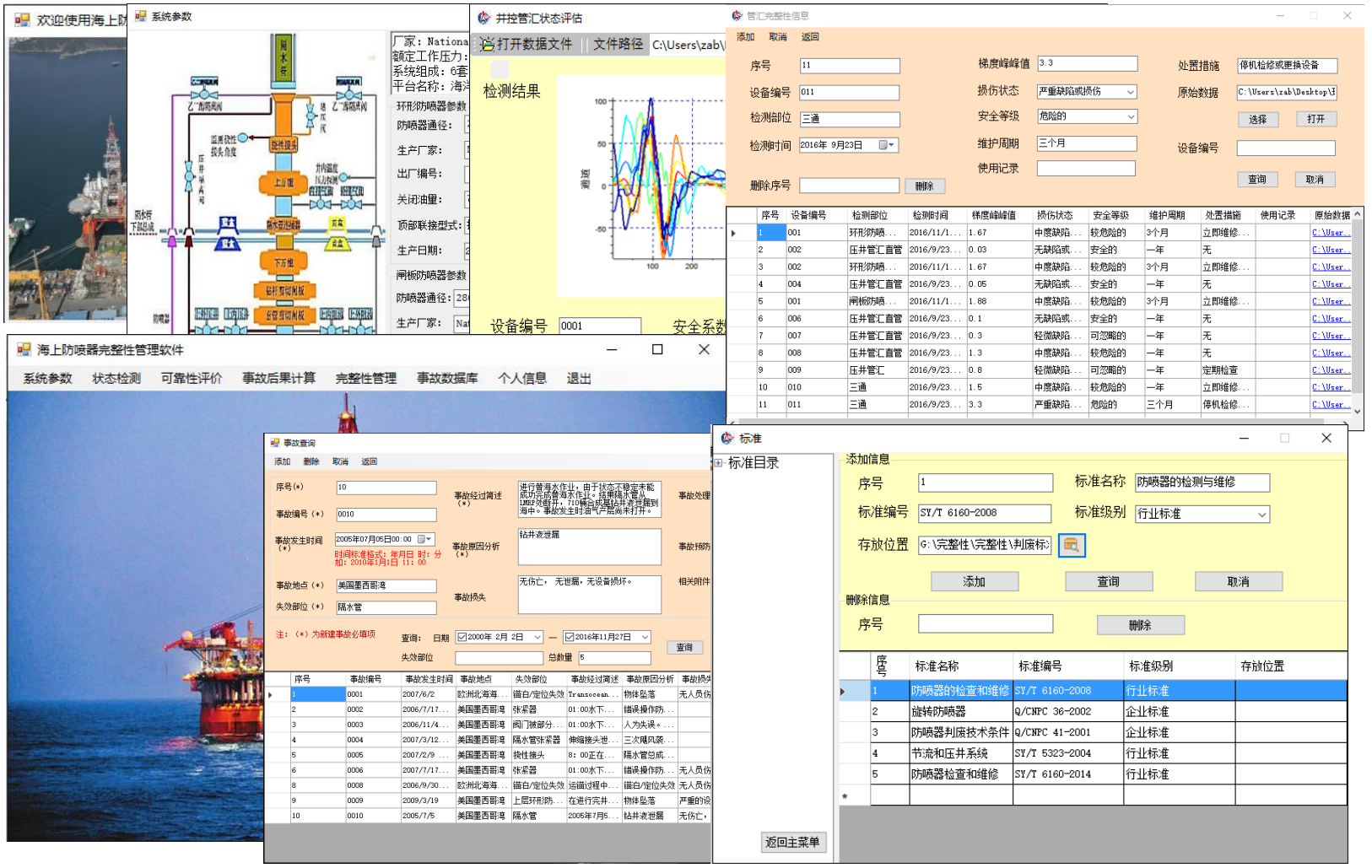
Brief: Researching on the evaluation of BOP reliability and integrity;

Developing the software of well control equipment integrity management.

BOP integrity



Integrity management software



CONTENT

1. Self-Introduction
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Research plan

Topic: Hybrid prognostics and health management for safety-critical systems in infrastructures

-supervisor: Yiliu Liu

-co-supervisor: Anne Barros

Key words: Prognostics and health management(PHM)

safety barriers

safety-critical systems

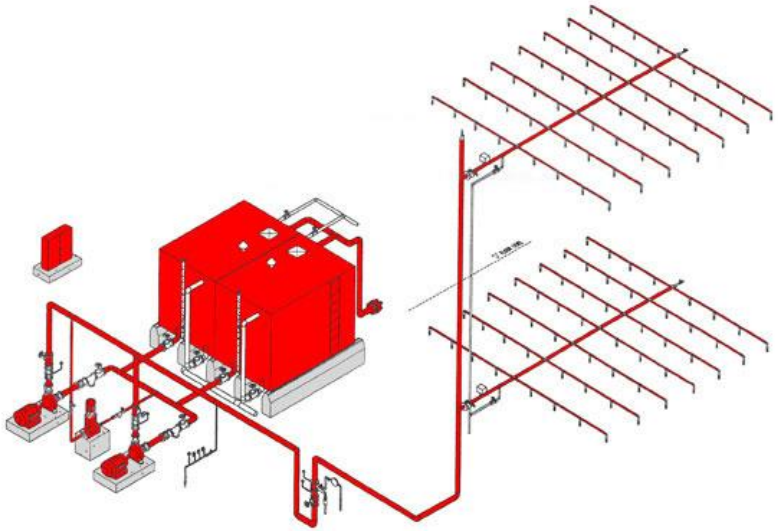
- Mostly in a dormant mode

⇨ gives uncertainty about their operationality when demanded

- Periodically tested or inspected

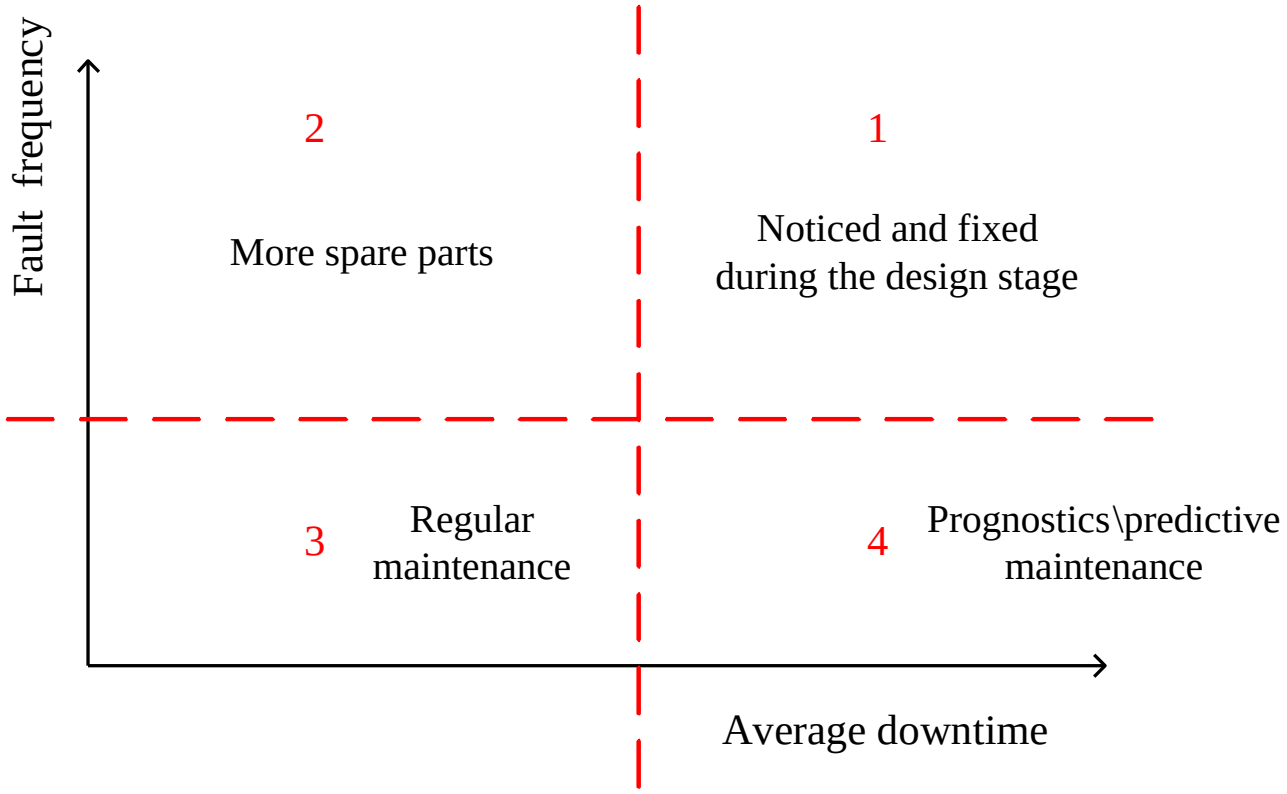
⇨ periodic tests and inspections are inaccurate;

About 33% of failures per year of fire suppression systems was the result of an inadequate inspection*.



Simplified illustration of a fire sprinkler system

*D. Dieken, Inspection, testing and maintenance of fire protection systems at industrial plants, Process Saf Prog 18(1999),151-155.



Four quadrant chart for identifying systems

Maintenance types characteristics

Maintenance	Reactive	Preventive	Predictive
Frequency	On demand	Scheduled，time- or cycle-based	Condition based
Labor cost	high	high	Low
Labor utilization	high	Low	low
Parts cost	high	medium	Medium
Throughput impact	high	medium	Low
Urgency (Acceptable resolution timeframe)	High (minutes to hours)	low (days to weeks)	Very low (depends on impact)

*Barajas L G, Srinivasa N. Real-time diagnostics, prognostics health management for large-scale manufacturing maintenance systems[C]//Proc. ASME International Manufacturing Science and Engineering Conference. 2008, 2: 85-94.

Challenges:

1. Observation of degradation for safety-critical systems

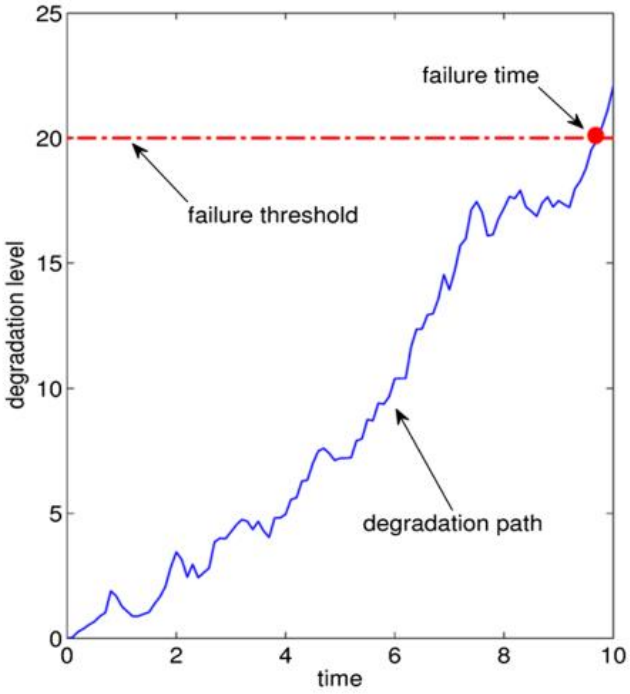
- Assume the degradation as exponential distribution

2. Evolving environment(EE)

- EE changes the conditions, degradation and failure occur.

3. Uncertainty

- obtain component failure rates
- Reliability information for systems especially in a dormant mode



An illustration of traditional degradation-threshold failure

Thanks for your attendance !