中国石油大学
CHINA UNIVERSITY OF PETROLEUM

Investigate Deepwater Pipeline Oil Spill Emergency Repair Methods

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Agenda

1. The current research

2. Investigate deepwater pipeline oil spill emergency repair methods

3. Introduce deepwater pipeline oil spill emergency repair methods database

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1. The current research

- Overview
- Overseas current study
- Domestic current study

2. Investigate deepwater pipeline oil spill emergency repair methods

3. Introduce deepwater pipeline oil spill emergency repair methods database

1.The current research

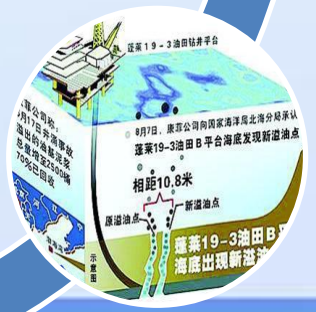
1)Overview

China's offshore oil march to the deepwater.

HYSY981

Crude oil import dependence breakthrough 60% in 2013

"Deepwater Horizon" oil spill accident



Penglai 19-3 oil spill accident

Personal research

INVESTIGATE DEEPWATER PIPELINE OIL SPILL EMERGENCY REPAIR METHODS

Oil spill accidents is certainly increasing in the foreseeable future

1.The current research

2)Overseas current study

19th century

Oil tankers builded at the end of 19th century

1967

"Torrey Canyon" oil spill accident

1990

"Exxon Valdez" oil spill accident

1990

American “OPA90” OPRC1990

1954

INTERNATIONAL CONVENTION RELATING TO INTERVENTION ON THE HIGH SEASINCASES OF OIL POLLUTION CASUALTIES

World War II

Plenty of oil spill accidents

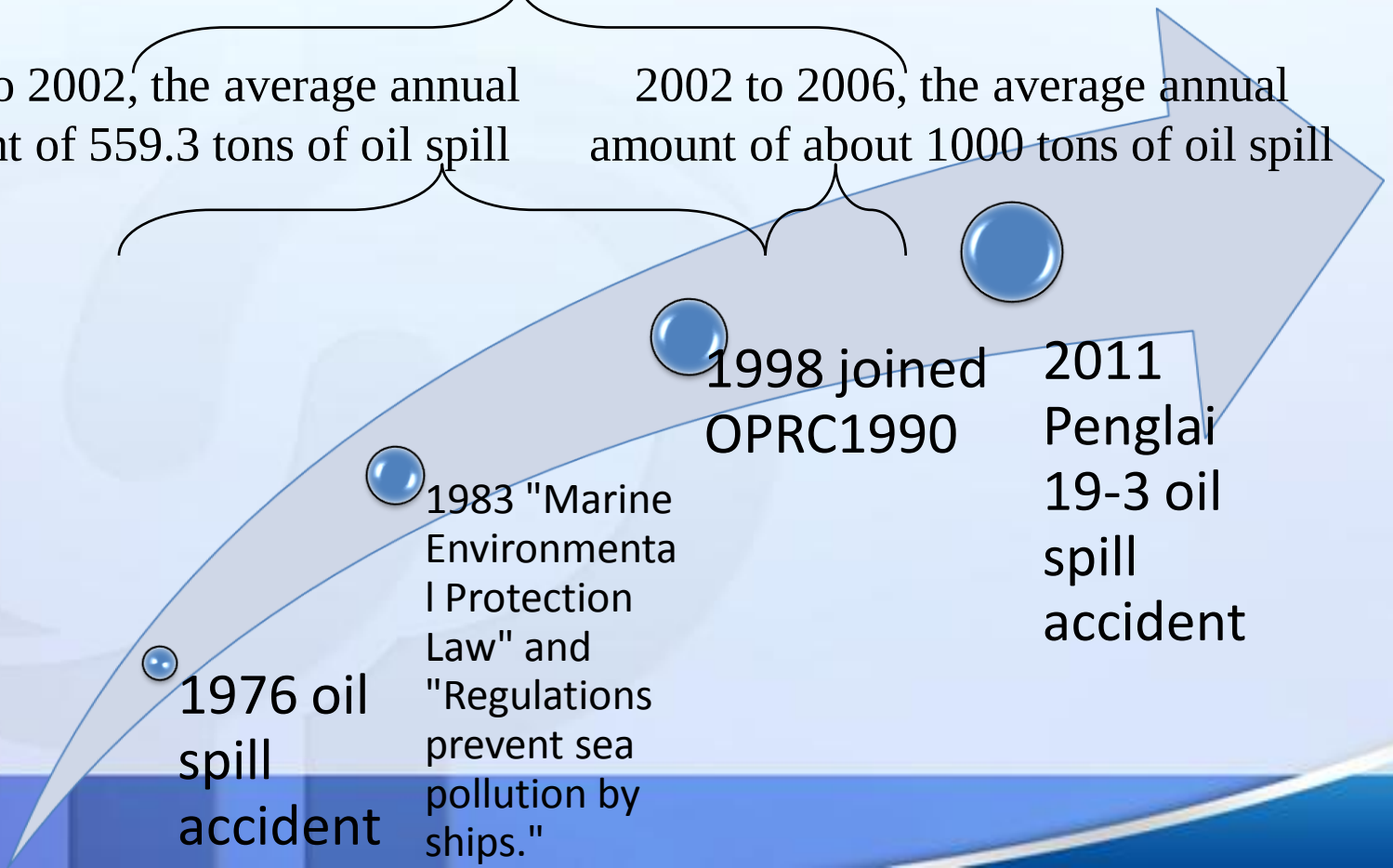
1.The current research

3)Domestic current study

1973 to 2006, there were more than 2,600 oil spill accidents, including 60 large-scale oil spill accidents, total amount of 3.7 million tons.

1973 to 2002, the average annual amount of 559.3 tons of oil spill

2002 to 2006, the average annual amount of about 1000 tons of oil spill



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1. The current research

2. Investigate deepwater pipeline oil spill emergency repair methods

- Selection Criteria
- Deepwater pipeline small-scale oil spill emergency repair method
- Deepwater pipeline large-scale oil spill emergency repair method

3. Introduce deepwater pipeline oil spill emergency repair methods database

2. Investigate deepwater pipeline oil spill emergency repair methods

1)Selection Criteria

Underwater visual inspection by ROV

Deepwater pipeline **small-scale** oil spill emergency repair method

Deepwater pipeline **large-scale** oil spill emergency repair method

Assessment formula validated by micro-pool

Process + Equipment

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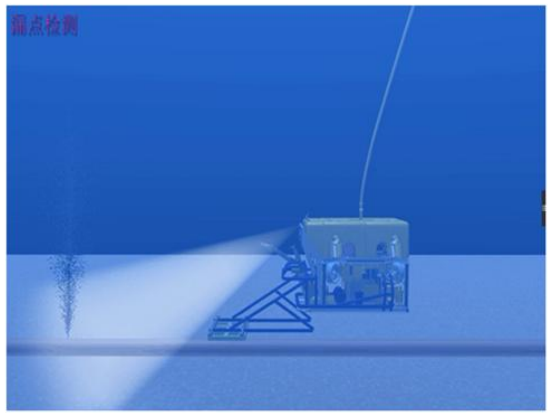
2) Deepwater pipeline **small-scale** oil spill emergency repair method



Step1:
Determine the location

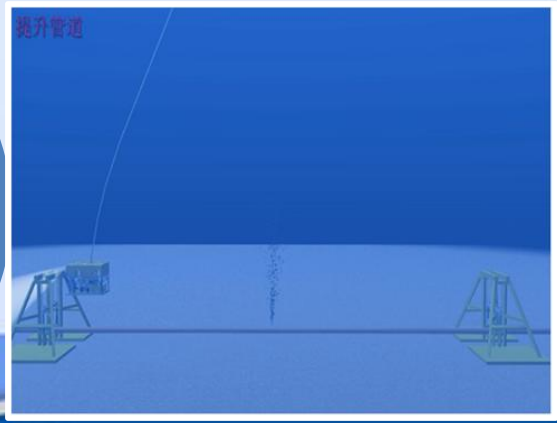
Visual inspection operated by ROV

ROV

pipe supports and hangers

two pipe supports and hangers are used to obtain operating space.

Step2:
subsea based treatment



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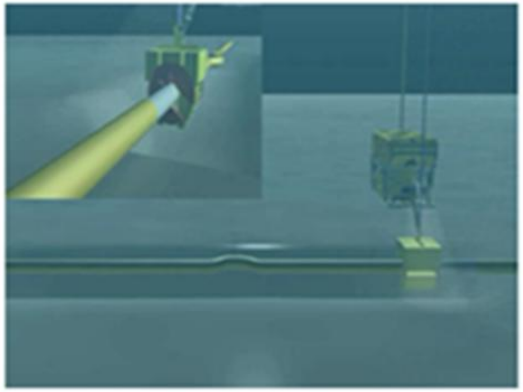
2) Deepwater pipeline **small-scale** oil spill emergency repair method



Step3: Pipe surface treatment

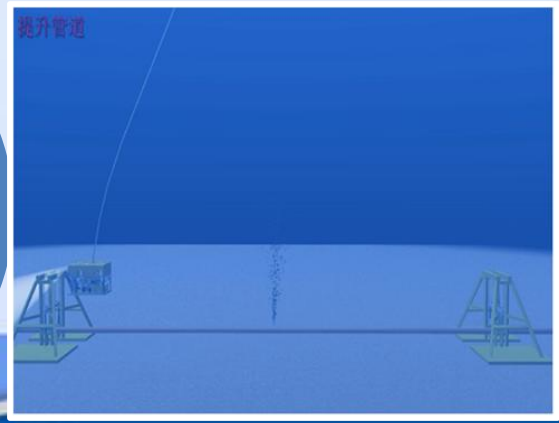
Clear up counterweight and coating of the pipe

Coating and welding tools

Plugging fixture

Install plugging fixture by ROV, fill insulation materials, and coat anti-corrosion coating.

Step4: Plugging fixture installation



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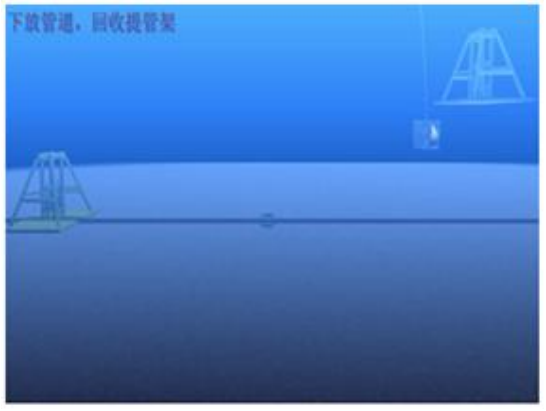
2) Deepwater pipeline **small-scale** oil spill emergency repair method



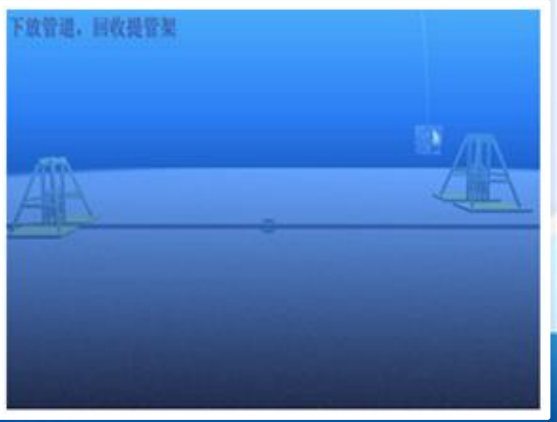
Step5: Pressure testing

Testing pressure is stable at least 24 hours under the production pressure.

Support boat

Withdraw pipe supports and hangers and other equipment to support boat.

Step6: Withdraw equipment



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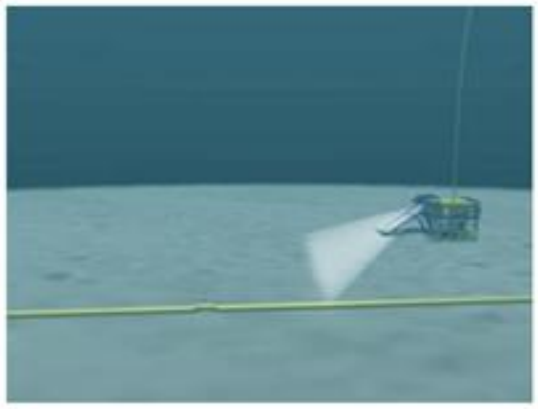


Step1: Determine the location

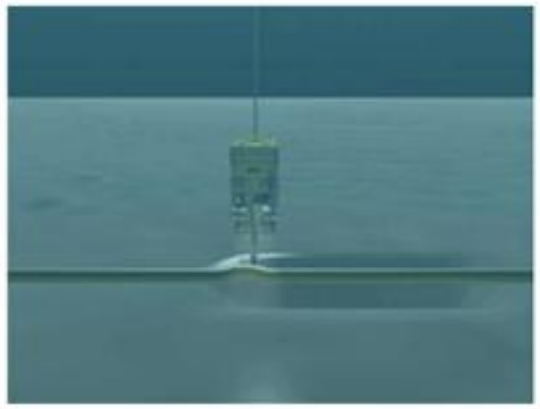
Visual inspection and acoustic detection operated by ROV

ROV

pipe supports and hangers

two pipe supports and hangers are used to obtain operating space.

Step2: Subsea based treatment



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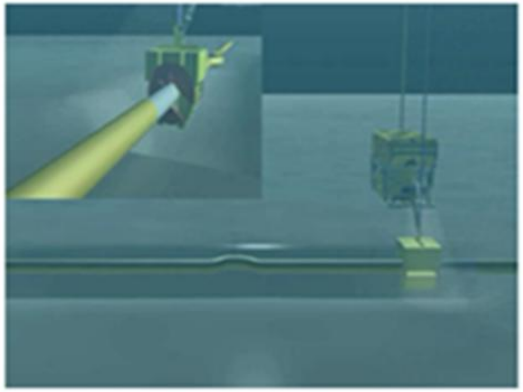
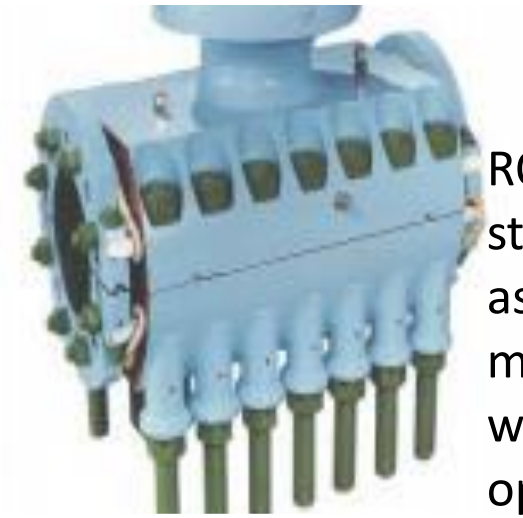
3) Deepwater pipeline **large-scale** oil spill emergency repair method



Step3: Pipe surface treatment

Clear up counterweight and coating of the pipe

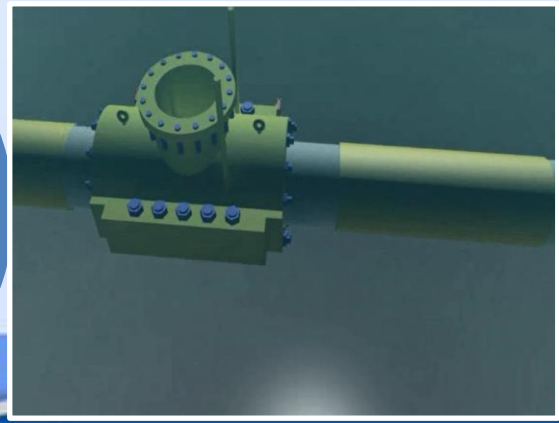
Multifunction pipe repair machine



machine tee

ROV measures straightness, ovality, assisted installation of mechanical tee, sealed with a tapping machine openings, install and open the sandwich valve.

Step4: Install machine tee



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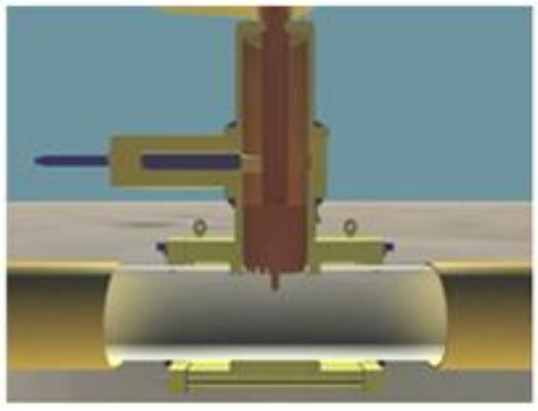
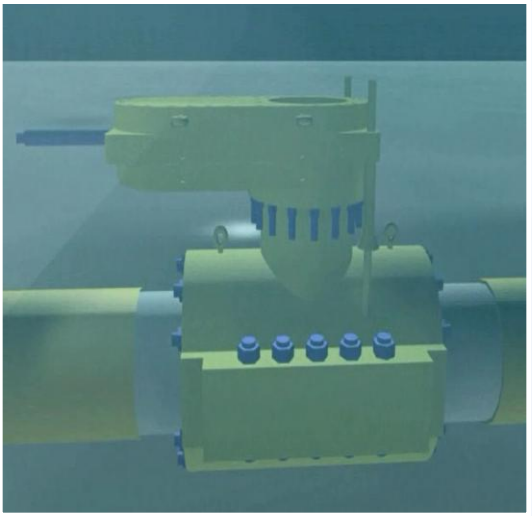


Step5:
Tap holes

Tap holes by tapping machine, and close sandwich valve.

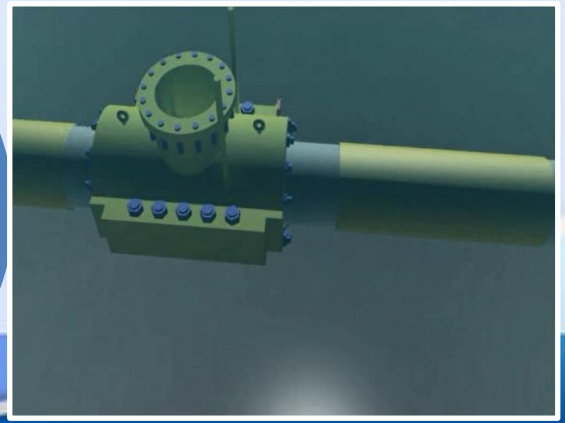
Tapping machine



Bypass tee

Install bypass tee, and then install bypass line.

Step6:
Install bypass line



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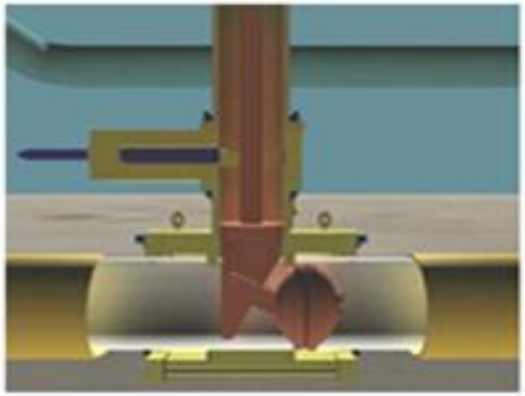
3) Deepwater pipeline **large-scale** oil spill emergency repair method



Step7: Plugging the oil spill line

Open sandwich valve by ROV, plug replaced pipeline, lead crude oil to the bypass pipeline and check tightness.

Plugging machine

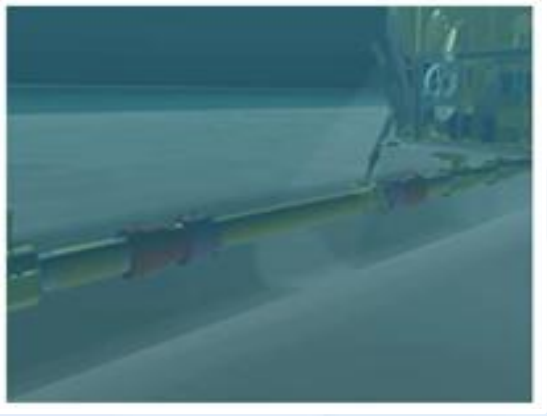
Cold Cutting Machine

Crude oil is replaced with nitrogen. Pipeline is removed by cold cutting machine, the pipeline end is measured and processed.

Step8: Cutting and treatment

2. Investigate deepwater pipeline oil spill emergency repair methods

3) Deepwater pipeline **large-scale** oil spill emergency repair method



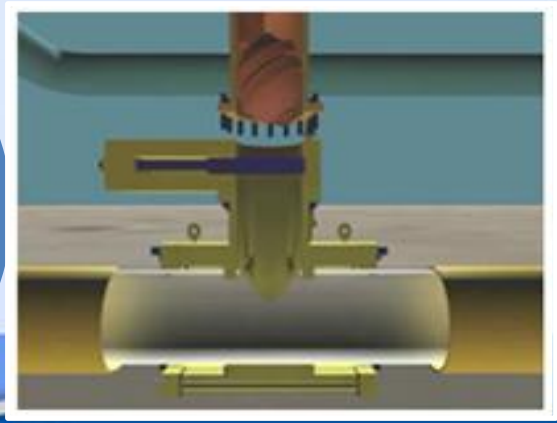
Step9: Mount flange and pipeline

Spherical flanges are installed in the ends of the pipeline. Measure the length between flanges to prepare and install the pipe section.

Pipe end measurement tool

Adjust the line pressure, open sandwiches valve closure head off, remove the bypass line, clear sealing machine and sealed blind.

Step10: Lift Plugging machine



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3) Deepwater pipeline **large-scale** oil spill emergency repair method

Step11: Pressure testing

Testing pressure is stable at least 24 hours under the production pressure.

Support boat

Withdraw pipe supports and hangers and other equipment to support boat.

Step12: Work surface backfill

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- Structure of the database
- Function of the database

3.Introduce deepwater pipeline oil spill emergency repair methods database

1)Structure of the database

C # language

Based .net Framework

SQL Database

Forms Program

3.Introduce deepwater pipeline oil spill emergency repair methods database

2)Function of the database

General inquiry

Quick search

Addition

modific ation

deletion

Thanks!