



INTERFACES BETWEEN PIPELINES AND SUBSEA STRUCTURES

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Ingeniørenes Hus, 09.03.06

Technip

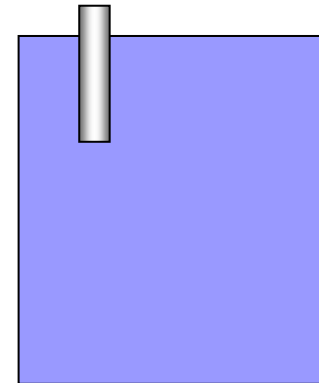
STARTING POINT



PIPELINE

- Subsea structures normally installed first
- Pipeline installation on critical path
- Different contractors
- Often separate design contract for pipeline and tie-in
- Pipeline Expansion

**SUBSEA
STRUCTURE**

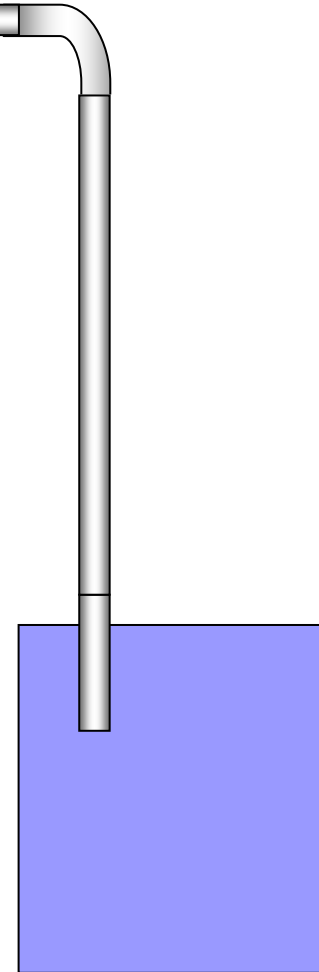


RIGID EXPANSION SPOOL

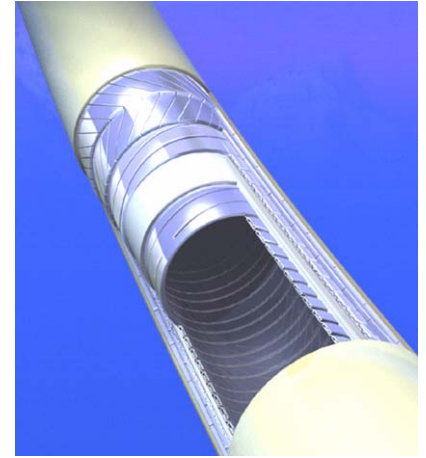
PIPELINE

- Requires design to ensure acceptable loads on structures
- Geometry only final after structure and pipeline installation
- Requires special installation vessel and crane
- Always on critical path

SUBSEA STRUCTURE



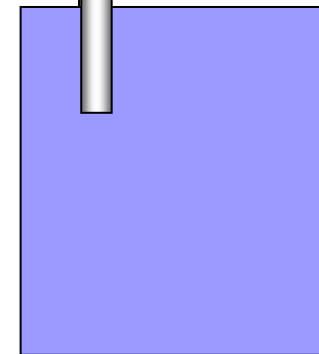
FLEXIBLE TAIL



PIPELINE

- Normally ensures acceptable loads on structures
- Length decided early in project, long lead time
- Normally only economic on projects with flexible risers
- Installation with or immediately after pipeline installation
- No need for detailed metrology and accepts large tolerances on pipeline / structure installation

SUBSEA STRUCTURE

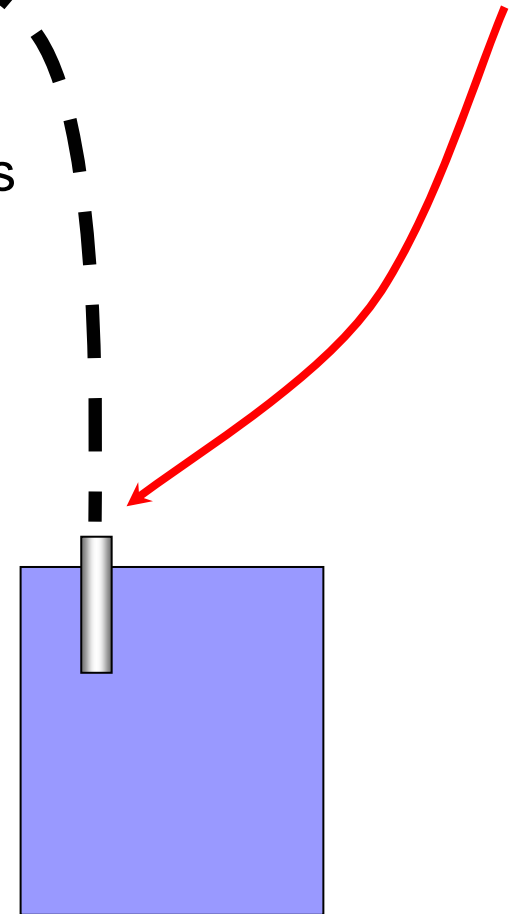


DEFLECT TO CONNECT

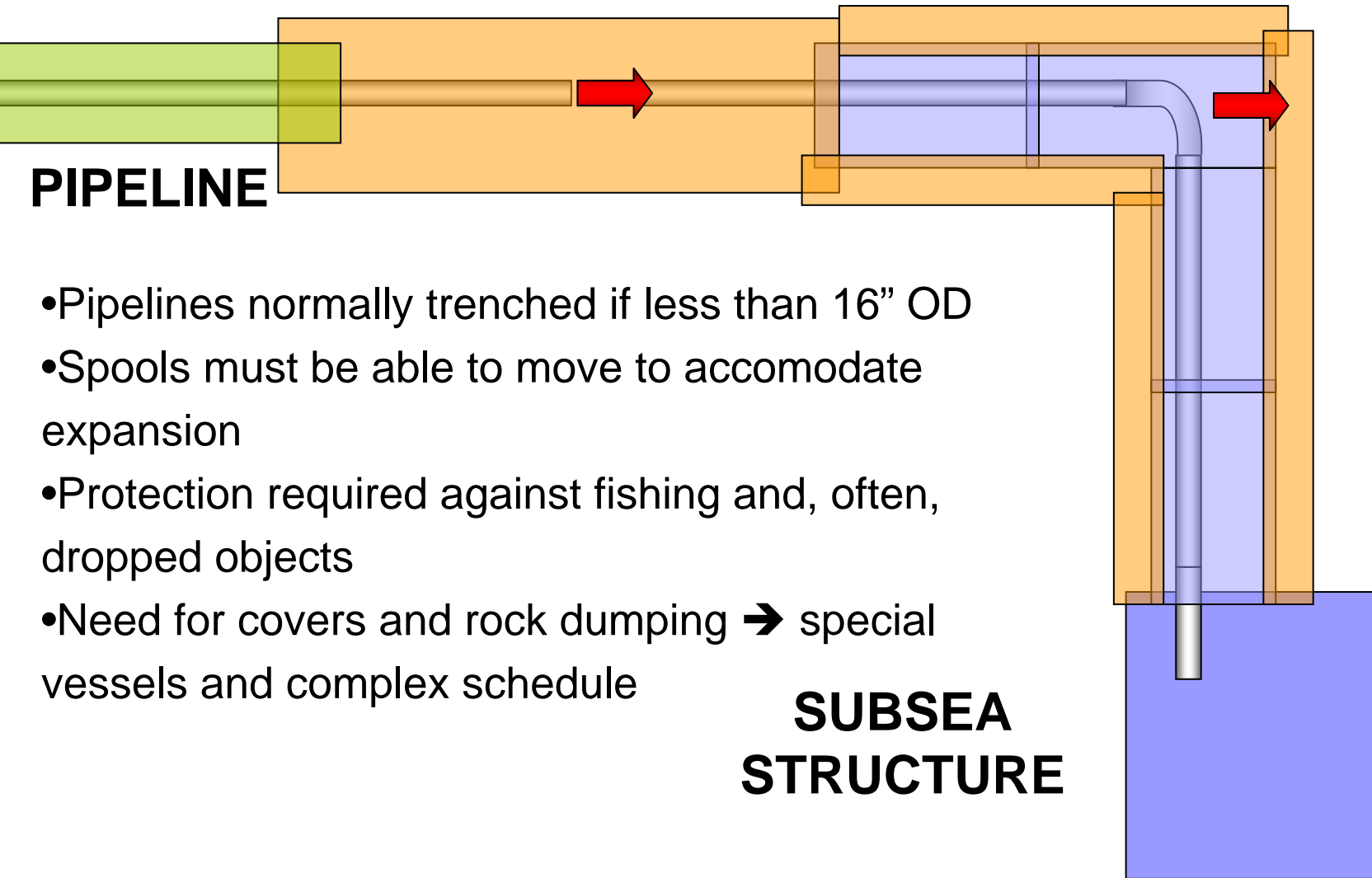
PIPELINE

- Only normally suitable for smaller pipelines / umbilicals
- Needs detailed design and analyses
- Can result in large loads on structures
- Needs special subsea equipment (winches etc.) in addition to tie-in tool
- Eliminates need for separate lifts

SUBSEA STRUCTURE



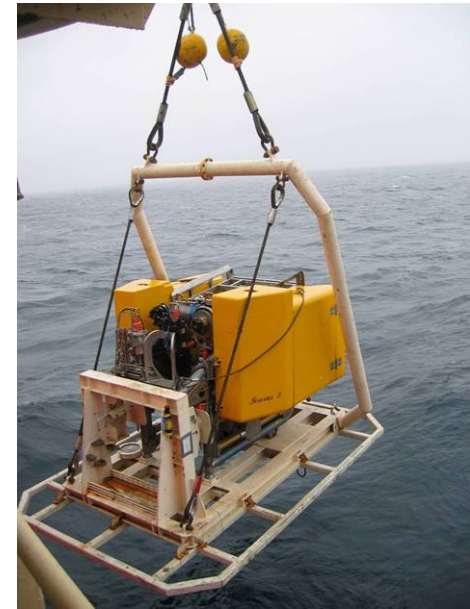
PROTECTION REQUIREMENTS



TIE-IN METHODS

■ ROV based tools

- Available from all major subsea suppliers and some marine contractors
- Can be used in all water depths
- Require specialised back-up equipment and vessels
- Not always too reliable
- Need for special hubs etc..



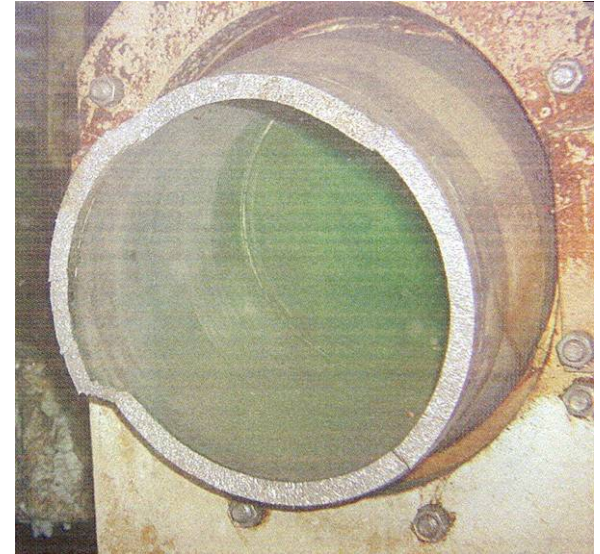
■ Divers

- Can use simple standard flanges
- Limited to 180m water depth
- Needs very specialised vessel



CHALLENGES

- **Control of loads in structures**
 - **Pipeline expansion and contraction can impose very high loads, if these are not handled correctly failures can occur.**
- **Need for very clear interface responsibilities between the different parties**
- **Need for an overall analysis of pipeline, expansion device and structure behaviour**
- **Need to account for external effects**
 - **Fishing**
 - **Rock dumping**
 - **Seabed movements**
- **Selection of optimum method**
 - **No standard solution**
- **Coordination of marine operations involving several vessels**
 - **Pipelay, survey, spool lifting, tie-ins, cover installation, rock dumping, more survey, etc..**



REAL CASES ALWAYS MORE COMPLEX

