# FPSO Training Course

Radisson Blu Boulogne Hotel, Paris ~ December 2016

## Session 1.7 - Interface management for FPSO projects – tools, procedures & key lessons learned

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## Agenda

- What are interfaces?
- Interface management.
- Interface management systems.
- Key interface systems and areas.
- Lessons learned.

## What are interfaces?



## What are interfaces?

- Interfaces exist where two work scopes meet and data needs to be supplied from one interface party to the other.
- Interfaces exist in two forms:
  - "Hard" interfaces: Where there is a physical connection;
  - "Soft" interfaces: Where the connection is data and is more information / design basis / philosophy related.
- The number of (main) contracts will not change the number of physical interfaces, but it will change the number that need to be managed across scope boundaries. Within scope boundaries, main contractors still have to manage interfaces with sub-contractors, vendors and within functions/disciplines etc.

## Hard interfaces

"Hard" interfaces may comprise:

- Structural supports, e.g. flare tower or process support structure.
- Piping tie-ins, e.g. Utility supplies from marine supply systems to topsides users.
- Offloading systems.
- Cabling, e.g. power or control cables.
- Escape route locations.

## Soft interfaces

"Soft" interfaces may include:

- Motion and acceleration data.
- Turret riser & mooring dynamics.
- Swivel path flow rate and pressure requirements.
- Material handling requirements.
- Crude oil density for stability and motion analyses.

# Interface management



## Interface management objectives

The objectives of the Interface Management are to:

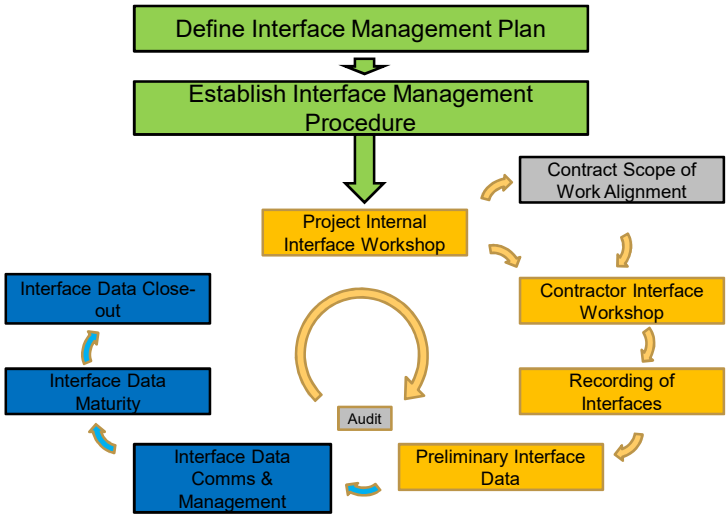
1. Ensure that all interfaces, interface data requirements, any potential problem areas are identified early in the design process, clearly defined, documented and agreed by both parties; **Identification.**

2. Ensure that interface scope boundaries are known, communicated, understood and agreed by all relevant parties; **Responsibility.**

3. Ensure that interfaces and interface data requirements are reviewed, provide a process to track status/close-out of interface issues/problems, and interface data maturity plan is updated regularly; **Visibility.**

4. Ensure that all engineering and construction activities are executed in a manner to enable timely and relevant interface data exchange and identified interface issues/problems are resolved and closed out; **Deliverability.**

## Interface management process






## Other Forms of Interface Data Records…

- Not all Interface Data will be captured in the Interface Management System.
- Some interface data will be captured in:
  - Key Project Documents
    - e.g. Basis of Design (product specifications)
  - Key contract documents
    - e.g. Contract Specifications (riser sizes)
  - Standard engineering deliverables
    - e.g. interface P&IDs
  - This information will not have formal interface documentation associated with it.

Interface management systems.

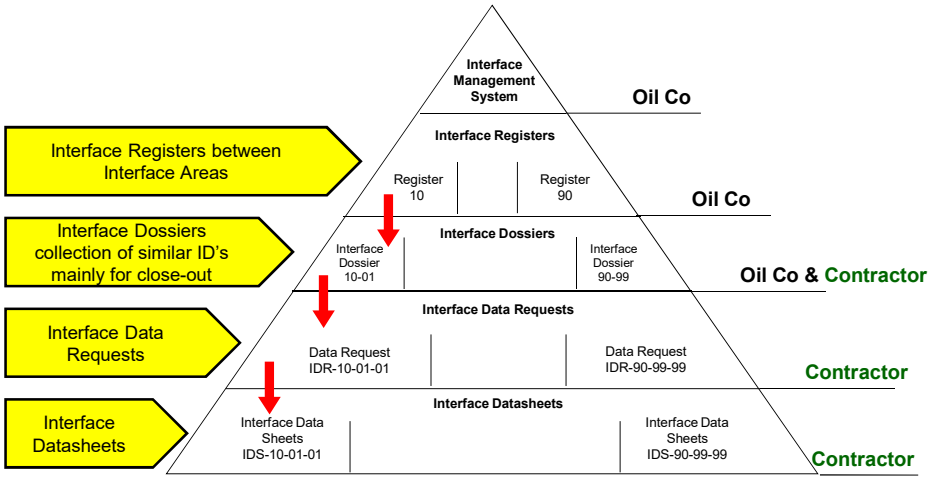


## Interface Management Systems

Hierarchy of Interface Management documents to effectively manage the complex data sets.

- Interface Database:
  - The work horse of the Interface Management System;
  - Stores all interface data;
  - Produces required registers, reports & forms.
- Interface Registers:
  - Highest level of interface data;
  - Collates all data and requirements at each defined interface.
- Interface Dossiers:
  - Collection of Interface Data Requirements (IDRs) and Interface Data Sheets (IDS) relating to a common issue/ topic within a particular defined interface area (interface register);
  - May be single or multi discipline.

# Interface management hierarchy






# Interface data forms

**INTERFACE DATA REQUEST (IDR)**

| Interface Data Request | | | | | |
|---|---|---|---|---|---|
| Interface Data Request No. | IDR - - - | | Revision | | |
| Interface Description | | | | | |
| Data Requested by | | | Data Supplier | | |
| Project Interface Ref. No. | - - - | | | | |
| Dossier Title | | | Dossier No. | - | |
| Critical IDR (Y/N) | | | | | |
| Raised by | Name | | Date | | |
| Data Maturity Plan (requested dates) | | | | | |
| Preliminary Data | AFD Data | | AFC Data | | |
| | | | | | |
| Interface Data Requirements | | | | | |
| | | | | | |
| Acceptance/ Approvals | | | | | |
| Contractor | | | | | |
| | Required by | | Supplied by | | |
| | Name/ Signature: | Date: | Name/ Signature: | Date: | |
| Discipline Engineer | | | | | |
| Interface Coordinator | | | | | |
| Scope Manager | | | | | |
| OilCo | | | | | |
| | Required by | | Supplied by | | |
| | Name/ Signature: | Date: | Name/ Signature: | Date: | |
| Discipline Engineer | | | | | |
| Scope Manager | | | | | |
| Interface Manager | | | | | |
| Engineering Manager | | | | | |

**INTERFACE DATA SHEET (IDS)**

| Interface Data Sheet | | | | | |
|---|---|---|---|---|---|
| Interface Data Request No. | IDS - - - | | Revision | | |
| Interface Description | | | | | |
| Data Supplied by | | | Data Request by | | |
| Project Interface Ref. No. | - - - | | | | |
| Dossier Title | | | Dossier No. | - | |
| Critical IDR (Y/N) | | | | | |
| Raised by | Name | | Date | | |
| Data Maturity Plan (agreed dates) | | | | | |
| Preliminary Data | AFD Data | | AFC Data | | |
| | | | | | |
| Interface Data | | | | | |
| | | | | | |
| Acceptance/ Approvals | | | | | |
| Contractor | | | | | |
| | Required by | | Supplied by | | |
| | Name/ Signature: | Date: | Name/ Signature: | Date: | |
| Discipline Engineer | | | | | |
| Interface Coordinator | | | | | |
| Scope Manager | | | | | |
| Oil Co | | | | | |
| | Required by | | Supplied by | | |
| | Name/ Signature: | Date: | Name/ Signature: | Date: | |
| Discipline Engineer | | | | | |
| Scope Manager | | | | | |
| Interface Manager | | | | | |
| Engineering Manager | | | | | |

## Interface management systems

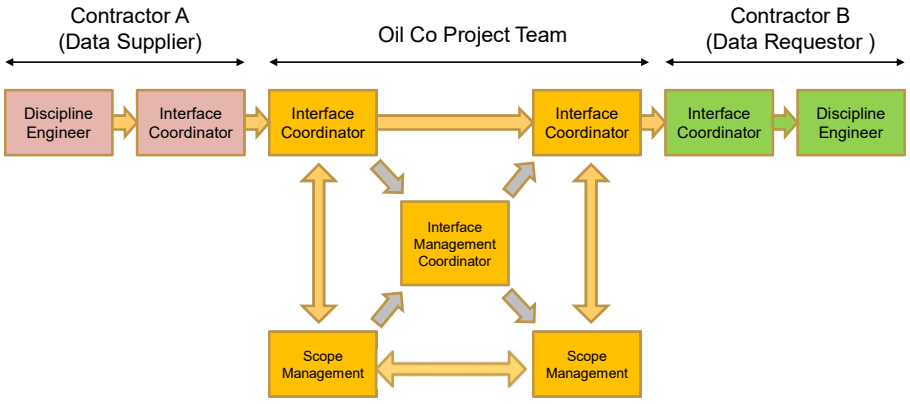
- Data base structured in various sections to allow multiple sorts, e.g.:
  - Interface Data Requirement (IDRs) by chronological log;
  - IDRs by Contractors;
  - IDRs by Discipline.
- Data entry by Interface Data Sheets (IDSs) based on Interface Data Requirements completed by Contractors at interfaces, including:
  - Piping;
  - Electrical;
  - Instrument;
  - Structural;
  - Safety.
- Miscellaneous reports available from the Database, typically:
  - IDR's Raised this Week;
  - Unassigned IDR's;
  - IDR's in Dispute.



## Interface Management Systems

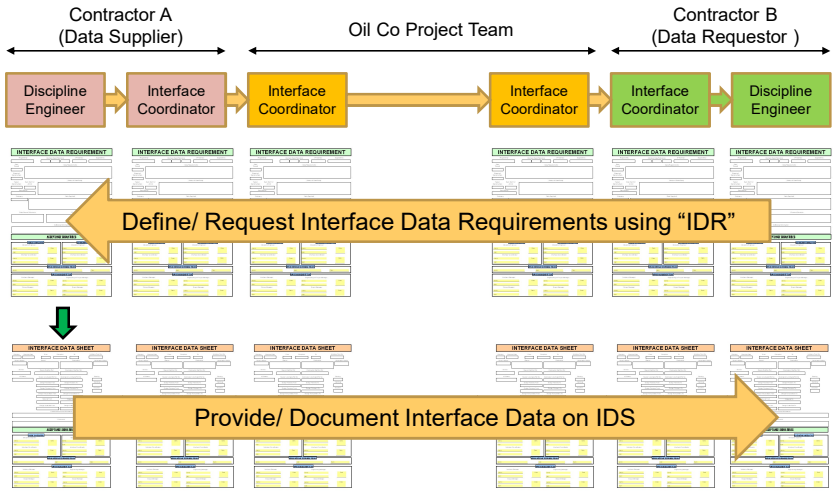
- Preference for Interface Management Systems to be:
  - Web based or enabled;
  - Proven systems.
- Other important interface documents include:
  - Responsibility Matrices:
    - Defines responsibility of each interface party throughout project lifecycle, e.g. RACI chart / matrix (Responsible – Accountable – Consulted – Informed).
  - Data Maturity Plans:
    - Key planning documents defining interface data maturity, i.e. preliminary, AFD or AFC status;
    - Defines when interface data is required as well as when it will be developed to required level.
  - Interface queries:
    - Provides mechanism for additional data requirements to be raised and controlled;
    - These additional requirements may or may not have contractual implications.

# Interface Lines of Communication?






# Interface Data Exchange



# Interface responsibility matrices

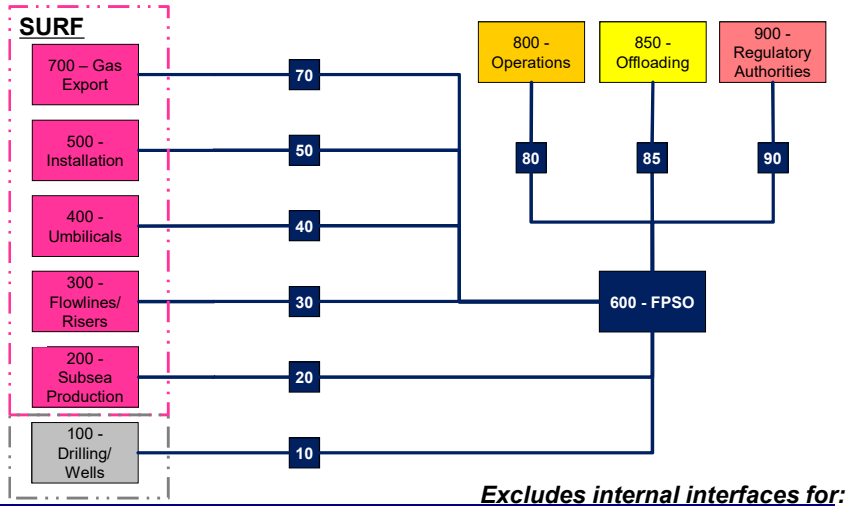
| Scope Item | Scope Description | DB | Eng | Pro | Con | Del | Ins | MC | Pcom | Com |
|---|---|---|---|---|---|---|---|---|---|---|
| **20 - Subsea Production System** | | | | | | | | | | |
| 01 | **Umbilical Interface/ TUTU** | | | | | | | | | |
| | Topsides Umbilical Termination Unit (TUTU) | EPCM | FPSO | FPSO | FPSO | FPSO | FPSO | FPSO | SPS | SPS |
| | Foundations, supports and fixings | FPSO | FPSO | FPSO | FPSO | FPSO | FPSO | FPSO | FPSO | FPSO |
| 02 | **Subsea HPU** | | | | | | | | | |
| | Main Subsea Hydraulic Power Pack | EPCM | SPS | SPS | SPS | SPS | FPSO | FPSO | SPS | SPS |
| | Package foundations, supports and fixings | SPS | FPSO | FPSO | FPSO | FPSO | FPSO | FPSO | FPSO | FPSO |
| | Hydraulic piping to interface point | SPS | FPSO | FPSO | FPSO | FPSO | FPSO | FPSO | FPSO | FPSO |
| | Hydraulic piping to swivel | SPS | FPSO | FPSO | FPSO | FPSO | FPSO | FPSO | FPSO | FPSO |
| | Hydraulic piping from swivel to Umbilical interface point | SPS | FPSO | FPSO | FPSO | FPSO | FPSO | FPSO | FPSO/SPS | SPS |
| | Power supply cables and cable trays to/from unit | SPS | FPSO | FPSO | FPSO | FPSO | FPSO | FPSO | FPSO/SPS | SPS |
| | Control cables and cable trays to/from unit | SPS | FPSO | FPSO | FPSO | FPSO | FPSO | FPSO | FPSO/SPS | SPS |
| | Hydraulic Fluid First Fill | SPS | - | FPSO | - | FPSO | FPSO | - | FPSO | SPS |
| 03 | **Subsea EPU/ UPS** | | | | | | | | | |
| | Main Cabinet | EPCM | SPS | SPS | SPS | SPS | FPSO | FPSO/SPS | FPSO/SPS | FPSO/SPS |
| | Foundations, supports and fixings | SPS | FPSO | FPSO | FPSO | FPSO | FPSO | FPSO | FPSO | FPSO |
| | Cables & cable trays from EPU to Turret interface point | SPS | FPSO | FPSO | FPSO | FPSO | FPSO | FPSO | FPSO/SPS | SPS |
| | Cables & cable trays from Turret to Umbilical interface point | SPS | FPSO | FPSO | FPSO | FPSO | FPSO | FPSO | FPSO/SPS | SPS |
| | Power supply cables and cable trays to/from unit | SPS | FPSO | FPSO | FPSO | FPSO | FPSO | FPSO | FPSO/SPS | SPS |
| | Control cables and cable trays to/from unit (all input/output) | SPS | FPSO | FPSO | FPSO | FPSO | FPSO | FPSO | FPSO/SPS | SPS |



# Interface Areas

| Interface Area Ref. No. | Interface Area |
|---|---|
| 100 | Drilling / Wells |
| 200 | Subsea Production System (SPS) |
| 300 | Flowlines & Risers |
| 400 | Umbilicals |
| 500 | Subsea Installation |
| 600 | FPSO |
| 700 | Gas Export Pipeline |
| 800 | Operations |
| 850 | Offloading |
| 900 | Regulatory Compliance |

## Example interface register




***Excludes internal interfaces for: SURF; Drilling; FPSO***



## Interface Register 30: Riser-FPSO

| Interface Number | |
|---|---|
| **Dossier Ref** | **Dossier Title** |
| 30-01 | Riser bend stiffener connection to FPSO |
| 30-02 | Riser hang off |
| 30-03 | Riser flange details |
| 30-04 | Riser FPSO I-tube interface |
| 30-05 | Riser annulus gas venting & monitoring |
| 30-06 | Riser & Mooring Analysis |
| 30-07 | Riser/Mooring Configuration |
| 30-08 | Mooring system design premise |
| 30-09 | Vessel Offset Requirements. |
| 30-10 | In-field pipelines pre-commissioning |
| 30-11 | Pigging facilities |
| 30-12 | Soil Data |
| 30-13 | Cathodic Protection |
| 30-14 | Riser properties |

## Interface Register 50: Installation-FPSO

| Interface Number | |
|---|---|
| **Dossier Ref** | **Dossier Title** |
| 50-01 | Riser Installation |
| 50-02 | Company Installation Vessel |
| 50-03 | Anchor Details |
| 50-04 | Diver Intervention Requirements |
| 50-05 | SIMOPS (FPSO Installation) |
| 50-06 | Riser commissioning philosophy |
| 50-07 | Umbilical commissioning philosophy |
| 50-08 | SURF contractor commissioning equipment |
| 50-09 | FPSO commissioning post riser pull-in |



## Interface due diligence activities

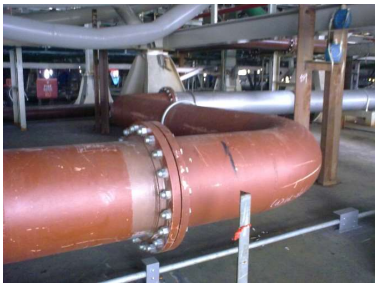
- Interface Coordination Audits:
  - Right procedures & systems – working by the same rules gives best chance of success.
- Discipline checklists:
  - Key risk areas – discipline based.
  - Examples include:
    - Electrical – voltages & frequencies;
    - Piping stress;
    - Material handling;
    - Material selection/ compatibility.
- Gap analyses:
  - Interface workshops and interface responsibilities checks.
- High level scope reviews:
  - One page contract summaries – senior management review.
- Interface HAZOPs.

Key interface systems and areas.



## Key interface systems and areas

- Key interface areas will be between scope areas as defined above e.g. subsea etc.
- BUT –main contractor will need to manage sub-contracts with TMS and possibly topsides module vendors. The following systems and areas will require particular focus:
  - Module to module piping;
  - Structures;
    - Hull to turret, hull to topsides etc.
  - Power generation, distribution & fuel (main, essential and emergency);
  - Safety and control systems;
  - Escape and access ways;
  - Mechanical handling;
  - Utilities e.g. firewater, seawater, drains, steam, compressed air.



## Lessons learned



## Interfaces are a key risk area

| SUBSEA | HES | HULL + TURRET | TOPSIDSES | OPERATIONS |
|---|---|---|---|---|
| INTERFACES<br>Management of interfaces and complexity | HAZOPS<br>Management of Hazops, HES participation in and overall effectiveness | INTERFACES<br>The risks associated with ineffective management of interfaces | INTERFACES and COMMON PROCESSES<br>Management of interfaces and engineering standards across the project | OPERATIONS CONTRACTOR<br>Definition of an effective contract relationship recruitment of senior staff |
| OUTSTANDING DESIGN ISSUES<br>Designs not complete due incomplete studies or missing data from others | NORSOK<br>Implementation and clarification of Norsok standards | WORKSCOPE DEFINITION<br>Uncertainty in conversion workscope due to Topsides, approvals, engineering etc | DESIGN ISSUES UNRESOLVED<br>Design issues incomplete due studies, waiting on contractors or data. | OPERATIONS INFLUENCE ON DESIGN<br>Opportunity for Ops staff to improve design and operability |
| INSTALLATION RISKS<br>Delays and problems related to installation vessels | APPROVALS<br>Class, Norsok, NMD. PSA interfaces and implementation in design and verification | APPROVALS<br>Class, Norsok, NMD. PSA interfaces and implementation in design and verification | CONTRACT SELECTION AND MANAGEMENT<br>Selection of contractors, management of work,performance motivation | MAINTENANCE BUILD<br>Need to define maintenance strategy, agree the MM system and start entering data |
| SUBSEA QC/QA<br>Implementing an effective programme of quality management | | | LLIs<br>Implementing common standards of design and managing interfaces | OPERATIONS BUILD<br>Delivery of all the systems, documents, processes and approvals |

- Extracted from Alvheim lessons learned.

## Lessons learned (1)

**Interface management strategy**

- Keep number of main contracts (and hence contract interfaces) to a minimum.
- Get Interface Data Requirements built into contracts.
- Avoid transferring interface uncertainties on to contractors – don't throw scope to the other side of an interface in the hope that it will go away!
- Minimize change by systematic and stepwise close out of interfaces.
- Set up for formal interface procedure for engineering data sharing.



## Lessons learned (2)

**Interface management tools**

- Use tried and tested interface procedures – do not use a prototype system.
- Do not solely rely on project tools – also concentrate on key interface drawings / documentation as set-out in Contracts.

**Communication**

- Best communication is through face to face meetings, formally confirmed through the interface management system. Phone and video conferences can also be used to a limited extent.

**Interfaces are best managed through good personal relationships.**

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**For further information on our services go to:**
**www.crondall-energy.com**

**Any questions?**