Platform Construction and Installation
Platform Construction and Installation

- UK Construction Yards.
- Worldwide Construction.
- Construction Quality and Safety.
  - Construction Risks.
- Offshore Installation.
  - Offshore Installation Risks.
UK Construction Yards

• During 1970, 1980 and 1990 there were in access of 20 Construction yards throughout the UK.

• The five Major Yards were;
  i. Highland Fabricators – Nigg
  ii. McDermots – Ardesier
  iii. RGC (Kvaerner) – Methil.
  v. Howard Doris - Kishorn
UK Construction Yards.

- Highland Fabricators specialised in large self-floating jackets, skid loaded jackets and at a later date, deck units
- McDermots specialised in large skid loaded Jackets and deck units
UK Construction Yards.

- RGC (Kvaerner) specialised in Skid loaded jackets, deck units and modules.
- Amec was a topside specialist constructing decks and modules.
UK Construction Yards

- Howard Doris - Kishorn was the main Concrete platform constructor for the UK sector.
UK Construction Yards

- At the end of the nineties most of the large North Sea oil fields were completed and the industry turned to the marginal fields.
- Most of these fields were, and still are, developed by using sub-sea template tie-ins with a tie-back to existing platforms.
UK Construction Yards.

- There are only a small number of construction yards left in the UK.
- There are three yards which can still construct small jackets.
- The bulk of the UK construction is Subsea completions and small extension modules to existing platforms.
- Jackets, FPSO and Semi-submersible platforms for the West of Shetland Developments are being constructed in Norway and in the case of floating rigs/vessels Far East and Asian yards.
- Although Construction within the UK has diminished considerably over the past 12 years, there is still a great deal of design, subsea contractors, pipe laying and specialist equipment manufacture being carried out from Aberdeen.
- Design houses continue to operate throughout the UK.
UK Construction Yards

Existing Yards Include

• Burntisland Fabricators Fife.
• Isleburn Marine. Ross-shire.
• Heerema Hartlepool.
• Hertel Middlesborough
• McNulty South Shields
• Offshore Group Newcastle
UK Construction Yards

Burntisland Fabricators.  

Isleburn Marine
UK Construction Yards

McNulty Offshore

Offshore Group
Worldwide Construction.

• There are many major developments in the Oil & Gas Offshore industry being carried out Worldwide, oil/gas fields under development and construction are;
  - Africa 48 fields
  - Asia 49 fields
  - Australasia 38 fields
  - Central America 8 fields
  - Europe 139 fields
  - North America 11 fields
  - South America 23 Fields.
Worldwide Construction.

- Africa; The bulk of development is taking place for the East African countries with Iran and Saudi-Arabia being the main drivers developing in the Persian Gulf Area. East Africa is forecast to become the largest developer over the coming years.

- Asia; The major developments are based in China with offshore construction yards in many coastal areas. China has the bulk of raw materials such as steel available within their country and are almost self sufficient. China does lack some of the engineering expertise.

- Australasia; The construction industry has been established in this area for a long time and fabrication is mainly carried out in Australia, some construction is being contracted to Malaysia and Singapore yards.

- Central/North America; Development continues in Canada with some challenging fields being developed in the Alaskan Waters. Development of fields in the Gulf of Mexico also continues development but these are a lot fewer than previous years.
Worldwide Construction

• Europe; UK North Sea development is now mainly marginal field completion with larger developments West of Shetland. Norway continues development but as with UK mainly marginal fields. Azerbaijan continues to be the main driver in Northern Europe with development of the Caspian Sea. Russia are mainly developing offshore gas fields. The remainder of European countries continues small pockets of development.

• South America; Brazil is the major player in this area with 19 fields under development. The remaining developments are for Mexico and Venezuela.
Worldwide Construction

• The fields in Africa, Asia and Canada tend to be in deep waters consequently use of fixed platforms are in the minority. Most developments use FPSO’s, Semi-submersibles and TLP installations.
Worldwide Construction

• The advantage to FPSO, Semi-submersible and TLP construction is that the units can be completed and commissioned 100% at the yard/drydocks.
Worldwide Construction

• In contrast to the deep waters of Africa/Asia, the Gulf of Mexico has many platforms installed and linked in more shallow waters, this means that the jackets are smaller and much lighter in construction. There are some deep water platforms also.
Construction Quality & Safety.

- The combination of handling hazardous substances, working in an alien and remote environment makes the Offshore Oil & Gas Industry a very dangerous industry if not designed, constructed and safely operated.
- The design of offshore structures, whether fixed or floating, must not only be operationally correct but designed to make it a safe place of work.
- To ensure safety standards from the outset the construction yards have very strict quality and safety procedures which are adhered to at all times.
- The Oil & Gas Industry have well qualified and experienced management, engineers and trade operatives.
- At shop floor level trade operatives are trained and tested to meet the strict quality and safety requirements.
- Supervision and inspection levels have a much lower ratio than other industries with the normal level being 6 to 8 operatives per supervisor depending on trade type.
Construction Quality & Safety.

**Design:** It is essential that the design is not only fit for purpose but also fabrication friendly.

1. A construction team of engineers in the design office having an input to the design for ease and practicality of fabrication.
2. It is essential that once AFC (Approved for Construction) drawings are issued, the amount of change is minimised.
3. Wherever possible it is an advantage that the construction method is fixed so that this can be included in the design process.
4. Material choice can also have major impact on areas of fabrication such as, piping exotic materials Cunifer, Duplex etc require specialist storage, handling and isolated fabrication areas.
5. Deliveries of equipment can be a major driver in the programming of the construction schedule and may require to revision of the build method.
Construction Quality & Safety.

- **Construction;**
- Where ever possible large sub-assemblies are constructed undercover to ensure no delays from weather downtime and contamination of the works from winds, dust etc.
- This is most important in the welding process as all of the above can cause inclusions in welds, cracking and undercut (non-adhesion).
- Where sub-assemblies are to big for available workshop space then temporary buildings are erected to accommodate construction.
- The sub-assemblies are moved to final erection site and final assembled.
- After the structure is almost complete (All heavy lifting completed) then the fit-out trades move in.
- It is essential that the fit-out trades are well co-ordinated to avoid work area overcrowding and clashes.
- The deck/module is fully commissioned prior to load out.
Construction Quality & Safety.

• Pre-assembled Jacket Leg Sections & Mud Mats
Construction Quality & Safety.

• Jacket Load-out
Construction Quality & Safety.

- 8000, Ton Deck Unit
Construction Quality & Safety.

- Deck/Module Fit-out
Construction Quality & Safety.

- **Safety:** The aim of construction yards is for “Zero Occurrences and Injuries”
  1. Issue Safety Manual for Project.
  2. Carry out safety Inductions to all Project employees.
  3. Appoint Safety Representatives from each trade/area.
  4. Carry out regular Safety checks.
  5. Maintain accurate Safety records.
  6. Hold regular Safety meetings.
  7. Ensure clean and obstruction and hazard free area.
Construction Risks.

• There are many risks during the Onshore Construction Phase which can effect Delivery, Cost and Safety. The Main risks are;

• **Delivery & Cost:**
  1. Productivity.
  2. Late Design Change.
  3. Excessive Design Change.
  4. Weather (Outside Assembly and Load-out)

• **Safety:**
  1. Workplace Cleanliness
  2. Personal Protection.
  3. Lifting & movement operations.
  4. Pre-commissioning (High Pressures)
Construction Risks.

• The delivery and cost risks can be reduced by measures put in place that are shown in previous slides;

1. Construction input at Design Stage.
2. Minimum issue of design change. (Client Restraint)
3. Adequate Supervision.
4. Expedient Quality Inspection.
5. Operative training and experience.
6. Good productivity.
Construction Risks.

- Safety Risks can be mitigated by an enforced Safety Management System.

1. Work space cleanliness (Education of Workforce).
2. Regular Safety Inspections.
3. Regular Safety Meetings.
4. Issue of and adherence to construction Method statements and procedures.
5. Issue of and adherence to Testing and Commissioning procedures.
6. Regular Safety Training.
Offshore Installation.

- Offshore installation varies with the type of development involved.

1. Fixed platforms have the most work involved in an installation with Jackets and Decks needing to be transported to the well location. Jacket positioned and piled, deck lifted to Jacket and hooked up, commissioned.

2. FPSO Require the anchor buoys to be positioned and fixed at location prior to transport of vessel.

3. Semi-submersibles vessels require no offshore installation other than setting of drag anchors etc on arrival of vessel.

4. TLP unit require anchor bases laid sub-sea in readiness for the arrival of the TLP and then tension wires dropped, positioned and secured.

5. Sub-sea Templates and completions require transport to site, offloading to sea bed and coupling to pipelines.
Offshore Installation.

- **Fixed Platforms;**
- With fixed platform locations the Jackets are transported to site and then either tipped from barges or, for smaller Jackets, lifted to position.
Offshore Installation.
Offshore Installation.

• Once the Jacket is in it’s final position the piles (nails) are hammered into position by sub sea hydraulic hammer units controlled from the installation heavy lift vessel.
• Once this is complete then the Deck unit is lifted to position.
Offshore Installation.

- After lifting of the deck, it is welded to the Jacket and secured.
- Following the installation then hook-up is completed to services and production lines on the Jacket.
- Any additional modules are lifted to position, fixed and hooked-up to the deck unit.
- The platform is then commissioned before acceptance by the Client
Offshore Installation.

- **FPSO (Floating, Production, Storage and Offloading);**
- FPSO’s are brought in to position after the drilling is well underway with some wells complete and ready for production.
- The vessel is located over the wells and either fixed to a pre-fitted anchor boy or secured with dynamic controlled anchor system.
Offshore Installation.

- **Semi-submersible Platforms;**
- Generally semi-submersibles are used for the initial well drilling and then move off for an FPSO to continue production.
- There are some Semi-submersibles which remain through the production period.
- Semi-submersibles are moved to location and then final positioned using Dynamic controlled anchor systems which maintains it’s position accurately
Offshore Installation.
Offshore Installation.

- **TLP (Tension Leg Platforms)**
  - There is quite an amount of pre-installation work at the location prior to the TLP arrival.
  - The subsea anchor bases require installation in readiness for the anchor wires from the tension legs.
  - Once the TLP is on site then the tension legs are set.
  - There is no hook-up but completion of commissioning may be required.
Offshore Installation.
Offshore Installation.

- There are many types of TLP’s and over the years the installations have taken place in deeper waters.
- Below are examples of the use in increased water depths over the years.
Offshore Installation Risks.

- The offshore installation risks are mainly centred on the lifting operations and weather.
- Offshore installations, especially fixed platforms, are badly effected by weather and can be delayed from travelling to location due to bad forecasts.
- Upon reaching location the installation is again weather dependant with almost calm conditions required to final position and lift.
- The whole of the offshore installation of the Jacket & Topsides lifts require near perfect conditions.
- Once the lifting operations are complete the jackets/topsides secured then there is very little follow-on work which is at risk.
- Final Commission and start-up requires checking for transport damage, loosening of bolts, pipe joints etc. before commencing.