CONSTRUCTION POSSIBILITIES FOR MONOLITHIC CONCRETE SPAR BUOY SERIAL PRODUCTION

CLIMENT MILONS, ADRIAN YAGUE, PAU TRUBAT

CONSTRUCTION

Vertical

Unpressurized handling
Vertical derrick

ON-LAND

SHELTERED WATERS

OFFSHORE FACTORY

Large water depth required
Only feasible at very specific locations (fjords)
Minimum transport
Logistic difficulties
Extremely expensive

VERTICAL

HIGH PRODUCTION SPEED

Large water depth required

Giant Re-Usable MOLD

High-throughput

Technological simplicity

Low execution risk

Larger front costs to manufacture massive mold

Permanence of facilities

ARCH-TRAVELLERS

Highly-specialized travelers that move on rails parallel to the structure on both sides; they lower forms in place with a pulley system and then release them. A carriage supporting concrete equipment then follows while the Arch travelers are fed new forms and move on to the next section to erect. Different carriages should slide on separate rails to avoid interference between equipment.

CONCRETE CROWN

Comparable to slipforming in the sense that concrete is introduced axially, perpendicular to the cross-section of the tower into previously erected forms. The fundamental difference is how concrete is placed; linked to the fact that the device moves horizontally instead of vertically.

BASED ON ADAPTATION OF PIPE-JACKING TECHNIQUES. INSTEAD OF USING HYDRAULIC JACKS TO PUSH PREFAB CONCRETE SEGMENTS INTO THE SOIL, A CIRCULAR ARRANGEMENT OF JACKS WILL "SLOWLY" PREVIOUSLY FILLED MOLDS INTO A RECEPTION BASE. A NEW SET OF FORMS ARE THEN INTERLOCKED WITH THE PREVIOUS, FILLED WITH FRESH CONCRETE AND LAUNCHED AGAIN. ALL CONCRETE OPERATIONS ARE LOCATED AT A FIXED LOCATION.

CONCRETE PLACEMENT SCHEMES:

1. Concrete poured radially
   - Ideal way of filling forms
   - Difficult and time consuming

2. Concrete poured axially
   - More use of forms
   - Enable repetitive operation of cycle to maintain smooth workflow
   - Evolve the risk of joints appearing during all construction stages
   - Enhance productivity and minimize delivery time

3. Concrete poured from above
   - Concrete placed on the inner or outer forms panels
   - Through valves at different heights

SECTIONS

SEGMENTS JOINED IN FRESH

CENTRIFUGE

ASSEMBLY-LINE

INCIDENTAL LAUNCHING

SEGMENTAL

CONTINUOUS

HORIZONTAL

Coastal facilities like dry dock - Launching of structure into the sea also possible using sliding/shifting system.

Cluster all construction works on land

Unfavorable mounting direction for slipforming

SPECIFIC RECOMMENDATIONS

- Around-the-clock pouring of concrete
- Use self-propelled formwork systems that slide on temporary service tracks and with the ability to retract-collapse
- No need of inner core
- Enhance high-quality centrifuge concrete
- Use self-propelled devices for removal of inner forms

- Use self-propelled formwork systems that slide on temporary service tracks and with the ability to retract-collapse
- Post-reecing equipment
- Minimal handling of finished structure
- Smooth transition construction transport

Note: The image contains a diagram illustrating the construction possibilities for monolithic concrete Spar Buoy serial production. The text describes various construction methods, their advantages, and disadvantages, along with specific recommendations for implementing these methods. The diagram visually represents the different sections and components involved in the construction process.