MARGINAL FIELD PLATFORM

ZEEPod (Pattern No.: PI2015002104)

Prepared by:
ZEE ENGINEERING SDN BHD
882 Block A1 Pusat Dagang Setiajaya No. 9
Jalan PJS8/9 Bandar Sunway
46150 Petaling Jaya Selangor Darul Ehsan,Malaysia

1.0 Marginal Feilds

Historically, in offshore development centres around the world—such as the Gulf of Mexico, the North Sea, and the South China Sea—the largest oil fields were typically the first to be developed. This was primarily due to government incentives designed to attract the industry, coupled with the high rate of return driven by the size and productivity of these vast fields.

However, the drop in oil prices in the late 1970s and the oil crash of 1986 forced oil companies to explore alternative strategies to keep the industry profitable. This shift was largely supported by the development and introduction of new, more efficient technologies. Initiatives like CRINE (Cost Reduction Initiative for the New Era) in the North Sea and, more recently, CORAL (Cost Reduction Alliance) in Southeast Asia have led to more cooperative approaches aimed at improving the economics of oil and gas field developments. One notable result has been the increased focus on developing smaller, "economically marginally profitable" fields, commonly referred to as Marginal Fields.

In economic terms, a Marginal Field is defined as a field with a rate of return (ROR) lower than the minimum rate of return (MRR), which results in a negative profit margin. The MRR varies depending on the operator and is influenced by fiscal factors like the cost of capital, risk levels, tax regimes, and technical challenges. These fields are generally considered unprofitable or unattractive for conventional development.

To address this, oil companies are actively seeking new concepts to reduce costs, minimize the MRR, and make these fields economically viable. Many marginal field developments are based on the "satellite principle," where existing production and transportation facilities near the marginal field are utilized to significantly lower development costs.

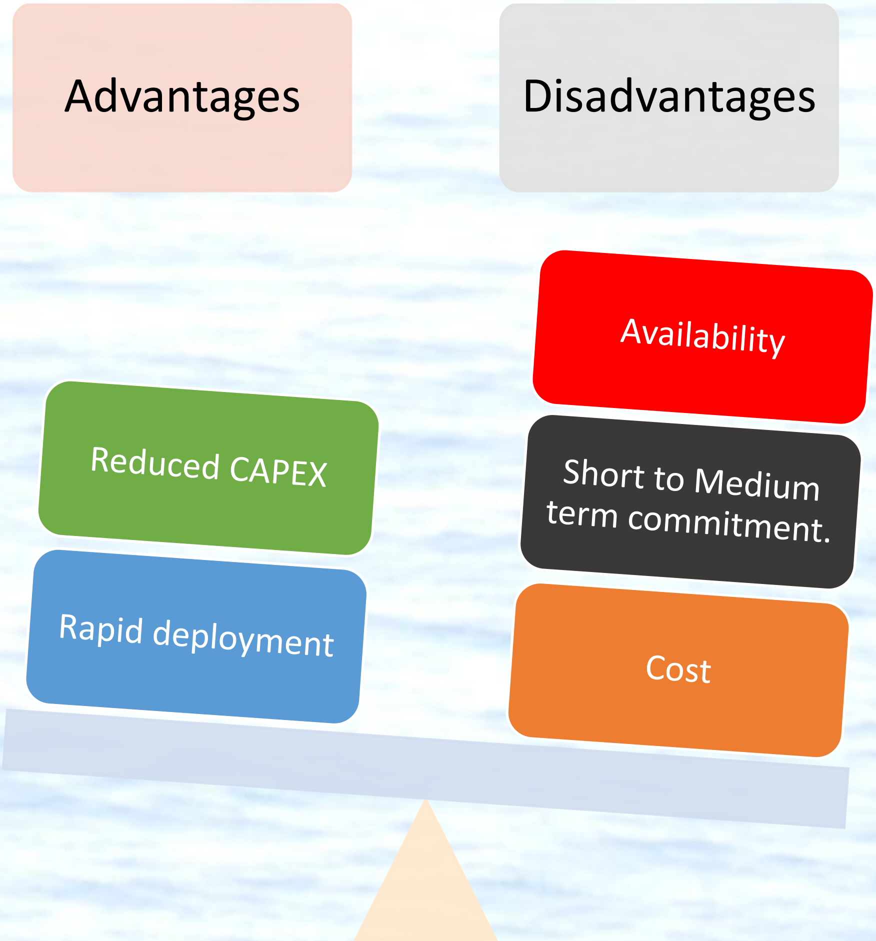
The shift toward marginal field development has encouraged oil companies to adopt more flexible and adaptive business models. Instead of relying solely on large-scale infrastructure, operators now explore modular and phased development approaches, allowing for incremental investments that align with market conditions. Digitalization and real-time data analytics have further enhanced decision-making, enabling more efficient reservoir monitoring and production optimization.

Additionally, partnerships between independent operators and national oil companies have played a key role in unlocking the potential of these fields by leveraging shared expertise, infrastructure, and financial resources. As the energy landscape evolves, the ability to develop marginal fields cost-effectively will remain critical to sustaining offshore oil and gas production.

1.1 Adaptive Solutions for Marginal Fields

There are numerous variables—such as water depth, reservoir size, equipment requirements, environmental conditions, and soil characteristics—that make it challenging to identify a single Marginal Field concept suitable for all situations. Over the past decade, a range of concepts have been implemented for the development of shallow water Marginal Fields, each tailored to specific conditions.

These include **FPSOs, MOPUs** and **Jack-ups**. These have their own set of pros and cons, including:



The FPSO, MOPU, and Jack-up units may be suitable for single wellhead operations, but a fixed platform is often the ideal solution for fields with multiple production wells spread across various locations. This paper explores a fixed platform solution for shallow water Marginal Fields. Several patented structures are available on the market today, including monopods, modular designs, guyed caissons, and braced legs, among others.

1.2 Cost Optimization

Since installation costs account for approximately 50% of the total platform cost, the choice of installation method must be prioritized when selecting a platform. The weight of the platform is not the sole contributor to project costs; in some cases, it may be more cost-effective to accept a heavier platform if it allows for a more affordable installation method. The following factors have been identified as potential ways to reduce installation costs and, in turn, lower the overall cost of Marginal Field Development.

- Utilize potentially more affordable, non-conventional installation equipment and offshore spreads.
- Implement designs that facilitate simplified fabrication methods.
- Adopt streamlined load-out and sea transportation techniques.
- Factor in mobilization and demobilization costs.
- Manage offshore installation activities with an appropriate contract strategy for the installation contractor.

1.3 Design Considerations for Marginal Field Platforms

In order to increase ROR, the following design considerations shall be considered when undertaking the design of a platform for Marginal Fields.

- The facilities should be designed for a short operational lifespan, based on the reservoir capacity.
- The project execution, from concept development to production, must be completed in a short timeframe.
- The facility must be lightweight and cost-effective.
- Fabrication should be carried out at a local yard using readily available materials.
- The design must consider low-cost load-out, sea fastening, and transportation.
- Innovative installation methods should be adopted, utilizing locally available, cost-effective equipment.
- The platform should be unmanned, automated, and designed with a simple operational philosophy.
- Enhance the competitive tendering process by selecting locally available standard equipment, fittings, and structural components.

1.4 Objective

Offshore operations in this region typically occur in shallow waters, with a maximum depth of around 60-70 meters. The objective of this report is to present a Well Head Platform system designed to meet the needs of these conditions and beyond.

2.0 Structural Design of ZEEPod

Each platform will be purpose designed to suit particular load and site Conditions, which include the following;

2.1 ZEEPod System

A typical General Arrangement of the ZEEPod for water depths (WD) of 55m and below is shown in Attachment 1, while the arrangement for water depths of 56m and above is presented in Attachment 2. The system primarily consists of a main caisson supporting the deck structure, with two raker piles driven through sleeves to handle lateral loading. For deeper water depths (56m WD and above), a subsea template will be used to stabilize the structure. The deck can be designed with multiple levels to suit process and operational requirements and can also accommodate boat landings. Additionally, the system is capable of supporting multiple conductors and risers.

2.2 ZEEPod System Components

The main components of the ZEEPod system include the piles and the deck, with the deck's design depending on the field's specific criteria, typically weighing around 1000 tons. Supplementary components include the caisson sleeve, boat landing, subsea template, and attachments such as handrails, ladders, etc. All of these components are lightweight, allowing for load-out with minimal crane capacity and easy transportation on a flat-top barge or designated installation vessel.

2.3 ZEEPod System Installation

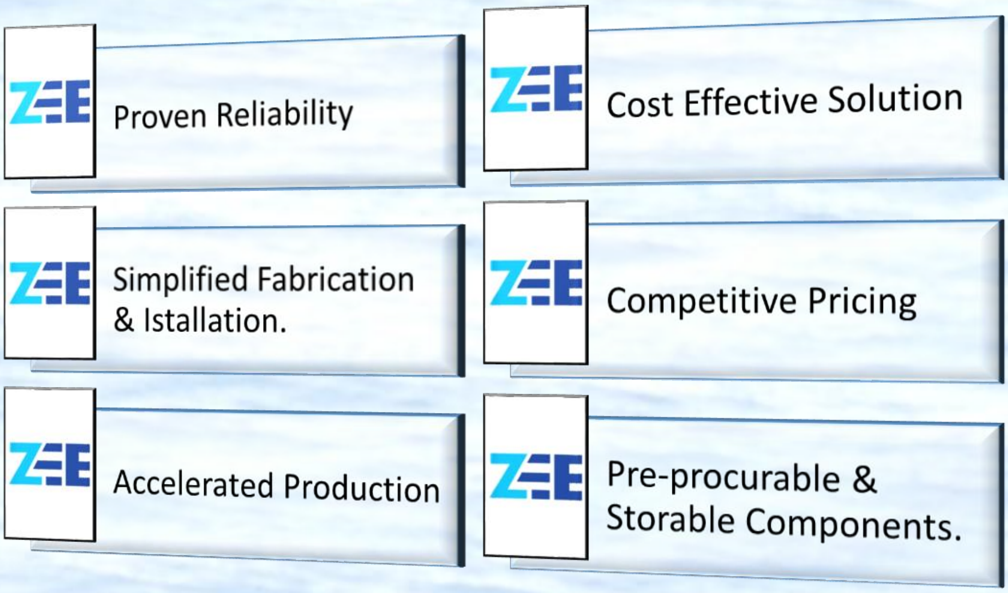
The installation can be performed using a crane barge, drilling rig, or any vessel with sufficient crane capacity. The primary cost driver for the platform will be the installation spread, which considers the following factors:

- Day rate
- Mobilization location
- Mobilization and demobilization costs
- Equipment
- Schedule

The installation sequence is outlined in Attachment 3 for the ZEEPod in water depths of 55m and below, and in Attachment 4 for water depths of 56m and above.

3.0 ZEEPod System Advantage

The ZEEPod System Advantages can be summarized as follows;



4.0 ZEEPod System Reliability

The ZEEPod system is characterized by its simplicity in fabrication, transportation, and installation, making it both technically reliable and cost-effective to install and operate. With over forty (40) units successfully operating in Indonesian waters, it is a well-proven system, and new braced monopods are currently being installed. Some of the existing platforms include:

CNNOC Fields:

South West Wanda, North Wanda A, North Wanda B, Yani A, Widuri F, Zelda F, East Rama A, Lita A, N Gita, Suratmi A, SWWA, Atti A, Kartini A, South Zelda A, Theresia A.

Pertamina Hulu Energi West Madura Offshore - PHE WMO (Formally Kodeco Energy)

PHE-40K, PHE 32, PHE 23, PHE 38A, PHE 38B, PHE 39, PHE 54,

PHE WMO

PHE 12, PHE 29, FSB, SP, KLB.

5.0 Related Documents

- ZEE-PMT-PCS-002 – ZEEPod Overview

Need more details?

Contact us at

✉ contact@zee-eng.com