4

FIXED OFFSHORE PLATFORMS

4.1 INTRODUCTION

Offshore platforms are used to support facilities required to extract oil and gas from oceans. The first offshore platform was installed in 1973 by Pure Oil Company (now Chevron Corporation) and its partner Superior Oil Company (now part of ExxonMobil Corporation) to develop a field in 14 feet (4.3 m) of water, one mile (1.6 km) offshore of Calcasieu Parish, Louisiana, USA [52]. Fixed offshore platforms operate in shallow waters, i.e., less than 500 m, while floating platforms are used in deep waters (Figure 4.1). There are a few fixed offshore platforms, including jackets, GPS, compliant towers, and others.

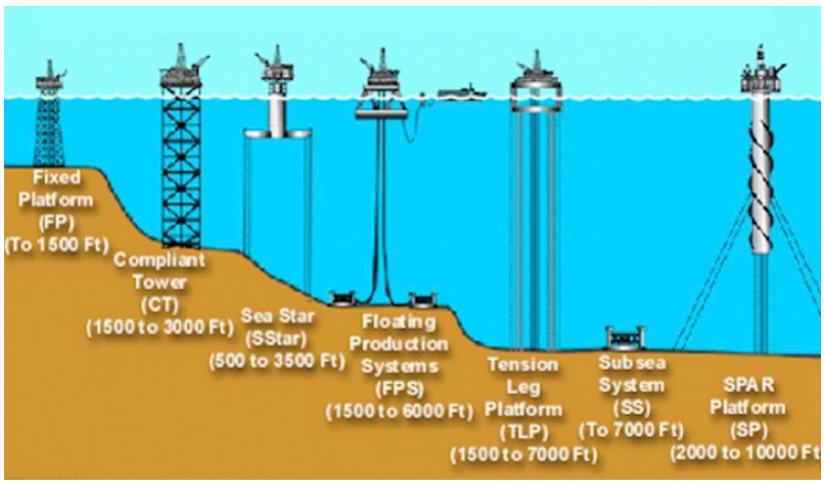
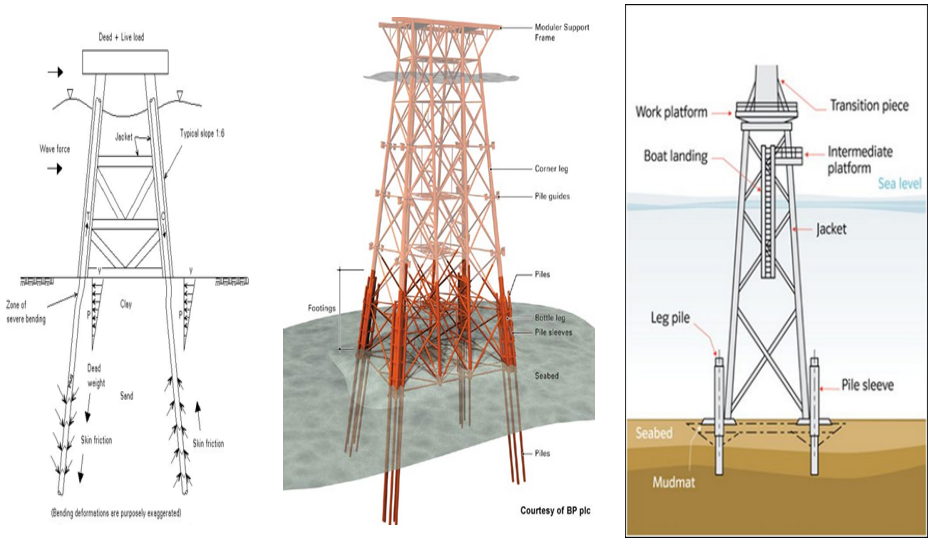


Figure 4.1 Schematic of platform production structures [53]

As shown in Figure 4.3, the jacket platform is a space-framed structure with tubular members supported on a pile foundation that operates at moderate water depths of up to 400 m.

Jackets provide a protective layer around the conductor pipes. The deck structure, which is supported by deck legs and connected to the top of the piles, contains the main deck, cellar deck and helideck. In fact, there are three main types of piles (Figure 4.2) that restrain jacket platforms against the movement,

Pile-through-leg, where the pile is installed on the corner legs of the jacket in this concept. Skirt piles are driven through pile sleeves at the jacket base, where the pile is installed in guides attached to the jacket leg. Skirt piles can be grouped in clusters around each of the jacket legs. Vertical skirt piles are directly installed in the pile sleeve at the jacket base, and all other guides are deleted. This arrangement results in reduced structural weight and easier pile driving. In contrast, inclined piles enlarge the foundation at the bottom, which helps in providing a stiffer structure.



Pile-through-leg | Skirt piles | Vertical skirt piles

Figure 4.2 Types of piles for Jacket offshore platform [54]

The typical natural period of jacket platforms is about 2.5 sec and is kept below the wave period range, which is between 6 to 20 sec, to avoid amplifying dynamic responses.