The Role of Concrete Marine Structures in the Recovery of Energy and Natural Resources from the Oceans

Alfred A. Yee
Dr., PE. President,
Yee Precast Design Group Ltd., Honolulu, Hawaii

Abstract
Concrete materials are derived from some of the most abundant and economically available sources on this planet. Recent advancements in the development of concrete technology related to the durability, strength, and elastomonolithic behavior of reinforced and prestressed concrete has created an opportunity to build concrete vessels and platforms with longer spans and higher strength to provide ample clear space necessary to install and arrange equipment for efficient and convenient operations, repairs, and replacement. High structural strength is essential to provide the required resistance to the huge hydrodynamic forces of ocean storm waves that the hull will have to withstand. By its nature, the added weight of concrete vessels and platforms becomes an advantage in furnishing the inertial requirements for hull stability by mitigating motion accelerations due to wave and current activity. This factor is of great benefit not only to the importance of operational efficiencies during the procurement, processing, storage, and transport of natural energy and resources, but also provides comfort toward the wellbeing of the personnel aboard the marine vessel. For long term durability and service, recent advancements in cement and concrete chemistry as well as the technology of improving concrete strengths, impermeability, and corrosion resistance with mineral and chemical additives have greatly enhanced the economics of concrete construction. It is now reasonable to assume that concrete exposed to a marine environment can be designed for a service life of 100 years or more. One of the costliest events in ocean resource recovery and processing operations is “down time”. Ordinary steel hulls require continuous maintenance and occasional drydocking operations which can result in expensive loss of revenue during repair and maintenance periods. Our experience with concrete vessels have demonstrated virtually no requirements for drydocking, maintenance and repair work as the concrete vessel can be built for a long service life and any repair work, if required, would be due to damage from external forces. In such case, repairs can be performed while the vessel is still afloat and in productive operations. This discussion will describe the many applications and experiences with concrete marine structures and the potential future contributions that this type of construction can provide toward the preservation of our environment, natural resources, world economy, and civilization.

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