# Dynamic response of submerged steel cylinder subjected to underwater explosion

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**Abstract**

Underwater explosion (UNDEX) is one of the most complex physical problems. In addition to its attractive theoretical aspects, today's it became to a vital matter in war and terrorism events. It has been the subject of many scientific researchers for many years. Investigation of submerged structures subjected to underwater explosion, is one of the important researches. In the present study the dynamic response of two submerged and different stiffened steel structures subjected to underwater explosion is presented. The structures are composed of ring-stiffened cylinders. The structures and surrounding water are modeled by shell and acoustic finite elements respectively. The system was analyzed by an acoustic pressure shock wave resulting from an underwater explosion (UNDEX). The incident wave is the shock wave produced by the UNDEX charge. The deduced results such as displacement and strain at some important nodes of structures are presented and compared.

**Keywords: Underwater explosion, Dynamic Response, Fluid-Structure Interaction, Finite element analysis, Cylinder**

## 1. INTRODUCTION

The pressure hull is important part of a submarine and it has quarter or half weight of the submarine structure. Configuration of hull is depend on some factors such as structural efficiency, internal and external arrangements, hydrodynamic form, complexity and cost of fabrication.Fig.1 shows an example of the submarine.

**Figure 1 - Samples of submarines**

Explosion of charge in underwater, produces chemical energy and hot gas bubble hence increases the hydrostatic pressure. Analysis of an underwater explosion event is a complex phenomenon. C.F.Hung, et al. [1] studied the linear and nonlinear dynamic responses of three cylindrical shell structures subjected to underwater explosions in a $4m \times 4m \times 4m$ water tank. Both end of the cylindrical shell were mounted with thick plates to provide support and enclosed space. The three cylindrical shells were differently stiffened.