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DESIGN AND FABRICATION OF UUV LAUNCHER MECHANISM IN DIFFERENT DEPTHS OF SEA

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INTRODUCTION

Nowadays, using of UUV has been developed in marine researches. UUV can be used for underwater repairing for offshore structures, search, rescue and hydro-graphing of ooze [1]. Different methods are applied for launching and conducting of UUV in depths of sea. In this research, procedures of design and fabrication of UUV launcher mechanism in different depths of sea using finite element simulation have been investigated and then the launcher mechanism has been manufactured [2].

DESIGN OF UUV LAUNCHER MECHANISM

In Fig. 1 the structure of UUV launcher has been shown. The launcher mechanism must be stable under water in definite direction. Therefore, in order to prevent the effect of water streams on UUV launcher mechanism, it must be weighted about 1000Kg. After design of this mechanism, its weight became more than 1000Kg, in order to arrange this weight, buoyancy thanks has been used to make positive buoyancy. Also for prevention of horizontal and rotational movements of mechanism under water, drag plates have been designed. In Fig. 2 the schematic model of carrier vessel of launcher structure has been shown. This vessel includes of metal structure, buoyancy thanks, winch complex (including 3D phase motor, gearbox, chain block and cable), retainer vertical beams and locking system [3, 4].

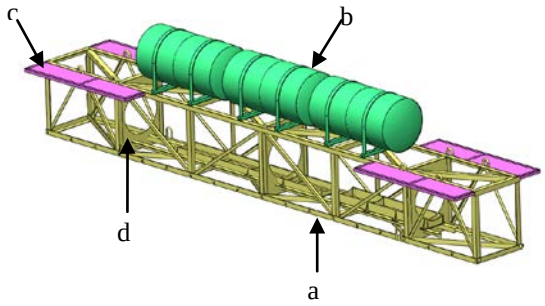

Fig. 1) UUV launching mechanism: a) holder structure of UUV b) buoyancy vessels c) rotational drag plates d) horizontal drag plates

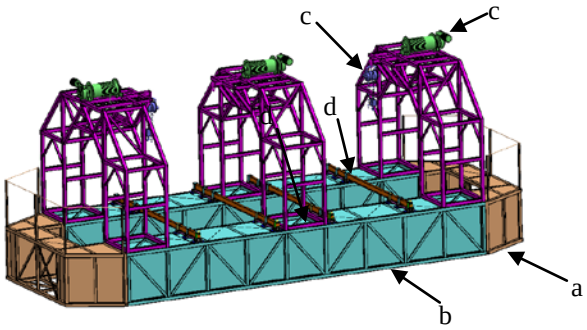

Fig. 2) Carrier vessel of UUV launching mechanism: a) metal structure b) buoyancy vessels c) winch complex d) Vertical I beams

FINITE ELEMENT SIMULATION

ANSYS commercial FEM code has been used for structural analysis of launcher mechanism and carrier vessel [5]. Analyses have been performed statically by considering linear elastic and small deformations conditions. In this research, von misses yielding stress has been considered as design criterion. The structure is made of different rectangular cross section beams and plates. The material of structure has been considered marine steel ,St52-3, according to DIN59410 standard with yielding stress of 355Mpa, tensile strength of 490Mpa, elasticity module (E) of 200Gpa and Poisson's ratio of 0.3. The deck sheets with thickness of 4mm were considered steel according to DIN1543-Rst37-2 standard with yielding stress of 215Mpa, tensile strength of 360Mpa, elasticity module (E) of 200Gpa, and Poisson's ratio of 0.3.

ANALYSIS OF CARRIER VESSEL AND LAUNCHER MECHANISM

For hydrostatic analysis, five types of loading have been considered: 1) HLC1: floating of the carrier vessel without launcher mechanism and UUV, 2) HLC2: transferring of vessel with all its equipments in sea to mission situation, 3) HLC3: suspending of launcher mechanism using two chain block from vertical I beams, 4) HLC4: transferring of launcher mechanism under water, 5) HLC5: transferring of launcher mechanism on top of vessel after processes. In Fig. 3 and 4 the distribution of von misses stresses in structure in movement conditions and hydrostatic curve of righting moment in different loading conditions have been shown. Fig. 4 show that even in the most critical case (HLC3), while the structure is removed from its stable mode, the torque with value 4 tone-meter is imposed to the vessel to return it to its stable mode.

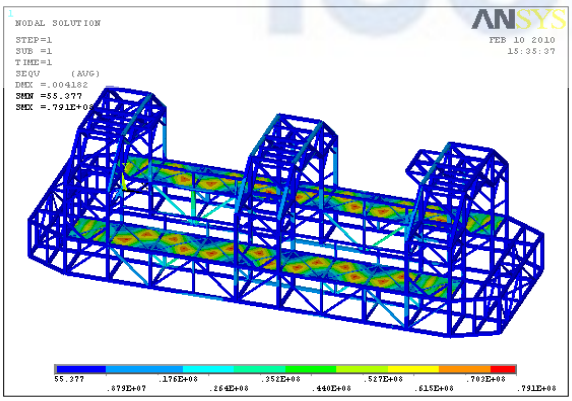

Fig. 3) Typical von misses stress distribution on structure in different conditions

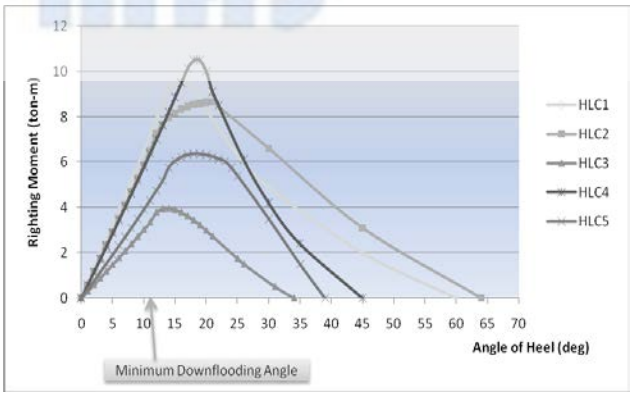

Fig. 4) hydrostatic curve of righting moment in different loading conditions

CONCLUSION

In this research, procedures of design and fabrication of UUV launcher mechanism in different depths of sea have been discussed. The results of structural and hydrostatic analyses show that this mechanism in sea state 2 can be used for performing of predefined missions. Also this mechanism has good mobility and can carry packages that weight 500Kg. Furthermore, the fabrication cost of this mechanism is less than other mechanisms.

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