

Mechanical Engineering Military Design Project

U.S. Coast Guard Repairs at Sea

Mission Statement

The goal of this project is to investigate the possible presence and application of 3D printers aboard U.S. Coast Guard vessels.

Synopsis

With the rapid development of 3D printing technologies there is potential for use of this technology aboard large vessels such as the United States Coast Guard cutters, where structural problems can cost large amounts of time and money, and possibly even lives. To investigate a beneficial application of 3D printers, the USCG Repairs at Sea team will design, manufacture, and test a method for patching ruptured pipes that is superior to current methods and easily reproducible through 3D printing, which can be used at sea under unfavorable conditions.

The goal of the Repairs at Sea team is to explore the benefit of having a 3D printer aboard large seagoing vessels like USCG cutters. The Coast Guard presented us with the problem of critical pipes bursting and needing to be patched quickly, and the current method has a number of drawbacks. The team came up with two main designs of a simple, no-tools-required patch that could be 3D printed. The benefit of utilizing 3D printing for repairs is that it offers the ability to reproduce them as repairs as needed, allows the integration of a features like a built in rubber seal for better containment, and easy modification such as scaling to fit different size pipes. The designs were improved to include an integral closing mechanism to eliminate the need for tools and a stackable design so patches can be linked together to cover long cracks. We had limited resources and our simple ABS models weren't ideal, though they do demonstrate a simple and superior way the Coast Guard can use to contain leaks that could be very reliable with the right machines on board or even on base.



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