

Abstract

This thesis focuses on the development of a prototype of fire extinguishing by infrasound, intended to be used on board merchant ships. Faced with the limits and environmental risks associated with NOVEC 1230, particularly in relation to PFAS substances and their regulation, this work proposes an innovative alternative, non-chemical and more environmentally friendly.

In the first part, the thesis analyzes the types of fires common in maritime environments (engine rooms, kitchens, cargo hold) and their propagation mechanisms (conduction, convection, radiation). It also presents the different classes of fire (A, B, C, D, F), their characteristics, their possible formation areas on board, as well as the detection means (temperature detectors, smoke detectors, flame detectors, call points).

The second part is devoted to acoustic waves, in particular infrasound, and their physical properties. These low frequencies can disrupt the combustion process by altering the distribution of oxygen in the flame.

The third part describes the design of the prototype: a compact system composed of a subwoofer, an amplifier, a 3D printed wave concentrator, a power supply, and detection sensors. Everything is designed for possible integration into the technical spaces of a ship.

Finally, practical tests were conducted on fires in order to measure the efficiency of the system according to different parameters (frequency, sound power, extinction time). The results are compared to those obtained with NOVEC 1230.

This infrasound system shows promising potential for maritime firefighting, particularly as a complementary solution that is more ecological and less harmful to humans.