

1.1 General Description and Practical Relevance

It is necessary to reduce infrared radiation emitted from hot combustion products of the gas turbine so as to conceal the naval and cargo ships from infrared guided missiles. Thus, it is vital to minimize the infrared radiation owing to the excessive demand for infrared stealth technology. Usually, infrared radiation is emitted from the exhaust plume, hot-spots on ship surfaces, and hot electronic gadgets. The exhaust plume temperature contributes significantly to infrared radiation. Therefore, the exhaust gas temperature needs to be reduced in order to minimize the infrared radiation. The hot combustion products are expelled into atmosphere through the aft and foreword funnels of the naval or cargo ship. At the nozzle exit, the flue gas is very hot (200°C - 500°C).

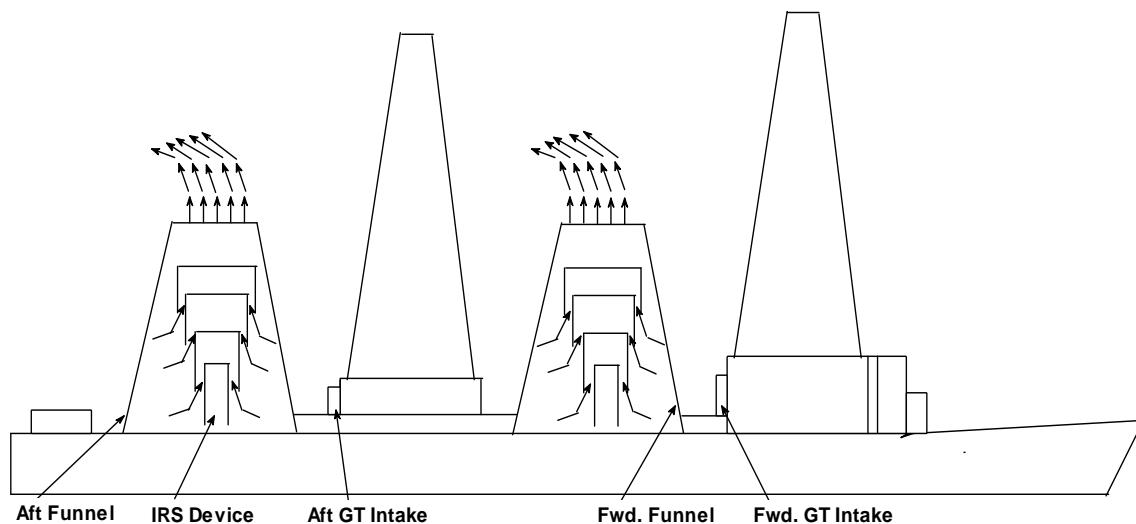


Fig.1.1 Naval or cargo ship with IRS device installed inside foreword and aft funnels

The hot flue gas enters the Infrared Suppression (IRS) device before they are thrown to the ambient.

These devices are installed inside the aft and forward funnels of a ship as depicted in Fig. 1.1. The IRS devices work on ejector diffuser principle. The ejector action provides suction effect by creating suction zones due to a high velocity jet. Low pressure zones (suction zone) are created inside the IRS device at the expense of the kinetic energy of the jet. As a result of this, fresh ambient air is entrained through the peripheral openings of the IRS device. The entrained cold air is then mixed with the hot flue gas to cool it, and the infrared radiation is reduced. Generally, the ship can be detected by the enemy ship in the Deep Ocean if the flue

gas is thrown into ambient without cooling it. Therefore, the flue gas needs to be cooled so as to reduce the infrared radiation, which is essential for naval and cargo ships.

Since the IRS device works on ejector-diffuser principle, this requires no extra power for its operation. These types of devices have an added advantage attached with them. The advantage is: these devices do not need any mechanically moving part for their operation. Thus, the operation of these devices is hassle free and easy to maintain. These devices entrain air from the ambient and mix cold air with the flue gas to cool it. Therefore, our objective is focused on investigation of air entrainment into an IRS device by varying different pertinent operating parameters.