Preliminary Hazard Analysis of Fire Systems of Tankers

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ABSTRACT

The purpose of this paper is the application of the first step of the Guidelines for Formal Safety Assessment (FSA) proposed by IMO(2002) to the typical fire systems for a tanker. First of all there’s a description of the IMO’s methodology steps, mainly the first one. Then there is a description of the typical fire systems for tankers that provides the necessary information to make possible the methodology application. Finally step one is applied with the “Preliminary Hazard Analysis” technique and some clarifying remarks and conclusions are exposed.

Key Words: Formal safety assessment; CO2 system; main fire system; foam system; preliminary hazard analysis.

INTRODUCTION

There is no human activity that is free of unexpected situations. When these situations somehow lead to consequences that damage any individual (related to the activity or non-related), any property or the environment it is natural that people concern about it. So the frequency that these consequences take place and the severity of them are really important to people directly or indirectly involved in the activity. When these two aspects, frequency and severity, are considered together, the risk is being considered. Nowadays people have great conscious of the risks they are exposed to and wish that they are controlled and mitigated. Of course people know that the non-risk state may cost a lot and what they want is that the risk is at an accepted level. Moreover, although safety is an obvious necessity, the society has other objectives that sometimes overcome it. So what must be clearly defined are the risk acceptance criteria. In the maritime activity IMO defines these criteria because it is responsible for the maritime safety. Actually, these criteria are the regulations that IMO imposes to the maritime activity in order to make it safety and less harmful to the environment. In a very close past, IMO just took reactive measures and regulations were only made after an accident or situation that could be prevented. In order to be more proactive and after a discussion of few years, IMO has adopted the FSA (Formal Safety Assessment) as its official way of receiving suggestions of its members to create or modify any regulation. Actually, the FSA is an objective and standardized methodology of applying the risk assessment. It is a process composed by five steps that IMO has described in its Guidelines for Formal Safety Assessment (IMO, 2002). This paper will briefly relate steps two, three, four and five, but will look carefully to step one because it will be applied to an example situation. It must be clear that the result of FSA is not a new regulation or the modification of an existing one. Indeed, it is a means of helping the IMO’s decision making through a formal study of the proposed problem and its final product is an evaluation of possible options to control the risky situation. Nowadays, the FSA is not used only by the IMO decision makers, but also by Classification Societies and designers because it is a powerful way of improving maritime safety. This situation demands the standardization of risk evaluation criteria in order to make possible that new projects can use the FSA and that their safety measures will be equally evaluated and accepted by IMO.

The principal maritime risks concern the environment, the property, the life and health of the crew (individual risk) and of people indirectly involved (societal risk), such as a fishing village that may be affected by an oil spill. FSA studies that concern life and health are very common, but studies related to the environment are not, even that almost 50% of the goods transported at the sea represent environmental risk.

The objective of this paper is to describe the typical fire systems of tankers, improve the understanding of the first step of the FSA and apply it to that system.

FORMAL SAFETY ASSESSMENT (FSA) METHODOLOGY

Before starting the FSA study, it is necessary to think of the problem and find out if it is the case of applying a risk analysis because it is only used in situations that have probabilities and consequences associated. If the situation can be studied deterministically or there are not interesting consequences the risk analysis is useless. For example, the release of regular substance, like sewage, in the sea can be estimated from data and deterministic studies of it. On the other hand, the oil spills is mainly result of accidents (groundings, crashes etc), so it only can be studied probabilistically and has consequences to the owner of the cargo, to the environment and possibly to any close city or village that depends on the fishing. Another important consideration is to precisely define the scope of the study because only after that it is possible to decide if the consequences of the problem are relevant or not. In addition, the system studied must have clear boundaries and must be a generic model of the reality if the FSA is being applied with the intention of proposing a new regulation. The following items bring a briefly description of the five steps of the FSA methodology. In the first one the hazards and its consequences and causes are identified and ranked. Then the more dangerous are deeply analyzed in the second step. After this process, measures to control the risk are proposed and grouped in the third step, in order to have their cost and benefits quantified in the fourth step. Finally the measures considered are compared and the more appropriate are recommended in the fifth step.