

# INTERNATIONAL UNION OF MARINE INSURANCE CONFERENCE

## OCEAN HULL PROGRAMME

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### **Machinery Breakdown and Engine Room Fires A Classification View**

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In order to contribute to the panel discussion on the matter of machinery breakdown and engine room fires from a classification society's point of view, the following points will be addressed:

- Machinery, including main and auxiliary systems for propulsion, steering, loading, ballasting, etc., plays a significant role in class rules and relevant surveys, both at the construction stage and for ships in service. Class represents an important link between the ship as designed and constructed by shipyards and manufacturers and as managed, maintained and operated by shipowners during her life. However, this link is not easy to establish in practice, in particular for machinery breakdowns.
- As stated in the general principles of class rules, classification societies require shipowners to inform them as soon as any problem, damage or malfunction, which may invalidate the class certificate, occurs. Cases of machinery damage requiring insurers' intervention should involve the classification society, too. Often, classification societies are called to explain the reasons for machinery breakdown but, in our experience, there are also a number of cases when the classification society is not informed at all.
- In order to contribute to the discussion, within an IACS ad-hoc group, about the development of a machinery defect database, we have recently carried out research regarding reports on "occasional machinery surveys". The research considered RINA classed ships of 500 GT and more in a three year period (1997-1999), representing about 3,000 ships-year. Surveyors issue this type of report every time they are called on board for machinery/system failures, as well as when items are found seriously defective (e.g. an auxiliary engine out of service, replacement of a complete piece of equipment, etc.). Some figures resulting from an analysis of these data will be presented. However, it is very difficult to understand from these reports whether the replacement or repair of the piece of equipment was due to normal expected wear, accelerated wear or any other cause. It is not even easy to define what expected wear is, without information from the equipment manufacturer and the history of the actual performance of the equipment during in-service conditions. The efforts to obtain this information have been so widespread and the results gathered by classification societies so uncertain and non homogeneous, that the scope of the whole study is doubtful.
- Classification societies have limited access to data concerning daily ship operations, including routine overhaul inspections and maintenance, crew interventions, replacement of worn or defective parts, use of spare parts, etc. Classification societies have tried to overcome this problem by moving from traditional machinery surveys to continuous machinery surveys and planned maintenance schemes. In the first case, the classification society requires the presence of the surveyor when the piece of equipment is dismantled, at fixed intervals. For the continuous machinery surveys and planned maintenance schemes, the intervention is in fact carried out by qualified crew or personnel on board and reported to the classification society to credit the piece of equipment at given intervals, in accordance with manufacturer specifications. Use of data derived from condition monitoring, which can demonstrate the proper functioning of the machinery system, may extend the original intervals given. The number of ships covered by RINA under PMS is encouraging but still relatively small.
- The point is the large amount of data to be gathered from ships in service, how to analyse these data and who will pay for it. From that point of view, it is encouraging to note that shipowners have started recording their own data concerning routine operations and maintenance, crew interventions, overhauling intervals, spare parts, etc., in information databases installed on board and transferable ashore, e.g. via Internet or satellite. The proper gathering and analysis of these data can allow the application of risk-based Reliability Centred Maintenance (RCM) methods in shipping, aimed at the optimisation of preventive maintenance intervals, management of spare parts on board and ashore and reduction of risks due to machinery breakdowns. RCM methods are an appealing concept, for instance from the point of view of better tailoring preventive maintenance schemes, planning and focusing class interventions on auditing the management system maintenance procedures and system's performance, rather than inspecting individual machinery components.

- In its rules for ship classification, RINA has recently introduced the application of RCM methods for the maintenance of on-board systems, as part of machinery surveys. Ships complying with these requirements will be granted the additional class notations concerning the application of the planned maintenance schemes (PMS) and risk-based RCM methods for gathering and analysis of ship-in-service records (STAR-MACH). In particular, for the latter, RINA will benefit from a pilot application developed together with an Italian owner of a fleet of ro-ro ferries (GRIMALDI GROUP) and SPECTEC. For instance, the results from this pilot application can be used for continuous monitoring and forecast of ship availability, possibility to benchmark results of different ships within the same fleet, optimisation of the logistics of spare parts. Hopefully, in the future, these data may become useful for insurance purposes, too, in order to determine the optimal deductible and/or insurance fee.
- In all these respects, the importance of the human element is to be underlined, for instance concerning the qualification and motivation of ship officers and crew to record operational and maintenance ship-in-service data in the manner required to follow RCM analyses. Part of such motivation should be the understanding that data concerning small incidents, damage, malfunctioning, failures are important to analyse the system's performance by means of risk-based approaches, in order to prevent escalation effects which may lead to serious consequences, like an engine room fire or explosion.

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#### BIOGRAPHICAL NOTE

Roberto Cazzulo is the manager of the New Building and Technical Services Department of the RINA Marine Division. He was born in 1954 and graduated in civil engineering in 1979 from the University of Genova. In 1981, he joined the classification society Registro Italiano Navale (RINA), as a researcher in structural response and reliability analysis. In 1993, he became head of the Research & Development Department. During this period, he was a member of the International Ship Structures Congress (ISSC). He has been working for the International Maritime Organization (IMO), in particular the Maritime Safety Committee, since 1993, where he chaired the Working Groups on the Human Element and Formal Safety Assessment, from 1996 to 2000. Within the International Association of Classification Society (IACS), he chaired the Working Party on the Human Element from 1995 to 1998, and he is presently the RINA representative in the IACS General Policy Group.