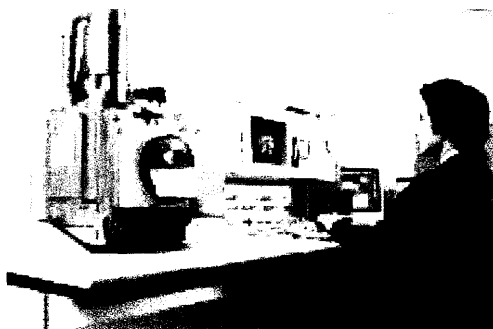


RESEARCH INSTITUTE ACTIVITIES

Ship classification has always been a complex and difficult job, influenced by a wide range of qualitative as well as quantitative factors. As ship classification has developed, it has become more quantitative and less qualitative, and class societies have become more and more technically based. Since its establishment in 1955, the ClassNK Research Institute has devoted much of its energies to research and development aimed at developing the soundest scientific underpinning for the Society's Rules. Currently the Research Institute has a wide range of projects, just some of which are described below, that aim to not only develop the soundest scientific underpinning for the Society's Rules, but also to help make the Rules and the process of their development more transparent and easy to understand for everyone.



The results of the year's labors are usually presented at the Annual Technical Research Seminar, which was held at the Nippon Kaiun Club in November, with some 150 persons in attendance.

The R&D activities of the

Research Institute in 2002 included the following:

- In the second year of the second three-year project researching wave loads, the research has been quite fruitful in the development and improvement of wave load estimation software, with the non-linearity and three-dimensional effects of the load taken into consideration.
- In the second year of a three-year project, a study into the impact load on ship structures, particularly with container carrier bow structural features in mind, has clarified certain parameters which need to be re-evaluated upon tank experiment results.

A previously developed computer program for sloshing load estimation has been improved for better precision and a simplified estimation formula for estimating sloshing load has also been developed.

- Research on the practical application of fatigue strength evaluation in the last year of a three-year project resulted in the "Guidelines for Fatigue Strength Assessment" in the "Guidelines for Bulk Carrier Structures" (August 2002), which followed the tanker version issued in the previous year.
- A three-year research project on the practical application of buckling/ultimate strength evaluation was completed, resulting in the "Guidelines for Direct Strength Analysis" in the "Guidelines for Bulk Carrier Structures" (August 2002), with its buckling strength evaluation standard developed. The project also successfully drafted a simplified estimation formula for the ultimate strength of a stiffened plate panel.
- The three-year research project on the reliability of in-service marine diesel engines was completed. Based on the results of in-service ship measurements the research showed that harmful wear of cylinder liners can be detected by means of monitoring engine vibration. The researchers also studied the mechanism of scavenging air space explosions in diesel engines, based on the results of numerical analysis and measurements on in-service marine engines, in order to establish measures to prevent those explosions, as the background for developing new rules.
- A three-year research project into the combustion characteristics of marine heavy fuel oil and wear diagnosis of slip-bearing surfaces of internal combustion machinery commenced in 2002. As the first stage of this research, the reliability of a combustion test device, in particular an FIA (Fuel Ignition Analyzer), in identification of ignitability and combustibility of heavy oils was proven.

With regard to diagnosis of wear of cylinder liners and piston rings, a watch-keeping method for monitoring wear particles in the oil phase was studied with related experiments executed.

- The research into the functional characteristics of shipboard equipment was extended by an additional year from the original two-year research schedule. The research followed the previous year's effort in the study of the most effective geometry of fire detector probes in engine rooms. The research conducted numeric simulations and fire experiments using a real ship's engine room to reach to a better understanding of the relationship between the location of the probes and the ventilation arrangement.
- In order to improve the precision of calculations of main propulsion shafting systems, the second year of research of the three-year project on methods of assessment of structural strength of diesel motors successfully established a method to model a complex crank shaft as a round bar having equivalent bending characteristics to a crank shaft. An FEM model of an engine room was developed for the purpose of analyzing its structural deformation under various draft conditions.
- Research into materials for shipboard machinery, in the fourth year of a five-year project, undertook crack propagation analysis on crankshaft steel material with an inclusion as the initial defect, considering its size effect. Through the research, it was confirmed that a fatigue limit still exists, and a method for the assessment of ultra-high cycle fatigue strength of the material was established.
- A new research project into corrosion of hull structural materials commenced. Data on how corrosion would develop was collected, regarding hull structure on which corrosion pits were

observed. Very basic data was collected on the strength properties of the materials under axial force, either tension or compression, using specimens from real hull structures, having been found corroded, or those with artificially made corrosion-like pits.

- The research into practical application of Formal Safety Assessment (FSA) was in the final year of its four-year research period. The assessment is already at the stage of actual practical application at IMO and IACS, where ClassNK was given opportunities to contribute.
- The Society is also actively cooperating in R&D activities with an informal grouping of other Asian societies. The second meeting of the JRP-MG (Joint Research Project) was held at the Head Office of CCS in Beijing in May. At this session, CCS, KR, IRS and NK discussed the results of research done during the first year of the second term (2001) of the Joint Research Project (JRP) by the societies on the themes of wave loads (JRT-WL), corrosion wastage (JRT-C/W), and FSA (JRT-FSA), as well as on the specifics of how research should proceed during the present year (2002). Each research team (JRT-WL, JRT-C/W, and JRT-FSA) proceeded with their particular research activities in accordance with their respective research programs. JRT-WL and JRT-C/W each held their second meetings at the Head Office of CCS in Beijing. The Asian Classification Societies (ACS) member societies were able to discuss and reach agreement on some themes common to both corrosion wastage and wave loads. This was a significant step toward the goals of the group. An overview and main results of the research activities carried out by each research team during the year were presented at the 10th ACS summit meeting of the four Asian societies held at the Shanghai Office of CCS in November 2002.