



JERZY KUBICKI, Contract. Prof., D.Sc.
Merchant Marine Academy
Gdynia

Ship operation cost control as a carrier's competitiveness factor

SUMMARY

In the paper general considerations on possible ways of controlling ship operation costs by a carrier are presented. Relationships of all important components of ship operation costs versus different internal and external factors are shortly described and possible ways of controlling the cost components are indicated. At this stage of the study only the qualitative aspects of the subject are considered.

THE ESSENCE OF SHIP OPERATION COST CONTROL

Sea-borne trade is the most international and market dependent branch of the transportation industry. The most important features of it are the following:

- high degree of competitiveness and,
- operating in a changeable technological, organizational, economic and political environment of shipping markets.

A competitive position of a carrier on the freight market depends on his ability to compete in respect to quality and prices of shipping services and costs of transportation. As a rule, the prices of shipping services are created on the freight market out of any control by an individual carrier and independently of the kind of ship's trade (irregular or regular). Therefore price must be taken as a market-derived information, to which a carrier is able to relate his individual price of shipping services, thus obtaining a picture of how effective a given shipping undertaking is. It means that an individual carrier has a limited ability of correcting a market price in relation to his production price.

Quality of shipping services depends on ship's quality, technological and organizational level of the services, ship service organization, management organization, transit time, and condition of shipped commodities when delivered to an end receiver.

It is indispensable therefore to make use of the achievements of technological, organizational and economic progress which allow to create the shipping services quality. There is a need for an individual carrier to keep under control his cost level in relation to the costs of other carriers competing on the market under control, in order to maintain his competitiveness related to production costs of shipping services.

The most important competitiveness factor on the market is the level of ship operation costs: the lower are the costs the stronger is the competitive position of a carrier. This principle is a source of progress in shipping as well as of a "cost and production management revolution". This leads to a new transportation philosophy: reducing overall costs of shipping to operate ships profitably even in conditions of a low level market.

A precise and watchful control of ship operation costs makes it possible to obtain savings and to lower overall and unit costs of shipping. Therefore ship operation costs serve as a checkpoint in the assessment of shipping effectiveness and create a basis for selection of a freight market or a ship's mode of trade.

Cost control allows to obtain improvements in operational effectiveness of a ship as well as of an entire transportation chain. The main role in this process is played by cumulated effects of progress in shipping industry, particularly in conditions of high market competitiveness and permanent oversupply.

NEED OF COST CLASSIFICATION MODIFICATION

Cost control demands a logical and consistent way of cost classification, which would create conditions for an appropriate grouping of all cost components, independently of a form of ships' disposal (own or time chartered ships, bareboat or leasing contract), a form of carriage contract, mode of shipping, carriage type and particular operational conditions. In the practice of Polish shipping companies cost classification methods, elaborated and implemented in the late 1950s, are still in use, in spite of that they are not well adjusted to changes that have since then appeared in shipping. This causes many problems connected with cost grouping, book-keeping, accounting and controlling which highly obscure a real picture of regularities and irregularities in forming the amount and structure of costs and relations of their particular components.

The situation makes it difficult to carry out the cost structure analysis and also to use the controlling methods.

A standard, worldwide accepted cost classification is still lacking which may lead to terminological misunderstandings and incorrectness in accounting of particular cost components [5]. Nevertheless it may be stated that some classification standard emerges [1], [2], [5], which is based on dividing ship operation costs into the following four groups:

- capital costs,
- running (or operating) costs,
- voyage costs,
- cargo handling costs.

CAPITAL COST CONTROL

Capital costs are a cost group containing the costs connected with the way of ship purchase or disposal and composed of investment expenditure amortization, capital interest and credit and loan servicing costs. Critical points in controlling this group of costs are: investment outlays (initial value), the amortization method, interest rate and the level of credit and loan servicing. Important factors in relation to capital outlays are the following:

- choice between the markets of new and second hand ships,
- a time instant of making investments (choice of low price conditions and favourable financial terms),
- proportion of the owner's share to the credit,
- ship's type, size and equipment (inclusive of propulsion plant),
- ship's technological level (labour or capital intensive investments),
- specialization level and special features of a ship.

On the other hand there is the problem of choice of the way of taking over a ship into disposal (own investment, mortgage credit, time charter, bareboat or leasing), to make the acquisition of a needed ship most profitable.

Amortization method is the next factor, if only a flexible national regulation exists dealing with amortization and tax policy.

The only choice in the countries applying the linear method is an amortization period determining the annual amortization rate. In the countries where the degressive method or the free depreciation method combined with special reduced tax rates is used a shipowner has a possibility of choosing and controlling the level of the annual amortization rate in connection with his financial standing and the profit before tax level.

The interest cost is dependent on the way of ship purchase and a bank interest rate (owner's investment with a defined share of the own capital and credits, mortgage pledge), or on the way of taking over a ship into disposal (amortization, interest and shipowner's profit are contained in charter and leasing charges). The second method of acquisition of a needed ship may be useful for a carrier, giving him a chance to immediately take over a needed ship on terms financially stabilized for a contract period; however this is undoubtedly more expensive way than own investment.

RUNNING COST CONTROL

Running costs are a group of costs arising as a function of time (indirect costs), and comprising : crew costs, maintenance and repair costs, material costs, insurance costs, classification and survey charges, administrative charges, and other indirect costs.

The costs depend to a large degree on national policy and legal regulations. The ability and level of controlling of this group of costs depends on how flexible are the national policy and regulations connected with national economy affairs.

Crew cost control depends on how far it is possible to reduce the man power: by crew number reduction, changes in manning structure, in on board work organization, in level of mechanization and automation of ship systems and on board work. It can influence costs of labour (wages, boarding, lodging, social costs). Labour costs can be substituted by capital costs (additional investment outlays for mechanization, automation, and computerization of ship systems) in particular situations justified by crew market conditions and the level of crew costs.

Ship maintenance and repair costs consist of costs of ship technical-operational availability and her service readiness.

The ability to control this group of costs depends on:

- national regulations which govern technical standards in shipping,
 - a rational repair scheduling and the shipowner's flexibility in selecting a place and time of repairs,
- as well as on :
- routine ship maintenance procedures (upkeep, conservation, minor repairs).

Material costs can be controlled due to the rationalization of technical materials and spare parts consumption within a system of national regulation of materials management, planning, supply system and costs accounting.

Insurance costs can be controlled through the shipowner's flexibility in choosing the insurance market as well as by decreasing insurance premiums due to lowering the damage rate and improvement of insurance record.

Administrative costs can be controlled and rationalized by creation of modern solutions for the enterprise organization and management and by applying information techniques relevant to management needs.

It is indispensable to create:

- modern, flexible organizational structures adjusted to ship operation modes,
- direct and reliable information systems assuring transmission of information and documentation, cost recording, analyzing and control,
- a modern book-keeping system, and
- a flexible decision-making system supplied with the processed information needed for ship operation management on different levels (operational, tactical or strategic).

VOYAGE COST CONTROL

Voyage costs form a group of direct costs such as: fuel costs, channel and port costs, agent and broker costs, official entertainment expenses, passenger costs, additional insurance charges, and other special voyage costs. Possibilities of controlling them are different. The most important are the fuel costs, heavily influencing voyage costs level, which justifies shipowner's interest in their control. The main ways of controlling fuel costs are the following:

- economization of ship propulsion ,
- operation of a ship with economical speeds,
- automation of navigation, propulsion systems and their control systems.

On the other hand, the control of this group of costs may be effected by minimization of fuel consumption, the choice of fuels and oils of a proper quality, the shipowner's material procurement policy (fuel prices, purchasing place, terms of contract , financial terms of delivery). The fuel cost control may be a source of savings in overall costs of operation, influencing the transportation cost level and competitiveness of a carrier on the market.

Channel costs and charges, if channels appear on the ship's route, may be an object of choice for a carrier: operating modern ships with high daily costs justifies using channels against an alternative route; the use of conventional ships may justify choice of the alternative route when time factor is not decisive.

Port costs and charges are a group of costs which depend on the quality of ports of destination: it is possible to choose between worse organized ports of a low technological level but less expensive and well organized ones of a high technological level, but more expensive.

The critical points are: port lay time and daily cost rate level. Operating modern ships with high rates of daily costs leads to preference for ports of a high technological and servicing level as higher harbour costs and charges are compensated by savings appearing on operating accounts. The use of conventional ships leads to the opposite preference.

The rest of voyage costs, in spite of that they do not play a decisive role in creating ship operation effectiveness, should also remain under carrier's control with possible savings in view.

CARGO HANDLING COST CONTROL

The general idea of controlling cargo handling costs consists in minimization of expenditures for cargo manipulation not only in port (cargo handling costs) but also within cargo holds (stowage and trimming costs).

Their importance in irregular shipping depends on the kind of ship's trade and on the way the cargo handling costs are shared between carrier and charterer. If, according to a freight contract, the costs are borne by the carrier, then the question arises of choice between special terminals which offer a high technological and organizational level of servicing (high rates of loading, short servicing time) and universal ports offering a lower technological and organizational servicing level at lower costs but a longer servicing time. A critical point is the level of running daily costs which are much higher for modern and special ships but lower for conventional ships.

In regular shipping criteria of control and choice are diversified. In the conventional ship use general criteria are similar to those applied in irregular shipping on gross terms. In highly specialized shipping services and highly advanced ships' use the general idea is to shorten port operation time to an indispensable minimum. In this case special port terminals are preferred which offer services on a high technological-organizational level with relatively high cargo handling costs. This results from high daily cost rates of the advanced ships and from a time regime of technologically advanced transport systems.

There is a need to maintain compatibility between the technological-organizational level of shipping industry and that of sea ports.

The transportation cost criterion is a source of seeking time reserves in port service organization (transportation logistics, pre-planning, servicing coordination by dock or port captains, organization of carriers' regional offices, computerization of collecting, processing, and transmission of information and documentation etc.), which allow to shorten port lay time of the highly technologically advanced and special ships.

Application of modern management methods and logistics in ship operation is a new approach to economization of cargo handling costs and time engagement of special ships.

COST CONTROL IN MULTIMODAL TRANSPORTATION SYSTEMS

Highly advanced - in respect of applied technological and organizational methods - complex multimodal sea-land transportation systems are orientated to the users' preferences: transportation time minimization, transportation costs minimization or combined minimization of transportation time and costs in the entire transportation chain. A general idea is to offer total services in «point-to-point» mode of the transportation chain by a single system operator who is responsible for technological and organizational realization of transportation processes as well as for transportation costs. To reach this aim it is necessary to collect full information as to:

- physical motion of unitized cargoes in the transportation chain,
- all services rendered to cargoes when displacing and handling them, and
- services during transferring cargoes from one transport facility to another (in land-based and sea terminals) as well as - costs of the services.

A system operator is able to extend his control over this information by means of a computerized information system which makes it possible to collect, process and transmit information and documentation connected with the above mentioned cargo operations, services and costs.

A modern form of realization of the idea of multimodal transportation systems is the application of methods of transportation logistics which allow for designing technological and organizational features of the system in compliance with one of the preferred criteria mentioned earlier. However for a system operator offering combined services (who can be an international forwarder, a land or oversea carrier) the sea link in a complex transportation system is only a part of the entire system, though not always the most important. From some literature sources of the subject it may be

estimated that the sea link of an intercontinental transportation system produces not more than 30% of the overall costs of the system. It may imply that land links of such a system are even more important for the minimization of the overall transportation costs. This argument underlines the importance of transportation cost control not only for the sea link, but also for the entire system, as well as the role played by the system operator in that process.

SHIP OPERATION EFFECTIVENESS AND COST CONTROL

It results from the foregoing considerations that ship operation costs are the decisive criterion for carrier's competitiveness on the freight market. To achieve this aim a carrier should create and maintain a cost control system which would make it possible to effectively operate his ships. Application of all the methods and tools allowing to minimize the ship operation costs is necessary. It is therefore vital to elaborate and implement a precise cost classification system, and an information system based on it for supporting decision-making at all levels and assuring quick and reliably transformed cost information [3].

It is also important to create a complex computerized information system and to apply methods and tools of transport engineering and logistics to the design and realization of all the above mentioned aspects of transportation processes as well as to solving problems which arise from the new transportation philosophy.

BIBLIOGRAPHY

1. "Comparative labour costs". A study by the UNCTAD Secretariat, Doc. TD/222/Supp. 4, Geneva 1978.
2. "Container market profitability to 1997". H.P. Drewry Shipping Consultants Ltd., London 1993.
3. Kłoka J.: "Model systemu informacji ekonomicznej kosztów jako podstawa do podejmowania decyzji w przedsiębiorstwach żegluga morskiej". Int. Publ. of WSM (Merchant Marine Academy), Gdynia 1993.
4. Neider J.: "Przewozy intermodalne w transporcie międzynarodowym". Int. Publ. of UG (Gdańsk University), Gdańsk 1992.
5. Stopford M.: "Maritime economics". Unwin Hyman Ed., London 1988.

Appraised by Janusz Żurek, Prof., D.Sc.

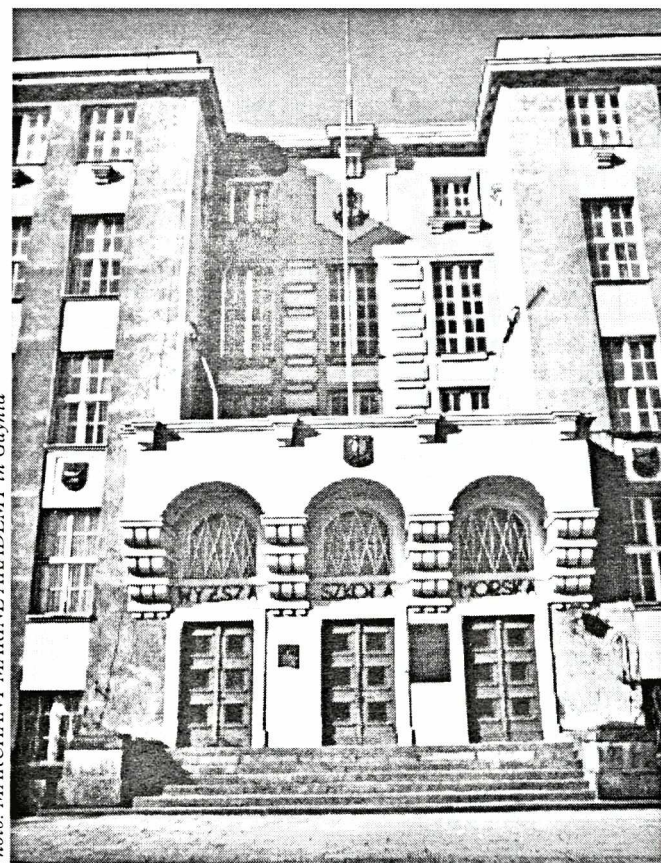


Photo: MERCHANT MARINE ACADEMY in Gdynia

Scientific Research Profile of the Merchant Marine Academy, Gdynia

The scientific activity of the Academy is carried out by the staff of the Chairs functioning within the Faculties and inter-faculty units in compliance with their individual scientific specializations. Research is carried out within Academy's statutory activity supported by the Scientific Research Committee.

FACULTY OF NAVIGATION (5 Chairs) carries out investigations in the following areas: marine navigation, geodesy and cartography, telecommunication as well as nautical meteorology and oceanography. Among numerous research topics the following may be taken as the basic ones:

- safety of navigation, automation of navigation and ship routing optimization in different nautical conditions;
- operating parameter assessment of GPS receivers of different types and makes as well as navigation calculation programming;
- operating condition investigations of marine radars, ARPA systems, ECDIS system and selected radionavigation systems;
- safe ship manoeuvre space determination for different ship types taking into account steering and propulsion systems of different type;
- application of GMDSS satellite communication system for search & rescue action at sea;
- ship stability estimation for ship loading control systems;
- ship loading optimization in respect of the ship stability, strength and operation requirements;
- influence of hydrometeorologic conditions on ship's routing and operation;
- hydrometeorologic conditions in high latitude (subpolar and polar) sea & shore areas;

MECHANICAL ENGINEERING FACULTY (3 Chairs) is concerned with:

- theory of ship's and ship installation safety;
- ship reliability theory and engineering methods;
- design of maritime enterprise modernization;
- dynamics of ship machines and structures;
- ship installation diagnostics, in particular: optimum scope determination of diagnostic system, simulation model and algorithm elaboration for typical unserviceability investigations, elaboration of diagnostic methods and determination of control and measurement equipment for the process realization;
- ship power plant operation analysis, inclusive of the choice of optimum plant operation parameters;
- analysis of heavy fuel oil combustion in ship diesel engines, in particular, optimum control and engine operation parameter setting;
- development of means and methods for prevention of sea pollution from ships;
- development of new ship-applied materials, methods for extension of their useful life and testing;
- ship's and ship equipment repair optimization.

Moreover the Ship Power Plant Chair produces special measuring equipment on customer's request.

ELECTRIC ENGINEERING FACULTY (3 Chairs) is specialized in :

- investigation of ship electroenergetic systems in respect of: electric energy generation, distribution and consumption, as well as electroenergetic system optimization, its routine operation and diagnostics;
- investigation of diagnostic systems (both stationary and portable) for servicing ship installations and equipment;
- automation of safe optimum ship manoeuvring control;
- automation of ship power plants and electric drives;
- ship energoelectronics;
- theory and operation of marine radiocommunication systems.

ADMINISTRATION FACULTY (3 Chairs) is engaged in: science of commodities, food and catering technology, food chemistry, commodity keeping, physics & chemistry of polymers, commodity packaging.

Research carried out in the Chair of Commodity and Cargo Sciences deals with:

- influence of technological parameters, keeping and transportation conditions of food products on their quality when subject to thermic, chemical and biological preservation processes;
- food chemical pollution in commodity properties research;
- quality and durability testing of ecological commodities;
- catering technology and organization, test method application in ship's crew feeding preference testing;
- physical and chemical properties testing of polyurethanes mixed with polystyrene and organic polymers;
- biodegradation testing of synthetic materials actually used in commodity packaging as well as of new polymer configurations.

In addition research works are carried out in the following areas :

- shipping organization and economy;
- technology and organization of multimodal transportation systems;
- transactions and documents in ship-port traffic;
- organization of marine recreation;
- modern project management tools;
- enterprise development strategy, its macro- and microeconomic conditions, manpower management;
- main problems of managerial work.

INFORMATICS CHAIR carries out investigations in computer programming as well as in applied operation research theory and shipping-applied computer aided decision-making techniques.

CHEMISTRY CHAIR is engaged in research on properties of small particle bulk cargoes and dangerous goods in respect of their safe shipping.

MATHEMATICS CHAIR is specialized in research on probability and mathematical statistics theory and their application to system reliability assessment and optimization, orientated on information systems and energy transmission lines.

Chemistry Chair is the only Poland-based laboratory testing humidity of small particle bulk cargoes and issuing on forwarder's request the conformity certificates which are required in shipping of the cargoes.

ERRATA

to the paper:

Gadomski D.: «Calculation method of the specific fuel oil consumption in low-speed marine diesel engines».
Polish Maritime Research No 2, Dec.1994,vol.1.

1. On page 17, outer column, line 24 (from the bottom):

is: „... of piston...”, to be read: „... of cylinder...”.

2. On page 19, outer column, line 1 (from the top):

is: „ 4. Pichowicz W.:...”, to be read: „ 4. Pichowicz W.,Gadomski D.:...”

3. On page 18, in eq.(2):

is:

$$b_{MEO} = \left[340.38 - 54.385 \left(\frac{S}{D} + \frac{S}{D^2} \right) \right] N_{MCR}^{-0.333} + \dots$$

to be read:

$$b_{MEO} = \left[340.38 - 54.385 \frac{S}{D} + 6.935 \left(\frac{S}{D} \right)^2 \right] N_{MCR}^{-0.333} + \dots$$

Ship Propulsion Automation

The international symposium on « Propulsion Control in Ships and Offshore Units » was held from 16 to 18 November 1994 in Gdańsk, organized by the Technical University of Gdańsk (Faculty of Ocean Engineering and Ship Technology, Chair of Ship Automation and Turbine Propulsion).

The symposium was devoted in respect of automation installations to:

- design principles,
- simulation and laboratory tests,
- education methods.

19 papers were presented and discussed during the following four sessions:

- I - Diesel engine automation (5 papers),
- II - Gas turbine automation (4 papers),
- III - Education, Simulation (5 papers),
- IV - Selected problems of ship propulsion automation (5 papers).

The specialists taking part in the symposium represented: Technical University of Gdańsk, Merchant Marine Academy in Gdynia, Naval Academy in Gdynia, Polish Naval Forces Command, Maritime University of Szczecin, Polish Register of Shipping and ABB Zamech Ltd. The following persons participated from abroad: 4 persons from the Technical Maritime University in St. Petersburg (formerly LIBO) and 2 postgraduates from Iran.

The symposium was sponsored by the Scientific Research Committee, ABB Zamech Ltd and Polish Register of Shipping. The organizers announced that similar symposia will be held every second year. ■

Symposium on Selected Problems of Ship's Hydromechanics

The Symposium was held on 5-6 December 1994 in Gdańsk, organized by the Technical University of Gdańsk (Ship's Hydromechanics Dept., Faculty of Ocean Engineering and Ship Technology). Participants of the Symposium represented Polish and foreign institutions engaged in solving hydromechanic problems of floating units. Some guests from shipbuilding industry and the Faculty students took also part in it.

17 papers read during session were prepared by scientists from :

- Polish Academy of Sciences (4 papers),
- Foundation for Maritime Safety and Marine Environment Protection (1 paper),
- Technical University of Kaliningrad (3 papers),
- Maritime Technical University of St. Petersburg (2 papers) and
- Technical University of Gdańsk (7 papers).

Apart from the papers, the results of works, carried out within research projects financed by the Scientific Research Committee, were presented.

The results related to the following topics:

- "Simulation of coupled ship motions leading to ship capsizing" (Dr inż. W. Blocki, the project's manager).
- "Maritime safety and marine environment protection - ship stability, unsinkability and manoeuvrability" (Prof. dr hab. inż. L. Kobylński, the project's manager).
- "Expert system for preliminary design of ships and offshore units for stability, unsinkability and seaworthiness" (Dr. inż. M. Gerigk, the project's manager).

International Symposium on Refrigeration in Sea Transport Today and in the Future

Commision D 2/3 of the Paris based International Institute of Refrigeration met on September 29 - October 1, 1994, in Gdańsk. Usually the body discusses problems of refrigeration in general. However this time the symposium was devoted exclusively to marine refrigeration.

Not without reason Gdańsk has been chosen for the event and Stocznia Gdańska (Gdańsk Shipyard Co) as its organizers. As it has been mentioned in « Reefer Trading Prospects to 2000 » - a report recently published by Ocean Shipping Consultants - « In 1993 more reefer vessels (as opposed to refrigerated fish carriers) were on order at Stocznia Gdańska than at any other yard ».

Nearly 100 participants represented reefer companies, refrigerating equipment suppliers, universities, refrigerating institutes, independent consultants, classification societies as well as newbuilding and repair yards. ■

The aim of this symposium was to review and discuss the technical revolution in the field which is currently under way. The main changes are: phasing out environment unfriendly refrigerants and their replacement with other friendly ones (like ammonia, carbon dioxide, different freon mixtures), replacement of bulk reefer carriers with pallet friendly ships, containerization of reefer trade with gradual replacement of porthole with integral containers, introduction of efficient reefer cargo handling methods etc. The phenomenon is accompanied with a hopefully short, but deep reefer market depression mainly resulting from the EC banana import quotas.

The third day of the symposium was devoted to a guided visit on DOLE ASIA, a 519 000 cuft reefer, lying at the quay in Stocznia Gdańska practically ready to Dole Fresh Fruit Int. A comprehensive description of this interesting vessel was presented in the September 1994 issue of the POLISH MARITIME REVIEW. Finally all the participants met for a round table discussion.

The symposium was very well organized and interesting. It gave a good overview of what could new reefers and their plants be as soon as the market improves. The general impression was that the industry was confident in the future despite the present depression. ■

Jubilee Symposium on Selected Problems in Development of Heat Engines (Szczecin, June 1994)

On the occasion of 80th birthday anniversary of prof. Henryk Dziewanowski the Symposium was organized by the Department of Marine Heat Engines, Marine Technology Faculty of the Technical University of Szczecin. Prof. H. Dziewanowski is a distinguished specialist in heat engines, author of numerous patented inventions, teacher and master of many outstanding marine engineers.

A large group of Polish heat engine experts and scientists took part in the Symposium, hearing and discussing seven papers prepared by authors from Technical Universities in Gdańsk, Poznań, Szczecin and Wro-

claw, as well as by those representing Merchant Marine Academy in Szczecin.

The topics of the papers were the following:

1. New ways for extension of periodical survey intervals in marine main two-stroke diesel engines;
2. Heat exchange model for a closed fluid flow system;
3. Test stand model for simulation of piston ring-cylinder bore collaboration;
4. Exhaust gas composition of low speed marine diesel engines;
5. Planning of experiments in diagnostic investigation of injectors for piston engines;
6. An attempt to evaluate the starting properties of diesel engine with renewable fuel;
7. Ecology-diesel, what does it mean ?

Full texts of the papers have been published in a separate issue, where *curriculum vitae* of the celebrator of the jubilee and his professional achievements have been also described. ■

XVIth International Symposium on Ship Power Plants

For already 16 years the scientific meetings of marine engineers are held every year in Poland to consider the different problems of ship power plant design, construction and operation. At the beginning it was thought as a forum for exchange of research experience gained by the scientists from the five Polish maritime universities: Technical University of Gdańsk, Technical University of Szczecin, Merchant Marine Academy in Gdynia, Maritime University of Szczecin and Naval Academy in Gdynia (formerly Naval High School), which by turns were the symposium organizers.

However as early as several years after, other scientific and design centres working in the ship power plant field joined them.

Some time later, once the symposium organization was improved and some new possibilities emerged, new participants were invited from the scientific centres cooperating already earlier with the symposium organizers.

This way the XVIth International Symposium on Ship Power Plants was held on 27-28 October 1994, organized by the Technical University of Gdańsk (the Ship Power Plant Chair of the Ocean Engineering and Ship Technology Faculty).

77 specialists took part in the symposium from the five above mentioned maritime universities as well as from the Institute of Fluid Flow Machinery of Polish Academy of Sciences, Maritime Institute, Polish Register of Shipping, some ship engine makers (Sulzer, MAN & BW, ZGODA Works), Gdańsk Shipyard Co and Gdańsk Ship Repair Yard. Unfortunately only few specialists represented Polish shipbuilding industry and no one the shipowners, which are after all the ship power plant users.

The guests from abroad, being the authors of some papers as well, were representatives of such firms as: SULZER of Switzerland, MAN & BW of Denmark, and two representatives of the Maritime Technical University in Kaliningrad (Russia).

26 papers were read, which initiated interesting discussion. The papers were presented and discussed during the six sessions:

- I - Modern ship power plants, their design and construction;
- II - Reliability and repairability of the power plant machines and installations;
- III - Analysis of the ship power plant performance characteristics and parameters;
- IV - Ship engine operation and marine environment protection;
- V - Ship gas turbine operation;
- VI - Ship power plant testing.

The next, XVIIth International Symposium on Ship Power Plants is planned to be organized this year by the Technical University of Szczecin. ■