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On possible usage of a database on accidents in marine power plants in the lifecycle of a ship

INTRODUCTION

The process of creating an employment place safe in the best possible manner requires a great variety of information, the gathering and processing of which are best accomplished in the form of a data bank. The functional efficiency of such a bank depends on active participation of all the persons involved in the lifecycle of a ship, in its creation and usage. A diagram of a complete cycle of existence of a technical object (ship) starting from the moment of generating needs of its existence up to the recovery of materials after its withdrawal from service, was presented in Figure. At every stage of the lifecycle of an object a different kind and range of information is useful to various groups of recipients, hence the data bank seems the most proper form of their presentation. The authors elaborated a base of information on injury at work, limited to the engine room deemed the most „dangerous” place on the ship. On the basis of the first experience gained from its usage the possible utilisation of the information so far collected are described below.

INFORMATION ON THE FULFILMENT OF NEEDS IN THE INDUSTRIAL PROCESS

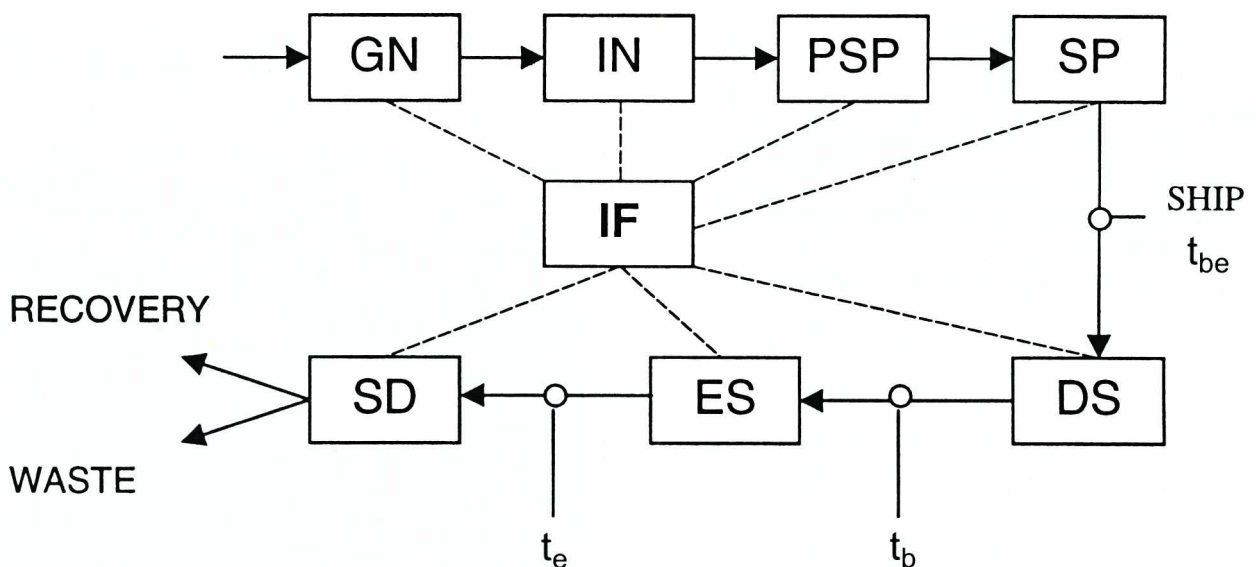
The diagram in Figure illustrates the time configuration of elements contributing to the fulfilment of needs in the industrial process (FNIP).

Each manufactured product goes successively through all phases of this process and the time in which it takes place is the lifetime of an object. The fulfilment of this process is possible due to the existence of an information feedback – IF. The feedback is a key element in every process of the fulfilment of needs and represents the system-forming relation which determines the existence of a system to meet well-defined needs. The lifecycle of a sea-going vessel is such system and the proper operation of its IF element is necessary for its effective existence, i.e. an adequate supply of information allowing to form an effective feedback. The role of the database is to precisely supply such information as far as safe work in ship power plants is concerned.

DESCRIPTION OF DATABASE ON ACCIDENTS IN SHIP POWER PLANTS

A relational database was elaborated in the form of an application in the *Access* system within the *Windows* environment. The possible use of the Internet was taken into consideration. The currently collected data on accidents have been divided into four following groups containing the relevant detail information :

- **Occurrence** : date, hour, place on the ship, kind of accident, direct cause (most likely), description



The lifecycle of a ship as the fulfilment of needs in the industrial process

Notation : GN – generation of need [origin], IN – identification of the need, PSP – preparation of ship production, SP – ship production, DS – distribution of the ship, ES – exploitation of the ship, SD – ship disposal, IF – information feedback, t_{be} – the beginning of a ship's existence as a manufactured product, t_b – the beginning of ship exploitation, t_e – the end of ship exploitation

- **Victim** : post, age, period of time on the job, duration of work on the post at the time of the accident, period of stay on this ship, period of incapacity to work in result of the accident, influence of the accident on the state of health
- **Ship** : name, tonnage, building year, rated power of engines, exploitation state at the time of accident, climatic zone
- **Device** : name, basic technical parameters, description of a breakdown, manner, place and cost of failure elimination, losses in the result of the breakdown.

The data group concerning a device is included into the base if a breakdown of the device in question causes an accident or the device breaks down on account of an accident. The described database was designed as open one which makes its development possible.

USE OF INFORMATION INCLUDED INTO THE DATABASE

The content of information of the presented database may be used at every moment of the lifecycle of an object. However the range of helpful information is different in the successive stages of this cycle. Experience of the authors has shown that the timing of proper subsets of essential information is not obvious. A systematisation is below described to illustrate the problem on the basis of the above mentioned database. In this description the object of design is a hypothetical System of Ensuring Safe Work [SESW] in marine power plants.

Stage GN

Accidents are highly unfavourable occurrences from every point of view; thus the fact that they happen is sufficient to *generate the need* to undertake work aiming at their elimination. The recipients of this information are all decision-making persons who understand the need to limit the social losses caused by a low safety level of work at sea.

Stage IN

However, the existence of a need is insufficient to undertake technical activities. Therefore *identification* is necessary based on an explicitness of the problem to be solved. In this stage the most valuable pieces of information are those which make it possible to estimate the problem and global cost, as well as the losses caused by accidents and anticipated cost of activities for their elimination. The recipients of the above information are decision-makers responsible for conducting the policy regarding the operational safety of merchant fleet.

Stage PSP

This is the *stage of production preparation*; in the context in hand it means preparation of actions aiming at the elimination of accidents. Most of the collected information should be used at this stage. Technical pieces of information on devices and ships are useful for reporting to what extent these devices cause accidents and for suggesting appropriate changes in construction. Technical data should be used to determine those parts of an engine room in which the number of accidents is significant and on this basis design changes of engine room plans should be stipulated. Information on victims of a disaster is useful since it allows to evaluate their predisposition to be in a given profession. Conclusions from such analysis should be helpful in working out proper principles, conditions and forms of training and professional advancement. The recipients of this information fall into three groups of specialists: designers, instructors, and research workers.

Stage SP

This is the *production stage*, i.e. that of technical elaboration of the chosen project to solve a given problem. In this stage a body of manufacturers and technical specialists is engaged, and the usage of the information contained in the database is limited to introducing corrections stemming from the increasing data content along with the passage of time.

Stage DS

This *distribution stage* is that of initiation of the elaborated solutions. This is an arduous and laborious stage of numerous negotiations with different teams. In this stage informative materials are most helpful and they may be obtained from detailed information gathered in the database. Managers are their recipients in this stage.

Stage ES

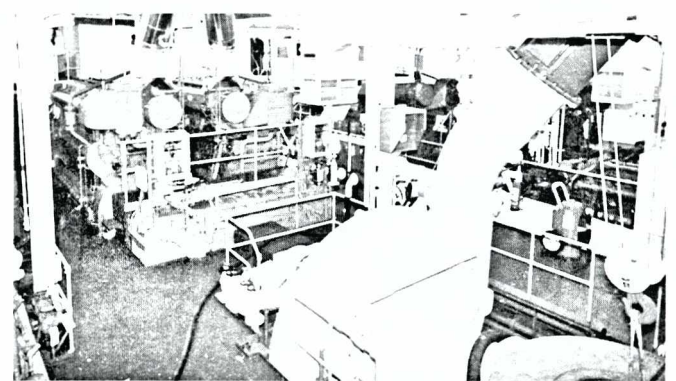
The usage period of the considered system is the *exploitation stage* in which new data are generated to supplement informative materials and evaluate the applied solution. In this stage a closure of the feedback loop occurs due to which it is possible to improve efficiency of the applied solution or to give it up if it is hardly effective. In the second case a signal is given to generate the need to work out an alternative concept. During exploitation stage a range of information content of the database is used almost as wide as in the preparation stage although the form of data usage changes. The recipients are the same groups of specialists as in the design stage, as well as crews of ships.

Stage SD

The disposal of a manufactured product is the end of exploitation of an efficiently working solution. At this stage the use of the database content is limited to general indices which may aid in justifying the decision to withdraw a product from exploitation. However, it does not mean the disposal of the database itself. It is merely a signal for the manager to realize the necessity of working out a way to adopt the base to the requirements of a new user. In the presented diagram the *recovery* is the information directed to the database. Decision-makers and research workers should be the recipients of that information.

CONCLUSIONS

- The presented elaboration is an attempt to highlight a concept of gathering, processing and usage of the data concerning work safety not only on sea going vessels but also in general. The suggested possible forms of usage of information files are very wide. However, the existence of a data bank is a necessary condition.
- A problem of major importance connected with the database formation is an access to reliable and credible information. At present, files on accidents are kept by various institutions, first of all by insurance societies; however, such information is confidential and today inaccessible. The authors hope that this presentation will inspire the persons interested in safety of work at sea to make an attempt at solving this problem and to find a reasonable solution.



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