

A management information system for ship repair



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Introduction

Shiprepair is a business in which short term change and variability are the norm. This inhibits planning and control. Capture and accessibility of data are essential to successful management of shiprepair contracts.

This article by Mike Evans, Technical Director of Incremental Ltd highlights features of management information systems as applied to the ship repair industry.



Computerised management information systems (MIS) can be exploited to enhance both initial planning of contracts and maintaining control during their execution.

Unfortunately the information technology (IT) applied in shiprepair yards is frequently inappropriate to the demands and needs of managers. This article looks at the needs of the industry, what types of system are currently in use, and describes the characteristics of management information system for ship repair.

Industry needs

Ship repair work can be categorised in increasing order of scale and cost:

- Voyage repairs (minor and continuous repairs)
- Routine docking (underwater work)
- Major repairs (typically steel)

- Damage repairs (usually steel)
- Refit and Conversion

The planning and management needs vary according to the category of work and vessel type.

Major refits and conversions are close in organisational terms to new construction. Some major repairs have an extended timescale and large material component which permits "shipbuilding" type systems. Here the heavyweight enterprise resource planning (ERP) systems used in the ship building industry are appropriate.

But what planning and management systems are available to support the routine and emergency repairs? This is a particular problem for the smaller companies in the industry, which have limited management resources.

Planning and control of shiprepair differs significantly from ship construction, refit and conversion projects.

The forward workload is frequently not certain at the time of commencing the contract work. The specification is often sparse, with detailed work requirements only emerging once the repair work is underway. Alternatively a relatively detailed specification may be quoted against, only to be changed significantly on vessel arrival. Items may be added, but others may be removed from the specification.

Whether highly specified or not, there will be emerging work as the contract progresses. This leads to the cancellation of other, less urgent work to ensure the total cost of the repairs remains within a budget total and to maintain a rigid end date.

Estimating and monitoring is complicated by a lack of reliable productivity measures. There are few routine jobs which can be used as a basis for productivity measurement.

Planning must be immediate and reactive, as timescales are typically days.

The management of a repair contract is therefore a case of maintaining the end date against that background of continual variation in work content and hence resource requirements, and a permanently uncertain future work load.

The response of the shiprepair industry in Europe has generally been to develop a highly effective infrastructure of sub-contractors, suppliers and casual labour. In other areas, where labour costs are lower, the pressure on managing resources may be less and some under-utilisation of resources, particularly people, may be acceptable.

Shiprepair yards typically have a low manager to workforce ratio. Because of this, the demands on their managers are high. Much management is conducted relatively informally with decisions taken locally to expedite the work processes, and the formal systems catching up later. Rapid decision making is essential, but can be at the expense of accurate information gathering.

IT in shiprepair

The role of IT in shiprepair is historically patchy. Isolated systems have long been used in specific functions. For example spreadsheets for estimates, planning software for Gantt charts, accounting software for finances. Often the systems are developed in an ad hoc way by individuals with some IT skills. While they are often effective in a limited area of operations, they do not assist data sharing.

However unlike in the ship building sector, integrated systems that cover all yard activities at all contract stages have not been widely adopted. Various types of IT system have been

attempted but with mixed results.

Accounting systems provide an accurate cost outcome, but are essentially designed for historical cost recording. They struggle to deal with ongoing changes to work scope or cancellations, and may not supply information quickly enough, or in a suitable format, to allow control of day-to-day operations.

ERP systems are designed for manufacturing operations. They are based around a pre-developed and optimised plan, involving routine, low variation work. Change is to be avoided if at all possible. Updates require considerable effort and systems may struggle to keep up with fast-moving contracts. There are large number of potential suppliers to shiprepair and low levels of materials, along with the varying workforce. The result for ERP systems is a large effort to input data with limited output.

Job shop systems are more closely aligned with the service nature of shiprepair. They seek to maximise efficiency of fixed resource, through re-scheduling of job sequences within resource constraints. This suits industry sectors with non-unique products and flexible completion dates (e.g. road vehicle maintenance where another vehicle can be substituted if an unexpected delay to repairs is encountered) but not shiprepair.

Bespoke systems offer another alternative. Developing a system from scratch allows a shiprepair yards' business processes to be perfectly accommodated. This also goes a long way to minimising the unavoidable cultural changes encountered when the system is introduced in the yard. However the costs of a ground-up development are large, and in the case of most small and medium sized repair yards, prohibitive.

A shiprepair MIS

The shiprepair industry requires its own type of MIS, a hybrid of the above systems. It will have the following features:-

Management of the client base

This is likely to be international even for a small repair yard. The system will track owners, agents, managers, and the vessels for repair. The data must be accessible and remotely updateable.

Information must reach the shipyard quickly.

Management of enquiries

The typical repair contract is relatively small. The success rate on enquiries is typically one in five. A large number of enquiries must be managed, and linked to the client database. Maintaining a history of enquiries and their results is invaluable for marketing.

Yard planning will look at all current contracts, and any enquiries which may be converted in the period covered by the shipyard planning horizon. The rapidly changing contract situation, and the possibility of a damaged ship requiring immediate attention contribute to the volatility of the planning situation.

Estimating

Estimates can use past data, supplier estimates, sub-contractor rates and standard tariffs. Easy access to past estimates and contract data is a valuable addition to the process. Estimates are easily modifiable and provide 'what-if' scenarios during tender negotiation.

Production planning

Once an estimate has been converted to a contract, the estimate data is converted into a work schedule, which is then kept up-to-date in real-time throughout the contract. This schedule may take the form of a work list and/or project plan. Emergent work must be easily recorded and incorporated in plans, with necessary knock-on effects such as cancellations etc.. Integration with planning tools is a must.

Labour costs

Man-hours are recorded promptly and their costs assigned to specific tasks. Rapid man-hour recording is the key to effective production control.

Progress monitoring

The work schedule is used as the base on which to track progress. Ongoing costs are recorded at a task-level. The state of a contract is assessed quickly, along with its potential profitability. Problem areas are identified quickly, with the system proactively alerting managers to

potential risks. The system automatically provides the status reports required by ship superintendents.

Purchasing

The system facilitates purchasing of items and services. It enhances communications between purchasers and production so that no purchases are delayed, nor costs 'lost' to invoicing. Estimated and final costs are made available as soon as they are known.

Invoicing

The system provides an accurate commercial position for the contract from day one. The completed work schedule, with hours and costs for all tasks ensure the development of an accurate and complete invoice. The outcome can be compared with the estimate and early agreement with the client can be managed more effectively.

Flexibility

The MIS supports different working practices where the type of contract or owner requirements mandate this. It allows for exceptional events to be recorded outside of normal procedures where necessary.

Affordability

The system can integrate with yards' existing IT investments, and can be cost-effectively customised to minimise process and cultural disruption when introduced.

Conclusions

The specific needs of the shiprepair business, especially the variability in work load, resource requirements and scope of repair, create a number of unique problems. An effective information management system is essential for the smooth running of a shipyard, and more particularly to ensure that:

- information is readily available to all who need it
- the information is up to date and reliable
- all costs are captured accurately

The availability of the required information, in time to be of value, will be a major step in improving the efficiency of a shiprepair company. ”