LARGE YACHT PROJECTS:

SOME TIPS FOR PROPER MANAGEMENT AND CO-ORDINATION

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LARGE YACHT PROJECT MANAGEMENT AND COORDINATION

In the production of a large yacht there are quite a large number of persons, companies, regulatory bodies, authorities and processes that have to be very carefully monitored and co-ordinated in order to produce the desired product by the owner.

In many cases, to make this process more complicated, these entities involved in the design and production have a direct say that can seriously affect the final product. Some examples are Classification Societies, Maritime Authorities, engineering requirements, etc.

From a shipyard point of view this process starts with a peculiar aspect of this industry that generally does not occur in other sectors. The yard receives a project in its initial stage and it has to be developed and completed. Someone starts the project and somebody else finishes it. This does not happen in the vast majority of industries where there is just one responsible for the entire duration of the project.

Since the very beginning, then, all things have to be very carefully tied up. Times, dates and precise definition and description of the information to be received from the architect's office have to be set.

The yard, in a large number of cases, has signed a contract with the owner that has a fixed delivery date and, most probably, with penalty clauses. Hence, establishing the precise number of drawings and also when will the lines plan, deck plan, GA, etc. will be received is important.

Not only that. The extent and content of that information has to be clearly defined. All drawings to be received should be mentioned with the extent of the information contained in them. It can be very frustrating to expect a complete structural definition of the boat with all details, and just received a couple of drawings with a general description of the structure, typical solutions with very few or no details. This last case is

not as rare as one could imagine. In a 40m+ sailing yacht with a metallic structure the yard can expect to receive from the architect's office –if clearly stated in the contract- a general description of the structure with a profile, plan and deck plan of the structural arrangement, all in an A0 drawing with the scantlings of the reinforcements and platings. Besides this some typical sections and bulkheads – may be 20 out of 80 – and some details of rudder and keel. These five to ten drawings end up

being transformed into more than 500 full detailed structural drawings that will enable a proper construction of the boat in the shop floor. If such things are not foreseen the project will not sail smoothly.

The specification

Besides the initial drawings from the architect's office, a key document in all this process is the specification. This contractual text establishes everything that will go on board, qualities, sizes, materials, everything. If it has been properly written, together with the corresponding drawings, absolutely everything will be precisely defined. A good spec will ensure a construction without ambiguities, with all items defined, will avoid problems with the yard and most important this will allow the yard several important functions.

The first and crucial use of the specification is to produce an accurate pricing of the boat. Whatever has not been included in the specification will not be included in the quotation. To put it in other words, if something is not in the specification it does not exist. A good specification will also allow a proper construction of the boat with the desired standards and elements. This document will permit a correct planing of the construction. Having defined all the points of the boat allows the yard to make a good timing of the necessary engineering time and construction times that will not be affected in the future by unexpected or unforeseen additions and delays.

It is then in everybody's interest to have a good specification written. The owner will get what he has asked for and in the time and price expected. The yard will be able to run a smooth construction with everything perfectly planned. A poor or ambiguous specification, on the other hand, can have disastrous effects for all parties. Headaches, fights, claims, delays and losses for everybody.

Communication and keeping track of things

In most cases it is the yard that following the specification designs and develops all the systems for the boat. At this point the number of persons involved with the project starts to grow. Depending on the size of the yard's design office and the work load everything will be, either

developed in house, or if the resources are not enough or the complexity of the system requires external assistance, some parts or isolated items will be subcontracted to external engineering offices.

It is very important to clearly establish communication channels with the other parties and to assign to each of the team members the necessary management functions.

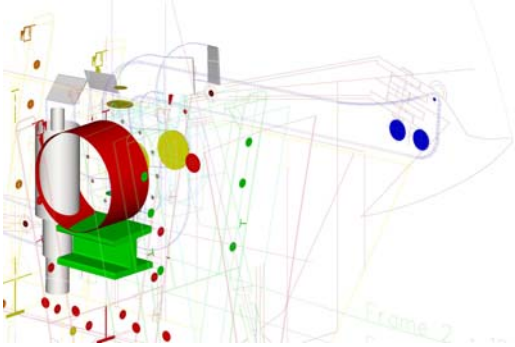
The amount of information that starts to flow in all directions can be overwhelming and if all these channels are not defined in a correct manner, things might be overlooked or even done twice. There are in the market several software packages designed to simplify and order all this information, many even integrating the entire process from the very first telephone call to the last invoice including in between all the documentation, purchases, production, payments, invoices, stocks, etc. If this is not available a good set of spreadsheets can help a great deal.

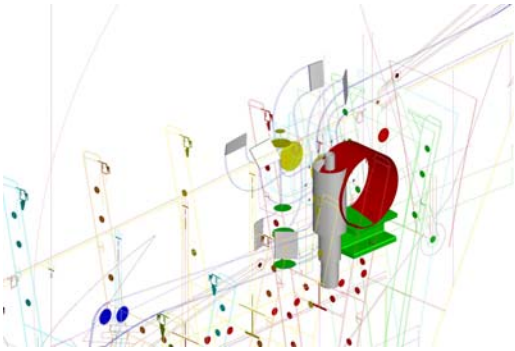
Depending on the experience of the team and necessities the number of necessary spreadsheets will vary, but some examples are:

- Drawings and reviews
- Schedules
- Invoices
- Change orders
- Classification Society
- Regulatory authority
- Subcontractors
- Engineering analysis and reports
- Inspection deficiency reports
- Owner furnished information
- Owner furnished equipment
- Weight and stability reports
- Etc.

Each of these sheets will keep track of all modifications, changes and actual status of the construction of the boat allowing all team members to be informed and up to date of all incidences as well as being able to trace anything if needed.

1-Design





Planning means, foreseeing problems, testing and double checking

2-Test with a model

And 3 - double check with the real thing

During the detailed engineering stage, the design office has to be in very close contact with the purchase department, suppliers and keep all channels open with engineering subcontractors. Even if a system is well designed and engineered with the correct pipe sizes, thickness, pressure, etc. if, for instance, when the element arrives to the yard the threads do not match this can mean serious problems, delays and always extra cost that could have been avoided.

Partial planning and schedules should be ready for most important items and updated regularly. Besides, a close monitoring on delivery dates of all subcontractors has to be made -spreadsheet-. This includes following the development of each of the systems, elements, etc. and most important, double checking and asking to each of the individuals

involved in the process with a degree of responsibility if they will deliver on time, even though it does not seem necessary. These reminders should be made periodically. If a subcontractor, the architect or the owner is due to deliver a drawing or item on a certain date, with sufficient time he should be reminded in writing. This can be irritating to some people, thus a good deal of diplomacy is needed when writing such letters or making the phone calls. This will allow, both to monitor the progress and detect early any possible delay as well as having written evidence that the following and monitoring of the schedule was carried out. This last part can be very helpful in the case of problems or litigation.

External requirements

To correctly plan the design stage of a superyacht, not only the specification has to be regarded. This document represents the wishes of the owner, but there are other inputs that can affect and even contradict those requirements. Basically there are three main sources that have to be inputted: National Authorities' requirements, Classification Society's rules and good yacht building practices. In some cases these can clash against each other.

Authorities

Maritime Authority's rules have to be implemented for obvious reasons. They are compulsory and if the standards are not met, the ship will not be allowed to sail. A thorough knowledge of these requirements and of the administration is a must in order to quantify correctly the time that will be involved in approvals, tests, inspections and visits of the maritime authority surveyor. It must also be bared in mind that some of the official visits or official tests can seriously affect the planing and the production. The local maritime surveyor most probably has a different working schedule than the yard and usually he will not come to the yard when the yard wants, but when he can. There is not much that can be

done about it. It is important to keep him happy. The maritime inspector should be notified in writing when he is requested at the yard way in advance, and he should also be reminded periodically of the dates. Otherwise he might have new compromises or urgent inspections and cause delays.

As an example, something as simple and apparently without effects in the production as a stability test can mean between one to two working days lost because of the maritime authority.

This test has to be carried out with the boat nearly completed, which means towards the end of the construction period. At this time the flexibility in the planing is close to zero and nearly all tasks are in the critical path. For this test the boat has to be emptied from all alien elements and of course no one can be on board except for the strictly necessary personnel to carry out the test. Hence if this depended exclusively on the yard the test would be carried out on a non working day, but this is not acceptable by the authorities (this probably varies between countries). Also it would be desirable to start very early in the morning to have the best meteorological conditions -calm wind and water- and to lose the least amount of working hours. Again this is in conflict with the timetable of the authorities. Summarising, if all these details are not known and foreseen, the boat will be delivered on a late date.

Classification

Classification societies are not a compulsory issue. As a matter of fact there are quite a number of superyachts sailing around the world without any class. Many people question nowadays the use and benefit of classing a ship. Nevertheless, for a large yacht, some owners might decide to class the vessel for some reasons like the added value for the boat and better resale price, or because some national authorities rely on the classification society for the supervision of most of the plan approval and construction processes.

If this is the case, there are a large number of points that have to be taken into account when planing and organising.

First of all, a good knowledge of the rules is desirable, as this will make easier to produce plans that will be easily approved and will also give arguments for discussion with the surveyors.

The plan approval can be a very long process. All construction and systems engineering drawings have to be submitted to the classification society for their approval. The lapse of time that goes from the time the drawings are handed to the society until they are returned to the yard can be superior to two months, and in some cases even more. Some societies are working with a reduced staff and depending on which approval department, they might be collapsed. There is very little that can be done to reduce this time but requesting the documentation on a regular basis, - or choosing quite carefully the society prior to signing the contract-. The drawings returned to the yard might have some comments and modifications that have to be resubmitted for further approval. This means even more time, and in cases this might mean a stop in the production.

The yard should keep a very good track of all approved material, especially with large classification companies. Some things might have been approved at the local office, some others at the central office in the local country, some others at the central headquarters, and some even in a third country. Even though one would expect a good co-ordination and a good internal organisation of the society, some times this is not so. It will be the work of the yard to prove to the local surveyor all the different approvals and even provide him with the approved documentation from his own company.

Besides this another big source of problems and delays from classification companies, not to mention the additional cost, is that all equipment and material has to be approved by that class society. One example, a ship-side valve from a good manufacturer, with a good QA

program -that might have been issued by the same class company- that can be found in stock and be in the yard in less than one week is not valid. The valve must have a certificate, the surveyor has to witness the foundry and the tests of the samples and give his go-ahead. In this case one week becomes easily eight weeks, if not more, and a huge extra cost. In many cases several times the price of the valve. This can even reach to real absurd situations where one can find equipment approved by a different classification society with the same requirements ore even some more restringing, but if the certificate is not from the original classification society, the equipment is not valid.

This applies to most of the equipment of the ship, from the main engine, to the hull material, valves, pipes, hatches, generators, pumps, etc.

These societies are mainly involved with ships, and even though they might have specific rules for yachts, the chances are that the surveyors around the superyacht project are not very familiar with yachts. This means that it will be very difficult to argue with them and make them understand many of the special features of this world.

For instance, a real case with a large sailing yacht classed by one of the main and most known societies. The owner wants to have in the main salon windows in the hull, way above DWL. These windows have been designed very conservative, are completely safe, watertight, fixed, without possibility of opening and with storm deadlights. This society allows in passenger ships to have windows below the water line for underwater sightseeing, but does not allow the windows in the hull because the particular rules applied to the yacht do not contemplate them. This means that a long and tiresome process has to be started to make the surveyor understand that a yacht is a very special ship, and that if the owner does not have his windows he will not build the yacht. It is even more difficult for the yard to tell that to the owner. Could he understand how, in the space age we are living, the windows are

unfeasible, if there are no technical problems at all that make them impossible? Of course not.

During the construction process the surveyors will visit the yard periodically checking that things are built according to the drawings. These surveys are at their own will, but care has to be taken to advise them with time enough for all the milestones they have to witness. These include materials tests, individual hydraulic or pneumatic piping tests, tank tests, etc. If the surveyor has been told, preferably in writing, with sufficient time of the test and he cannot make it, this should be no excuse for delays. In this case the yard is the customer and the Class. Society is providing a service for which is being paid, so they should make all arrangements to visit the yard when needed.

Unpredicted problems

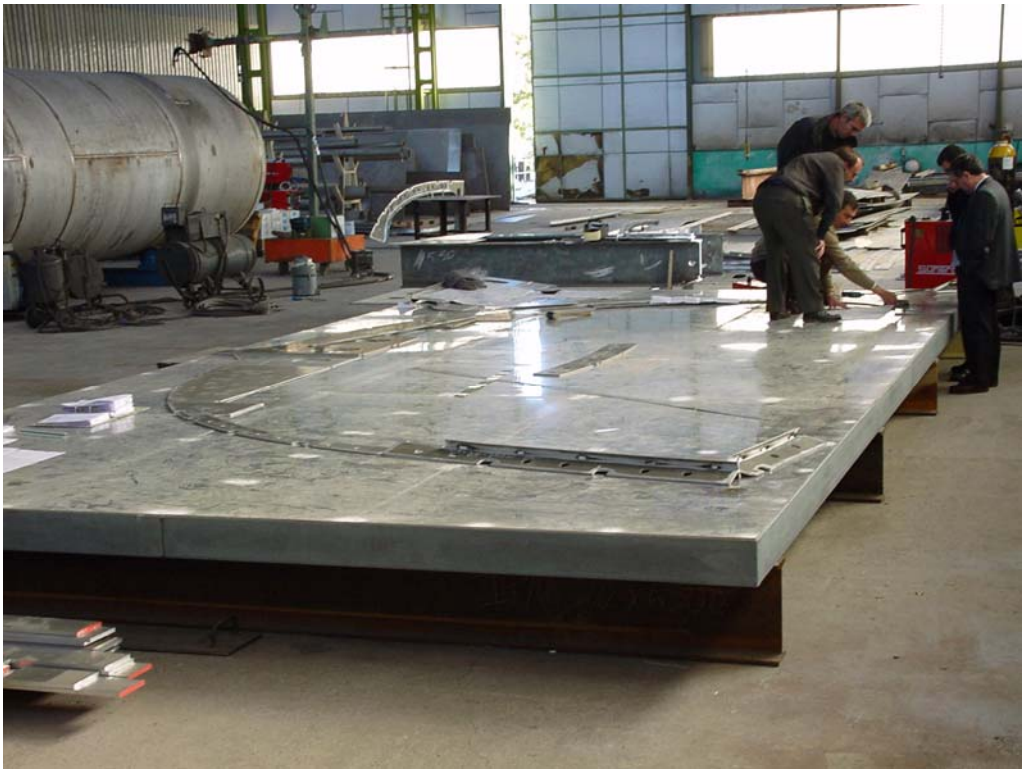
Once the plans have been approved by all interested parties -owner, yard, Class. Society and flag authorities- and the construction starts, besides planing the "expected" processes and times, sufficient "margin" should be left for all the unexpected situations that can happen, no matter how well the whole process might have been planned.

These problems can have many origins. The largest number will come from subcontractors and suppliers, no matter how close they are being controlled and monitored.

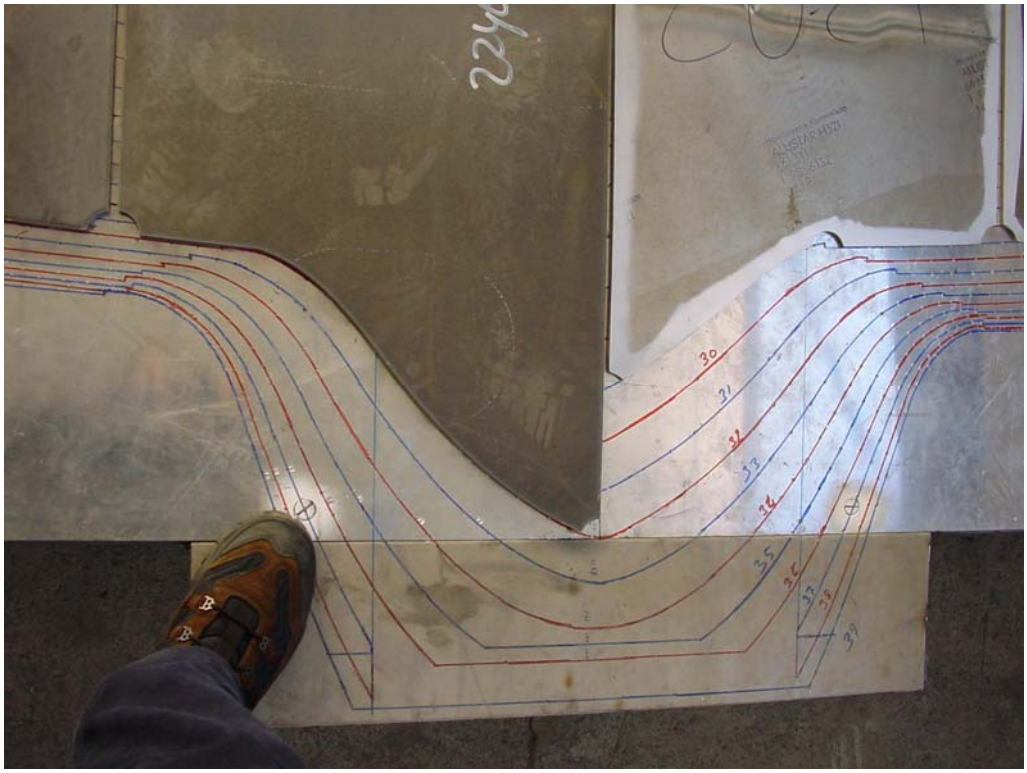
The subcontractors that work in great extent or almost exclusively for the yard most probably will not give "unexpected" problems. These will come mainly from subcontractors that have much larger contracts elsewhere. If there comes a time where one of their big contractors requires an extra effort from them, suddenly we might find out that our project has been suddenly delayed or even temporarily abandoned. This type of situations should be minimised or neutralised by contract, but this is not always possible.

Similar problems can happen with suppliers, and suddenly we can be left without a necessary piece of equipment or material.

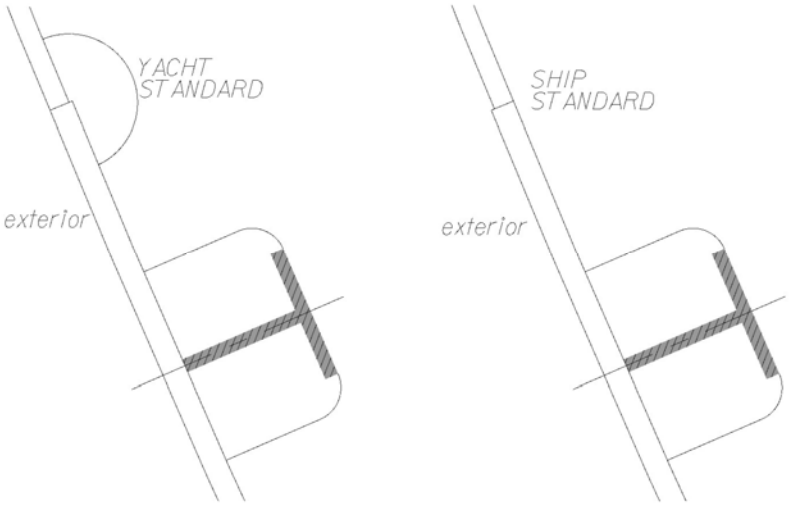
Another problem that occurs with suppliers is that they can deliver something different from what they were asked, even if all drawings and information were correct, unambiguous and delivered in due time.



That was the case with the first batch of CNC cut aluminium for a 144' sailing yacht. All drawings were delivered to the supplier with clearly marked lines for the frames, beams, etc with very clear marks of the shell and the recesses in the reinforcements for shell thickness. This is normal practice in yacht building. That way the outer face of hull and deck are completely flush, making easier the paint job afterwards. All differences in shell thickness are inside the hull, hence allowance for that has to be cut in the floors, frames and beams.



When the material was received at the yard and checked against a full plot of the hull lines it was found out that despite all the details of the drawings, the boat received was 8 mm larger than the original. This extra measurement being not in length, but in all the girths of the boat. What had happened is that the company in charge of preparing the files for the CNC machines and cutting the material works basically for the shipbuilding industry. There, the normal practice is just the opposite. To make the construction process faster and cheaper, the frames, floors and beams are cut flush and the differences in thickness of the shell are left outside the hull and can be seen. Hence in yacht construction the reference line from the lines plan is the outer side of the shell, whilst in shipbuilding it is the inner. This company did not pay attention to the drawings and worked in the same manner as they always did, with the subsequent problem for the yard. An 8mm difference might seem negligible in a 144' boat, but it can give serious problems when the construction advances due to misalignments, differences in heights, etc.



Not all sources of possible problems are external. Unexpected things can happen also inside the yard, no matter how well everything has been planned.

Another illustrative example occurred in a shipyard when turning around the hull of a yacht. The hull needed to be taken out of the shed for turning her around; hence this moment was decided to be profited for digging a well inside the shed. This well would be used for sailing yachts keel assembly and testing. This way the keel could be assembled and tested inside the shed prior to launching. It was thoroughly checked and double checked with the authorities and administration that no pipes, cables, etc. were laying underneath the ground in the position of the well. When the boat left the shed and the operation started, what initially had to be a 3x2m 4m deep well ended up being 12x4x6 meters because an old metal tank was right were the digging was taking place. This was not reflected in any of the drawings of the harbour authorities. This also meant that the amount of concrete that had been ordered and was available was clearly insufficient. The operation was extended in time, etc. Thanks to having planned it all with sufficient time and margin, the whole process ended in the expected timeframe. Otherwise this could have originated serious problems.

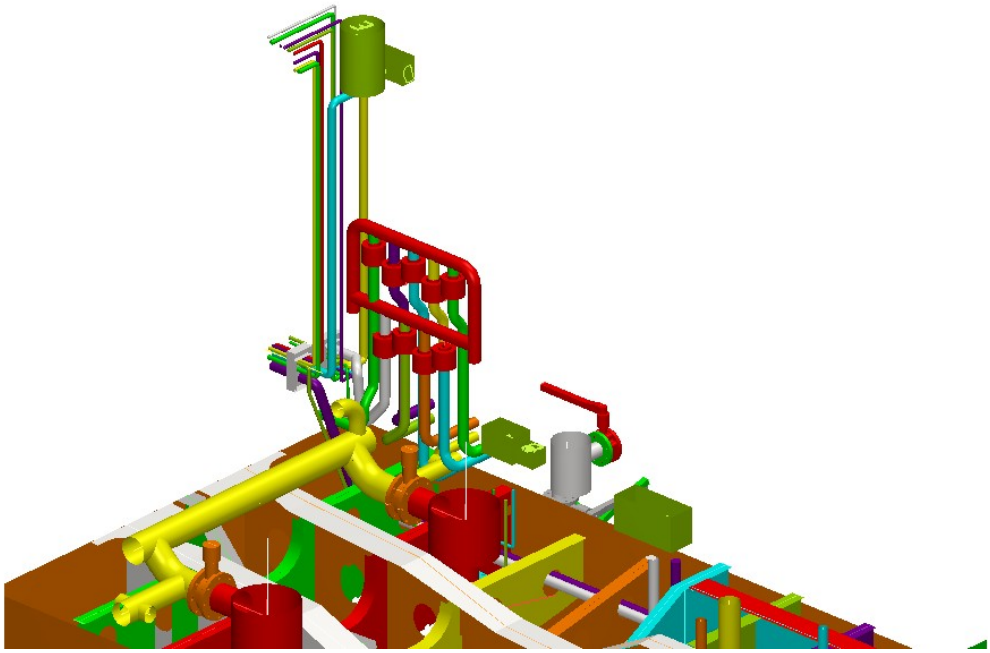

CAT
Barcos
Deportivos

Change orders

With these types of vessels there is always a very important point that can completely ruin the best of the plans. Change orders. These are very common, especially every time the owner visits the yard. He might realise that something does not please him or that he needs a larger galley, or that he wants to change all the completely finished teak furniture. These modifications can be minimised building real size mock-ups of the interior, the furniture, cockpit, etc. That way, prior to starting the construction of the real thing, the owner most probably has made the majority of the changes, and in further visits the modifications probably will be minor.

The owner will seldom make technical changes, and he will probably stick to the technical specifications without important modifications. To keep this part running smoothly it is mainly the yard's responsibility. An

extensive use of 3D modelling to solve all conflicts and problems prior to starting the production will save a lot of time and money afterwards.



Systems start up and tests

A point that needs big care when planing is the final stage of starting the systems and testing them. Depending on the complexity of the system, the start up process can take easily several days, if not more. Even with a good QA system in the yard with modern and complex boats the amount of variables in play is so large that it is very difficult, if not almost impossible, to have everything in perfect working order at the first shot. This is obviously, talking about complex systems, especially those with large amounts of electronic control.

An illustrative example could be a twin generator set with automatic synchronisation and electronic control. To start the generator sets of a boat which are electronically controlled and monitored, there will be many companies and people involved. First, the mechanics connecting all systems to the generators and in charge of the mechanical part. Then the electricians connecting the generator sets to the main switchboard and connecting the electronic control board to the gen. sets. A specialist from the generator set manufacturer will also be present, plus one from the electronic control of the generator sets, which is different from the gen. set manufacturer. Co-ordinating all the electric- electronic part, we will also have the electrical engineer responsible for the design of the ship's system. All these parts and people could come from more than three different countries and some use SI units, and others Imperial. With this cocktail it would be unrealistic to expect to switch on the engines and have everything working fine and smoothly. A realistic allowance has to be made.

Once all systems have been started and tested by the yard, there is a relatively large amount of official tests and trials that will take several days, even weeks. These official tests have to be witnessed by the maritime authorities and by the classification society. An example list of such tests follows:

Electrical:

- Insulation Resistance
- Generators. Full load test
- Test protective devices and alarms.
- Emergency lighting.

Control:

- Test alarms and shutdowns.

Pumping arrangements:

- Hydraulic tests.
- Running. Fire and bilge.

Closing arrangements:

- Hose testing.

Quay trials:

-Main Engine starting arrangements

- Remote controls for stopping machinery and shutting fuel supply.

Sea trials:

- Endurance trials. (2 hrs. @ full load).
- Manoeuvring trials.
- Steering gear trials. (port & stbd. @ full speed).
- Shaft vibration.

Windlass trials

Once all this is completed and the boat finally handed over to the owner, the work is not 100% finished. Last moment changes and modifications have to be implemented in the "as built" drawings and delivered to the yacht.

Also, it is of crucial importance to have in mind that what has been built and delivered is a prototype. Not another unit from a series production chain. It will take easily around one year to fine-tune such a yacht, so one can expect a call from the boat any moment.

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