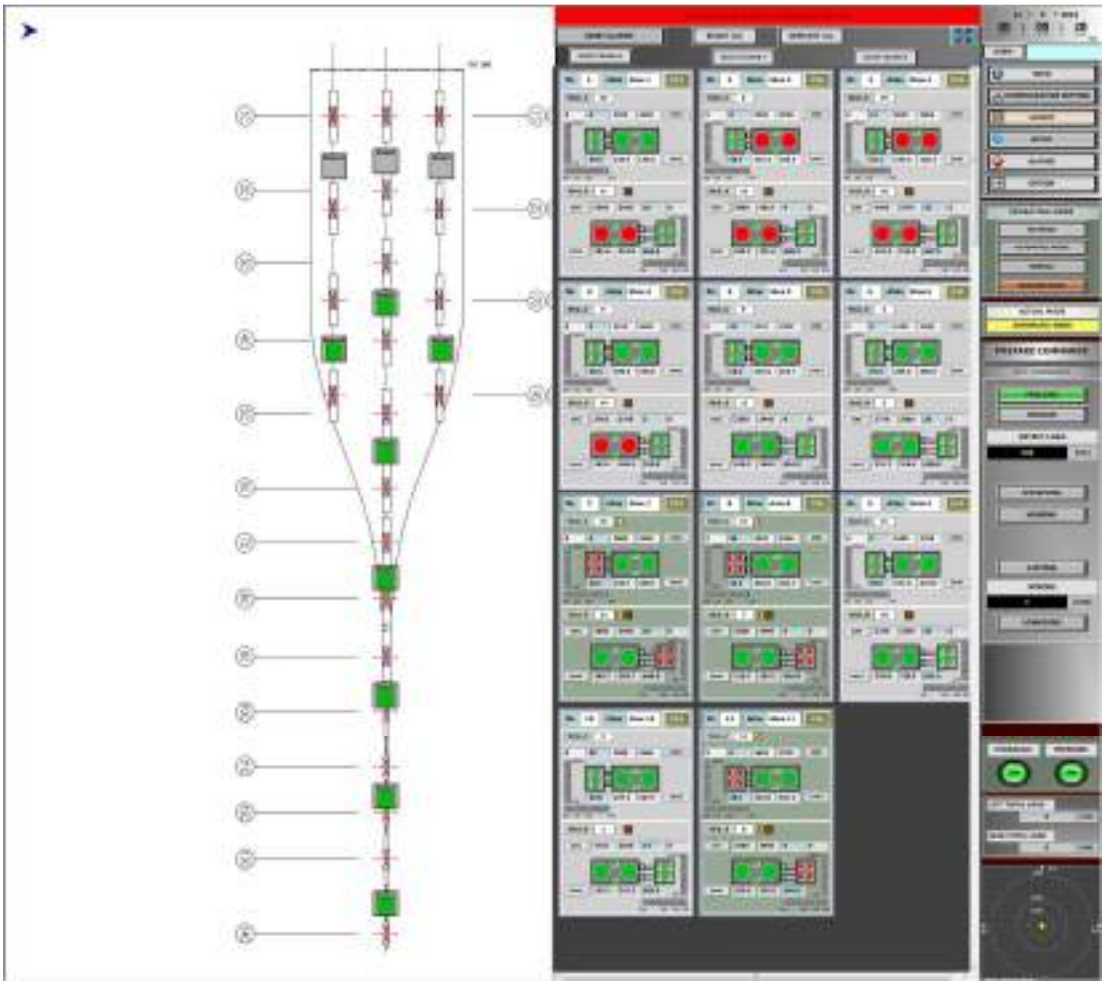
Gigantic Cruise Ships cut in half and Lengthened with the supervision of Movicon 11

For the first time ever two seafaring gigantics have undergone restyling to implement a new section. This record operation was supervised using Movicon 11.

The entire project, which cost 200 million euro, was designed engineered to upgrade and lengthen four of the MSC Lirica class cruise ship fleet by adding a 24 meter long mid-section. Work has nearly finished on lengthening the first two, Armonia and Sinfornia, of the four Msc cruise ships which are taking part in the Renaissance project. Just imagine a 'palace' that can host 2,200 passengers, measuring 54 meters in height, 251 meters in length and 28 meters in width weighing 60 thousand tons. The ships are being lengthened in order to add new facilities on board: additional cabins with balconies, more spacious public areas with new amusement areas, meeting points, bars, a great choice of restaurants and new clubs dedicated to the younger guests. There is also colourful outdoor water Spray Park, with fun sprays, waterfalls and water slides. This extraordinary engineering feat was achieved by cutting the ship in half. To ensure that this was done accurately the area was marked by a sandblasted line to cut along. The electrical system, consisting of fifteen thousand electric cables, was deactivated. Once sliced in half, the parts of the vessel were separated 30 meters apart by rollers to enable the insertion of the new midsection in between. The vessel was supported on its keel by twenty two skid-shoes,



1. A Movicon screen showing the ship's bow with skid-shoe positions

like rollerblades, driven by a hydraulic balancing system. By lifting a thousand tons each, the skid shoes were able to slide the 14 thousand ton cruise ship on its keel with little effort. Once this phase in the project was over, 80 axles were then used to move and position the additional mid-section between the separated ship's bow and stem. The ship's bow was then moved back with the skid-shoes and connected to the new mid-section. An operation which could only be accomplished by playing a step-by-step game with the 'shoes' worn by the ship. This permitted the mid-section to be slid and fitted perfectly between the bow and stem and welded. Pairing 700 linear meters to enable the perfect matching between the edges, internal structure and partitioning was a spectaculous performance achieved not only by technology but also the brains of the engineers involved in the project. A high technology lifting that enabled an extremely heavy cruise ship to be lifted and moved into place by using skid-shoes. This was evidently a very critical operation where any error and malfunction could absolutely not be tolerated.

Supervision project analysis

Eureka System controlled the synchronized operations to move and lift the cruise ship and control stablility while doing so.
This was a very complex task which required top engineering experts to work on the Msc. One which initially entailed a few problems to solve as Eurika System soon discovered while carrying out a project analysis:

- At System configurability level: each application has its own story to tell because each skid-shoe configuration had to be analysed and implemented according to the application type needed and the object to be lifted.
- A great number of animated objects had to be displayed: configured to the maximum, the system had to be capable of handling up to a hundred skid-shoes, each one being an independent machine composed of actuators, sensors, motors and cylinders represented by animated

objects. Therefore the amount of animated objects to be used was huge.

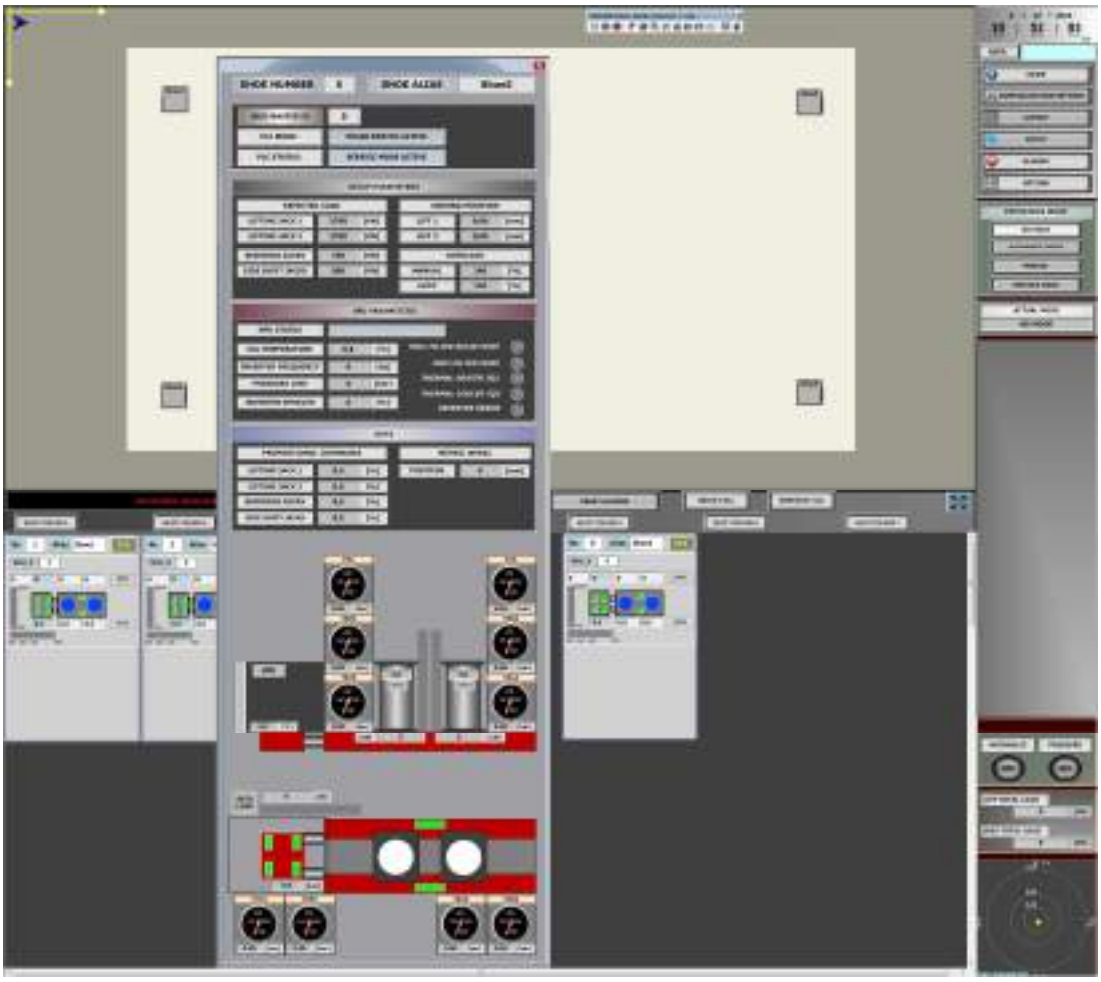
- Quick grasp of information: it was essential that information could be interpreted at a glance considering the criticality of the operations involved.
- Data storage: it was important that everything that occurred during each one of the operations was recorded (events, alarms, data process) and stored in a computed ship building operations file system. The number of these events was remarkably high due to the great quantity of sensors and actuators used.

System architecture

The resulting system architecture is composed of a Dual-Monitor workstation PC with the Movicon SCADA 11.4 version software and a Bosch XLC PLC. Each skid-shoe is equipped with its own PLC and Movicon 11 is the only supervision system installed which must communicate with the PLC of each individual skid-shoe. Therefore a maximum of 100 PLCs have to be handled using a Bosch driver created especially by Progea to cope with the excessive workloads. The new communication driver, that Progea developed, has proven to be ideal for such complex architecture.

The adopted solutions

To deal with all the problematics that emerged from the analysis, Eureka System developed a configuration Wizard that first starts with importing the CAD design in DWG format of the object to be transported, in this case the cruise ship. It then continues with entering a series of parameter inputs and concludes by creating a layout with skid-shoes which are dragged as objects from the Repository and dropped on the screen layout.
This is done in Run-Time by the operator instead of in development time in order to cope with problems which may occur while configuring the system at such a level. This also enables the operator to have full visual control of an enormous amount of devices in a vast widespread area in Real-time of. In order to reproduce such a large number of objects with at a glance information comprehension, Eureka System chose to represent the system with 3



2. Screen showing all the skid-shoe parmameters

different zoom levels and varying degrees of detail. For example, in the event of alarm occurrences, those skid-shoes at level 1 change to red in order to distinguish them from the rest. While at level 3 only the specific sensors change to red. Movicon's powerful graphics engine along with Visual Design has enabled the objects to be represented in great technical detail and eliminate any visualisation problems that were apparent at the beginning.
To solve the problem of storing data, Eureka System paid particular care in structuring the MS-SQL Database in combination with balancing out the events management between the PLC and HMI as demanded by their clients. This also satisfied the client's need for post operation analysis allowing them to perform a 'play back' of all the operations performed throughout the different processes.
Where the graphical effects are concerned, the graphics have been designed with great accuracy to enhance intuitivity. Major research was carried out to combine the aesthetics with functionality in the best way possible. As a result some process values are represented numerically and graphically. Furthermore, the need to go beyond the usual techniques, such as those used in Bar Graphs, Gauges and Trends, new types of graphical displays have been created by exploiting the flexibility and powerful graphics engine of Movicon 11 to the full.
The clients also needed a software that was reliable, easy-to-use with detailed graphics and data logging of all the operations that are extremely critical considering the size and weight of ship and the marine environment in which they are performed. This also meant having effective at-a-glance data comprehension along with the ability to perform speedy and in-depth diagnosis of problems if they should occur.

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