Digitization of a boat hull using photogrammetry

GIVING A NEW LEASE OF LIFE TO VINTAGE SAILING VESSELS

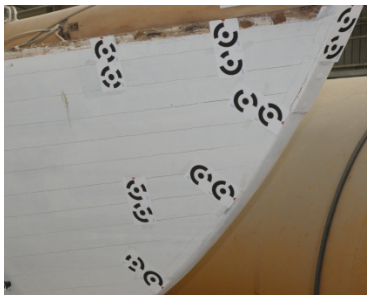
The engineering office of the CNS-Co Shipyard uses Rhinophoto and rebuilds a 3D model of a yacht hull in a record time

In order to enhance its already exceptional fleet of hire yachts, Escoffier, a well-known professional skipper in St. Malo and founder of Etoile Marine Croisières, decided to do a refit of a mythical and prestigious vintage sailing vessel that he owns. It's a 14m single-hulled sloop designed by Cornu (an illustrious French naval architect). The interior, the mast and the sails need to be completely renewed. Only the hull will be preserved though it will have to be repaired.

The Project Manager, Patrick Balta, who is a naval architect, needed precise information on the shape of the hull in order to make stability calculations which were necessary to design a new mast and new sails. He confided the digitization of the existing hull to the engineering office of CNS-Co Shipyard based in Port Saint Louis (13). The company is specialized in boat design, construction and repairs and their engineering office uses hi-tech material and software allowing them to model boats in their finest details with the required precision for repairs, manufacture and rebuilding.

Measuring the hull is the first step in the repair process; a job which is generally tedious and not very precise. However, CNS-Co have been using the Rhinophoto application since the release of the very first version in 2009 and this software has allowed them to carry out the measurement process quickly, easily and precisely.
Rhinophoto, developed by QUALUP, is an automatic photogrammetry system which allows 3D objects to be accurately digitized from a set of photos. The application is a plug-in for Rhinoceros CAD which is perfectly adapted to the naval construction industry. Within the scope of this project, the aim was to obtain a precise model of the hull geometry which could be read into a computer in order to reconstruct an exact 3D copy of the real hull.

"Laser technology also allows us to digitize a complete boat or particular parts of the boat, but it's a costly procedure and the resulting data processing can be extremely complex. The problem is that we end up with an enormous mesh which is often difficult to exploit because of the sheer quantity of data that we recover with this type of system. With Rhinophoto, only the points of the object that we are really interested in need to be digitized and this allows us to work very rapidly with a much smaller volume of data which give us full control over the whole operation", explains Christian Moulin, the Manager of CNS-Co.



The first step consists in positioning a certain number of coded targets with adhesive tape at strategic positions on the hull; the deck line, the waterline and the bow. Others are positioned to indicate the form of the hull, but in any case, there's no need to place too many on the hull because Rhino reconstructs the surfaces based on definition points by 3D interpolation.

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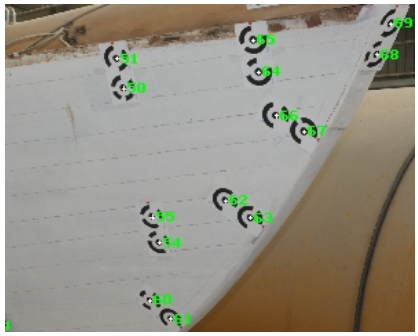
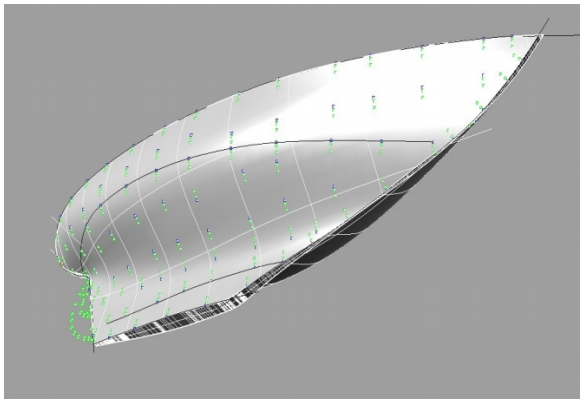


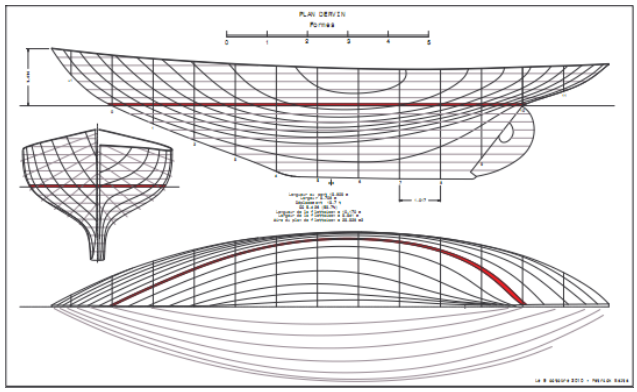
Each target is coded and corresponds to a specific number in the form of a circular barcode that Rhinophoto reads automatically from the photos.
Once the series of photos has been taken, Rhinophoto precisely calculates the position of each target. The system then creates the 3D points which represent the exact 3D image of the targets placed on the hull. The scale is determined by adding reference bars which define the real size (the size can also be determined by making a specific measurement). After adjustment and scaling, the engineering office then creates the surfaces which pass through the defined points which permit reconstruction of the hull.

"The real interest of this technology is that it leaves the architect or the engineer the choice of which 3D points will be processed because as the surface of a hull is normally curved and smooth there's no need digitize the smaller clapboard imperfections as would be the case with a laser digitizer" explains Christian Moulin.



Surface reconstruction has been performed which results in a nice 'clean' hull and a 3D object which can be used for stability calculations to determine the center of the hull, etc. With a few supplementary surfaces CNS-Co will dispose of a 3D model of the boat from which the architect will be able generate a lines drawing.

Christian Moulin concludes, "*It took two people a little over an hour to position all the targets on the hull then another 15 minutes to take the photos and, finally, 5 minutes to run the calculations. Thanks to Rhinophoto we can accurately digitize boat hulls and interiors. It's a great tool, I decide myself the points that I want to digitize and I get a reliable but 'light' result. The system really is incredibly powerful and so easy to use though it costs less than 5000 €...including everything!"*



http://www.cnsco.fr/

www.balta.fr

www.etoile-marine.com

For further information:
Watch the hull digitization video at: http://www.rhinophoto3d.com/see-it-in-action.html