High-tech conservation solutions for old warship

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A workman inside the Mary Rose. (Image courtesy of the Mary Rose Trust)

Scientists from the Mary Rose Trust are using cutting edge synchrotron technology at Diamond Light Source to provide 21st century solutions to enhance the conservation of Henry VIII's Tudor warship. This work is part of an ongoing research programme to safeguard this unique historical artefact for posterity, and thanks to a grant from the Heritage Lottery Fund, the hull of the Mary Rose will be displayed in a controlled environment within a brand new museum which is due to be built in time for the Olympic Games in 2012.

Scientists from the Diamond synchrotron are working with the Mary Rose Trust and researchers from the National Museum of Scotland, Daresbury Laboratory (STFC) and the University of Kent. The team are

using Diamond's intense X-rays to enhance their knowledge of the conservation process to preserve the historic timbers of the ship.

The Mary Rose capsized in the waters of the Solent in 1545. The ship settled on the soft silts of the old Solent rivers which washed into her, eventually filling almost half the hull with a protective anaerobic covering. The resultant lack of oxygen preserved the timbers of the starboard side, whilst the exposed port side and masts slowly rotted away. Over 400 years later, on 11 October 1982, archaeologists raised her remains from the seabed.

Initially the ship was sprayed with chilled, fresh water to rinse out salts and acids and since 1994, she has been continually sprayed with polyethylene glycol (a water soluble wax) - a standard treatment which stabilises the wood structure and prevents shrinkage during drying. This conservation process has been effective in stabilising the timbers and removing almost all of the salts and acids which may harm the structure of the wood if left untreated.

Now that the Diamond synchrotron is online, Mary Rose scientists are taking advantage of its advanced technology to assure the ship's long term stability. Particular interest lies in those areas of the vessel where iron was present - specifically in timbers surrounding the location of bolts, or where other iron artefacts such as the cannon had been in contact with the wood and in which iron sulfide compounds have been found.

The research team are investigating the structure of the ship's timber in microscopic detail using one of Diamond's research stations (I18), known as a microfocus spectroscopy beamline. Mirrors focus the x-ray beam down to about 1/80th of the width of a human hair, allowing the sample to be probed in very fine detail. Previous analysis of samples taken from this historic ship have been carried out at the Daresbury SRS,

the European light source (ESRF) in Grenoble and now with data from the Diamond synchrotron, the team will be able to investigate how sulfur and iron compounds are distributed in the individual wood cells, so completing the scientists understanding of the complex interactions between the iron, sulfur and wood cell walls.

Dr Mark Jones from the Mary Rose Trust says:
"This has been a fascinating journey for us and now thanks to research at Diamond Light Source and the help of our collaborators, we have great confidence of the safe preservation of the Mary Rose and other historic ships for the continued enjoyment of future generations."

Diamond Scientist, Dr Fred Mosselmans says:
"Our beamline has the potential to address a wide variety of conservation issues – not just the preservation of wood, but also bone, metal and stone artefacts. We are very excited about the opportunities for Diamond in the area of cultural heritage and look forward to introducing new users to synchrotron techniques in the future. "

Source: Diamond Light Source