QUINTA DO ROUXINOL (SEIXAL, PORTUGAL): SURVEYING, RECONSTRUCTING, 3D MODELLING AND DIGITALLY REPRESENTING A ROMAN ERA POTTERY KILN

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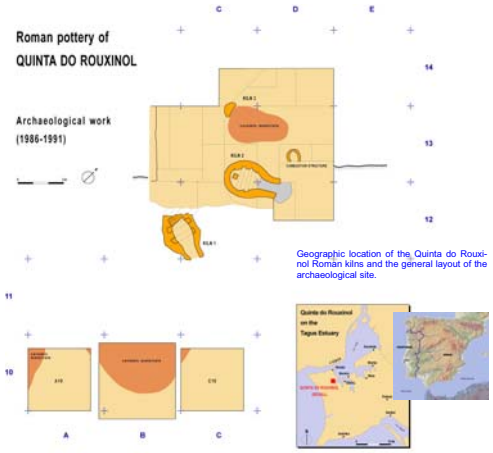
1. Introduction

Within the context of the programming for the "Quinta do Rouxinol: Roman kilns on the Tagus estuary" exhibition, ongoing at the National Museum of Archaeology (Lisbon) from March to November 2009 (see http://www.mnarqueologia-ipmuseus.pt/?a=2&x=3), the Seixal Municipal Ecomuseum carried out a digital survey of one of the kilns used for firing amphoras and domestic pieces between the 3rd and 5th centuries AD.

In parallel, the archaeological research program focused not only on the architecture and workings of this type of combustion structures of the Roman period but also on the anthropological and ethnographic dimensions through comparison with archival material on traditional Portuguese pottery along with potters deploying artisan production techniques.

The process enabled a proposal to be put forward for a volumetric reconstruction of the oven and its respective means of operation based on the oven chamber partially preserved on the site. This record and later digital modelling provided the grounds for the integration of a replica oven into the exhibition's scope built on a 1:1 scale and with the oven partially filled with replica amphoras and other ceramic types produced locally so as to recreate the way the kiln operated. The modelling furthermore resulted in a 3D digital representation, which explains the architectonic characteristics of the kiln and its working methods to a wide range of publics.

2. Context and archeological site presentation



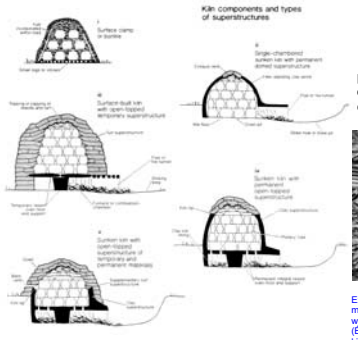
Geographic location of the Quinta do Rouxinol Roman kilns and the general layout of the archaeological site.

Of the second Quinta do Rouxinol kiln only a section of the combustion chamber remains "in situ" along with its respective access corridor.

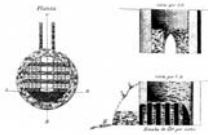
Between the 3rd and 5th centuries AD, the Quinta do Rouxinol Roman kilns were producing a varied range of domestic ceramics, construction materials, lamps and especially amphoras for the transport of fish products and, probably, wine.

3. Archeological and Etnographical Research

► In order to carry out the full reconstruction of the kiln a wide ranging research was made of Portuguese and international archaeological sources.



Architectural details of Roman period kilns discovered on the British isles as presented by the archaeologist Vivien G. Swan (1984).



The S. Bartolomeu de Castro Marim Kiln (Algarve, Portugal) in accordance with the records of the Portuguese archaeologist José Leite de Vasconcelos (1898).

► Other important sources included footage on traditional potters from the RTP Portuguese state television archives and other institutions in conjunction with field research and the collection of oral testimony from potters using such techniques.

Excerpts from the 1973 documentary on the traditional pottery works of Viana do Alentejo (Évora, Portugal), depicting a kiln of a type and operation similar to those proposed for the Quinta do Rouxinol Roman kiln.

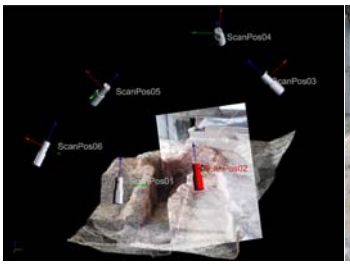
The potter Paulo Franco (Sobreiro, Mafra, Lisbon) in 2009 shaping replicas of the amphoras and domestic pieces found on the Quinta do Rouxinol Roman kiln site.

4. A reconstructed kiln in exhibition

▲ The kiln constructed and integrated into the Quinta do Rouxinol Roman kiln exhibition (National Museum of Archaeology, Lisbon, Mar.-Nov. 2009). ►

5. Laser Scanning and Digital Photographic Survey

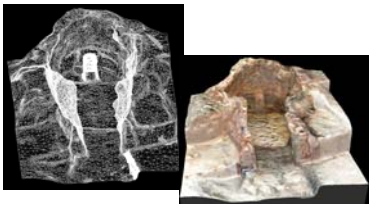
The survey and modelling of the kiln was carried out by Artescan – Tridimensional Digitization, using a combined terrestrial imaging system integrating laser scanning and digital photogrammetry.



With this technology large quantities of precise tridimensional and semantic information were able to be collected from six different acquisition positions (*scanpositions*), in few hours and without any contact whatsoever with the surveyed object. From each *scanposition*, oriented photographs with a full 360º coverage were taken and a point cloud of more than 1000000 points with a homogeneous sub-centimetric precision, and representing a density of one point per centimetre on the object, was acquired.

6. Orthoimagery production and 3D Modelling

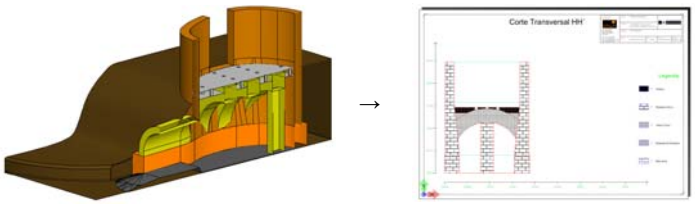
After on site analysis and verification of the collected digital data, all the information was collated for processing. Using CAD tools, 3D modelling techniques and digital image processing it proved possible to virtually reconstruct two photo-realistic 3D models. The first model is faithful to the preserved combustion chamber and therefore provides a 3D geometrically accurate record. The images acquired were projected onto the digital surface model (meshes) thus creating a realistic effect. Orthogonally projecting these textured meshes onto pre-defined planes generated the orthoimages.



► Geometrically accurate triangulated model generated from the survey of the remaining kiln structures. Wireframe model (left) and the textured model (right).

► Orthoimage from a longitudinal CAD profile onto wich the correctly scaled details can be drawn.

The second 3D model is a digital reconstruction of a Roman kiln. The restitution proposal was based on the data collected from the remaining structures and on archeological research.



► From the virtually reconstructed 3D model some conventional 2D drawings were generated to support the physical reconstruction.

7. Interactive 3D Visualization, Virtual Reality and Animation

For supporting interactive 3D visualization, 3DPDF models were generated and hence the user can interact with and explore the object . ►

Virtual animation was then produced, highlighting the several constructive components and the different stages in firing the pottery. ▼