



## **Integrated methodologies for the 3d survey and the structural monitoring of industrial archaeology: the case of the Casalecchio di Reno Dyke, Italy**

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The concept of “Industrial Archaeology” was introduced in the 1950s in England in order to consider the branch of Archaeology that, in integration with engineering, architecture and economics, studies the industrial past, with the purpose of document, protect and exploit the industrial-cultural heritage.

The systematic study of this kind of structures and artefacts need a wide range approach, that starts from the investigation about the object historic forms until its complete qualitative and quantitative description, also considering the characteristics of the surrounding territory.

This task often needs the integration of different survey techniques for data capturing and processing, in order to perform the 3D modeling and to analyze the structural deformations of manufactured articles.

The paper presents the surveying and monitoring activities on the important structure of the Casalecchio di Reno dyke, near Bologna.

The first historic notes on the dyke are very old; they are dated back to the I millennium A. D. and report the news of a wooden barrage of the Reno canal. The construction of the actual structure is in the period 1360-1367 and suffered during the centuries numerous interventions and restores.

The surveying activities on the dyke were realized in 2005-2006 and 2009 and involved different techniques (classical topography, high precision geometric levelling, range-based method by terrestrial laser scanning, digital photogrammetry, thermal imagery) integrated together in a unique local reference system, in order to study the stability and the movements of the structure in a established period of time and to realize a 3D model. Together with detail surveys on the single parts of the structure, an analysis at a larger territorial scale was performed by aerial photogrammetry, either using current imagery and historical data.

The topographic measurements with traditional differential techniques have achieved a very high level precision and the realized three dimensional mesh on the dyke surface has permitted the establishment of a unique local reference system also used for all the other surveys; the 3D model from terrestrial laser scanning permits the comparison between the object current shape and some geometric information, as for example the slope, derived from historic drawings.

The overall activity has been performed in the framework of an important consolidation and restoration work carried out after severe problems suffered by the structure after the 2008-2009 winter season.