

## **La salvaguardia degli affreschi del Camposanto Monumentale di Pisa da eventi di condensa: l'utilizzo dei teli scaldanti.**

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The Monumental Cemetery of Pisa is a semi-confined monument known to be affected by problems of condensation with significant consequences on the painted surface that constituted its original decoration. The frescoes were detached from the wall and, after various restoration phases, were transported on new supports and relocated on the wall. In order to ensure their good conservation and eliminate condensation damages, the Opera della Primaziale Pisana (OPA) has started a study and analysis work involving different subjects and Research Centers. With reference to the specific problem, the scientific contribution of ISAC-CNR of Bologna was fundamental and provided the OPA with detailed reports on the intense campaign of analysis and microclimatic and environmental measurements carried out inside the monument. This proposed case study concerns the continuous monitoring inside the Camposanto and measures undertaken to prevent condensation damages. Sensors placed in various areas of the building enable data to be gathered using a Data-Logger with GSM modem. The data, transmitted remotely every ten minutes on a database, lead to the elaboration of graphs that detect the formation of condensation. Thanks to this system of monitoring, the Technical Commission has developed an "anti-condensation" device which is able to avoid any damage and also to protect against the deposition of fine aerosol. In particular, we are talking about a frame structure heating cloth produced from carbon fiber in the warp and from polyester yarn in the weft which, applied on the back of the fresco support, brings the surface temperature to a degree higher than that of environment. After positive results of a first experimental phase, this system was put into practice in April 2014 when a fresco attributed to Buffalmacco was relocated on the wall. The positive results of the researches carried out and the devices created can be considered to be an iterable model of good practice.

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