Preservation and usage: the Altar Machine in the Church Mother of Gangi (Palermo, Italy) and its microclimate

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Abstract

The aim of this work has been to study the correlation between delicate poli material artefacts, like painted wooden sculptures, and their microclimate. In particular the Altar Machine in the Church Mother of Gangi, a little town near Palermo (Italy), has been investigated. The Machine is constituted by carved and painted wood and a complex system of winch and pulleys allows to move various statues and parts of the Machine in accordance with the baroque scenographic machineries. The microclimate of the Machine has been investigated in order to verify if the thermoigrometric values fall within the tolerance intervals that, for wood and painted wooden sculptures, has been set between 19 and 24 °C (temperature) and between 45 and 60 % (relative humidity, RH%)[1]. Analyses for the identification of wood species and for the study of the painting materials have been also carried out. All images and data are at disposal on the web site www.dendrocronologia.org.

Introduction

The first nucleus of the Church Mother in Gangi (Palermo, Italy) was built in the 14th century by Francesco I, Count of Ventimiglia. The Altar Machine, object of this paper, dates back to the second half of the 18th century and it has been attributed to the sculptor Fabio Pane. The Machine is a complex artefact made of carved and painted wood. Moreover during some periods in the year various statues and parts of the Machine are moved by means of a complex system of winch and pulleys in accordance with the baroque scenographic machineries.

The aim of this work has been to study the correlations between the artefact and its microclimate in order to evaluate the state of preservation. The Italian Standard UNI 10829 [1] underlines the need of a long-term monitoring and of a statistical treatment of the data. The Machine is a particularly delicate system made of several materials: wood, pigments, binders, gilding, so the study and characterization of the constitutive materials has been also required.

A reference for museum environments can be considered the so called tolerance intervals [1]. For wood and painted wooden sculptures this area has been set between 19 and 24 °C as regards temperature and between 45 and 60% as regards relative humidity (RH%). Daily temperature and moisture cycles cause mechanical stress in wooden artefacts [2-3] that can affect also the painted layers. Moreover, under specific conditions, they also make wood susceptible to biotic degradation.

Therefore a microclimate campaign has been useful to evaluate if the thermoigrometric parameters of the Machine environment were included within the tolerance range.

Materials & Methods

Temperature (T) and relative humidity (RH) values have been recorded through a digital data logger Testo 177-H1 model. The data logger has been calibrated and hanged on the northern wall of presbytery. Data have been recorded every two hours from 26 of July to 8 of September and then elaborated by Excel software to obtain mean, standard deviation, frequencies and other values. Wood humidity (U_L) has been determined according to the hygrometric equilibrium method [3].

Identification of wood species has been carried out according UNI 11118 standard [4]. Samples from the painted layers have been analyzed through polarizing microscope Zeiss Axioskop equipped with a Zeiss AxioCam and by FTIR (Fourier Transform Infrared) spectroscopy using a Nicolet Avatar 360 instrument operating in diffuse reflectance modality.

Results

The results of wood analysis are summarized in Table 1.

Code	Localization	Botanical species
LA 1	Altar decoration	*Populus* ssp.
LA 2	Pulley	*Quercus* ssp
LA 3	Framework	*Castanea sativa* Mill.
LA 4	Beam	*Juglans regia* L.
LA 5	Tilting table	*Pinus* ssp.
LA 6	Tabernacle	*Picea abies* Karst

Table 1: Botanical species found in the Altar Machine.

Stratigraphic and chemical analysis revealed the presence of many superimposed layers constituted by several different materials (protein binders, siccative oils, natural terpenic resins, shellac, calcium carbonate, gypsum, zinc white, iron oxides). For these kinds of artefacts is usual to find many superimposed painted layers due to a continuous usage of the object that has got a demo ethno anthropological significance.

The microclimate campaign has been carried out during the most critical period for the artefact. In fact summer sultriness is particularly high during August. Moreover in August the Machine is moved on the occasion of religious festivities and many people crowd into the church influencing the microclimate.

Considering the little space at disposal only the tolerance matrix may be reported (fig. 1) [5]. This diagram is particularly useful for the microclimate studies. P_i represents the Performance Index that is the set of T and RH data falling within the tolerance range. F_i is the failure index, that is the percentage of T and RH values falling outside the tolerance range. In general it is possible to assess that most of the data fall outside the tolerance area and only 5,30% is within the range. It is interesting to note that most of the data (65,7%) fall within the area where RH values are acceptable whereas T values are too high.

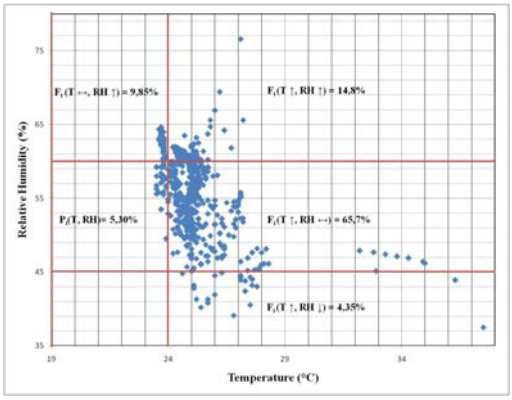

Fig. 1: T and RH performance and failure index in the tolerance matrix [5].

High values of temperature can favour the microbiological attack (fungi and xylophagous insects). Moreover, graphs of T and RH as function of time (data not show) showed that T values were in general high (out of the tolerance range) but they appeared quite constant; on the other hand RH values fell almost always inside the tolerance area but they often exhibited dangerous variations.

Conclusions

In conclusion we can underline the following results:

1 – the microclimate of the Altar Machine exhibit peculiar characteristics, dangerous for the artefact;

2 – the work methodology has been useful to discriminate in exhaustive way the trend of the thermoigrometric parameters;

3 – the experimental data have to be increased with other measurements to be done during the winter and the other Seasons in order to suggest measures, if possible passive, to correct the risk condition of the artefact.

References

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