

PLAYING HISTORICAL CLARINETS: QUANTIFYING THE RISK

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Context

It has been stated that the conservation and use of historic woodwind instruments is problematic because they are in very different states of preservation, and they are made from a wide variety of materials. Furthermore, their method of playing incurs rapid changes of temperature and relative humidity, the results of which can be catastrophic. This unpredictable behaviour makes clear guidelines for using early woodwinds impossible to establish (Barclay 1997). This level of uncertainty in the development of damages has led to the widespread assumption that woodwind instruments in public collections should not generally be played under any circumstance. On the other hand instruments in private collections have been extensively used by musicians without evident damages being noted, and many of the damages that are found on historical instruments are not apparently related to playing. The paper presents research in progress which at this stage has concentrated on clarinets.

Survey of Damages and Measurement of Moisture Gradients

A survey of the damages that can be found in historic clarinets in UK museum collections has been conducted. The damages have been classified in the attempt to identify their potential cause. This has included split ferrels (metal and ivory), cracks in the wood associated with the key fastenings, cracks in the different sections of the bore. Specifically, identifying cracks in the barrel and the bell which appear to relate to differential moisture or temperature gradients between the outside and the inside of the clarinet when played.

A database has been setup to collate documentation, images and information gathered during the project (eventually to be online). Within the UK the following collections have been considered: Museum of Music (RCM), the Musical Instrument Museum (Edinburgh University), The Bate Collection and The Horniman. Other collections in

Europe and the USA will be contacted and potentially involved in the project, particularly: Cite de la Musique (Paris), Germanisches Nationalmuseum (Nuremberg), Staatliches Institut für Musikforschung Preussischer Kulturbesitz (Berlin) and the Metropolitan Museum of Art (New York). The UK collections are being investigated first. ICOM-CIM CIM (International Committee for Museums and Collections of Musical Instruments) will be a platform from which to communicate and discover the relevant international collections as further research develops. The focus initially has been on the Sir Nicholas Shackleton collection at the University of Edinburgh, an extensive collection of over 900 clarinets and sections of clarinet ranging in date from 1750 to 2003 (Myers, 2007).

Although there are many publications on the acoustics of clarinets only one paper exists, to the authors' knowledge, which includes experimental work measuring breath moisture in woodwind (Stein 2004).

The research presented in this has measured the temperature and moisture gradient, and the rate of moisture uptake specifically imposed on clarinets when played: it takes into account different materials used in their construction and different configurations of the parts for both wooden modern and period instruments. In particular, clarinets made from boxwood and/or mixed wood as the moisture uptake is high and more differential expansion is expected. Preliminary testing was performed with a Noblet N 25 year old Grendilla wooden clarinet. This instrument has been regularly played and was used to gain an understanding of the rate of change in RH before subjecting historical instruments to moisture gradients. Figure 1 shows that a single blow in the lower register will lead to the RH at the bell end of the instrument going from 38%RH to 65%RH in seconds. This is also pitch dependent suggesting that it relates to increased air flow and hole coverage. The bell of the clarinet is of particular interest because it is turned from one block of wood crossing over the growth rings which may account for the splits following the grain. There also appears to be a

difference of opinion as to how much splits in the bell affect the quality of the sound. Values of 95%RH are measured inside the barrel after a single breath. The wetted reed inserted into the mouth piece results in an increase in RH of at least 20-30%RH.

The testing on “model” and historic clarinets has included accurate measurement of the relative humidity inside and outside the bore at different points. The sensor used for measuring the ambient relative humidity and temperature is s EL-USB -2-LCD+ and measurement of RH and temperature inside the bore is a low profile temperature and humidity iCelcius 20 probe which sits inside the clarinet without restricting airflow when played. Airflow measurements inside the bore were also made with a hotwire anemometer. Measurement of the change in internal bore diameter was made with a telescopic bore gauge and Micro-Mag internal measuring micrometer. Using published data on the moisture response of different woods, an attempt was made to correlate the experimental results with the specific behaviour of different clarinets. This correlation takes into account the contribution of metal components and individual structure of the instrument; in order to reach a better understanding of long term dynamics of degradation and assessment of risk.

Non-invasive techniques and more accurate measurement methods are being investigated including the feasibility of using CT scanning. The aim of which is to dynamically measure the deformation of whole instrument when artificial breath moisture is introduced. There is a problem of scanning clarinets with the keys in position because they mask the X-rays over parts of the wood. Removing the keys leads to a change the internal stresses that would be present in the real case. However, to understand the bell end of the instrument CT offers the best possibility of imaging changes in dimension associated with the wood structure. Electronic Speckle Pattern Interferometry (ESPI) at the Courtauld and other mechanical methods at ICL are also being explored to measure deformations and strain distributions.

Impact

The results of this research on clarinets will serve as the basis for a more extensive study of different typologies of woodwind instruments, and will set the methodological framework and research methods also for the further development in this direction. The long term aim will be an increased understanding of the behaviour of materials, and the creation of a benchmark system to guide curators and musicians in the assessment of the risks related

to playing historical clarinets: the effect and best procedure of conditioning, practical ways to quantify risk and guide the decision making process.

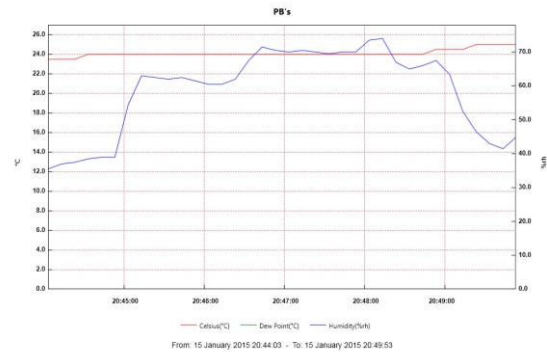


Figure 1: Noblet N Ambient-lower-higher-lower-ambient. Continuous playing with 10 second blows.

References

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