Fresh breeze for the queen of instruments

How new technologies could gently revolutionize organ building...

Wood lives...

At the first glance a basson and an organ pipe have only little in common outwardly. And yet, both shall perform similary: sound brilliant, sustainable and rich of overtones, keep their size accuracy and tuning, persist decades with low maintenance efforts & besides look good!
Not so easy if you are made of wood. As well as the basson is exposed to changing temperatures and variations of humidity by playing irregularly in different places as well wooden pipes of an organ are similary affected.
Different places (unheated village church vs. concert hall) in different climes, seasonal variations and disadvantageous heating- and air conditioning practise cause again and again distuned organs, seizing (wood-) mechanic parts and infestation by mildew and putrafactive bacteria. That is not only annoying and dangerous for the organists or/and associated with cost for the owner of the organ but also for the organ builder himself, who often repairs more at his own expense than bearable, just to keep the customer.

The reason is nature itself...

Depending on the respective relative environmental air-humidity and temperature a certain humidity of wood is reached in the medium term. That so called equilibrium moisture content means the ratio of water content in wood compared to absolutely desiccated (oven-dry) wood (e.g. Beech at 20°C/65% rel. air-humidity approx. 12%).

Water is contained in wood as two different constitutions:

1. as physical, so called „free“ water in cellulary cavities and
2. as chemical, so called „bound“ water at resp. in the cell walls

Below a certain moisture content, the so called fibre saturation point only bound water is still present in the wood. Below that fiber saturation point, which varies depending of the species around 30% (and therfore mostly above equilibrium moisture content), there will occur reversible dimensional changes. That means the material is swelling and shrinking – it „warps“ or „moves“. At the worst it can break, too. The grade and direction depends highly on the primary location of the piece of wood in the bole.
Microorganisms as mildew can only survive and degrade organic substance, if there is water – the obove mentionned 12% bound water in native wood are already sufficient.
The bound of water in the cell walls happens in the so called micro fibrils above all via hydrogen bonds to hemicellulose, which is one major component of wood next to cellulose and the „fill – substance“ lignin. It contains particulary many functional groups, which act like magnets as „docking device“ for the polar water molecules. If the water molecules squeeze in spaces inbetween, the wood swells.
One possibility to avoid that is to reduce the number of that docking devices for water as strong as possible or to block them.

For over two years the Dresden based company ***HEYDAY'S®*** deals with research and product development for manufacturing musical instruments. One of the founders, Johannes Wahrig, is engaged for many years in woodwind instruments manufacturing, laboring for hunderts of years with the same problems.
HEYDAY'S® now succeded in refining selected domestic wood in such a way, that it becomes quasi ***dimensional stable and crack resistant***, while having ***excellent acoustic properties*** and a minimal equilibrium moisture content – mildew and putrafactive bacteria have the essential water missing.

In a multiple-stage procedure the substance of native wood is modified by physical and chemical processes in a manner, that it befalls an ***artificial aging***, which results in an impressive sound characteric. Simultaneously the surface becomes harder as well as ***air tight & resistant against fluid water***. The microresonance-spaces inside remain open and are not filled as it is the case with aging oils (linseed oil). Therefore the primary vibration properties are not affected.
Further benfits of the new material with the literally euphonious name ***[arbo]sonic®*** (lat. Arbor = tree; sonare = to sound) is the ***immediate availability (no long lating cost intensive storage necessary), the low weight and a noble appearance***. As a result of the procedure the wood receives a warm colour, which can vary from caramell to deep african blackwood-brown, also again similar to very long aged wood. Analogue with natural wood it can be machined with conventional equipment as well as modern CNC – processes.

In the high-end segment of basson building *[arbo]sonic*® is already well – established. After only a few prototypes the well known manufacturer Gebr. Mönnig – Oscar Adler & Co. / Markneukirchen was so convinced of the acoustic qualities, that a series of exclusive soloist instruments is now made of *[arbo]sonic*® and played by such international famous bassonist as Sergio Azzolini. Beside bassons, clarinets, flutes and haut-bois have been created ever since.

Thanks to the friendly, also Dresden based, organ builder Kristian Wegscheider the bridgeing to wooden pipes and other wooden parts in organ builing was not that far. Yet in february 2008 first wooden pipes were made. Already the first prototypes provided an distinct audible difference. ***In comparism*** to similar pipes made of natural wood of the same species ***the modified pipes did sound more resonant, more colourful and richer of overtones and will even survive a dishwasher cycle without any damage.***

After that first encouraging results, more pipes and parts were made of *[arbo]sonic*® to test different wood regarding their optimal suitability for pipes, mechanic parts, keyboards, pipe sockets etc. and to optimize the process.

Today there is a full range of different variations of the material for almost every purpose in organ building, which differ in physical parameters, colour or surface characteristic. Due to the antique look, the material is particularly suitable for restoration of historic housings.

Thanks to financial support of German Federal Environmenal Foundation (Deutsche Bundesumweltstiftung - DBU) 2-3 complete ranks shall be manufactured until end of 2008 and come into operation as sound reference and long-term observation object into the organ of evangelic-lutheran church at Dresden – Loschwitz. The project will be scientifically accompanied by the technical university (TU) Dresden and the saxonian state dept. for preservation of monuments and historic buildings. The results will be published after termination, prospectively at the beginning to mid of year 2009 in the ISO journal.

More of the „miracle box“...

Besides development of new materials as *[arbo]sonic*® a major-business field of HEYDAY'S® is surface protection of bare metals, being preferably used in manufacturing musical instruments. Above all with brasswind instruments, made of brass and other copper alloys, silver plated or massive silver wind instruments or their keywork occur problems with tarnishing and oxidization. Conventional varnishing is the current method but because of acoustic disadvantages and visual reasons not the silver bullet and does not persist reliably.

Especially for those instruments ***ultra-thin semi-permanent and permanent coatings***, named ***manufactura/clear***, were developed. They have such a low film thickness while having ***extremely high barrier effect,*** that they cause ***no measurable and audible side effects to vibration properties and acoustic***. The molecules bond so strong to the material, that corrosion cannot undercrawl the layer even if the surface is scratched.

The distance to organ pipes and parts made of copper and brass (brass lips) or silver plated pipes was not as far as again to organ builder Kristian Wegscheider. The brass lips and other brass parts of the Buchholz - organ at St. Marien/Barth, which restored organ builder Wegscheider during last years were extremely vulnerable to corrosion above all due to the salty maritim air. A coating of the parts by HEYDAY'S® will probably solve the problems for the next decades. Anyhow, for about 9 months the coated brass lips look like on the first day.

An extremely thin invisible semi-permanent protective film against tarnishing and fingerprints for silver surfaces provides „HEYDAY'S® - silver protection“, which can be purchased as consumer product directly from HEYDAY'S® or their distribution partners. The twin product for brass is in development and intended to follow soon.

Only a few weeks ago, further tests for modification of leather started. The target is air tightness, long lasting flexibility or solidification – thus it will remain exciting...

On 25.09.2008 – 18:00 p.m. the results of previous organ work will be presented by HEYDAY'S® within 25th ISO congress together with audible examples on 26th there is further opportunity for personal conversation.

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