Modular Cleaning Program lecture and practical workshop by Chris Stravoudis at the SRAL, Maastricht 2011

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After two days of theory on Richard Wolbers' aqueous solvent cleaning methods in Amsterdam, sixteen restores from various disciplines left for Maastricht. There they would learn the skill of mixing according to the five orthogonal components, and the systematic application of the aqueous cleaning method using the Modular Cleaning Program. All of this was done under the supervision of the untiring Chris Stravoudis.

The base for the aqueous cleaning method lies in water. Water is characterized by Chris as a special solvent as it is polar, has a strong mutual bond and partly dissociates into H+ and OH-. As such, water can be adjusted with acids, bases, chelators and surfactants (soaps). It is in these characteristics that we find the foundation for the development of the Modular Cleaning Program.

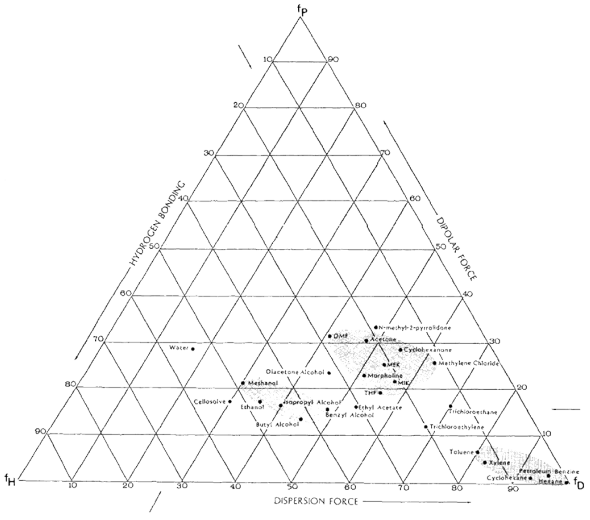
At the workshop everyone mixed their own RN-MCP-set both for oil and acrylic paintings. The set consisted of 6 pH buffers, 2x6 chelating agents, 6 surfactants, gelling agent and 2x4 types of adjusted water.

By mixing water with one or more concentrated solutions from the set, restores were able to remove layers of different types of dirt, paint, and varnish, individually or jointly.

From the *aqueous cleaning method*, Chris and Richard developed the set "Solvents and Solvent Gels". In this system free solvents and Carbopol® based gels are used based on the idea that "like dissolves like".

Three properties of solvents are important here: dispersion forces (also known as Van der Waals forces), dipolar forces, and hydrogen bonds. With these properties in mind, Hansen formulated the 3 solubility parameters which Jean P. Teas simplified in a triangular graph which is once more used in the MCP.

In the solvent set, the dispersion forces are further divided into aromatic and aliphatic, and eleven gels were mixed based on four basic types of solvents. Three based on shellsol D40, three on xylene, three on benzyl alcohol, one on isopropanol and one on acetone.



Mixing the MCP

The practical program consisted on the mixing and testing of the MCP set- reviewing the theory behind it in a short time.

Meta Chavannes, our lab assistant, listed and provided all necessary ingredients so thirty five

bottles of aqueous solutions, eleven bottles of solvent gels and three bottles of Pemulen gels were made. Sixteen restorers mixing solutions together fill up a small lab quickly.

Prior to mixing the buffers and chelators the pH meters were calibrated first at pH7 and then pH4. There were some problems with the calibration and sometimes small or large differences were observed. The recipes used for mixing the sets were described in the RN master class syllabus. These recipes were formulated by the MCP filemaker Pro program and are therefore sometimes a little confusing to understand in both language and intent.

For most substances, mixing is easy. For instance, in a buffer of pH6,5 a determined amount of weak acid is mixed in a measured amount of water. The base is then added to this until the desired pH is reached. At first the little amount of base will cause the pH to rise rapidly, as the buffer equilibrium is reached larger amounts of base have to be added until the desired pH of 6,5 is reached. When too much is added and the resulting pH is higher than desired, it is possible to lower the pH by adding a little of the acid. Getting the correct pH is a starting point.

It is different for the surfactant sodium deoxycholic acid. The deoxycholic acid does not dissolve directly in water, in order to dissolve it is necessary to add a 10% NaOH solution to the water. With each addition of hydroxide more acid is dissolved and the pH varies more, and slowly the initially cloudy mixture becomes clearer.

The lab became more crowded with large stocks of half litre bottles that were later poured into 16 sets of 100ml bottles. All bottles were labelled and divided. Mixing 16 sets was a lot of work and the time pressure was clearly felt.

Testing the MCP

On Tuesday afternoon tests were carried out with the set of aqueous cleaning from the SRAL in order to study and practice the method. Groups of four were created and treated several paintings.

The arrangement of the bottles in the set corresponds to the arrangement in the computer, and is as follows: left (first row) the buffers, sorted by pH values, increasing from the front to the back of the row until pH 8,5. To the right of the buffers are the two rows of chelators, first the weak chelator and then the strong, both sorted from low to high pH. The fourth row is for the surfactants, sorted from low to high HLB values (Hydrophilic Lipophilic Balance number: the higher the number the more easily soluble in water).

Deoxycholic acid works only at a pH of 8,5 and stands in the back of the row. The HLB of Maypon is unknown, and is therefore in the front of the row. This sequence corresponds to the order to the substances as described in the

computer. Note that the computer program does not propose the sequence of testing only the organization of the set. This was stressed throughout the workshop by Chris. The restorer decides based on the object treated the sequence in which the mixtures are used and tested. All solutions from the set are concentrated; this is expressly stated on the labels, and they are not to be used pure as their conductivity is too high. There should always be 5 parts (5ml) used, starting with 1 part of water (1ml). Even when using the computer program you cannot mistake this, as the top blue bar is for water.

Suppose you want only to test a buffer of pH5.5, for this add 1ml of concentrated buffer 1ml of water, bring it to a total of 5ml by adding the remaining 3ml of water.

In the MCP program, written in FileMaker Pro you follow the following steps: on the left of the "home" page is a "start a cleaning test". When you select this, you get spaces to fill in basic information: "identify yourself", "identify your artwork" and "identify type of cleaning". The user can then selects the set he wants to work with and can start a cleaning test. The program then opens a window where three questions are asked about cleaning with pure water. The idea is for a conservator to make a test with water. If the user is not satisfied with the result he can click on next, and then start the MCP method. The screen now shows five boxes under each other, each one representing 1ml solution, the top is blue "water within", then a yellow one "buffer pH5,5, followed by three blue fields making a whole of 5 ml. Test results can be recorded by clicking the "test it" button and the "test result "screen offers the opportunity to record findings and even to complement these with pictures. You then have the option to continue testing, or to select a "fresh start" to start with another mixture. If you continue testing you have three options to adjust the current mixture: you can "increase or decrease" pH or "modify" the mixture by adding a chelator, surfactant or gel. Start again by adding 1ml of water, 1ml of buffer and/or add another substance and dilute to a 5ml solution.

It is useful to label the test pots with a number corresponding to the sequence in which it was tested. The test results can be printed out.

Test Results

The paintings tested during the workshop wielded interesting results.

On a painting where there was the presence of an adhesive coating, good results were obtained with the surfactant Maypon. On another painting a mixture of buffer, surfactant and chelators was used to clean the dirt debris leaving the glossy varnish behind. Clearance procedures should be carried out for all aqueous cleaning methods. For this adjusted water is used at the same pH but low conductivity.

Additionally lecturers got the latest features of the MCP that are not yet included in the current computer version. Chris is hard at work on a new adapted version of the program that will soon be available. To this version the co-solvent and Pemulen TR2 gel will be added. The Pemulen gels are also listed in the back of the syllabus. On one hand by adding a

10%aromatic or aliphatic solvent (a combination is possible) such as ShellsolA10 and Xylene and Benzyl Alcohol, such a mixture may dissolve and remove a varnish from a painted surface. On the other hand adding 1:1 PemulenTR2 gel-with the same pH- to the 5ml , the mixture can then be manipulated with a brush and achieve better results. A combination of these two is also possible. As with all other water based solvents, this can also be cleared with “adjusted water” with the same pH.

The painting on which I worked on was a mixture containing water, buffer pH 8.5, chelator Citric Acid and Surfactant Deoxycholic acid with 10% Benzyl alcohol co-solvent was observed to dissolve the varnish well. Unfortunately due to time constraints we could not perform tests with free solvents or solvent gels in order to compare results.

Conclusion

The potential of the MCP was made clear for many during the practical session in which the restorers themselves could mix and perform cleaning tests. In my opinion the aqueous set provides many more insights than the solvent set. The reason for this is that since mixing was time consuming, testing during the workshop was mainly focused on this set.

Due to the workshop and the theory lessons, I believe that this method will become for many restorers a new development in their practice.
During the workshop, some people agreed to jointly buy products and perform tests. And so the first orders were placed.

For those who did not have the opportunity to participate in the workshop but who followed the theory workshop was based on, I want to stress how it was an ‘eye opener’.
Next time around take the opportunity to participate, or take the challenge and sign up with Chris Stravoudis and download the Modular Cleaning Program.