

Title:

Internal procedure developed for the reduction of solvent (Heptane) consumption when conducting analysis (Viscosity according to ASTM D7042-04) with the Anton Paar SVM-3000 instrument.

INTRODUCTION:

Ever since laboratories have existed, solvents have been used to clean instruments between samples. However, such products (solvents) have four "flaws" in common:

- the cost, which people have always tried to cut down or at least reduce (for example, looking for a viable, cost-effective alternative);
- their more or less severe toxicity, therefore any way to reduce their use will be much appreciated by the "occupants" of the laboratories;
- last but not least, the environmental impact of solvents.

Not including the other administrative aspects that often accompany solvents (limited quantity that can be held, the need for a dedicated warehouse, etc.).

Therefore, solvents are valuable in safeguarding delicate tools and essential to ensure a flawless analysis result, but there are so many disadvantages to them.

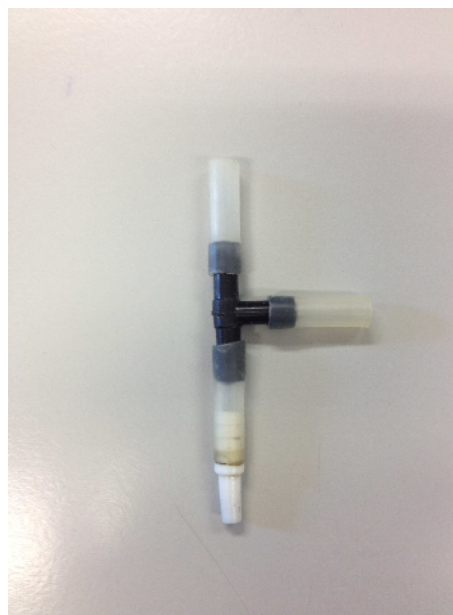
Ideally, we would be able to eliminate all solvents and always have perfect instruments and analyses, but we still have to wait for that to be possible.

However, by "racking our brains" day in and day out, we at Mecoil were able to overcome at least part of these problems: we are able to clean our instruments with half the amount of solvent that was originally recommended by the manufacturer, continuing to ensure reliability of both the instrument and our analyses.

The instrument in question is an SVM 3000 viscometer from Anton Paar. Let's talk more about it...

OPERATION:

Connect a three-way tube as follows: connect the air outlet tube of the SVM to the lateral part of the three-way tube, a syringe filled with 4ml of solvent and 2ml of air to the upper part of it and the SVM inlet hole for the sample to its lower part. When you start the drying process of the SVM (with the "Esc" button), the pump inside the viscometer starts blowing and the air, finding a junction, will try to standardize its flow in both directions.



This way, air is blown into the syringe creating a slight pressure that, to balance itself, will push down the solvent contained in it, which will be pulled into the instrument in the form of a "mist". The search for balance between the pressure entering the syringe and the solvent will only stabilize when there is no more solvent. The drying time of the previously activated instrument is long enough for you to empty the syringe and dry the instrument. So we can also say that you save time when it comes to washing and drying the tool, since once the system is loaded and the drying process is activated, the operator is free to devote themselves to other tasks.

It is IMPORTANT to empty the viscometer tubes after the analysis, flushing them with a syringe full of air, as described on the original instrument procedures.

Test conducted using an SVM viscometer with initial density of about 60 g/cm³

Viscosity ISO	ml used with the classic system	ml used with the Mecoil system	g/cm ³ at the end of washing with the classic system	g/cm ³ at the end of washing with the Mecoil system
320	6	4	279	63
320	8	4	195	63
320	10	4	160	63
320	12	4	119	63
320	16	4	80	63
320	20	4	72	63
32	4	4	110	62
32	8	4	70	62

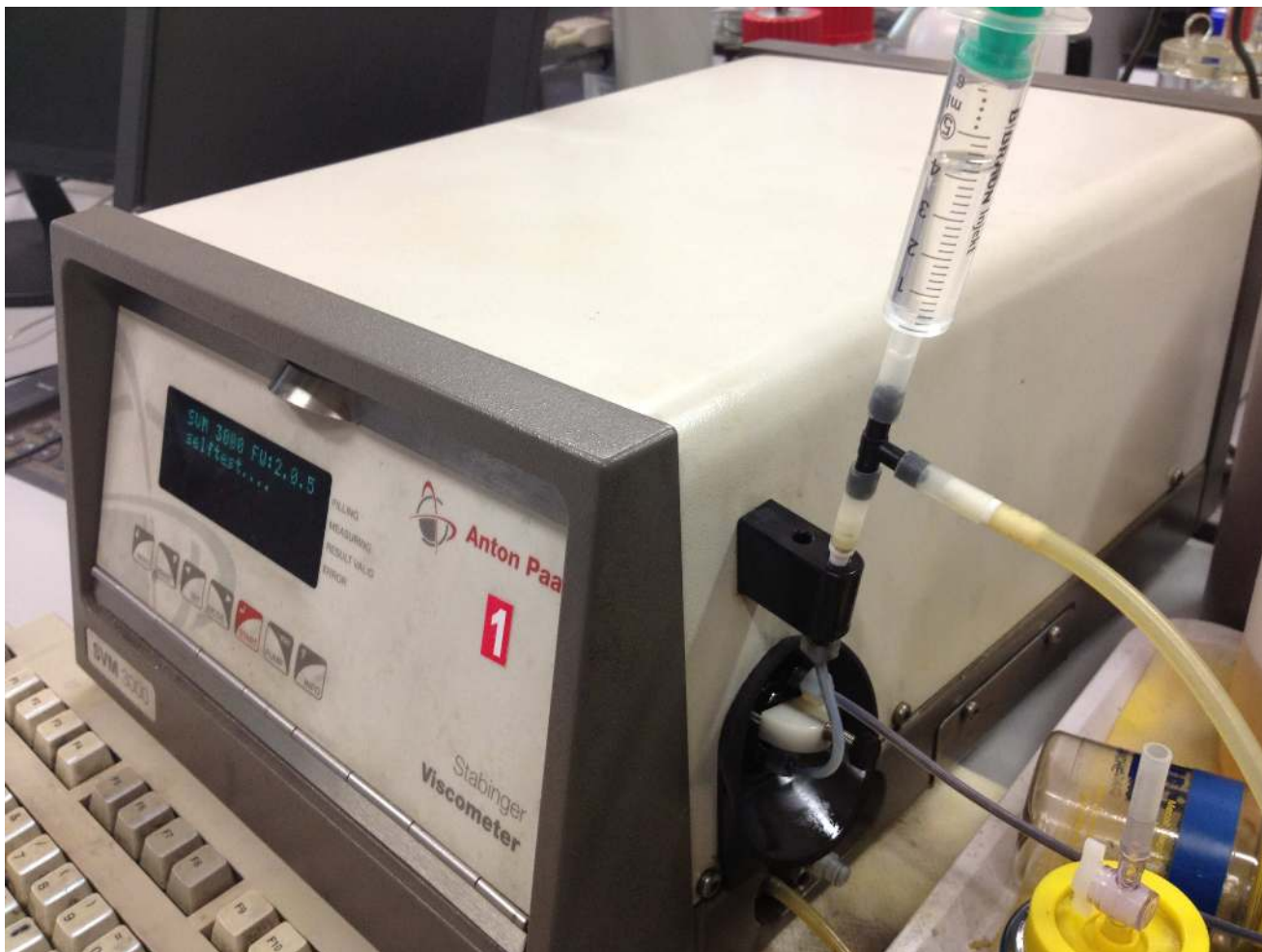
Looking at the data, we can see that with an ISO VG 320 oil, in order to obtain a satisfactory level of cleanliness of the instrument, we must use more than 20 ml of solvent. On the contrary, with the Mecoil system, just 4 ml of solvent are enough to reach an optimal cleanliness level. So, whenever the instrument is washed, the amount of solvent we are saving is between 50% (for low viscosity fluids) and 85% (for high viscosity fluids).

Let's make the case of a solvent whose price per liter is about 8 euros (quite realistic), and assuming we would be using about 10 liters of it per month.

The annual cost of the solvent using the classic cleaning method would be about **960 euros**, so with a saving of about 70%, the annual cost would be only **291 euros**, with a difference of **669 euros** per year!

The figures taken into consideration are purely indicative and only serve to show how great the savings could be.

There are many factors that can affect solvent delivery and consequently the cleaning time of the viscometer. One of many is the length of the connecting tube between the syringe and the three-way connection: the longer the connection, the slower the solvent will be dispensed; a good balance is to have a 1.5 cm connection.



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