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Meltfit One at Akzo Nobel, replacing the Pressfit

Interview with Theo Jelink at AkzoNobel

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Key words:

capillary GC, Meltfit, column connector, GCxGC, leakage, detection time, inert

Summary:

This application case study describes the use of the Meltfit One at the Chromatographic Department of the RTC Research and Technology Centre at AkzoNobel. The connecting device is being used in all cases where previously pressfit connectors were used. This is especially the case in GCMS, where columns of different size are coupled with retention gaps and where they interface with valves and detectors. In addition, the Meltfit is used in all critical systems in QC labs and research labs where columns have to be coupled.

Analysts face many problems in their day to day GC operation. One of the most common frustrations is the leakage of column connectors, causing hours of delay and losing valuable sample material. Theo Jelink is Chemical Research Assistant in the Chromatographic Department of the RTC Research and Technology Centre of AkzoNobel. He tested an innovative connecting device, The Meltfit One, that claims to eradicate all of those problems and wanted to share his experiences with us. His conclusion was: "In the past we had problems on a regular base with leaking columns. Now with the use of the Meltfit One we have very reliable connections. The Meltfit One is easy to operate and can be used in many labs."

Theo Jelink went on to say: "We were always aware of the leakage issue, but until now there was no reliable technique to solve it. It is silly when you think about it: we work with extremely advanced instrumentation but we are hindered by a simple mechanical problem. It is as if you drive a Mercedes and use tape to keep the windows shut." The most irritating effect of leakage is that it not only

occurs at the wrong moment but also when you least expect it. According to Theo: "When you are having trouble during an analysis it is not always easy to figure out what is causing the problem. For instance we had problems with the quantification of permanent gases in chlorine gas, leading to irreproducible results during calibration. We then lost two days preparing calibration gas mixtures and trying to find the cause of trouble. It appeared to be caused by leakage from one of our pressfit couplings. We had many similar problems but each of the techniques we tried to solve them had their own disadvantages. I first became aware of the Meltfit One in Riva at the Symposium on Capillary Chromatography. It was claimed that it would eliminate the problems associated with the use of the usual column connectors and make connections without leaking, I realized that this was what we had been looking for."



TABLE

Theo Jelink's conclusions and comments in a table.

Pro and cons	Meltfit	Pressfit	Metal connectors
Easy to make a connection*	Easy	Experienced operator	Normal
Leak tightness	Tight	Prone to leaking	Tight
Risk of down time	Eliminated	Considerable	No experience
Dead volume	No	Yes	Yes
Inertness	Excellent	Good	Poor
Extra column band broadening	No	Possible	possible
Thermal degradation	No	Yes	No
Size	Small	Small	Medium
Mechanical stability	Good	Poor	Good
Overall result	Prevents time loss, improved reliability & robustness	Needs good check for leak tightness and poor mechanical stab	Thermal mass is bigger than other systems, no visibility check for connection possible, poor inertness

How did you test the Meltfit?

"We tested this new technology in the AkzoNobel labs. We applied it to many connections and checked all the connections visually under the microscope and with oxygen sensitive detectors. We can immediately see the effect of leakage and loose connectors when you use oxygen sensitive detectors".

What were the results?

"We found no leakage at all and in addition we proved that shorter stabilisation times for oxygen sensitive detectors and lower detection limits could now be reached. Such reliable couplings increase the reliability of our analysis. With these couplings we prevent the loss of time and valuable sample material". Jelink went on to say: "I cannot express it in money, but the main gain is in the time we would otherwise lose in solving problems or repeating our analysis. Another advantage is that there is no longer a dead volume in the GC-system. The dead volume is reduced by at least a factor one hundred, in essence to zero. In this set up, there is no more contact of the analytes with the glass of the coupling, so there are no more disturbances. I am convinced that our connector problems are now solved".

Will you be using the Meltfit?

We will use the Meltfit One in all cases where we now use pressfit connectors. This is especially the case in GCMS, where we couple columns of different size with retention gaps and where we interface with valves and detectors. We will also use it in all critical systems in QC labs and research labs where we need to couple columns. In addition many more GC applications will now be possible such as coupling an additional column or a pre-column to the analytical separation column. Due to the experimental difficulties associated with the use of column connectors so far, we have been reluctant to use coupled column systems. The use of the Meltfit One will allow many users in AkzoNobel to take advantage of coupled columns in GC." My next wish is to have Y connectors that can be used in several systems for our tandem column configurations, and prepare effluent splitters for the use of two detectors.



Theo Jelink has 30 years of experience with many separation techniques at AkzoNobel. He started by making capillary columns, then did fundamental research for the development of stationary phases, and developed new separation systems for specific projects. He is involved in setting up new analytical systems by modifying instruments and testing new chromatographic techniques.

"We have several analytical groups that are strongly connected to the various Business Units Base Chemicals, Functional Chemicals, Polymer Chemicals and Surface Chemistry. We develop and test columns and techniques and handle the complex problems that come from the Business Units worldwide. We serve as an expert center, carrying out problem solving and research to develop new techniques and develop prototypes that can be used in the business units. We bring in our know-how and our goal is to keep the group state-of-the-art. We have a lab with quite a number of separation techniques including wet chemical analysis, Molecular Spectroscopy & Process Analysis, Mass spectrometry, LCMS, GCMS, surface analysis TEM and SEM microscopes and Atomic Spectrometry. We have fifteen people in the Chromatography laboratory operating 30 GC's, 25 LC's and one GCxGC.

