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Summer Time!

We hope all of our clients are enjoying a fun summer, whether that be working in the laboratory, camping in the NC mountains, visiting Yellowstone National Park or enjoying some time away in Martha’s Vineyard (admittedly, I was jealous when I heard about this one!).

In this issue, by request, we’ve had one of our staff put together some server maintenance information. Once again, I’ve reached out to various consultants and companies to provide us some information to that should be of value to our clients. As always, any feedback, ideas, or request for articles in the next issue are welcome!

Timeline Note: As of January 15th, 2019, Omega Version 11 will no longer support Access 2000 and 2003. The only version of Access that will work will be Access 2010. Please note, Access 2010 Runtime version will work for workstations and is free.

SQL Server Maintenance

At Khemia Software, we are often asked for help or for suggestions with SQL server maintenance. Though this does go well outside of our inherent “LIMS” services, we did feel it best to outline some basic recommendations. One of our lead programmers, Olga Nadgorny, put together the following information, complete with suggested reading.

Recommended reading: This document is based on [Brad's Sure Guide to SQL Server Maintenance Plans](#) e-book. Google it and download the pdf; it's free!

Maintenance Plan Tasks

1. Check Database Integrity

Runs DBCC CHECKDB against selected databases and performs an internal consistency check to determine any problems with integrity. While this task is very resource intensive, it is critical to perform it on a regular basis to ensure that your databases are not damaged.

2. Shrink Database

Never shrink a database automatically (see Chapter 6 of Brad’s Sure Guide); this should only be done manually by professional DBA if necessary.

3. Rebuild Index

Runs the ALTER INDEX statement with the REBUILD option on indexes in the selected databases by physically rebuilding indexes from scratch. This removes index fragmentation and updates statistics at the same time. If using this option, do not run the Reorganize Index or the Update Statistics task as doing so would be redundant.

4. Reorganize Index

Runs the ALTER INDEX statement with the REORGANIZE option on the indexes in the selected databases. This task helps to remove index fragmentation but does not update index and column statistics. If you use this option to remove index fragmentation, then you will also need to run the Update Statistics task as part of the same Maintenance Plan. In addition, you will not need to run the Rebuild Index task, as the use of Reorganize Index task (followed by the Update Statistics task) renders the Rebuild Index task redundant.

5. Update Statistics

Runs the sp_updatestats system stored procedure against the tables of the selected databases, updating index and column statistics. It is normally run after the Reorganize Index task is run. Do not run after running the Rebuild Index task as the Rebuild Index task performs this task automatically.

6. Execute SQL Server Agent Job

Allows you to select SQL Server Agent jobs (ones that have been previously created) and to execute them as part of a Maintenance Plan. This feature offers additional flexibility when performing database maintenance using the Maintenance Plan Wizard.

7. History Cleanup

Deletes historical data from the msdb database, including historical data regarding backup and restore, SQL Server Agent and Maintenance Plans. If you do not perform this task periodically, the msdb database can grow very large over time.

8. Back Up Database (Full)

Executes the BACKUP DATABASE statement and creates a full backup of the database. You will probably want to run this task daily against your system and production databases. In most cases, the databases being backed up with this task use the Full Recovery model and you will also want to run the Backup Database (Transaction Log) task as part of your Maintenance Plan.

Make sure to include the system databases as a part of the full backup. It will be helpful should you need to rebuild the server. This will allow you to restore custom configurations-jobs, logins, etc.

9. Back Up Database (Differential)

Executes the BACKUP DATABASE statement using the DIFFERENTIAL option. This task should only be used if you need to create differential backups.

10. Backup Database (Transaction Log)

Executes the BACKUP LOG statement, and, in most cases, should be part of any Maintenance Plan that uses the Back Up Database (Full) task. It is a common practice to run this task every hour.

Current Conference List – 2018 (so far)

Aug. 6-10 – NEMC (www.nemc.us) in New Orleans

Aug. 16 – WEASC Laboratory Workshop in Columbia, SC

Oct. 15-18 – 34th Annual Int. Conf. on Soils, Sediments, Water and Energy in Amherst, MA

Oct. – FSEA Fall Meeting in Jupiter, FL

In addition, various direct client and prospect visits will be made throughout the year. If you happen to know of a good, local conference that you think we should attend, please let us know! We are always looking for smaller, local/regional conferences.

Syringe Filter Selection Criteria, Part One of Many!

PVDF – Polyvinylidene Fluoride – Hydrophobic

Excellent for HPLC and GC sample preparation and clean up and for protein-based samples due to broad chemical compatibility, low protein binding and low UV absorbing extractables. PVDF can be used for filtering alcohols, weak acids, proteins, peptides and other biomolecules.

Strengths: High flow rates for biological sterilization and clarification

Weaknesses: Strong acids



11. Maintenance Cleanup Task

The Maintenance Cleanup task is problematic as it does not really do what it is supposed to do. In theory, it is designed to delete older backup files (BAK and TRN), along with older Maintenance Plan text file reports (TXT) files that you no longer need. The problem is that it can only delete one type of file at a time within a single Maintenance Plan. For example, if you choose to delete older BAK files, it won't delete older TRN or TXT files; if you choose to delete older TRN files, it won't delete older BAK or TXT files.

What we really need is a task that performs all three inside the same Maintenance Plan, but we don't have it. So, what is the best way to delete old BAK, TRN and TXT files? One way is to use the Maintenance Plan Designer, which allows you to create three separate subplans that will take care of deleting each of these three kinds of files within a single Maintenance Plan (see Chapter 17). However, if you want to use the Maintenance Plan Wizard exclusively to delete all three file types, you must create three different plans to accomplish your goal.

Order in which to execute tasks:

Here are the general guidelines for task execution order:

- Logical Task Ordering. A task such as Clean Up History can be performed at any point in the plan however, for other tasks, there is a certain logical order in which they should be performed.

- It makes sense to start the Maintenance Plan with the Check Database Integrity task, because there is no point in running the rest of the maintenance tasks if the integrity of your database is in question.

A snippet of current programming task by one of our programmers:

The following programming task are on the agenda for Olga Nadgorny over the next month/year. Please note, these are not necessarily in the order in which they are being worked on as beta-testing, revisions and start & stops are all part of the equation for programmers at LIMS companies. Also note, many of these revisions may take many months to make it into even a beta copy of Omega.

1. Corrective Actions Reports revisions (nearing completion)
2. One major area of focus is our client web portal, FlashPoint:
 - a) Adding date range and extra filters to the Work Order screen
 - b) Improving the status listing of sent objects via fax/emailer for Omega linked files
 - c) Adding a new Historical results trending and charting feature into Flashpoint
 - d) Adding new regulatory limits functionality into FlashPoint and regulatory limits table support functionality
3. Management dashboard review and modifications of calculations

- The Back Up Database (Full) should come before the Backup Database (Transaction Log) task as it cannot perform a transaction log backup before it performs a full database backup. An attempt to do so would yield an error.

- If a Rebuild Index task (or the Reorganize Index and Update Statistics tasks) is performed during the same maintenance window as the Back Up Database (Full) task, then perform the Rebuild Index task first. This way, should a restore of the backup need to be performed, it will have its indexes defragmented and will be ready for production.

- The Maintenance Cleanup task, if selected, should be performed only after the Back Up Database (Full) has been completed. This ensures that a good backup has been made before deleting older backups.

- Task Scheduling. If you choose separate schedules for each task, the scheduling of these tasks (covered later) will determine the actual order in which they occur. For example, it is possible to schedule the tasks in such a way that the Backup Database (Transaction Log) task runs before the first ever Back Up Database (Full) task for a given database, although this would cause the Maintenance Plan to fail. The key thing to remember is that the logical task order you select is not absolute and that it can be overridden by the schedules set for each.

- Some would argue that you should optimize your indexes THEN check the database integrity because

sometimes optimizing indexes will correct corruption issues. If you want to go this route, then in the example below, Scheduling Considerations, you would move the Rebuild Index line to be first. After doing this, the second step would be to check database integrity.

Controlling order of the tasks:

When you start the Maintenance Plan Wizard it will ask if you want separate schedules for each task or a single schedule for the entire plan.

Selecting separate schedules for each task will get a different job under SQL Agent | Jobs.

Selecting a single schedule for all the tasks will get one job in SQL Agent | Jobs.

Selecting the single schedule option, the wizard will ask what order is wanted for them to execute. If separate schedules are chosen, then you control the order based on the date you schedule the tasks.

Scheduling Consideration

Regardless of selecting one or multiple schedules for your tasks, you will want to perform these operations off peak hours if possible. Some task can run in parallel or overlap, while others should not. For example, the Check Database Integrity task and Rebuild Index task should not be executed at the same time since they are both resource intensive. Doing so may result in a slow server.

I will be chairing a session at [NEMC](#) again this year on August 6-10th in New Orleans. Please do stop by and say hello if you are at the meeting! I always enjoy speaking directly to our clients when I have the chance.

If you choose to have separate schedules for each task then you will need to take an educated guess as to how long each task will take and set the schedule accordingly. The tricky part is that the same task does not always take the same amount of time to run. So, you will want to watch it over time to see if it needs to be adjusted to accommodate the longer durations. You can view these durations by going to the View History on the jobs.

How often to run jobs?

This will vary depending on your needs. The following schedule is used by several of our larger clients:

- Check Database Integrity – DAILY
- Rebuild Index – DAILY
- Back Up Database (Full) – DAILY
- Back Up Database (Differential) – HOURLY
- Backup Database (Transaction Log) – HOURLY
- Maintenance Cleanup Task – WEEKLY
- History Cleanup – WEEKLY

We certainly hope this helps answer some of your questions. Please note, Khemia Software is NOT, nor will we pretend to be, experts on IT infrastructure or all things programming. We can only share our opinions and quote from valid sources. We strongly suggest speaking to a local IT group/consultant.

[**Khemia Software User's Group on LinkedIn:**](#)

I encourage everyone to join! It is truly setup to allow users to communicate and share ideas with other users. Log on and request to join the group at <https://www.linkedin.com/groups/8355103/profile>.

A new Omega LIMS Feature! The new MDL calculations, as per the TNI standard, have been completed and will be/is being installed with the latest update. We know this is a revision many of you would like to have and we are in the process of installing updates as quickly as we can.

What is Needed in a LIMS System in a Cannabis Laboratory in California

Author: Edward F. Askew PhD, President, [Askew Scientific Consulting](http://askewscientific.com) (easkew@askewscientific.org)

This article will focus on the current [California](#) cannabis rules and regulations as they apply to cannabis laboratory requirements. These rules are detailed in the Bureau Of Cannabis Control, Text Of Regulations, California Code Of Regulations, Title 16, Division 42. Bureau Of Cannabis Control. The requirements for laboratories within these rules as they apply to receiving and holding certification are:

Article 2. Laboratory License

§ 5701. General Laboratory License Requirements

(a) A licensed laboratory shall maintain ISO/IEC 17025 accreditation for the testing of the following:

- | | | |
|--------------------------|---|--|
| (1) Cannabinoid |  | (5) Residual pesticides |
| (2) Heavy metals | | (6) Residual solvents and processing chemicals |
| (3) Microbial impurities | | (7) If tested, terpenoids |
| (4) Mycotoxins | | |

§ 5702. Laboratory License Application

In addition to the information required in section 5002 of this division, an application for a testing laboratory license includes the following:

(a) A valid certificate of accreditation, issued by an accreditation body, that attests to the laboratory's competence to perform testing of the following:

- | | |
|--------------------------|--|
| (1) Cannabinoids | (5) Residual pesticides |
| (2) Heavy metals | (6) Residual solvents and processing chemicals |
| (3) Microbial impurities | (7) If tested, terpenoids |
| (4) Mycotoxins | |

(b) Standard operating procedures for the following testing methods:

- | | |
|---|--|
| (1) Cannabinoids | (6) Mycotoxins |
| (2) Foreign material | (7) Residual pesticides |
| (3) Heavy metals | (8) Residual solvents and processing chemicals |
| (4) Microbial impurities | (9) If tested, terpenoids |
| (5) Moisture content and water activity | (10) If tested, homogeneity |

(c) Standard operating procedures for the sampling of cannabis and cannabis products.

Article 4. Standard Operating Procedures

§ 5711. Laboratory Analyses Standard Operating Procedures

(a) The laboratory shall develop, implement, and maintain written standard operating procedures (SOP) for the following laboratory processes:

(1) Sample preparation. Sample preparation SOP(s) shall address the following:

- | | |
|---------------------------|--------------------------|
| (A) Sample homogenization | (B) Handling and storage |
|---------------------------|--------------------------|

(C) Preservation

(D) Hold time

(2) Test methods. Each test method SOP shall address the following:

New Member of the Team!

*We at Khemia Software are delighted to welcome **Mike Patrick** to our team. A few of you have already spoken to him and I am sure many more of you will follow. While new to Khemia, Mike is not new to Omega and has been a LIMS Administrator for 8 years. Prior to that, he was a programming and database consultant.*

Mike studied computer science at University of Michigan and brings with him experience in .NET, C#, SQL (Server), XML/XSLT, HTML, and Java. He has done extensive work on Omega reports, SSRS reporting, employing .NET libraries and web-based client reports.

We are excited to add Mike to our team and feel that his knowledge will greatly benefit Khemia for the long run.

- (A) Test method name
- (B) Applicable analytes and matrices
- (C) Method sensitivity
- (D) Potential interferences with the analysis, if any
- (E) Analytical instruments used for testing
- (F) Types, frequency, and acceptance criteria for quality control samples
- (G) Types, frequency, and acceptance criteria for calibration standards
- (H) Procedure for analyzing analytical batch samples
- (I) Calculation of results, if any
- (J) Reagent, solution, standards, and reference material preparation, if any

(b) The supervisory or management laboratory employee shall review, approve, sign, and date each SOP and each revision thereto.

(c) The laboratory shall keep each SOP at the laboratory premises and ensure that each SOP is accessible to laboratory employees during operating hours.

(d) The laboratory shall make each SOP available for inspection by the Bureau upon request, as well as any other SOPs associated with the licensee's ISO/IEC 17025 certificate of accreditation

§ 5712. Test Methods

(a) The laboratory shall develop, implement, and validate test methods for the analyses of samples as required under this division.

(b) To the extent practicable, the laboratory test methods shall comport with the following guidelines:

- (1) US Food and Drug Administration's Bacterial Analytical Manual, 2016;
- (2) AOAC International's Official Methods of Analysis for Contaminant Testing of AOAC International, 20th Edition, 2016; and
- (3) United States Pharmacopeia and the National Formulary's Methods of Analysis for Contaminant Testing, 2016.

§ 5713. Validation of Test Methods

(a) The laboratory may use a nonstandard, amplified, or modified test method or a method that is designed or developed by the laboratory to validate the methods for analyses of samples.

(b) The laboratory shall follow the guidelines set forth in the US Food and Drug Administration’s Guidelines for the Validation of Methods for the Detection of Microbial Pathogens in Foods and Feeds, 2nd Edition, 2015, incorporated herein by reference, to validate test methods for the microbial analysis.

(1) The laboratory shall include and address the criteria listed in the following table when validating test methods for microbial analyses of samples.

Criteria	Requirement
Number of target organisms; inclusivity	5
Number of non-target organisms; exclusivity	5
Number of analyte levels per matrix: Qualitative methods	3 levels: high and low inoculum levels and 1 uninoculated level
Number of analyte levels per matrix: Quantitative methods	4 levels: low, medium and high inoculum levels and 1 uninoculated level
Replicates per food at each level tested	2 or more replicates per level

(1) The laboratory shall include and address the following criteria to validate test methods for chemical analyses of samples:

- (A) Accuracy
- (B) Precision
- (C) Linearity and range
- (D) Calibration standard
- (E) Sensitivity and selectivity
- (F) Limit of detection and limit of quantitation
- (G) Recovery
- (H) Reproducibility, and
- (I) Robustness
- (d) If available, the laboratory shall use cannabis reference materials or certified reference materials to validate test methods.



[Seeding Labs](#) is a US-based social enterprise with the goal of ensuring everyone has equal opportunity to make the scientific discoveries that improve life and our planet.

We identify talented scientists at strong institutions who are training the next generation and tackling local and global development challenges. Through our [Instrumental Access program](#), we have built a coalition of over [140+ public and private sector partners](#) and provided equipment and training worth more than \$30 million to scientists at 63 institutions in 33 countries. [With this influx of resources](#), these scientists have trained tens of thousands of students, produced several patents, secured new funding and collaborations and generated real results ranging from a new dairy breeding technology for African farmers to drug candidates for antibiotic resistance.

Khemia Software is a proud supporter of this organization. Whether through financial support or unopened supplies, you can be too!

So, what are your **Minimum Requirements** for a LIMS?

Storage and Availability of the following records:

- Section 5701
 - The ISO 17025 accreditation and Quality Manual.
 - You must have a section in the LIMS that contains your ISO 17025 Scope of Work listed and all PT (Proficiency Testing) sample results.

- Section 5702
 - Valid ISO 17025 valid certificate of accreditation for each analysis
 - Copy of all SOPs relevant for:
 - Sample collection Sample Storage Sample Analyses
- Section 5711
 - Copy of all SOPs relevant for:
 - Sample collection Sample storage Sample analyses
- Section 5712
 - Copy of all methods
- Section 5713
 - Validation reports for all methods used
- The specific quality control (QC) required for each type of analytical test is not listed, but the quality control developed in the validation statistical report will set the QC limits. The State of California has directed users and laboratories to the FDA manual "[Guidelines for the Validation of Chemical Methods for the FDA FVM Program, 2nd Edition, 2015](#)". The laboratory must have on file for user review the following minimum results in an analytical statistical report validating their method:
 - accuracy
 - limit of quantitation
 - ruggedness
 - precision
 - linearity (or other calibration model)
 - confirmation of identity
 - selectivity
 - range
 - spike recovery
 - limit of detection,
 - measurement uncertainty
- These same QC limits should be recorded in the LIMS system.

These requirements will be covered in more detail in the series: [Quality Plans for Lab Services: Managing Risks as a Grower, Processor or Dispensary](#). Additional articles written by Ed Askew may be found in the [Cannabis Industry Journal](#).

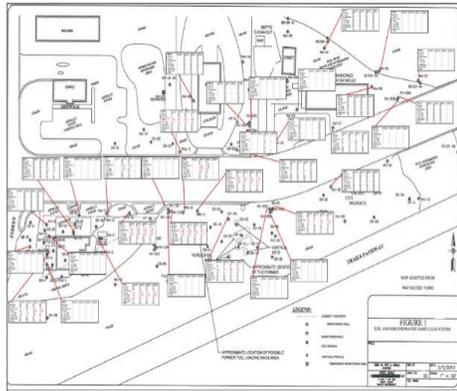
Laboratory Data Deliverables by SampleServe.com/Russell Schindler

*"Civilization advances by extending the number of important operations which we can perform without thinking of them."
-Alfred North Whitehead*

I may be dating myself, but when I started working in the environmental industry, the fax machine was just becoming standard office equipment. They were slow, used thermal paper that came on a roll, and you had to cut the paper into the right size yourself. The paper was difficult to work with as it wanted to roll back up on itself. When we needed results from a laboratory in a hurry, we would ask them to "fax it over." Otherwise, laboratory reports were always printed on paper and mailed via US Postal Service. Once the paper or fax reports were received, we would take the data and put it into a table, sometimes. We would have to re-type the data ourselves into whatever format we wanted it in. We didn't always do tables because I'm talking about a time before Microsoft Excel. The tables I worked on back then were mostly rudimentary tables constructed in a software called WordPerfect. Full laboratory reports were always included as an appendix to the report and reports were always printed and delivered on paper. I spent hours and hours re-typing data from paper to a computer only to print it back out on paper again. It was a good thing both I and my employer were getting paid by the hour.

It was around the time that e-mail became mainstream in the late 1990s to early 2000s that laboratories started giving the option of having your data delivered via e-mail, but it was still an image on paper. It wasn't until the early to mid-2000s that most labs started offering data delivered as an Excel file.

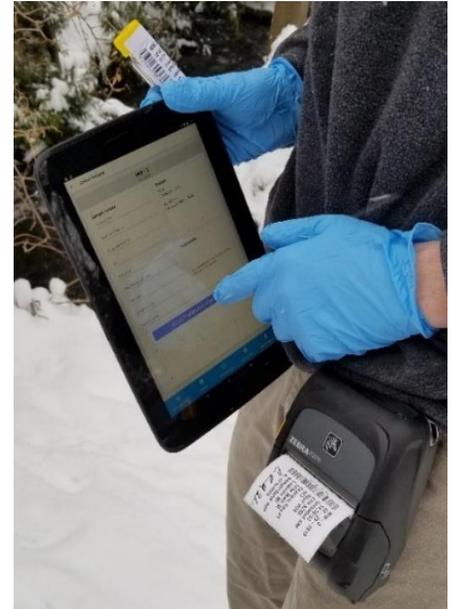
Thus, getting paid to re-type data was gone. Think of the hundreds of millions of dollars saved collectively across the country over the years by end-user simply removing the need to re-type data because the data table could be delivered electronically. Seems like a small thing now, but it was a huge savings overall. Laboratories that embraced the Excel data tables early on gave themselves a competitive advantage over late adopters of the data table delivery method. Although not having to re-type data cut into the billable hours of the engineering firms, it ultimately made them more competitive in the eyes of their clients.



Analytical Box Map. Easily customizable and generated in seconds.

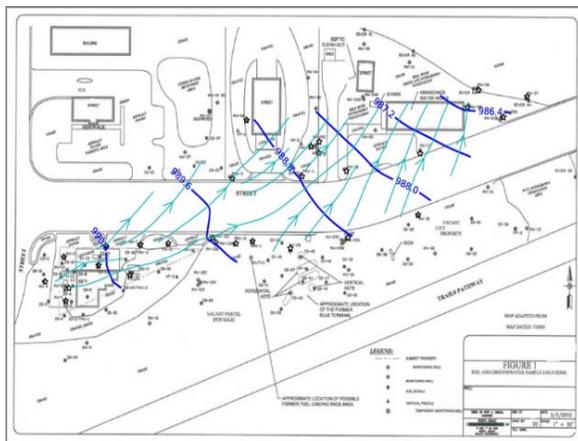
send you an Excel file customized to your exact specifications, but it's still just a fraction of what the end-user client needs. The end user (the regulated oil companies, manufacturing firms, etc.) need full reports with all the full color graphics, maps, contours, graphs, etc. completed well beyond just simple Excel tables.

The future is a scenario where the laboratory is providing the mechanism for the client to get all those required full color info-graphics as an electronic deliverable. It's the next logical technological progression in data deliverables. I've had conversations with numerous laboratories about taking the next step, as SampleServe's software has been developed for just this purpose.



SampleServe.com mobile app and barcoded sample labels. Sample collection data from the field goes straight to the lab.

The resistance to date by some of the laboratories to this concept is somewhat baffling to me. The response I hear most often is "The consulting engineering firms will think we are competing with them and might not use us anymore." At first



Groundwater Elevation Contour Map. Easily customizable and generated in seconds.

glance I can understand this initial reaction, but it doesn't stand up to the history of technological advancements. If a technology delivers a comparable product, saves time, and saves money, it will ultimately win in the market place. The situation is like the days when Excel files were first delivered. I personally remember making the decision not to use a lab because they couldn't deliver data as an Excel file. Most labs wouldn't even think of not delivering data via Excel these days. No one would use them. Today delivering data means delivering a mechanism quickly and easily convert the data into a final usable format. Soon, as happened with Excel tables, not doing so will mean not getting or worse, losing the business.

If you would like to talk about how your lab can easily allow custom created data info-graphics to your clients, please contact Russell Schindler at schindler@sampleserve.com.

Your comments and questions about anything I've written are appreciated.

- Russell Schindler, P.G., SampleServe.com, email: schindler@sampleserve.com or 231-933-7035 (office) or 231-218-7955 (cell)

Microscopy Corner

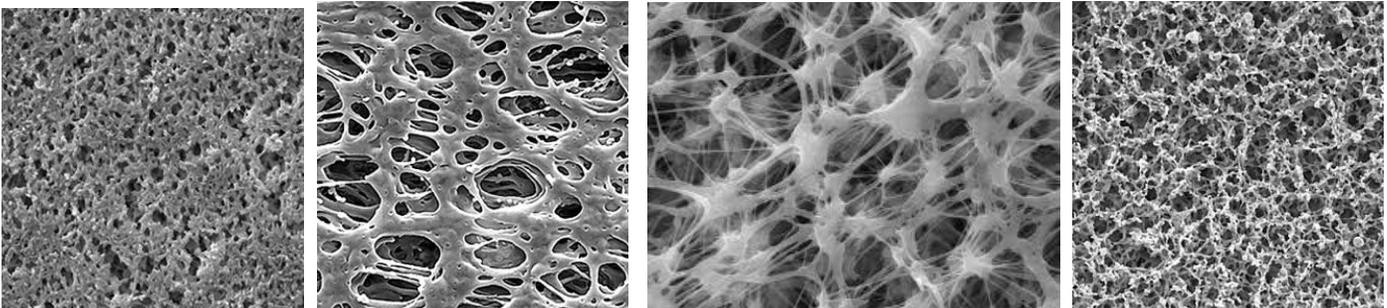
Ever wonder what was growing in the water under the potted plant in the window? If so, ever take a look? I entertained my son and of a couple of the neighbors' kids with the microscope one afternoon doing just that. Aside from the single-celled algae that made the water green and a couple of very fast protozoa I could never keep in the field of view for more than a second, we found a number of these [rotifers](#):



For short video of the rotifer feeding, click [here](#).

Filter Media

Ever want to know what the membrane filters you use in the laboratory really look like? The images bellow are from various filter media commonly found in an environmental laboratory (pictures were provided by [SyringeFilter.com](#)).



Nylon

Polyethersulfone (PES)

Polypropylene (PP)

Mixed Ester Cellulose (MCE)

Newsletter 101!

Want to get this newsletter but not on the mailing list? Great! Just send me an email at rbenz@khemia.com and ask to be placed on the list. Getting it but do not want to? No problem! Our apologies. Just asked to be removed.

Want to submit an article? That would be terrific! Please send over a rough draft. Suggestions? We'd love to hear them! At the start of every newsletter, I am always looking for ideas.

Robert Benz

Director of Sales & Marketing, [LinkedIn](#) | [Blog](#)