



Dear Readers,

► By the close exchange with our partners and customers we are acquainted with the challenges arising in practice. Again and again it can be seen that only with individual solutions we achieve together our aim. The "improvised" soot generation described in this edition is such a case. The highly-special requirements of our customers are the reason why our service is not limited to the established Palas® product range. Our task comprises also the realisation of technical special solutions together with our customers. Often, new products have their seeds in this continuous development work. Practice proximity is very important also with the development of technical standards. Especially on international level it is important to consider the experience of German companies as well. Therefore, Palas® employees collaborate in different DIN, ISO and VDI committees.

Leander Mölter
Managing Director
Palas® GmbH

In this edition:

- **Cover topic:** New test rig guarantees highest quality
- **Practice:** Practical filter testing with open flame
- **Customers:** Hollingsworth & Vose
- **Development:** welas® system covers wide measuring spectrum
- **Development:** Palas® collaboration in standards committees
- **Internal:** Retrospect 21st ATS

New test rig guarantees highest quality

Exclusive service for the calibration of aerosol generators

► Since middle of 2007, the Palas® measuring laboratory has been working at full capacity. This is due to a new test rig offering an unrivalled wide spectrum for calibrations. For approximately four months the faultless quality of each Palas® aerosol generator has been backed up with this fluidic-optimised and stably working test rig.

With the new calibration test rig, the device parameters of aerosol generators regarding particle size and particle concentration can be clearly determined. This applies to most different dusts, salt particles and droplets as well as to the diverse operating conditions and setting parameters of the different aerosol generators.

„This test rig was originally conceived only for internal quality control“ says Palas® Managing Director Leander Mölter. Now, the new calibration test rig serves no longer only for the outgoing inspection of the Palas® aerosol generators. Palas® offers also its customers and its partners an unusual service with this test rig. The maintenance of the aerosol generator is done with this test rig – in case of ambiguities a broad and fast diagnostics can be placed.

The test aerosols must be made measurable

„The quality of the measurement results obtained with test aerosols depends on the reliable calibration of the used generators“, explains Mölter. Commercial aerosol spectrometers can measure coincidence-freely, depending

upon the manufacturer, only within the concentration range between $10^3 - 2 \times 10^5$ particles/cm³. Therefore, the test aerosol must be made measurable first. That happens in the new calibration test rig. In contrast, so called clean room counters are not suitable for the calibration of such test aerosols.

„For calibration, the aerosol generator is attached to the aerosol processing tube“, describes Mölter the procedure.

There is a tube for dust particles, a tube for liquid droplets such as DEHS and a tube for salt particles. In the aerosol processing tube, the aerosol is distributed homogeneously over the cross section. The sampling takes place in an isokinetic way, i.e. at constant speed and in vertical arrangement. Thus it is ensured that one gets also large particles of for example 40 µm representatively into the measuring device. Technically unusual: the inflow can be alternatively adjusted to pressure, suction, circulating air or mixture operation. The volume flow can be variably set stably between 40 and 600 m³/h with an accuracy of one per cent of the final value.

The measurement of the particle concentration and of the particle size distribution is accomplished



Measurable quality: The new Palas® test rig

with the aerosol spectrometer welas® according to the guidelines VDI 3867 and/or ISO/DIS 21501-1. The size classification accuracy and the size resolution are proven reliably over the measuring range. In addition, the welas® system has a coincidence detection.

Not only generators made by Palas® are calibrated

Not only generators made by Palas® are calibrated. Also commercial aerosol generators made by other manufacturers can be sounded out with this test rig. Mölter assures: „Everyone having its generator tested with us gets from us naturally a Palas® calibration certificate including the current values of the calibrated device.“

Practical filter testing with open flame

Improvised soot generator shows filter performance of nanofibres

► The automotive industry continuously requires new and innovative concepts to increase the performance of filter media. The efficient capturing of fine particulate matter – above all soot – currently is the main scope of these discussions. The Hollingsworth & Vose Company (USA) develops filter media which are coated with nanofibres. The use of such nanofibre coated filter media in field tests have shown great improvement with much higher efficiencies compared to conventional cellulose papers for the finest particles. Beside this, the life of the filter media is extended as well.

How to show the filter performance of nanofibres?

It is difficult to show the benefits of nanofibres in filtration if the media is tested in the laboratory, reports Immo Schnieders from Hollingsworth & Vose Company. "The standardized tests using AC Fine test dust do not reflect the merits of the nanofibre coated media. Of course there is recognizable improvement of the efficiency, but the advantages of such media in a fine particulate environment are not shown. This makes the commercialization of such media more difficult". Furthermore the tests have not shown the increased life of the nanofibre media due to the fact that existing test standards are not comparable to real life conditions. "The particle size distribution of the standard AC Fine test dust with the presence of extremely large particles is not comparable to soot - which is a heightened area of concern in the debate of fine particulate matter", says Mr. Schnieders. As consequence the test protocol has to be adapted towards more real life conditions.

Filter testing in the lab using real soot

The focus of the work was to find out, how flat sheets can be tested in the laboratory with real soot. "For such small flat sheet areas

no test equipment was available" describes Mr. Schnieders the starting position. "The soot emission from the Palas® VSG-3000 simply is too high. The particle concentration of the VSG-3010C, designed for calibration of the big generator, on the other hand is too low to get useful results in an acceptable time."

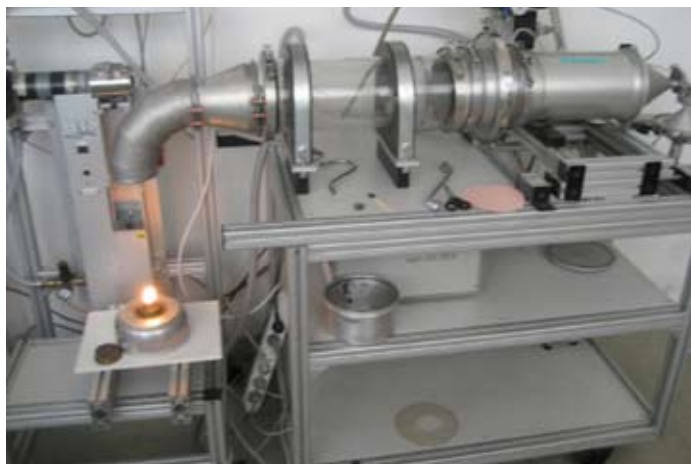
Test results using a "camping stove"

Based on the Palas® principle of generating soot using a combustion process an improvised solution has been found, giving amazing results. A simple paraffin flame unceremoniously has been used as soot generator, "supplying an unexpectedly constant soot generation source", according to Mr. Schnieders. This 'generator' has been combined with the Palas® MMTC-2000 test equipment for cleanable filter media to test the nanofibre media with soot. With success: "The reproducibility of the results certainly is only partially verified", explains Mr. Schnieders, "but with the improvised equipment we are able to show the strong differences for nanofibre coated media if they are measured with 'real' soot and we can demonstrate the huge benefit of nanofibres in the capture of finest soot particles".

Of course this is not a really rigorous scientific work, confesses Schnieders, but the results are an important basis to adapt the existing test protocols towards more realistic conditions and to develop filter media for fine particle emissions.

Together with Martin Schmidt from Palas® alternatives are now being evaluated. The adjustment of the VSG system with constant and reproducible intermediate soot emissions is certainly feasible.

A further possibility is the use of an aerosol generator, which is also able to generate particles in the sub-micron range. Results with Sodium Chloride (NaCl), genera-



„Real Diesel soot“ on filter test system

ted with the AGK-2000 aerosol generator from Palas®, have shown the same advantages and improvements of the nanofibres as they have shown with soot - even if the particle characteristics of NaCl and soot are quite different.

What is the particle distribution in the 'real world'?

According to Mr. Schnieders, there are still more open questions: "What is the particle distribution in the 'real world'? If one is only measuring with soot it is not considered that trucks are also 'brea-

thing' particles from brakes, wheels and road dust - all these will be part of the overall particle mixture. Therefore the next task is to approach the real life conditions much better." In cooperation with the Palas® company the possibility of a soot generator is evaluated as well as the possibility to simulate soot-conditions with aerosol generators, which are able to adjust the appropriate particle sizes quite easily using different particle size distributions of the NaCl solutions.

► Palas® Customers



Hollingsworth & Vose

► Hollingsworth & Vose is one of the worldwide leading manufacturers of special papers and nonwovens for technical applications. With its advanced R&D and pilot manufacturing facilities, Hollingsworth & Vose drives value in their customers' products by inventing next-generation materials with superior performance. H&V products are found in applications such as engine filtration, high efficiency air and liquid filtration, battery separators, gasket materials, and specialty and industrial nonwovens.

The expertise and process capabilities include wet laid, dry laid, melt blown, and composite technologies.

Hollingsworth & Vose is operating twelve manufacturing sites in Europe, North America and Asia. Since 2007 a new manufacturing site in China, near Shanghai, belongs to the company.

Contact:

Hollingsworth & Vose Company
112 Washington Street
East Walpole, MA 02032, USA
Phone: +1 508-850-2000
Fax: +1 508-668-3557
E-mail: info@hovo.com
www.hovo.com

welas® system covers wide measuring spectrum

New welas® sensor 2500 for low concentrations

► The welas® system now covers an even wider measuring spectrum. The new welas® sensor 2500 allows particle measurements also in very low concentrations. "We now cover almost the complete range of possible applications with the welas® system", says Palas® Managing Director Leander Mölter, "from measurements in a maximum concentration of 7×10^2 P/cm³ with the new welas® sensor 2500 up to measurements in a maximum concentration of 2×10^5 P/cm³ with the welas® sensor 2100S."

With the diverse sensors, the welas® system is now suitable for different fields of application. It can be used for the gauging of medical nebulisers (MDI/DPI) and filter tests according to ISO 5011 with 1000 mg/m³ ISO Fine dust as well as for measurements in very low concentrations of the clean room class 100.000 or for determining the initial fractional efficiency of filter media.

ency of filter media.

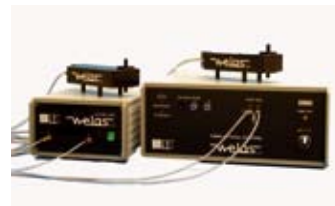
The new welas® sensor 2500 allows for instance measurements of oilmist and soot particles during formation and of radioactive particulate material. It can also be used for tests of filter media up to inclusively filter class H 13.

Among other things, final filters for clean rooms, final filters in civil protection systems, but also exhaust air filters in nuclear installations can be examined.

Measurements in different fields with just one control unit

Apart from the large application spectrum, a further advantage of the welas® system is the fast adjustment to most different measuring requirements by the simple exchange of the sensors. Due to the various combination options, the user needs for all measuring tasks just one control and evaluation unit. A big advantage is also the patented optical fibre technology that allows measurements in areas being difficult to access, e.g. in chimneys or passenger compartments. The evaluation unit can be installed up to 60 metres away from the sensors. With welas® 3000, even a quasi simultaneous measurement at two measuring points is possible. Depending on the measurement task, welas® sensors with different concentration ranges can be combined for

example for measurement upstream the filter with a high concentration and downstream the filter with a very low concentration.



Overview of the welas® sensors (series 2000/3000):

welas® 2100S:

measurement up to a max. concentration of 2×10^5 P/cm³

welas® 2100:

measurement up to a max. concentration of 10^5 P/cm³

welas® 2200:

measurement up to a max. concentration of 10^4 P/cm³

welas® 2300:

measurement up to a max. concentration of 7×10^3 P/cm³

welas® 2500:

measurement up to a max. concentration of 7×10^2 P/cm³

welas® 7000S:

isothermal measurement up to a max. concentration of 10^5 P/cm³

Palas® collaboration in standards committees

► Palas® incorporates its longtime experience in development work and practical use into the formulation of safe standards in the particle and filter technology. Managing Director Leander Mölter and Dipl.-Ing. (FH) Martin Schmidt, Technical Sales Manager, are members of several ISO-/DIN- and VDI-committees.

In the focus: filter test of car interior filters

"A focus of our current collaboration in standards committees are filter standards for the automobile industry" reports Mölter. The Palas® Managing Director contributes for example to technical specifications in the field of filter test in the German standards committee for motor vehicles (FAKRA).

Due to the work on an international level, Schmidt can deliver interesting information on this topic. "Currently, ISO/TS 11155-1 filter

test of car interior filters is red-hot". However, the participation of Palas® is not only limited to the committee meetings. "Palas® employees participate actively in comparative measurements with which the comparability of filter test systems is being examined and improved" says Schmidt.

Beyond that Palas® joins in ISO "Blow-by" for oil separators as well as in ISO/CD 19713-1 and -2 for the examination of engine air intake filters. This standard is going to be adopted soon.

Another subject area Palas® contributes to is the particle measurement technology. Leander Mölter for example is member of the committee for the normative description of aerosol spectrometers and their function in ISO/CD 21501-1. The task is the clear determination of the operating limit.

"It is a matter of classification accuracy and size resolution of



optical aerosol spectrometers: how can the the concentration and the size of particles be determined? – a core competence of Palas®" says Mölter.

Always up to date due to committee work

"For the formulation of standards, the professional and practical expertise is decisive", says Schmidt. "Last but not least, with our broad experiences we make an important contribution. When concrete questions and problems arise, we are able to judge what is technically possible and what is not." Among other things, Mana-

ging Director Mölter is currently appointed to the technical committee "Particle Measurement Technology" of the VDI-society Process Engineering and Chemical Engineering (GVC).

Sometimes, Palas® hosts VDI meetings on its premises. "Thus we can demonstrate our technology directly on site", explains Schmidt. The company itself benefits from the committee work as well: "Thanks to our participation in the different committees and working groups, the Palas® employees are always up to date with regard to technology and the new and revised standards."

Retrospect: 21st Palas® ATS

► Over 50 participants of this year's Aerosol-Technology-Seminar (ATS) gave kudos to Palas®. Latest developments and current challenges in the filter industry, professional papers and inspiring discussions - like each year, the ATS 2007 provided a special framework to experts from industry and research for exchanging their experiences and views.

The ATS 2007 took place from

ences, always mirrors the current topics.

Apart from papers about particle technology, contributions to the key words fine dust and diesel soot were part of this year's programme.

The seminar was opened by Dipl.-Ing. Ulrich Klenk from the Bergische Universität Wuppertal. In his paper „Secondary dust creator ammonia - Performance of

out that the generation of a reproducible test aerosol is the general problem of this measurement. Another topic was the difficulty of so-called Round-Robin-Tests. A Round-Robin-Test is accomplished to determine the reproducibility of a measurement device or of a test system.

In his paper about the comparison of filter test systems according to DIN 71460/ ISO/TS 11155-1 using a homogeneous filter medium, Leander Mölter from Palas® GmbH presented exemplary measurement results by means of a metal grid filter. Afterwards, this metal grid mesh was described more closely by Dipl.-Ing. Walter Haver from the company Haver & Boecker OHG, wire weaving mill and machine works in Oelde. Title of his paper: "Exact determination of the aperture size of metal wire mesh". He was followed



*A cappella singing in perfection
Multiple Voice from Karlsruhe*

by Dipl.-Ing. Philipp Kopf from the Institute of Mechanical Process Engineering at the Stuttgart University who reported on the "Determination of the grade of filtration of metal wire mesh with the help of the capillary pressure method".

The first seminar day was concluded by an excellent knight's meal at the Badisch Brewery in Karlsruhe. In the relaxed and inspiring atmosphere of this house, the participants could further deepen and discuss the topics of the day.



Herbert Hoffmann, Managing Director Technologiefabrik Karlsruhe, Palas® Managing Director Leander Mölter and Prof. Dr.-Ing. Klaus G. Schmidt, IUTA e.V., Chairman of KRdL in VDI and DIN

October 14-16 at the Schlosshotel in Karlsruhe. The seminar, that was held already for the 21st time, opened traditionally on Sunday evening with a formal dinner at the Schlosshotel. The a cappella group Multiple Voice arranged for conviviality with their varied musical repertoire.

The two-day ATS seminar, in proven quality moderated by Prof. Dr. Christoph Helsper of the Aachen University of Applied Sci-

ences, always mirrors the current topics. laboratory tests", Klenk presented the connection between the reduction of fine dust and the reduction of ammonia, SO₂ and NO_x emissions.

Dr.-Ing. Stefan Haep from the Institute for Energy and Environment Technology e.V. (IUTA) reported on the diesel soot problem. In his paper "Fractional efficiency measurement with soot particles - Comparison of diesel engine with combustion aerosol" he pointed



Works outing into Palatinate

In April 2007, the Palas® employees and their families were invited to a works outing into the beautiful Palatinate. Meeting point was the base station in Rhodt unter Rietburg, from where everybody took the chair lift to the Rietburg castle. After a walking-tour, one met at the Edesheim castle for a champagne reception. The evening was concluded by a delicious buffet and a cosy get-together.

► Palas® Agenda

Palas® will participate in the following conferences and exhibitions (excerpt). We are looking forward to meeting you there!

► 9th Symposium „Textile Filter“

04.03. - 05.03.2008
Chemnitz, Germany

► Clean Rooms Europe

11.03. - 13.03.2008
Stuttgart, Germany

► 10th World Filtration Congress

14.04. - 18.04.2008
Leipzig, Germany

► Automotive Testing

Expo 2008 Europe
06.05. - 08.05.2008
Stuttgart, Germany

► Filtration & Separation Asia 2008 + 5th China International Filtration Exhibition & Conference

28.05. - 30.05.2008
Shanghai, China

► VDI-Colloquium „Neue Entwicklungen bei der Messung und Beurteilung der Luftqualität“

24.06. - 25.06.2008
Nuremberg, Germany

► TechnoPharm 2008

30.09. - 02.10.2008
Nuremberg, Germany

► Palas® Contact

Palas® GmbH

Greschbachstr. 3B
76229 Karlsruhe, Germany
Tel.: +49 721 96213-0
Fax: +49 721 96213-33
E-Mail: mail@palas.de
www.palas.de

Editors

Nina Heim, Claudia Matlak

Words and Layout

Andreas Mauritz - Public Relations

Palas® **Particular** is published half-yearly. We are looking forward to your suggestions and critical comments. Should you need further copies or should you want to recommend our newsletter, please send us an e-mail with your contact details.