



AUTOMATIC PARTICLE COUNTING

Effective way to deal with turbidimetry – The German company PAMAS develops, manufactures and distributes Automatic Particle Counters for fluid cleanliness control, e.g. of hydraulic or lubricating oil, fuel, pharmaceutical liquids like infusion solutions, WFI (Water for Injection) and process water. Here is a case study on how the instrument works.

The PAMAS WaterViewer is an automatic particle counting system designed for water applications.

There are various existing methods to determine whether the water is clean and free from particulate contamination. In water treatment systems, both particle counters and turbidimeters or nephelometers are used for water quality control. Turbidimeters and nephelometers measure the

collective amount of solid contaminants in liquids. The more turbid a liquid is, the higher the measuring value will be. Automatic Particle Counters do not measure the collective amount of solid particles, they analyze size and quantity of each single particle, which is part of that population in the online sample flow. The knowledge of the particle sizes is of paramount importance in water applications, as it helps to quickly identify certain types of bacteria or even a failure in the system (e.g. break-through of a membrane filter in case of an above average number of large sized particles). The Automatic Particle Counter thus gives more versatile and significant results than a turbidimeter.

PAMAS, a German company, develops, manufactures and distributes Automatic Particle Counters, designed for fluid cleanliness control. The extensive PAMAS product range provides more than 20 different particle counting models for multiple applications. Besides the most widely used models, which are applied in contamination control of hydraulic fluids, fuel and insulation liquids there are more specialised models for the determination of



Source: PAMAS Partikelmess- und Analysysteme GmbH



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filter efficiency (beta-ratio analysis) and parts cleaning. Fluid cleanliness control in the pharmaceutical industry and water quality control in water treatment plants are other applications within the extensive uses of Automatic Particle Counters.

Features of the instrument

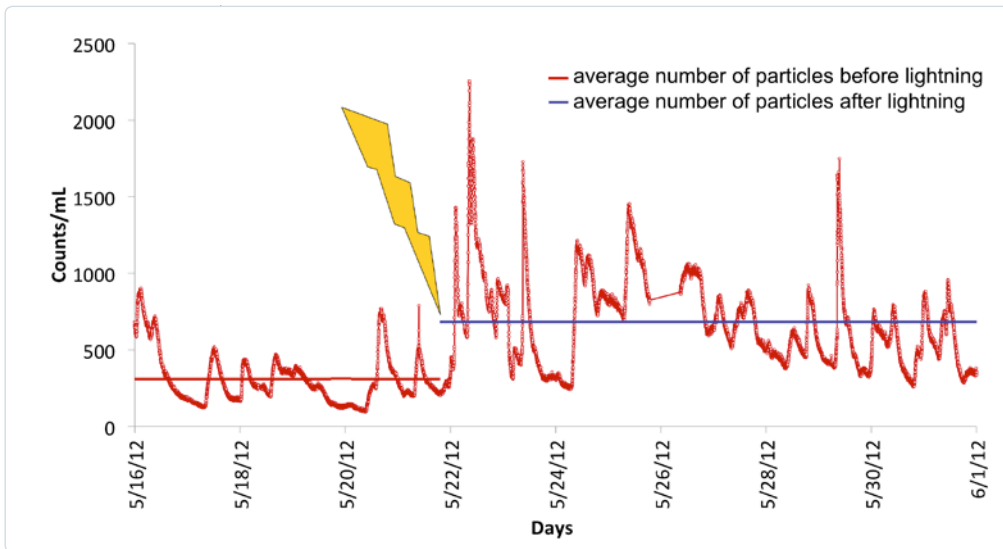
PAMAS WaterViewer is specifically developed for water applications. This unit takes measurements online and is installed as a fixed stationary instrument for water condition monitoring. The system is used for the cleanliness control of potable water, raw water and purified waste water or process water. For condition monitoring, the instrument may be connected to up to 32 measuring points. With the aid of microprocessor controlled valves, it is easy to change between measuring points and bypass connections. It can also be fitted optionally with an automatic Sensor Flushing Unit, the PAMAS SFU. This attachment will automatically remove mineral deposits (e.g. manganese, calcium, iron oxide, etc.) from the optical cell windows which may otherwise diminish the laser light beam. The instrument stays in action round the clock without anyone having to take care of it. The instrument configuration can be set up according to the customer's requirements: Depending on the user-specific application, the PAMAS WaterViewer may be

Use of PAMAS WaterViewer at the water treatment plant in Nancy, France.

Highlights

- Automatic Particle Counters do not measure the collective amount of solid particles, they analyze size and quantity of each single particle, which is part of that population in the online sample flow.
- PAMAS, a German company, develops, manufactures and distributes Automatic Particle Counters, designed for fluid cleanliness control.

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The measuring results of the PAMAS WaterViewer clearly showed that the average number of particles per millilitre was seriously increased due to the lightning event and the changes in water production and distribution.

equipped with different particle sensors with different sensor specifications. The sensor PAMAS HCB-LD-25/25 for example, analyses particle sizes between 1 and 200 µm.

Case study

In a scientific study, the University of Lorraine in Nancy, France studied 'Particle Counting for early detection of contaminants in drinking water'. The results of this study were then presented at the WCEC5 conference (Water Contamination Emergencies – Managing the Threats) in

Mülheim an der Ruhr, Germany. Based on measurements of a real application at the city waterworks of Nancy in France, the study provided evidence on the benefits of the PAMAS WaterViewer for water quality control.

Particles were counted in three different online measurements: Under stable and normal conditions, the PAMAS WaterViewer measured a mean number of 310 P/ml in the specific interval of particle sizes between 1–15 µm.

In a second step, the particle concentration was analyzed after a major raining event. During a thunderstorm, a lightning stroke

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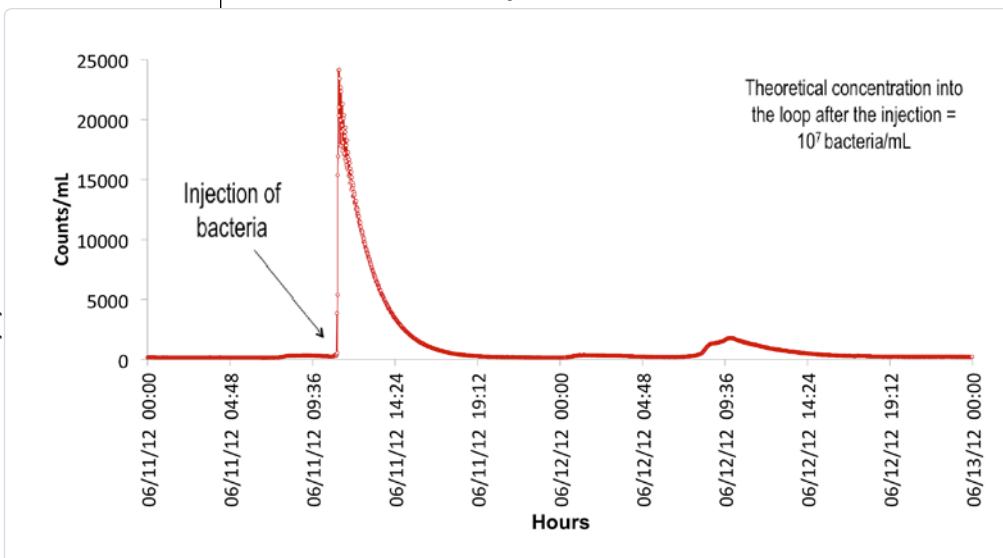
into the water treatment plant of the city of Nance and seriously affected the plant operation. The water production was stopped for several hours and water had to be taken out of highly chlorinated security reservoirs. When analyzing the water coming out of these reservoirs, the PAMAS WaterViewer counted between 801 P/ml and up to 2300 P/ml for the particle size range between 1–15 µm.

During the third experimental step of analysis, the water was contaminated by injecting a bacteria suspension into an isolated loop circuit, in order to examine the effects on water quality. During the first hours after injection, more than 20,000 P/ml were counted. The graph of online measurements however shows that the particle concentration decreased within few hours after injection. The authors of this study attribute this fast decrease of particles to sedimentation and dilution processes.

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The analysis in the water treatment plant of Nancy gave evidence on the fact that the PAMAS WaterViewer is an ideal instrument for the early detection and warning of contaminants in drinking water. The online particle counter instantaneously gives alert in case of drastic changes in the measuring results and immediately informs about exceeding particle contamination.

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