

Smart Process Monitoring

Compact, quick, flexible – the next generation of diode-based process monitoring

Quality monitoring in laser-supported manufacturing processes has become mandatory in today's environment because of the very high demands for precision expected for components produced. To meet this requirement, Plasmoprovides its customers with a comprehensive portfolio of solutions and services for the monitoring of automated production processes.

However, due to the rapid technological development, applications are becoming quicker, more complex, and dynamic. The Plasmoprocessobserver has proven itself over many years and is used with extreme success in the automotive sector for the monitoring of safety-critical applications.

Keeping with these developments, the latest generation of the diode-based sensor is now on the market. With this new innovative approach, a whole new area of application is now available.

Diode-based process monitoring

With diode-based sensors, a photodiode is used to measure the light emitted by the process. Not only the visible light but also the thermal emissions and the reflected radiation from the laser are of particular interest.

Therefore, the sensor must be capable of measuring optical radiation of different wavelengths with a very high resolution while reducing noise as good as possible. The processing, evaluation, and correlation of the measured data is taken over by the Plasmosoftware using algorithms specifically designed for this purpose. As soon as the processing procedure has been completed, the result is visualized and transmitted to the customer without any delay or increase to cycle time. This is one of the huge advantages of "online process monitoring" compared to other technologies.



Fig. 2 The next generation – quick, flexible, compact

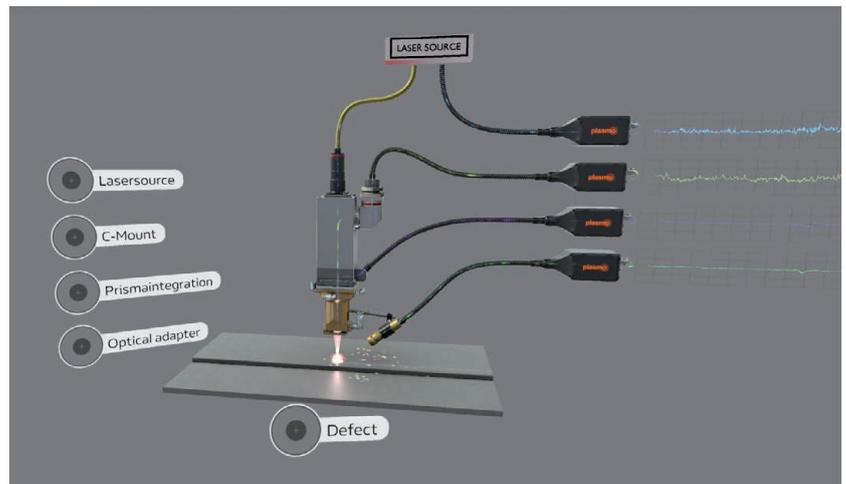


Fig. 1 The numerous integration possibilities of the new Processobserver.

Optical integration

There are several possibilities for how the optical radiation can be transmitted from the process to the sensor.

Currently, an optical fiber is used for most of the applications. In the future, the new compact design makes it possible to connect the sensor directly to the C-mount adapter of a scanner optic.

Basically, there are three options available. With the "off-axis" integration, the process is observed from a sideways perspective. The second possibility is to observe the process via a camera adapter "on-axis", and the third option is the direct integration into the process laser (Fig. 1). For many applications it makes sense to use a combination of all three options, in order to be able to assess the process quality as good as possible.

Quality suite

This quality assurance is much more than just the recording and evaluation of measured data. The intent is to offer a comprehensive approach. The Plasmoo Quality Suite is an approach that allows to combine different sensor technologies with each other. The measured data is then processed, linked to one another (integration level) and evaluated (correlation level). Depending on the application, the data and results are then visualized in a format suitable for the customer (Fig. 3).

The customer is continuously supported through training, process consulting and service operations in order to get the most out of the system.

Speed

Scanner optics offer possibilities for extremely quick and flexible component processing. This leads to more and more dynamic processes and shorter weld cycle times. A challenge for the process monitoring.

The rapidly growing electro-mobility sector has set new benchmarks with battery welding applications. Extremely short seams with rapid cycle times and high-quality requirements are welded. With a processing time of only a few milliseconds, the sampling rate and measurement bandwidth are of vital importance.

With a specifically designed analogue amplifier and a measurement frequency of up to 250,000 samples per second, the monitoring offered by Plasmoo's solutions is easily possible.

Scalability

Systems and processes are becoming more individual and complex. Therefore, not only the software, but also the sensor technology must be capable of being adapted to the often very different requirements.

The Ethernet interface allows the integration of several sensors into a sensor network, which makes the system highly scalable. The sampling rate, sensitivity, and a number of other parameters can also be adapted to the respective application.

Even a completely customer-specific and unique development is possible: The modular construction offers the

ability of adapting the sensor individually to the customer's needs. If there are special requirements on the wavelength, sensitivity, or the dynamics, a module optimized for these parameters can be developed without having to change the complete sensor electronics.

Today, already a specially adapted version of the Processobserver is being used for 3D printing processes by the company EOS.

Outlook

In such an innovative branch as laser processing, you have to think about the future today. Currently, a version of the processobserver with photodiodes sensitive in the near infrared range, is being worked on and will be released in 2019. This means that thermal process

emissions can be measured even more accurately.

In the future, more and more intelligence and processing will be transferred from the software to the sensor which makes closed-loop control of processes much easier.

It allows the early recognition of trends and thereby the avoidance of rejects. This helps to optimize the process, hold it within specified limits and in the end to achieve the ultimate goal to "Produce Quality. Always."

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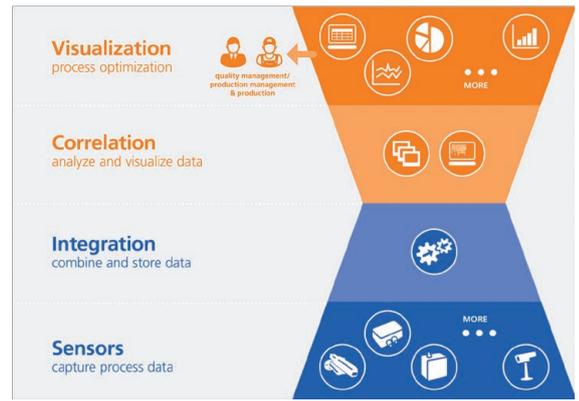


Fig. 3 Plasmo Quality Suite