PROline – ready for the next Industrial Revolution
(Industry 4.0) and SCADA

Göran VOGT 1
1 VOGT Ultrasonics GmbH
Ehlbeek 15, 30938 Burgwedel, Germany
Tel. +49 (0)5139-9815-0, Fax +49 (0)5139-9815-99, info@vogt-ultrasonics.de, www.vogt-ultrasonics.de

Abstract. Germany’s industry is making real progress on the path to the next industrial revolution – Industry 4.0: components communicate with production plants which detect faulty parts, initiate the necessary repair or reject the corresponding parts. The Fed.Gov. of Germany has declared that industry 4.0 is a core element of their High-Tech Strategy, with the PROline inspection system it is already reality.

PROline links the production with the latest communications technology. Being PC-based, it can be easily integrated directly into the production line. PROline allows economically automated 100% defect control of products and the same time contributes to optimal material flow. It communicates interactively with the production environment.

Among others PROline was developed for testing welds on penetration, binding and volume defects, the control of soldering and thicker coating compounds and the monitoring of wall thicknesses. In particular, in conjunction with mechanized and automated ultrasonic testing applications PROline shows its strength. It communicates with a PLC or ERP interface and provides flexible software modules for optimizing and increasing the range of applications of existing test systems.

If, despite a high degree of automation, a user wants to evaluate ultrasonic data manually, he gets various possibilities to process additional data to the ultrasound signal (A-scan) and gate information, e.g. B-Scans, C-Scans, TD-Scans, side and top views. PROline controls the operation and communicates from start, stop, signals for o.k. or not o.k. sorting, statistics, up to combinations of ultrasonic gate and system information as an and/or/nor-scan.

The automatic, standardized evaluation, individual test report creation and result archiving saves time and creates production reliability. Additional test measures such as the rescan of a conspicuous part to validate any material defects can be automated. A remote connection allows for quick updates, linearity calibration and the flexibility of a modern production.

PROline supports SCADA (Supervisory Control And Data Acquisition) for recognizing individual parts, controlling systems, and storing all data during scanning. PROline receives and transfers all part connected data with its production environment.
To remain competitive or to gain future competitive advantages, companies constantly reduces their production costs while maintaining consistent quality. An important step towards long-term cost reduction and in order to maintain the competitiveness of a modern production is the networked automation in terms of “Industry 4.0”, the core element of a modern high-tech strategy. Industry 4.0 means the intelligent interconnection of the real with the virtual world. Single machines, plants and products are connected for an automatic, interactive data exchange. Thus enables the claims for e.g. a cost effective, individual mass production and a flexible reaction to the market.

In the age of global recall campaigns production accompanying component inspections become an important part for a cost-saving process. Regarding the non-destructive quality assurance Industry 4.0 means e.g. the communication of components with production plants which automatically detect faulty parts, initiate the necessary repair or reject the corresponding parts. The production process merges with information technology (fig.1).

![Fig. 1. Being PC-based PROline can be easily integrated directly into the production line and contributes to optimal material flow. Testing parts can be automatically be sorted (OK/ NOT OK).](image)

**PROline is ready for Industry 4.0**

PROline productions accompanying ultrasonic inspection system solutions satisfy the High-Tech industries requirements (e.g. machinery and plant engineering, automotive industry) for high quality, steadiness and simultaneously flexibility. PROline adapts to fast and flexible production needs. It supports an economic production by a high number of variants with small batch sizes in terms of Industry 4.0.

PROline inspection solutions link the production with the latest communication technology and communicate interactively with the production environment. The core of every PROline ultrasonic inspection solution is the high-performance PROline\textsuperscript{USB} Ultrasonic Inspection Device (fig.2.).
The PC-supported PROline\textsuperscript{USB} ultrasonic inspection device is characterized by its high-quality finish, the outstanding ultrasonic features and the extreme user-friendly software. This compact and solid ultrasonic device is splashproof, ideally suited for tough industrial environments and the integration in production lines.

Due to its universality, adaptability and open interfaces, PROline\textsuperscript{USB} offers ideal conditions for the testing of weld seams for cracks, shafts, rods, pipes, sheets and synthetic materials (e.g. CFK parts) of volume defects, solder and coating joints for adhesion quality, wall thickness or sound velocity measurement.

PROline inspection systems by VOGT Ultrasonics GmbH realize a process safe solution for a 100\% automated inline inspection.

**PROline\textsuperscript{PLUS} Inspection Software: flexibility and reliability**

The modular designed, Windows-based PROline\textsuperscript{PLUS}-Software (fig. 3) ensures a customer-related functionality. Thanks to the user-friendly software layout, just a minor training effort and a short-term period of familiarization is needed to enable safe handling with the system.
An important focus during the development of the ultrasonic inspection software was put on a high flexibility while hardware usage (ultrasound, probes, rotary encoders, I/O-interfaces) and on an easy integration especially into the automated production process with accompanying ultrasonic inspection with automated evaluation and ISO compliant documentation. PROline\textsuperscript{PLUS} inspection software enables one- and multi-channel ultrasonic applications.

![Image of PROline USB integrated in an inline production machine for Bubbler UT testing of differential gear wheels, networked with DMC and SCADA](image)

**Fig. 4.** PROline\textsuperscript{USB} integrated in an inline production machine for Bubbler UT testing of differential gear wheels, networked with DMC and SCADA

In conjunction with an inspection mechanics the test part (identified by Data Matrix Code) is tested in contact-, bubbler- or immersion technique (fig. 4). The automatic, standardized evaluation, individual test report creation and result archiving saves time and creates production reliability. Additional test measures such as the rescan of a conspicuous part to validate any material defects can be automated. The inspection system communicates information as test specification, type of component, start-, stop- and OK / NOT OK signals, statistics up to graphical result display of ultrasonic signal amplitudes, run times (sound path) or their signal combinations.
Fig. 5. The PROlinePLUS software communicates the inspection result directly to the PLC of the customer’s system for part sorting. Additionally an automatic OK/NOT OK colour marking is performed.

A remote connection allows for quick updates, linearity calibration and the flexibility of a modern production, e.g. by realization of a SCADA interface (Supervisory Control And Data Acquisition) for recognizing individual parts, controlling systems, and storing all data during scanning PROline receives and transfers all part connected data with its production environment.

For an individual evaluation of the inspection data PROlineUSB and PROlinePLUS provide an complete accurate ultrasonic signal storage (A-Scan), an imaging result display in optional colour gradations, e.g. as so-called C- (top view of the part, area scan) and TD- or B-Scan (side view).
HIGH FLEXIBILITY
- Being PC-based, PROline can be easily integrated into the production line
- The high-performance PROlinePLUS inspection software with Windows interface needs minimum amount of operator training due to an intuitive user interface
- PROline interacts with the present PLC or ERP interface
- A remote connection allows for quick updates, linearity calibration and the flexibility of a modern production environment

SMART COMMUNICATION
- PROline communicates interactively with the production environment
- It supports SCADA (Supervisory Control And Data Acquisition) for recognizing individual parts, stores all data during scanning and transfers them to the component tracking
- PROline inspection solutions receive and transfer all part connected data with their production environment
- A remote connection allows for quick updates, linearity calibration and the flexibility of a modern production environment

AUTOMATED EVALUATION
- The automated, standardized evaluation, individual test report creation and result archiving saves time and creates production reliability
- PROline controls the operation and communicates information such as start, stop as well as the signals for O.K. / not O.K. sorting up to combinations of ultrasonic gate and system information as and/or/nor scan
- Additional test measurements such as the rescan of a conspicuous part can be automated in order to verify any possible material defect

SAVING RESOURCES
- PROline allows economically automated 100% defect control of products and at the same time contributes to the optimal material flow
- The smart control saves costs for energy and personnel which could enable a reduction of the unit price
- The exact process planning increases the efficiency of personnel and production as well as safety and the competitive position in the market

SMART FACTORY
with fully automated PROline Industry 4.0 and SCADA Ultrasonic Inspection Solutions

ULTRASONIC INSTRUMENT
Ready for the next industrial revolution