KD Info

Contents

Contact

KARL DEUTSCH
Prüf- und Messgerätebau GmbH + Co KG
Otto-Hausmann-Ring 101 • 42115 Wuppertal • Germany
Phone (+49 -202) 71 92-0 • Fax (+49 -202) 71 49 32
info@karldeutsch.de • www.karldeutsch.de

1st Edition 2010

ECHOGRAPH-HRP.R: Ultrasonic inspection of welded tubes

There are many applications for welded tubes with small diameters and thin walls. Such tubes are being efficiently used for example in heat exchangers (chemical industry, desalination plants etc.). The inspection of these tubes is a major NDT challenge. For example, the seam tracking for the ultrasonic inspection on longitudinally welded tubes with small diameters is very difficult. Even small tolerances during the forming stage will cause a large deviation of the welding seam position in circumferential direction.

The KARL DEUTSCH company has built an ultrasonic testing system for the Fischer Group in Achern (Germany), an

Continued on page 2

ECHOGRAPH-HRP.R
Ultrasonic inspection of welded tubes
A: tube to be tested
B: immersion test chamber with ring of ultrasonic sensors
C: operator panel for entering and visualisation of the ultrasonic parameters
D: signal lamp (tube defect, system warning)
E: ultrasonic pre-amplifier
F: filter unit for coupling water treatment

KARL DEUTSCH

internationally leading manufacturer of precision tubes. The small diameters of the tubes (starting from 10 mm), small wall thicknesses (starting from 0.4 mm) and small-sized defects (notch depth starting from 0.1 mm) were challenges for this project. The proven online solution of the HRP-system was a suitable setup for this task. This system is normally being used for the inspection of seamless tubes with a high testing speed of up to 120 m/min. For this project, the testing speed was not a crucial factor. The high testing sensitivity for small wall thicknesses over the entire circumference of the tube was of higher importance. Due to the full coverage of the entire tube volume, a seam tracking was not necessary and thus enabling the use of a compact and low-maintenance mechanics.

The tube is being completely inspected for longitudinal defects (defects in the tube axis direction) by a ring of ultrasonic sensors, while being fed through the immersion test chamber. The normally required closing mechanism is not necessary in this case. When testing individual tubes, this mechanism avoids coupling liquid within the tube and also prevents the test chamber from running dry. Since this is not required in this case, a compact design was implemented which is robust and requires little maintenance compared to systems with rotating probes. The specially designed probes are connected by short cables. This way, capacitive or inductive transmitters between probes and stators are not needed, thus leading to a testing concept which provides a high signal-to-noise ratio.

The Fischer Group was very pleased by the short processing time of five months between order and shipment. The customer was also very satisfied with the fast installation of the system in Achern.

ECHOGRAPH-SNHF: Online testing system for ERW-Pipes

The production of ERW-pipes (e.g. pipes for gas and oil pipelines) includes several steps of NDT. A steel strip is fed from a coil, then formed and finally welded to a continuous pipe. Directly after welding, a first online weld test is often carried out with ultrasound. At the end of the production sequence, a final offline inspection of the weld and the heat-affected zone is carried out. This guarantees the customer a perfect quality of the product. For particularly high requirements, also the tube body is inspected. This type of inspection can be done either in the strip-stage or later on the finished pipe. In the last decades, KARL DEUTSCH has designed many testing machines for each of these tasks.

Continued on page 3

ECHOGRAPH-SNHF Testing system for welded pipes A: machine frame B: light barrier on entry side C: pilot line D: position encoder wheel E: camera for seam tracking F: pair of probes for internal longitudinal defects G: pair of probes for external longitudinal defects H: pair of on-bead probes for transverse defects

In the following, a testing testing system which is installed directly after the welding unit will be described: Our customer SMS Meer GmbH from Mönchengladbach (Germany), the world market leader for rolling mills, had to supply a complete pipe production line to the Russian company Severstal.

The probe holders are mounted to a stable machine frame. The probes are vertically positioned in accordance with the diameter of the pipe. Three pairs of probes are used, two pairs for the detection of longitudinal defects und one pair for transverse defects in the weld. The welding seam is near the 12 o'clock position. During the test, the probes must be guided symmetrically to the weld seam to ensure a reliable defect detection. For this purpose, the test mechanism with the probe holders is automatically kept in its perfect position. The weld seam itself can not be used for a proper orientation. Therefore, a painted line, the so-called "pilot line", is applied onto the pipe during welding having a constant distance to the weld seam. A CCD colour camera picks up the line and a control device places the probes accordingly in the correct position. The camera is equipped with a strobe LED illumination for better performance in poor lighting conditions. A precise tracking of the pipe position enables a true-to-location paint marking and registration of the defects. Despite of interfering welding units and annealing systems near the testing machine, various types of interference suppression and isolation methods lead to ultrasonic signals with high signal-to-noise ratio. Water jet coupling (squirter technique) ensures good test conditions also in case of hot pipe surfaces (approx. 200 °C). For this project, KARL DEUTSCH delivered all components such as the filter unit for the coupling water treatment and the devices for creating the pilot line and marking the defects.

ECHOGRAPH-TTPS:
Ultrasonic testing system of aluminium billets in immersion

The company Otto Fuchs KG in Meinerzhagen (Germany) produces high-quality products for the aerospace industry, the automotive industry, the construction industry and the general engineering industries. Aluminium and magnesium alloys are smelted in their in-house foundries according to national and international specifications. Of course, these materials need to be tested before further processing.

For this purpose, KARL DEUTSCH supplied Otto Fuchs with an ultrasonic testing system. The immersion technique was applied and two test stations were provided. The billets have a length of up to 2 m and a diameter from 172 mm to 620 mm. Support rollers, which are driven by servo motors, are used to rotate the bars. The ultrasonic probes are moved by a portal system.

Continued on page 4

During the test in one station, an unloading and loading process can take place at the second station providing considerable time savings. After finishing the test at the first station, the testing system starts again with the newly loaded bar in the other station. The test results are immediately displayed as C-scans. For this project, a customer-specific C-scan software package was developed by KARL DEUTSCH which offers many options for subsequent data evaluation and is an important instrument for the testing staff.

12,000 litres of water in the immersion tank must be kept at a constant temperature to fulfil the high aviation standards. A fully automated calibration station, which is permanently installed in the tank, controls the testing sensitivity, the quality of the TCG-curve (time-corrected gain) and the surface linearity. Due to the mounting of the station within the tank, the temperature is also kept constant. By means of the electrical control and the calibration station, all ultrasonic sensors can be automatically calibrated with respect to their sensitivity. Mechanical precision in all details and also a highly robust machine for the serial production were the top priorities in this project. Last but not least, another remarkable number should be mentioned: This testing system had a total weight of 25 tons (incl. water).

With the ECHOMETER 1075 against falsifications

The SilviOr GmbH company in Würzburg (Germany) deals or deposits valuable coins and bars. The materials are silver and gold. An important task is the unambiguous determination of the authenticity of the precious metals. This unusual NDT task can be handled with the ECHOMETER 1075.

From time to time falsified coins and bars appear on the market. The precious metal is being replaced by materials with a similar density and then covered by a thin layer of the precious metal. An authentication by measuring the density would fail in this case. The measurement of the sound velocity is a better approach.

Gold and silver have very different sound velocities compared with the materials used for their replacement. After feeding the ECHOMETER 1075 with the measured thickness of the material you can easily measure the sound velocity. The measurement is carried out with the aid of the probe DSE 4.2/4 PB 8 which covers a measuring range from 0.7 mm to 25 mm (in steel). Due to its small contact area, it is also possible to use it for coins with strong curvatures. The miniature probe is coupled on small flat surfaces.

This figure shows the measurement of sound velocity of an Australian silver dollar. The coin with a thickness of 12.30 mm shows a measured sound velocity of 3605 m/s. This is a typical value for silver.

Accessory for ultrasonic testing systems: Signal source to generate artificial ultrasonic signals (prototype)

A signal source is a compact and portable instrument to generate sinusoidal ultrasonic signals. This instrument can generate continuous or burst signals. Amplitude, frequency, time offset and pulse width can be adjusted. In addition, the amplitudes, the time offset and the width of two burst signals fed into one UT line can be set individually.

The frequency is digitally displayed and can be tuned between 0.2 and 20 MHz. The amplitude is also digitally displayed, calibrated on 6 Vpp and can be reduced within a range from 0 to 63 dB. As mentioned before, it can be separately adjusted for two consecutive burst signals. The signal source device can be triggered by any external signal or by a transmitter pulse.

The instrument saves the last adjustment, verifies the amplitude automatically and provides an additional measurement input. The cable has a length of 20 m and is electrically matched to 50 Ohm. The instrument can be externally controlled (e.g. by a bit pattern generator).

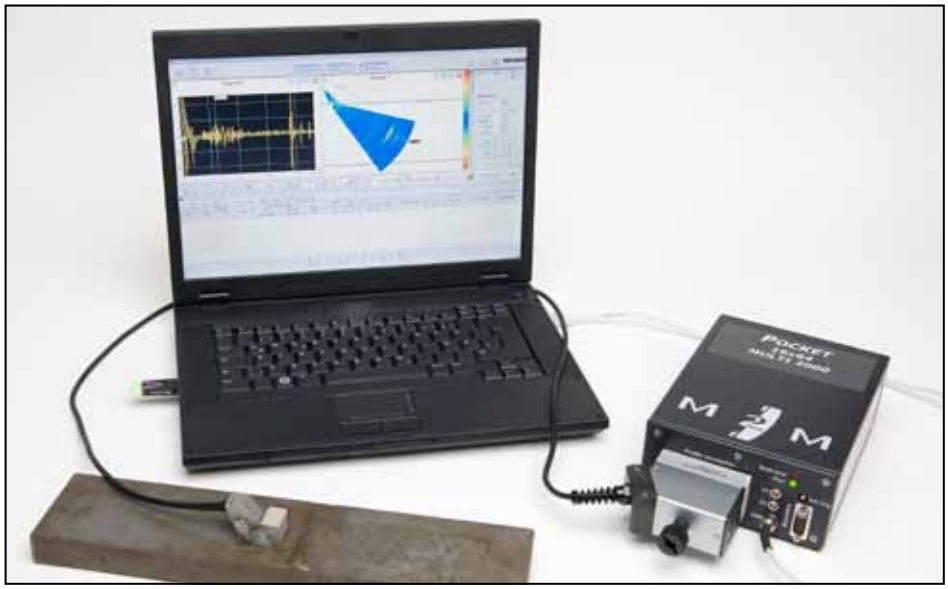
The signal source device has been developed for the inspection of ultrasonic instruments and systems and will be available, soon. It is suitable for the detection of linearity, frequency response and verification of wall thickness. Especially for our international subsidiaries and representatives, this portable device is an important tool for servicing ultrasonic instruments and ultrasonic testing systems.

The Multi 2000 Pocket by M2M

Small-sized and highly flexible phased array technique

Imaging methods for ultrasonic testing are getting more and more important. New technical developments of electronic components and fast computers make it possible to develop smaller and more sophisticated systems. The phased array technique has great potential regarding the visualisation of the test data. It allows two-dimensional and three-dimensional images of the interior of test pieces and often replaces mechanical scanning by electronic scanning.

The Multi 2000 Pocket is a current product of our French partner company M2M. Our strategic partnership was introduced in a previous issue of the KD-Info. This device combines all advantages of miniaturized ultrasonic technology with a software which is extremely flexible. The Multi 2000 Pocket has 16 parallel channels which can be independently controlled and can drive up to 64 channels when working in multiplex mode. The operation of conventional probes and of TOFD-setups is also possible. The test data obtained during weld inspection can be recorded in graphical format by using position encoders. The electronics and the control unit are connected via USB which ensures a quick and reliable transfer of the control signals. The Multi 2000 Pocket instrument can be used as a portable testing device but also for the operation of small and medium-sized ultrasonic systems.



KARL DEUTSCH is a distribution partner for the Multi 2000 Pocket. Please contact our sales department for further information (sales@karldeutsch.de).

News from our application laboratory

How to test plastic seats

Seats and backrests made of polypropylene usually do not have structural elements. These types of seats are self-supporting. To guarantee stability the material thickness must have a minimum value. Since the considered seats are double-walled a nondestructive test by means of a calliper or micrometre is not possible.

This problem was solved with our ECHOMETER 1075 wall thickness and sound velocity gauge. The ultrasonic travel time through the component is measured. The wall thickness can be easily determined if the ultrasonic velocity of the material is known. In this case, the material has an ultrasound velocity of 2730 m/s which is typical for plastic. This type of measurement is being used whenever only one side of the test piece is accessible (e.g. also for pipes).

The measurements on flat areas such as the seat and backrest are easy to perform. Curved areas with radii smaller than 10 mm are difficult to measure. This problem can be solved with the right choice of probe (for flat surfaces DSE 10.4/6 PB 4 and for edges DSE 4.2/4 PB 8). To test the inside radius, in this case the area between seat and backrest, a proper coupling of the probe must be checked in advance. Incorrect coupling of the probes can cause systematic errors while measuring. If the surface is extremely curved a measurement might not be possible at all. In our example, the curvature of the seats was large enough to enable proper measurements. Our application laboratory could recommend this possibility for the nondestructive quality control of plastic seats.

New semi-automatic KD-Check systems for stationary penetrant testing

Stationary solutions might be required for fast and reliable penetrant testing. The type of testing system depends on the workpiece size and the required through-put.

KARL DEUTSCH has developed a new semi-automatic KD-Check system for stationary penetrant testing. A prototype unit is permanently installed in our chemical laboratory and can be demonstrated to potential customers. Preliminary tests to determine important test parameters and the optimum mechanical setup can be carried out. Subsequent time for the mechanical construction and for trials can be reduced this way.

The system has a modular design. Therefore, customer-specific requirements can be implemented easily and cost-effective. The unit has a cover which opens and closes automatically and a lift device for a convenient and effective transport of the test pieces. It also contains an automatic washing device and an oven with circulating air for a temperature-controlled drying of the workpieces. All parameters are controlled by a PLC (programmable logic controller). In this way repeatable results can be obtained.

Please contact Dr. Ralf Wagner or Dipl.-Ing. Stephan Robens from our chemical products division for further information: chemie@karldeutsch.de

Semi-automatic KD-Check system for stationary penetrant testing

Pocket-LEPTOSKOP with extended memory

The smallest instrument of the KARL DEUTSCH product range, the Pocket-LEPTOSKOP, can now be upgraded with additional memory. The extended memory can store up to 9,000 measured values in 10 different files. The measured values are shown as digits or in graphical format. Single values can now be deleted. Thus, test series do not have to be repeated if a measurement is incorrect. Files can be selected by menu guidance in plain text which makes the operation very convenient.

Our Pocket-LEPTOSKOP also operates with the EasyExport software. This software transfers the measured data to many common PC applications, e.g. Excel and Word. Since measured values are transferred in ASCII format the user can as well save the data via a terminal program or import them into other software applications. The memory upgrade of our small Pocket-LEPTOSKOP is a response to customer requests.

New attachment poles for our DEUTROPULS hand yoke

How to detect cracks on galvanized material

Particular attention on hot-dip galvanized components is required to avoid damages. In Germany a new test specification for steel constructions which are hot-dip galvanized, the so-called DASt 022 guideline, was released. This includes heavy steel structures but also lightweight components such as stairs, balconies, handrails, shelters and carports. The new guideline enforces special rules for magnetic particle inspection of hot-dip galvanized components. This new guideline must be applied in Germany since January 2010.

In the recent years, many galvanized constructions showed dangerous cracking and caused changes within the production and the creation of the testing guideline. KARL DEUTSCH was approached by the SLV Duisburg, a daughter company of the German Welding Institute. Two new attachment poles for our proven DEUTROPULS hand yoke (type 3446) were developed and added to our product range. The magnetic particle inspection of hot-dip galvanized components in accordance with the new guideline is now possible. The geometrically optimized attachment poles provide a higher field intensity on the workpiece surface with a minimum value of 4 kA/m (40 A/cm). All of our DEUTROPULS hand yokes can be easily upgraded with these new attachment poles.

DEUTROPULS hand yoke with rigid attachment poles

DEUTROPULS hand yoke with flexible attachment poles

DEUTROFLUX: Magnetic particle crack detection system for billets

KARL DEUTSCH has recently delivered a magnetic particle testing system, type DEUTROFLUX HW 600, for a German well-known steel plant. Wires, bars and billets in a quite early stage of production can be tested with this system. The material of the workpiece is as rolled and the ends might still be rough. Therefore, the current is vertically introduced at the ends of the workpiece. Since fluorescent magnetic particles are used, an UV illumination is required and the new mobile UV-LED lamp from KARL DEUTSCH is used. Two of these lamps are placed over the workpiece. Like a classical large-area lamp for stationary use, the mobile UV-LED lamps are positioned above the testing area. If required, the lamps can be removed from the holders to be used for mobile handling.

DEUTROFLUX magnetic particle crack detector for our customer VECTOR in Hattingen (Germany)

Last fall, we supplied a magnetic particle crack detection system to the VECTOR company in Hattingen (Germany). This system replaced a previous model from KARL DEUTSCH which was successfully operated for many years. VECTOR is a leading company for educational training in NDT. The training and education centre made this investment to offer the students a testing machine which is up to date. A DEUTROFLUX UWE 350 was ordered which enables a maximum component length of 350 mm. The workpiece is placed between both contacts, becomes magnetized and then sprayed with test liquid. Surface cracks are clearly visible using UV light. In the case of NDT education, the machine operates under different conditions compared to a forge or a similar working environment. Nevertheless, the system is fully equipped to assure practical conditions. After putting it successfully into operation, the system was officially handed over to VECTOR in Hattingen by Dipl.-Geol. Stefan Kierspel and Dr. (USA) Wolfram A. Karl Deutsch. Managing director of VECTOR Markus-F. Hagen and quality manager Gerhard Ruhnau were very satisfied with our service. KARL DEUTSCH did a good job and we did not have to wait long for an additional order of two digital ultrasonic flaw detectors type ECHOGRAPH 1090.

From left to right:
Markus-F. Hagen (managing director of VECTOR), Stefan Kierspel (sales engineer of KARL DEUTSCH), Dr. (USA) Wolfram A. Karl Deutsch (managing director of KARL DEUTSCH), Gerhard Ruhnau (quality manager of VECTOR)

Education: KARL DEUTSCH supports the physics project “SchulPOOL”

Today, a good school and higher education of the younger generations is a main concern of our society. For this reason, KARL DEUTSCH supports the educational physics project “SchulPOOL” which combines theory and practice (remark: “Schul” is the German word for school).

The “SchulPOOL” project is for high school students in the “Bergische” region of Wuppertal, Solingen and Remscheid. Head of this project is Prof. Dr. Jörg-Uwe Fischbach (department of physics, Bergische University of Wuppertal). Furthermore, teachers of five local high schools were founding members of this project. A centrally administered pool of interesting experiments for pupils was created. This project should make regular physics lessons in schools more interesting and shows the importance of sciences. The experimental setups can be booked by each school which is a registered member of the project. Each school has now access to a large collection of physics experiments.

The Bergische University of Wuppertal looks after and maintains the experiments and takes care of financing and sponsoring.

Continued on page 10

As a team, the university, the teachers and the schools develop the corresponding lectures and arrange for the teachers to be trained in this matter.

If required, a scientist attends the experiment and explains the students their relevance in modern research. Each teacher, who would like to run an experiment at their class, can order it easily by internet (www.schulpool.uni-wuppertal.de). All experiments are fully documented and the teachers can plan them easily, too. Even the transport of the samples is organized by the university.

A test setup from KARL DEUTSCH is now available for “SchulPOOL”. This experiment covers basic knowledge about the wall thickness measurement with ultrasound. The measured values are either the ultrasonic travel time within a sample or the sound velocity of a certain material. E.g., the wall thickness can be easily determined with ultrasound if the sound velocity in the material is known from a calibration.

Various departments but one strong team

The production of customized testing instruments and systems for our customers requires a highly qualified team. KARL DEUTSCH works efficiently due to a good teamwork across the departments. For us, teamwork stands for equal opportunities within the team, extensive knowledge and personal responsibility. Therefore, our customers and our staff members are satisfied. In this issue, we would like to introduce our departments and divisional directors and managers.

Left to right: Dr. Michael Platte (technical director), Dipl.-Oek. Gernot Walter (head of controlling), Dipl.-Ing. Frank Bartholomai (head of magnetic particle systems division), Dipl.-Ing. Michael Joswig (head of ultrasonic systems division), Dr. (USA) Wolfram A. Karl Deutsch (managing director), Dr. Ralf Wagner (head of chemical products division), Dipl.-Kfm. Ralf Wiemer (commercial director), Dr. Michael Lach (head of ultrasonic probes division), Dr. Wolfgang Weber (sales director)

New employee at KARL DEUTSCH

Since 1st of March, Mrs. Birgit Auerswald supports our human resources department. She took over office from our former employee Mrs. Margot Leithold who went into retirement.

We wish her a good start in our company!

Exhibition news

18 - 20 August 2010
1st Control China
booth 1A12
Intex Shanghai
88 Lou Shan Guan Rd.
Shanghai 200336
China

11 - 14 October 2010
19th International Forum for Materials Testing
Zwick Company
August-Nagel-Str. 11
89079 Ulm
Germany

24 - 26 November 2010
JIMA 2010
Japan Inspection Instruments
Manufacturers' Show
Tokyo Big Sight
3-11-1 Ariake,
Koto-ku
Tokyo 135-0063
Japan

For the current event schedule please also refer to www.karldeutsch.de