

REVIEW OF “UKRRINDT” CJSC ACHIEVEMENTS IN THE FIELD OF DEVELOPMENT OF SYSTEMS FOR AUTOMATED TESTING OF PRODUCTS QUALITY

G. Lutsenko, A.Yurchenko, V. Mishchenko
“UkrRINDT” CJSC, Kiev, Ukraine

Nowadays automatic and manual NDT tools for products quality inspection which are used at domestic industrial enterprises, need overall modernizing or even complete replacing in many cases.

As the inner CIS market is saturated with portable native and foreign products, it's easier to solve the problem regarding the modernizing of manual NDT instruments. Taking into account the acceptable price range of manual NDT instruments, the customer should only choose the necessary level of equipment.

Talking about automatic NDT tools it should be noted that modernization has more complicated nature, because of replacing automatic units together with hardware-computer blocks, being created on the elements basis, which was topical tens years ago and at present day they cannot provide the corresponding level of NDT.

Taking into account the critical demand of enterprises in modernization of their own automated NDT systems or in buying new ones, Ukrainian Research Institute for Nondestructive Testing (UkrRINDT) is working continuously in this field. High prices and a complicated procedure of maintenance service provided by the foreign companies who offer automated NDT systems define the necessity of local developments.

Application field of automated NDT systems designed by UkrRINDT includes main industrial sectors: metallurgy, pipe industry, railways transport, engineering. Each automated NDT system is adapted directly to the customer's requirements and resolves the tasks using different NDT techniques. The most developed techniques are: UT (piezoelectric and EMAT-technique), Magnetic particle testing, ET.

Among automated NDT systems, developed and introduced at different enterprises the following can be mentioned:

- Ultrasonic NDT systems of rail axles on the basis of “Uniscan-Luch” multi-channel ultrasonic flaw detector which are intended for automated ultrasonic and eddy-current testing of finished rail axles under RD 32.144-2000. Customers: “Kremenchug Wagon Building plant” OJSC, Kremenchug, Ukraine; “Lyublynskiy Casting Mechanical plant” OJSC, Moscow, Russia.

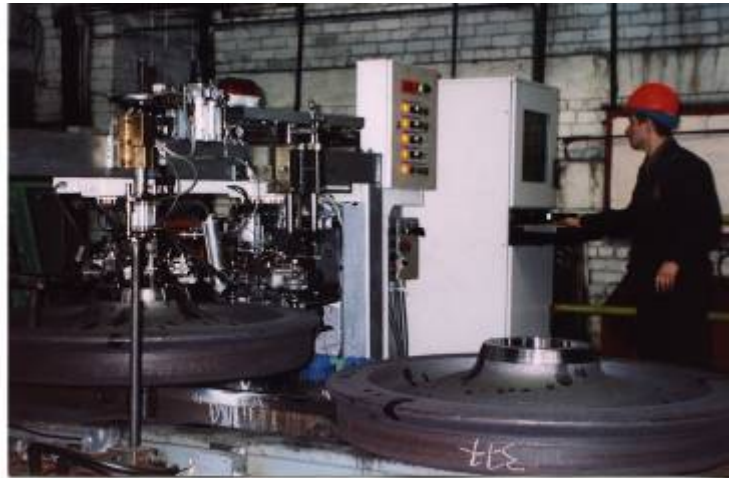


Today the given system exists in three variants, two of which are installed on the production floor spaces of the major manufacturers of finished rail axles and are successfully used. Each system has its own advantages and regarding the last modification all possible requirements of

regulatory documents as well as the aspects connected with application of such systems were taken into account. “Os-3” SAUST system of third version allows combined automatic simultaneous ultrasonic and eddy current testing of the axle with the results recording in the database and testing reports printing.

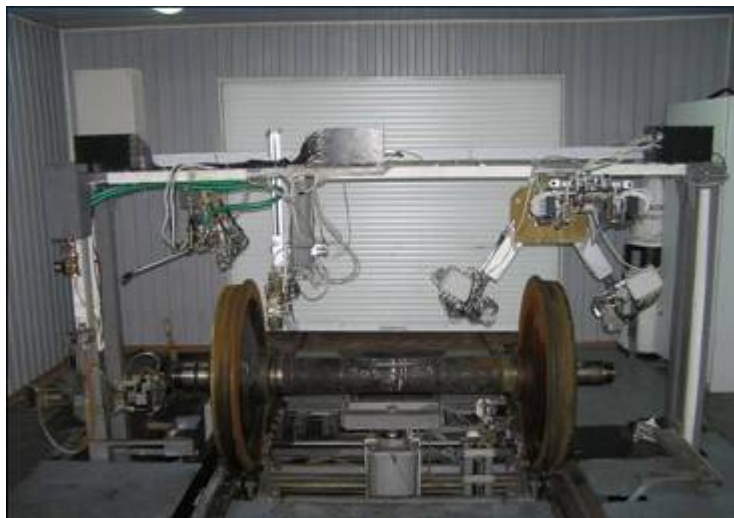
- UT NDT systems of rail wheels on the basis of “Uniscan-Luch” multi-channel ultrasonic flaw detector which are intended for automated ultrasonic testing of solid-rolled rail wheels under RD 32.144-2000. Customers: “Interpipe NTRP” OJSC, Dnepropetrovsk, Ukraine.

These systems were among the first developments in the service record of our institute. They have been manufactured and implemented on the production of solid-rolled wheels within 2 years from 2004 to 2005. The systems can be characterized as the ones with reliable mechanics, which was proved in service, easy to operate, but at the same time, trustworthy and accurate in measurements.



- Automated NDT systems of combined testing of wagon wheel pairs which are intended for automated testing of wagon wheel pairs parts using UT, EMA and ET techniques under RD 07.09-97. Customers: “Ukrzaliznitsya” State Enterprise, Odessa, Debaltsevo, Ukraine..

A series of by-turn produced (2007-2009) semi-automated and automated systems for the testing of



wagon wheel pairs became the next stage in the development of our institute in the field of automated NDT systems designing. Multifunctionality of SNK KP-8.3 system of third generation is its distinctive feature. The system consists of 2 testing sites where consecutive ultrasonic, eddy current and EMA testing of wheel pair as well as the measurement of wheels geometry are performed per one run.

- “UMPK-1” MT system which is intended for magnetic particle inspection of 55 dimension-types

of rail wheels with diameter from 650 up to 1300 mm for detection of surface and subsurface cracks of any orientation on the whole wheel surface, except for the surface of internal hub hole in compliance with GOST 21105, ISO 6933, PrEN 13262, DIN EN ISO – 9934 – 1,2,3, AAR M 107. Customers: “Interpipe NTRP” OJSC, Dnepropetrovsk, Ukraine.

UMPK-1 is a semi-automated system with embedded leading-edge technologies, which enable the quality testing of rail transport wheels by means of magnetic and luminescent technique. The assured testing performance is no less than 40 wheels per hour, provided that the wheels are continuously supplied to the testing site. The time of wheel testing without an account taken of the time of load-unload on the testing site does not exceed 1,5 min. the system can operate as an independent unit and be incorporated in the existing manufacturing lines of the customers' enterprises.

- Automated NDT ultrasonic systems which are intended for the testing of longitudinal welded joints of large-diameter pipes with diameter of 406-1420 mm and wall thickness of 6,3 – 41 mm under API SPEC 5L and other national and international standards. Customers: “Khartsyzk Tube-rolling plant” OJSC, Khartsyzk, Ukraine.



UkrRINDT produced and introduced 3 similar systems at one of the major enterprises of large-diameter pipes manufacture “Khartsyzkiy tube-rolling plant” OJSC from 2007 to 2008. The structural pattern of AUST systems is their distinctive feature. The structure provides for the max. performance of manufacturing line of the shop due to 2-module structure of the system, what assures the testing of 12 m long pipe with its shifting for 6 m.

- Automated NDT ultrasonic system which is intended for ultrasonic testing of pipes ends with diameter of 406-1420 mm and wall thickness of 6,3-41 mm according to API SPEC 5L and other national and international standards. Customers: “Khartsyzk Tube-rolling plant” OJSC, Khartsyzk, Ukraine.



“Uniscan-LuCh KT-7” automated ultrasonic system for pipe-ends inspection allows simultaneous combined 100% ultrasonic testing of 540 mm areas from the edges on each pipe-end throughout the wall thickness for the presence of longitudinally oriented cracks and plain flaws, such as delamination. The system software contains unique algorithms of data processing which improve the accuracy of measurement of detected defects coordinates, their conditional dimensions and enables to carry out an in-depth statistical analysis of the obtained data.

- SKV-01 mechanized NDT ultrasonic system for drive gear shaft. Customers: “AvtoZAZ motor” SFE, Melitopol, Ukraine.



SKV-01 system was implemented at “AutoZAZ-Motor” Self-financing Enterprise, Ukraine, in December 2006. Then, the institute experts trained the enterprise specialists in its operation, and the system was immediately implemented. For the last two years 90 693 shafts have been tested with the system. Due to the simplicity, high speed and reliability of testing, provided by the system, it became possible to monitor continuously the quality of welded joints, what, in its turn,

permitted to adjust the welding procedure so that today the rejection level didn't exceed 2 per cent.

- “UKTL” mechanized NDT ultrasonic system which is intended for ultrasonic testing of steel belt with thickness from 0,15 up to 0,6 mm and 1 mm with width from 300 up to 410 mm. Customers: “A.M. Makarov Yuzhny Machine-Building Plant” State Enterprise, Dnepropetrovsk, Ukraine.

The above-described system provides the following capabilities:

- mechanized testing of thin steel belt by ultrasonic technique for the presence of internal and surface flaws, such as delaminations, rolling marks, inclusions etc.
- mechanized testing of belt by ultrasonic technique using a pair of special angle-beam ultrasonic contact probes, which excite Lamb waves in the testing object.

Having singled out the above-mentioned projects, in general, I would like to add a little bit on the knowledge of our institute design engineers, acquired and gained with experience. Each stage of any great project is accompanied with discussion, detailed calculations and strategic decisions-making regarding the development of various system units. All technical decisions are adopted by a group of UkrRINDT leading experts and are directly coordinated with the customer for every project. Despite the fact that every project is virtually unique, the gained experience permits to consider the max. rates of reliability, functionality, efficiency, operation simplicity and lifetime in all design projects. Every installation of the automated system helps to reveal the visible structure, so-called "hand" of the developer of such equipment. Thereby, during 15 years of functioning, the Ukrainian Research Institute for Nondestructive Testing has worked out a complex approach to the solution of automated NDT tasks, possibility of short-term designing, innovative technical solutions and the acceptable pricing policy. This has allowed the institute to develop and offer its design projects not only on the territory of post-Soviet countries, but also in far-abroad countries.

