

## Software-hardware complex for automated processing and archivation of KORS 2.0

Martynov S. A., Samoilov D. V., JSC NIIIN "MSIA "Spectrum", Moscow, Russia

The report is dedicated to development of the software-hardware complex for automated processing and archivation of KORS 2.0 skiographs and implementation experience in Russian oil-chemical, oil refining industries, gas distribution and consuming systems.

The above mentioned complex was developed on technical assignment by GUP "MOSGAZ" and designed for quality control of welding joints in internal and external steel pipeline walls, units and parts of gas equipment. After the acceptance of "Safety rules for gas distribution and consuming BP 12-529-03" the KORS 2.0 complex was improved with respect to new requirements for radiographic testing.

Versions of program packages of the complex were developed and implemented allowing to perform quality control of welded joints in mainline and technological pipelines, steam and hot-water boilers, vessels operating under pressure, petrochemical storage reservoirs, gasholders, units and parts of oil-refining equipment.

The hardware component is represented by a PC, a specialized scanner designed for operation with x-ray films and peripheral units.

It ought to be noted that each scanner before its distribution, undergoes a special test system developed by our company which confirms its capabilities in x-ray images processing. High optical resolution of the scanner and ability to work with 16-bit gray scale in combination with an ability to process radiographic images with density up to 4D assures high quality image on Russian and foreign films. The scanner's operational field of A3+ format makes it possible to process radiographic images of 300x400 mm. size with a single run of a carriage.

A processed skiograph is placed in the scanner and digitized. The scanned image is displayed on a PC monitor and processed by means of software packages of the complex.

KORS 2.0 software includes the following:

- Data processing program (graphic module);
- Database;
- Training module (album). By means of the KORS 2.0 graphic module, an operator

performs digitizing of a skiograph,

selection of optimal parameters for interpretation of a skiograph, test of validation for interpretation according to GOST 7512-82 and interpretation in the "operator-program" dialogue mode. Defects allowability evaluation is conducted by means of corresponding universal sample of a radiograph. (e.g.: USR-3).

Graphic module also includes an extensive choice of tools:

- selection of optimal contrast parameters and brightness of an image manually or by a diagram density,
- automatic calibration of optical density measurement,
- 16 x zoom electronic magnifier,
- measurement of linear sizes and area sizes and summing linear defects' length.
- Defects marking,
- more than 20 filters (positive, negative, defects highlight etc.),
- diagram of optical density distribution along the whole skiograph,
- 3D display diagram of optical density distribution along the area of a skiograph under testing,
- data double-save algorithm for accidental data loss prevention,
- Saving of radiographer's actions sequence for the purpose of control over a decoding process.

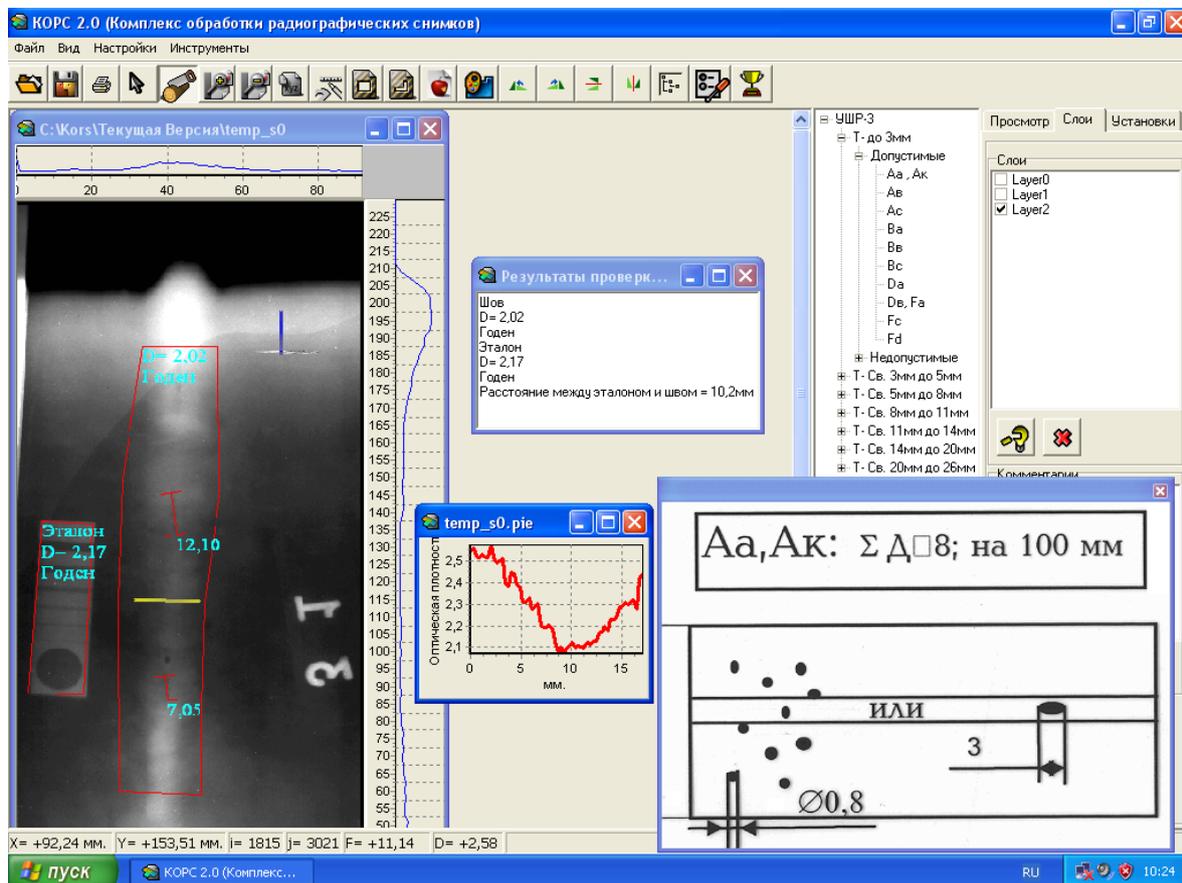


Fig.1 Graphic module operation on interpretation of results of a skiograph.

Interpretation results of a skiograph are transferred from the graphic module to the database, where control protocols are formed automatically. The database is programmed with respect to normative documents regulating radiographic testing (GOST 7512-82, VSN-012, STO etc.) The database also stores information on objects under testing, contractor organizations, radiographers and welders, their validity periods and statistical reports (on volumes of performed testing, flaws, performance of each radiographer and welder). A multi-component search is organized in the database. Data protection from unsanctioned access and copying is provided by HASP technology.

For the purpose of radiographers' skill improvement, a training module "Album of skiographs with common welding defects" was developed.

KORS 2.0 complex has the TESTIMONIAL OF COMPETENCE № 03 3 027 in the system of "Rostechnadzor".

KORS 2.0 complex was implemented in more than 50 industrial facilities of Russia, Kazakhstan and Turkmenistan.

In implementation of the complex by operating organizations a high reliability, rapid rejection of skiographs out of interpretation according to GOST 7512-82, convenient records and statistics keeping was noted which help to increase performance of operations.

Introduction of a technology and welders qualification monitoring system in a number of enterprises became another result derived from implementation of the system.