

## **Constitution and Prospect of Chinese Radiography Digital Imaging Nondestructive Testing Standard**

Xiangzhao ZENG

Qingyuan, Guangdong, China Guangdong Yingquan Steel Products Co., Ltd.

Tel: +86 763 3509995 Fax: +86 763 3509733 E-mail: zxzh1007@163.com

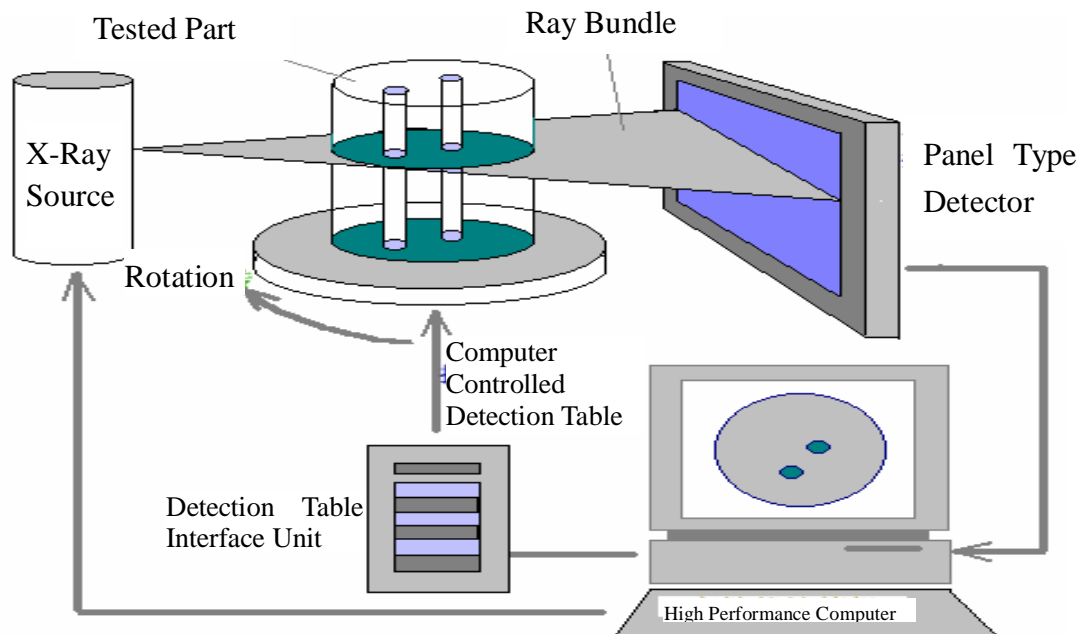
**Abstract:** Radiography digital imaging nondestructive testing technology has an outstanding development prospect with significant progress in theoretic research and rich experience in application in China, on this basis, it requires to quickly set up the Chinese radiography digital imaging standard. The thesis gives a brief introduction on the necessary and urgency on constituting radiography digital imaging nondestructive testing standard and the ideal on constituting radiography digital imaging nondestructive testing standard.

**Key Words:** radiography detection, digital imaging, standard

### **I. Coming of Digital Times**

As the development of computer technology, we have entered into the digital times. X radiography nondestructive detection has been applied in industrial field for nearly 100 years as a kind of common nondestructive testing method, X radiography nondestructive detection always takes film photographing as the main method, which can't meet the demands of fast development and sharp competition in terms of detection speed and cost. After over 10 years of development, a kind of new X-ray nondestructive testing method --- X-ray digital imaging detection technology has become mature and been successfully applied in China. The main feature of X-ray digital imaging detection technology is that it doesn't need film photographing, which is the same as the substitution of common camera with digital camera, the carrier of

detection result is digital image, which symbolizes that Chinese X radiography detection technology has entered into the film free times, and is the revolution of nondestructive testing technology.



Drawing 1 X-Ray Digital Imaging Detection

## II. Necessary and Urgency on Constituting Digital Imaging Nondestructive Testing Standard

Radiography digital imaging is a kind of new nondestructive testing technology and features time saving, labor saving, low cost, fast speed, and the original detection image file which can be saved for a long period and is convenient for browsing. The research and application of Chinese radiography digital imaging detection technology basically keep pace with the world, and the research on radiography digital imaging nondestructive testing technology started from the late 1980s, and the technology has been successfully applied for the nondestructive testing of industrial products in early 1990s, and corresponding radiography digital imaging nondestructive testing standard has been also constituted.

China has two formal standards on radiography digital imaging nondestructive testing: GB 17925-1999 “*Real-Time Imaging Detection with X-Ray for Gas Bottle Butt Welding*” national standard and GB/T 19293-2003 “*Digital Imaging Detection with*

*X-Ray for Gas Bottle Butt Welding*” national standard. The publication of above two standards symbolizes that the research and application of Chinese X radiography digital imaging nondestructive testing technology have stepped onto a new stage.

However, currently, the actual situation of the Chinese radiography digital imaging nondestructive testing standard can't meet the demands of the industrial fields on applying the new nondestructive testing technology with high difference compared with the international standard and standards of developed countries, therefore, we shall grasp the opportunity, basing on summarizing the successful experience for over 10 years, referring the foreign advanced standard, and accelerate the step on constituting radiography digital imaging nondestructive testing standard, and set up Chinese radiography digital imaging nondestructive testing standardization system.

### **III. Progress on Constituting Radiography Digital Imaging Detection Standard in China**

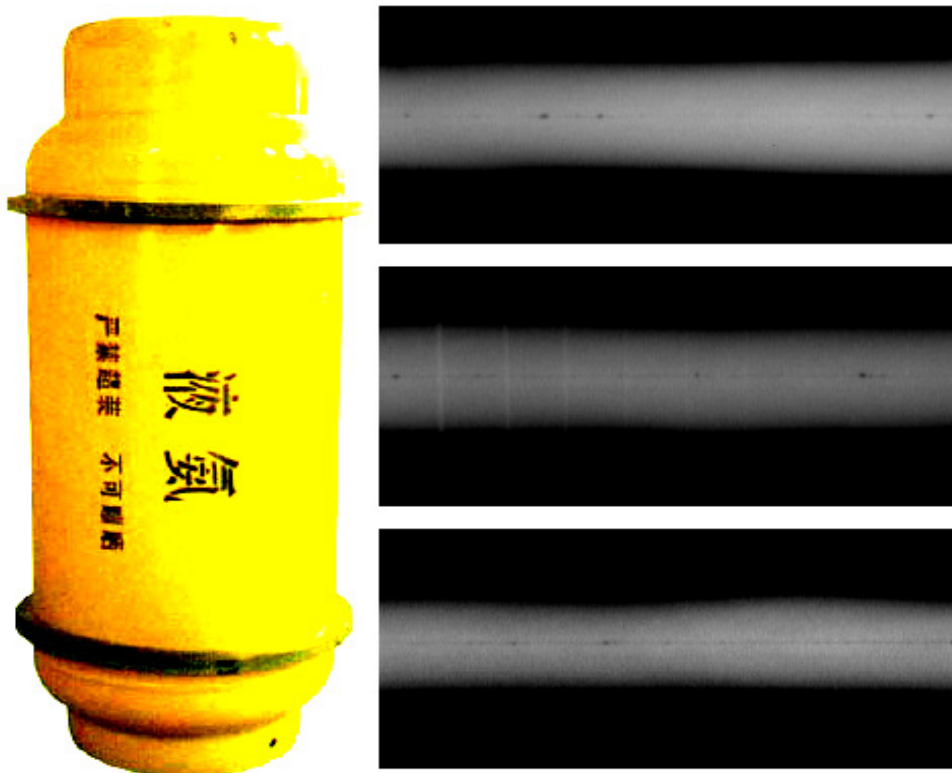
Currently, Chinese relative technical committees of standardization are constituting or modifying following radiography digital imaging detection standards:

#### **3.1 Modify GB 17925-1999 standard**

GB17925-1999 “*Real-Time Imaging Detection with X-Ray for Gas Bottle Butt Welding*” is the first Chinese national standard for radiography digital imaging, which has powerfully promoted the application of X-ray real-time imaging detection technology in gas bottle and other industries. As the development of real-time imaging technology, it is necessary to modify the GB17925-1999 standard. Modifying outlines: a) Since the specification and design thickness of gas bottle are increased, the modified standard increased the application scope, which increases from 2.0~20.0mm to 2~30mm steel and non ferrous metal materials to; b) Since the function of the key equipment in imaging technology --- image collector CCD is powerfully improved, the resolution of detection system improves to 3.0LP/mm, image dynamic scope also improves from 8 bit to 12 bit, which improves the quality of detection image.

#### **3.2 Constitute GB/T “*Nondestructive Testing Radiography Imaging Detection*” standard**

Chinese Nondestructive Testing Standardization Technical Committee constituted the “*Nondestructive testing radiography imaging detection*” national standard after referring the EN 12544 standard, and the standard composes of three parts: Part 1: Quantitative test for imaging performance, Part 2: verifying of the long term stability of imaging device; Part 3: metal materials X and  $\gamma$  radiography detection outline. Currently, the Chinese Nondestructive Testing Standardization Technical Committee has approved the examination to the standard, it is estimated that the standard will be formally published in the near future. As the method standard, it may regularize the radiography digital imaging nondestructive testing technology.



Drawing 2 Air Bottle X-Ray Digital Imaging Detection

### 3.3 Constitute “*Standard Practice for X-Ray Digital Radioscopy Examination of Pressure Equipments*” standard

The nondestructive testing of pressure equipments occupies high proportion in the application of nondestructive testing, radiography digital imaging nondestructive testing technology has outstanding prospect for pressure equipments, what is worthy of our happy is that pressure equipments radiography digital imaging nondestructive

testing standard has been listed into the plan for constituting industrial standards in 2008, it is estimated that it will be completed in early 2009, at that time, the radiography digital imaging nondestructive testing technology will be widely applied in the Chinese pressure equipments industry.

### **3.4 Constitute “*Petroleum and Natural Gas Steel Pipe radiography digital imaging nondestructive testing*” standard**

China has started to construct the second “West-East Natural Gas Transmission” pipeline and “Sichuan-East Natural Gas Transmission” pipeline, and is planning to construct several petroleum and natural gas transmission pipelines, and a lot of welding gaps shall perform X-Ray nondestructive test, digital imaging technology will be the ideal selection for long transmission pipeline welding nondestructive detection due to fast speed, accurate performance, high sensitivity and low cost, currently, it is urgent to constitute petroleum and natural gas steel pipe radiography digital imaging nondestructive testing standard. This standard was established in 2008 and it is estimated to be completed in 2009.



Drawing 3 Natural Gas Steel Pipe X-Ray Digital Imaging Detection

### **3.5 Constitute “*Die-Casting Parts Radiography Digital Imaging Nondestructive Testing*” standard**

Die-casting parts are mainly casting steel parts, magnesium, aluminum and titanium alloy die-casting parts with wide application in mechanical processing and big equipments and features complicated shape, high thickness and high change of section, the deflection is that they have loose nature and may easily crack, the defects are scattered in the workpiece, and are difficult for radiography detection, in the past, radiography film photographing nondestructive detection method which has low efficiency and accuracy. As the fast development of radiography digital imaging detection technology, it provides the convenient door for the nondestructive testing of die-casting parts, it can apply radiography real-time imaging detection technology which is based on plane array detector and image booster to achieve fast detection for die-casting parts, currently, related Chinese standardization technical committees are planning to constitute die-casting parts radiography digital imaging nondestructive testing standard.

#### **IV. Powerfully promote the process of radiography real-time imaging standardization**

In order to adapt the requirements of the Chinese standardization development strategy, improve the nondestructive testing standardization technology, with the approval of Standardization Administration of the People's Republic of China, in early 2008, the radiography real-time imaging standardization work team was set up in the national nondestructive testing standardization technical committee to take charge of constituting and modifying the national standards on nondestructive testing radiography real-time imaging detection. The work team is under the administration of the national nondestructive testing standardization technical committee and is planning to constitute the following standards:

*“Saving and exchanging of nondestructive testing radiography digital image”*

*“Classification and identification method for nondestructive testing radiography non-film imaging system”*

*“Motor Die-Casting (Forging) Parts X-Ray digital imaging detection”*

*“Guidance on the configuration of nondestructive testing radiography digital imaging nondestructive testing system”*

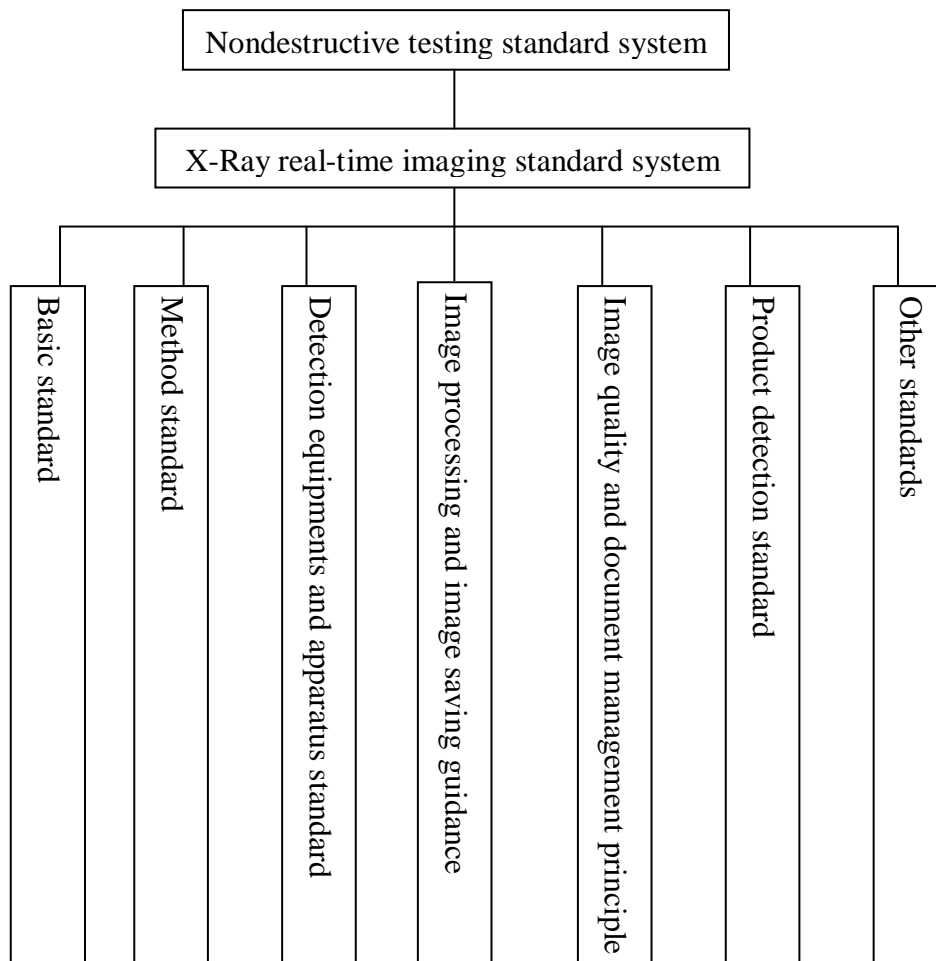
*“Guidance on nondestructive testing radiography digital imaging nondestructive testing computer application programs”*

*“Guidance on nondestructive testing radiography digital imaging nondestructive testing image processing and data transmission”*

*“Quality control outline for nondestructive testing and radiography digital imaging nondestructive testing”.*

## **V. Set up radiography real-time imaging detection standard system**

X-Ray real-time imaging detection standard system is one part of nondestructive testing standard system. According to the current level and development direction of nondestructive testing X-Ray real-time imaging detection technology, X-Ray real-time imaging detection standard system composes of such components as basic standard, method standard and product detection standard.



## **VI. Quickly set up Chinese digital imaging nondestructive testing standard through cooperation**

Radiography digital imaging nondestructive testing technology has nearly 20 years of application in China, with the efforts of the nondestructive testing researchers, it has achieved outstanding development in terms of theoretical research and rich experience in terms of application, the nondestructive testing researchers shall contribute to the establishment of Chinese radiography digital imaging standard through team work and cooperation.