



HEDRad

High Energy Digital Radiography System



HEDRad
(50mm to 140mm Thick Section Components)

DR1200 Digital Radiography System



2.5 MeV Betatron



Technological Partners

- CIT Ltd.
- BAM - Germany
- Blohm & Voss Service GmbH
- EON Kernkraft GmbH
- I KnowHow Informatics, SA
- TWI - UK
- NEXUS Engineering
- Technical University of Sofia



There are approximate 700 refineries, in excess of 5,000 major chemical plants, 450 nuclear power stations and 3,000 fossil fuelled power stations around the world. Comprising of large number of heavy wall pipes and thick-section components, composed of a multitude of differing materials including standard Carbon steel, stainless steel, austenitic steel and inconel, these facilities require a carefully structured approach to Non-Destructive Testing.

For the Non-Destructive Testing process to occur, the facility must undergo a scheduled shutdown. With conventional film-based radiographic techniques, there are severe limitations upon the number of items that can be examined due to the thickness of the components concerned and the relatively low sensitivity of X-Ray film. The technological advances as a result of HEDRad enable the internal condition of valves and other thick wall components to be assessed without the need for internal access, thus reducing the inspection time considerably.

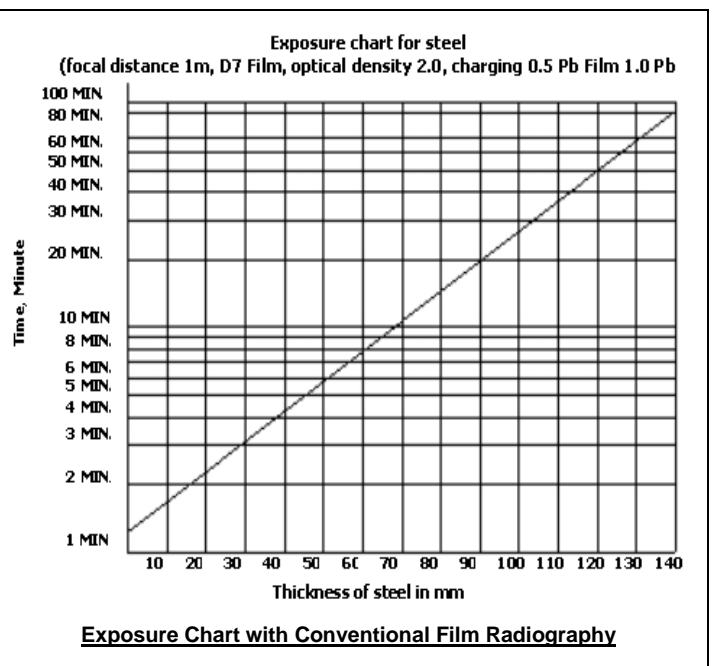
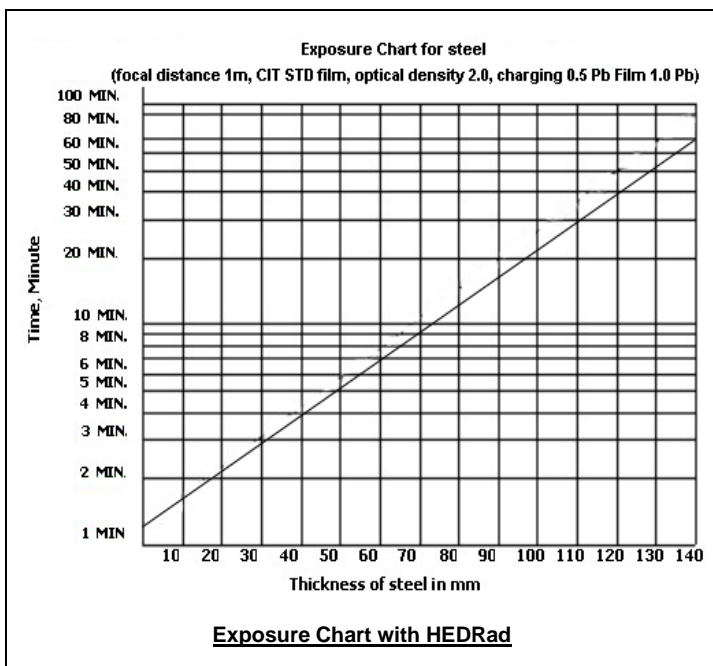
HEDRad presents a new and novel, mobile high-energy digital computed radiography system that allows new applications of radiographic inspection, by extending the range of energy levels currently applied to conventional film radiography in site applications.

What HEDRad Offers:

- Film free, time and exposure efficient digital radiography system applicable to power plant, chemical plant and other heavy industries requiring similar Non Destructive Evaluation
- In-service inspections of thick sections (40mm to 150mm) which normally involve downtime
- Minimum 40% saving in exposure time as compared to conventional film radiography

Technical Objectives

- Computed Digital Radiography System capable of operating at high radiation energies that includes an enhanced computed radiographic scanner and reader system
- Digital Radiography image quality matches conventional film radiography image quality with high Signal-to-Noise Ratio (SNR)
- Digital radiographic technique for the examination of large, thick section components to meet the needs of a number of energy related industries that conduct examination in thick section casting and also the functional assessment of the internals of thick section components such as pumps and valves



As depicted in above charts with conventional film radiography 100 minutes exposure time is needed to inspect 140mm steel plate which, in case of HEDRad is only 60 minutes and with some more advancement can be reduced to only 10 minutes i.e. 40% to 90% exposure time saving. This exposure time saving can be achieved through high energy radiation source (**Betatron**) equipped with digital radiography system (**DR1200**) using phosphor imaging plates (IP) and digital radiography software for analysis of images resulting in time saving in acquiring images.

HEDRad includes **High Energy 2.5 MeV X-Ray Betatron** and **DR 1200 Computed Radiography System**, a specialised Computed Radiography system for high energy radiography and inspection along with a special cassette design for multi-imaging plate exposures and software for fusion of the separate digital images of the multi IP technique.

2.5 MeV X-Ray Betatron System

It is a compact circular electron accelerator producing a high energy directional X-ray beam. Containing no moving parts except small airflow fans, and no circulating liquids, the Betatron is easy to assemble, operate and maintain, and is far less costly than other NDT accelerators such as Linacs.

Radiation levels outside the main beam are low, so safe working distances are moderate. After demarcation of dose rate boundaries, the Betatron is used at external sites or in fabrication shops with little or no additional shielding. The Betatron produces radiographs of very high contrast, sensitivity and resolution, meeting the tightest inspection standards.

Features

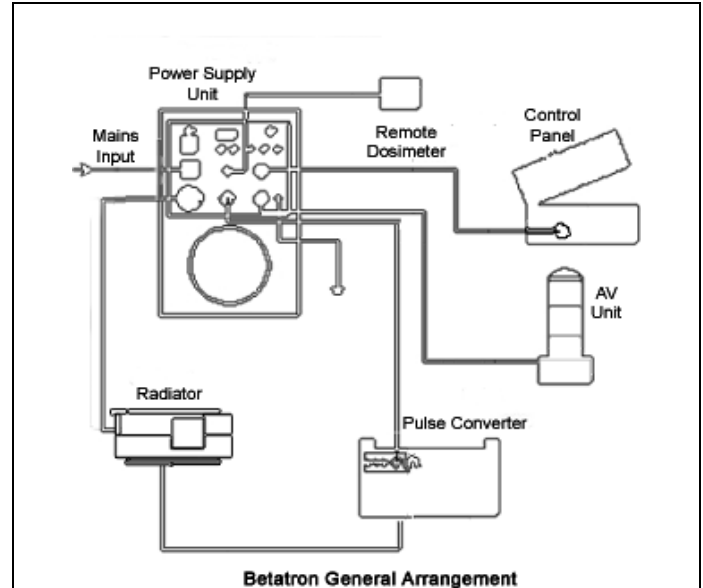
- Battery or mains operation
- Compact, powerful, mobile, versatile
- Output energy 2.5 MeV
- Excellent sensitivity and resolution

DR1200 Digital Radiography System

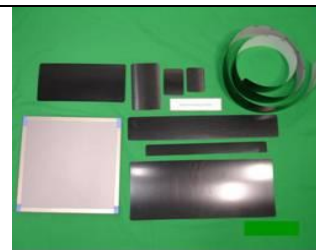
It comes with rotating drum on which imaging plate is mounted. When this drum is placed inside the scanner, there is no direct contact with the surrounding components, which prolongs the life of imaging plate. DR1200 comes with DR1200 digital radiography software package that manages image capturing, storage, retrieval, report generation and advanced radiograph analysis. The application also includes high security at all levels; operator, supervisor, interpreter and auditors.

Features

- Reduced exposure from hours to minutes
- Reusable digital imaging plate media
- Electronic storage and archiving of radiographic data
- Powerful product inspection software package
- Reduced radiation - over 60% saving
- Chemical free processing
- Meets the regulatory standards
- Environment friendly



2.5MeV Betatron



Imaging Plates



Erasure Unit



DR1200 Digital Radiography System

Technical Specifications of HEDRad	Radiograph Display Options
<p>Products under Examination</p> <ul style="list-style-type: none"> ▪ Material thickness - 50-140mm ▪ Material Type - steel, carbon steel, austenitic steel, stainless steel, mild steel, inconel ▪ Inspection – welds, pressure vessels, storage tanks, boilers, inplant piping, castings 	<p>View in monitor, High Brightness, Monochrome, with calibration software, Gradation display – 12-bit, contrast ration 600:1</p> <ul style="list-style-type: none"> ▪ Display Type : 20.8”TFT Mono Screen ▪ Display resolution : 2048 x 1536 ▪ Pixel size : 200 Micron ▪ Type : Diagnostic Quality Mono ▪ Model : 12 bit/Portrait/Landscape
<p>Meets the following standards</p> <ul style="list-style-type: none"> ▪ ASME Code V article 2, ASME V Article VIII Div 1&2, ASME B31.1, ASME B31.3 ▪ Nuclear NAS 160/AES 6001/BS2633, CEN 1435 ▪ API1104 ASNT and ASTM 7002, 2033, 7020, ASTM E186, ASTM E280, ASTM E446 ▪ UKAEA 6001 Nuclear weldment radiographic inspection 	<p>CIT Digital Radiographic Application Software</p> <p><i>Dedicated digital computed radiography software is provided that enables -</i></p> <ul style="list-style-type: none"> ▪ Acquisition, storage, and analysis of digital image ▪ Permanent archiving ▪ Customised product profile, radiographic technique and authorisation process.
<p>Digital Radiography System performance</p> <ul style="list-style-type: none"> ▪ Radiographic resolution better than 21 microns for 1200 dpi scan ▪ Contrast Sensitivity better than < 2% 	<p>Packaging Details</p> <ul style="list-style-type: none"> ▪ Dimensions/Weight of Betatron units, mm/kg <ul style="list-style-type: none"> Radiator - 440x300x150/31kgs Power unit - 445x245x390/20kgs Control panel - 235x200x115/1.5 kgs Pulse converter - 415x205x240/10.5kgs ▪ Connecting cables, meters <ul style="list-style-type: none"> Control panel to power unit – 35 meters Power unit to Pulse converter – 7 meters Radiator to Pulse converter – 3 meters Radiator to Power supply unit – 7 meters Mains cable (Power supply) – 10 meters Power supply to remote dosimeter – 15 meters ▪ DR1200 is usually packaged and dispatched in Heavy Plastic pallet box unit suitable for air freight or land transport ▪ Physical dimensions of pallets [Approx.] 3 off <ul style="list-style-type: none"> Width: 800 mm ; Height: 820 mm Length: 1200 mm ; Weight: 225Kg (approx.)
<p>Radiograph Computer Processor</p> <ul style="list-style-type: none"> ▪ Industrial standard high performance computer system with 4GB DDR2, 2T HD, BluRay Drive 	
<p>Radiation Sources - Betatron</p> <ul style="list-style-type: none"> ▪ Peak energy of accelerated electrons, not less than - 2.5 MeV ▪ Bremsstrahlung dose rate at 1 m distance from a target, not less than -7mSv/mi (0.7R/min) ▪ Maximal focal spot dimensions - 0.2x2.0 mm ▪ Maximal power consumption from AC mains at frequency 50, 60 Hz, Voltage 110, 220 V with permitted deviations from a nominal Value $\pm 10\%$, not more than - 1 KW ▪ The Betatron continuous operation should not exceed 10 hours per day with the cycle:45 min of operation, 15 min of interval with fans on 	<p>Facility Parameter</p> <ul style="list-style-type: none"> ▪ Mains supply <ul style="list-style-type: none"> ○ 110/240 Volts 50/60Hz mains, 1100 VA ○ Line stabilization recommended UPS with battery time of at least 60 minutes ▪ Installation suitability <p>Office environment with unimpaired light and air conditioner</p> <ul style="list-style-type: none"> ▪ Ambient temperature -20°C to +40°C ▪ Relative humidity (not more than) - 80% @25°C ▪ Atmospheric pressure - 1011\pm40mBar (760\pm30mmHg)
<p>Digital Radiography Scanner</p> <ul style="list-style-type: none"> ▪ Top Loading Imaging Plate system ▪ Selectable scan rate from 150, 300, 600, 1200 DPI ▪ 65535 grey scales (16 bit) ▪ Scanning Time – 20cm x 43 cm plate <ul style="list-style-type: none"> 150 DPI – 50 seconds, 300 DPI – 1min 40 Sec. ▪ 600 DPI – 3 min. 20 Sec., 1200 DPI – 4 minutes Linear response 	
<p>Digital Imaging Plates/Cassettes</p> <ul style="list-style-type: none"> ▪ Special High Energy Cassettes – 20 cm X 40 cm 	