PXB:2.5B
PORTABLE X-RAY BETATRON

NEW PRODUCTS
FOR 2024
JME:PBU

35TH ANNIVERSARY
EST. 1986

2024/25 EDITION
PRODUCT CATALOGUE

PIPELINE CRAWLERS • BETATRON PORTABLE X-RAY • DIGITAL RADIOGRAPHY

JME
ADVANCED INSPECTION SYSTEMS

2024/25 EDITION

PRODUCT CATALOGUE

PIPELINE CRAWLERS • BETATRON PORTABLE X-RAY • DIGITAL RADIOGRAPHY

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SCAN THE **QR CODE** TO FIND OUT MORE AT **WWW.JME.CO.UK**

If you would like to speak to a member of our sales team regarding our products, services or demonstrations, please contact us on **+44(0)1502 500969 / sales@jme.co.uk**

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JME ADVANCED INSPECTION SYSTEMS

PROUDLY SUPPORTING THE NDT INDUSTRY FOR OVER 35 YEARS

JME ADVANCED INSPECTION SYSTEMS

JME is regarded across the globe as the market leader for the development and manufacture of high quality inspection systems. **JME** are very proud to have supplied the industry for nearly 40 years.

For nearly four decades, **JME**'s objective has been to build its reputation on Innovation, Quality, Service and Commitment to the NDT industry. As a company, **JME** thrives on customer satisfaction, which explains why the majority of our customers have stayed with us for over three decades.

The products that **JME** designs and manufactures are recognised around the world as the premium brand in NDT, this is one of the reasons why **JME** remains far ahead of our competition for reliability, innovation and customer care. We offer field-service and support for all of our products, coupled with an extensive stock of spares, you can be assured of a prompt and efficient service at all times. Our core product range consists of the **JME** Pipeline Crawler Inspection System, DXB Digital X-Ray Buggy, Portable X-Ray Betatron Systems and Bespoke Digital X-Ray Systems supporting a variety of industry specific inspection tasks.

JME's Pipeline Crawler Systems are designed for the inspection of circumferential butt welds in a variety of pipeline sizes from 5.5" to 60" in diameter. The systems offer exceptional reliability and include a wide range of unique safety features. Our systems interface with a wide range of X-Ray generators from various manufacturers.

The Portable X-Ray Betatron systems are unique within the market place, available with energy output from 2.5Mev to 9MeV, they are capable of undertaking the inspection of a variety of materials. They will successfully produce radiographs of objects with a thickness of up to 300mm of steel or 1 meter of concrete. They are capable of producing radiographs of exceptional contrast, sensitivity and resolution, meeting the highest inspection standards.

JME HQ - LOWESTOFT, UK

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JME SERVICE PLAN

EQUIPMENT SERVICING

JME's 'Annual Service and Inspection' packages assist in supporting your **JME** products. Although our NDT systems offer the user exceptional reliability, planned and preventative maintenance is always preferable to reactive repairs during a live project. On-site repairs are not only more costly to arrange, the down-time on an active project can quickly reduce your profit margins.

For this reason, the majority of our clients find **JME**'s service plans invaluable for maintaining and maximising the productivity of their equipment. **JME** offers plans that cover Pipeline Crawler and Betatron Systems, these can be activated at the time of equipment purchase, or after your warranty period has expired.

FOR MORE INFORMATION: PLEASE CONTACT YOUR ACCOUNT HANDLER ON +44(0)1502 500969

NDT EQUIPMENT RENTAL/BAY HIRE

JME has invested in growing our stock of rental equipment to include high-energy Betatron systems (2.5 and 7.5MeV) and various COMET X-Ray Tubes. If you require additional/ replacement equipment for large, or one-off projects, contact us for stock availablity.

JME are able to offer both Long and Short term rental, so whether you require an X-Ray source for the duration of a project, or just short term cover for equipment breakdown, we have a solution to suit your requirements.

We are also able to supply a range of additional accessories to support our hire systems, including X-Ray tube stands and Audio/Visual Radiation Alarms. Please enquire for the availability of our full range of accessories.

In the event of your designated Radiographer requiring orientation/operation training on our systems, this can be offered alongside the rental agreement.

JME also has specialised bays for commissioning, and live radiography, up to 9MeV. Our bays provide a safe and secure, underground location for both film and digital radiography. Please contact **JME** for full specifications and safety criteria.

Due to the nature of Industrial X-Ray Equipment, terms and conditions must be met prior to a Hire Agreement being issued.

JME ADVANCED INSPECTION SYSTEMS

DXB:1

DIGITAL X-RAY BUGGY

The **DXB:1** Digital X-Ray Buggy; designed to produce high-quality panoramic radiographs of circumferential welds in applications such as new pipelines. As a versatile and configurable system, it can also be utilised for use in various non-pipeline applications, such as the inspection of tank walls or other ferrous metal structures.

This digital system is a replacement for traditional film radiography; this eliminates chemical processing, dark rooms, or flaws associated with conventional radiography. With an articulating digital panel, the system is fully adjustable for a range of different radiused surfaces.

The **DXB:1** includes a high-definition digital panel for instant verification of image quality and system settings. Images are digitally stored, preventing the need for film storage and enabling a permanent record to be saved within the control panel. These can be backed up via USB, a secondary hard-drive or using a network connection, allowing the images to be sent to an off-site Radiographer immediately after acquisition.

With a rapid magnetic deployment system, the **DXB:1** can be positioned by a single person in less than a minute, dramatically increasing productivity on-site.

Project settings, **DXB** Control and basic image manipulation can be controlled directly from the control panel which is supplied in a rugged case.

DXB:1 MODES OF OPERATION

SINGLE SHOT MODE: 150x100mm Single Image. The system can be used like a conventional DR system, while still utilising the Wireless communications from the DXB to its control tablet. Improving Safety, and the DXB system durability for use in Rope access, Small Bore Connections, and many other applications utilising X-Ray or Gamma Devices.

SWSI: Single Wall Single Image Mode: Utilizing an internal crawler system or Source for Panoramic inspection of Pipelines and other cylindrical objects. This mode is primarily designed for New construction of pipelines, but is transferable to other inspection applications such as Tanks and Vessels.

DWSI: Double Wall Single Image Mode: For use with any X-Ray or Gamma source this mode of operation is designed for Pipeline Tie-ins, enabling the imaging specifications to remain consistent throughout the project, along with enabling further durability of the DXB system into in-process pipelines and more.

DXB:1 SYSTEM FEATURES

- Single Wall Single Image (SWSI) + Double Wall Single Image (DWSI) + Stand-Alone Applications
- Deployed in seconds
- Film replacement technology
- Allows for 'Cloud-Based' storage and review
- Fully integrated with crawler operation
- One-touch operation
- Comprehensive safety interlocks
- Automatic back-up of images
- Magnetic mounting
- Integrated functionality with the **CR2** Crawler System

DXB:1 SOFTWARE SUITE

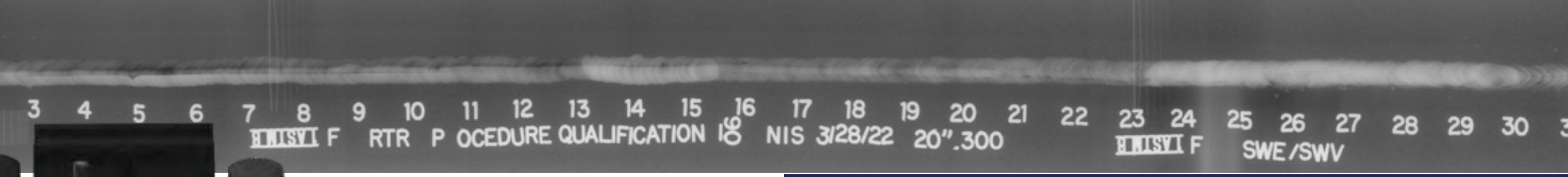
The **DXB** Software Suite allows for real-time X-Ray image acquisition, along with viewing, image processing and archiving of images. The Pipeline Crawler and X-Ray source settings can be controlled directly from within the software without the need for other control devices. X-Ray images are stored in DICONDE data format and saved to the current project, along with any additional photographs, notes, inspection date, time and GPS co-ordinates. Using the **JME** stitching algorithm, a single image can be viewed in real-time, with the full weld stitched upon completion of the weld acquisition.

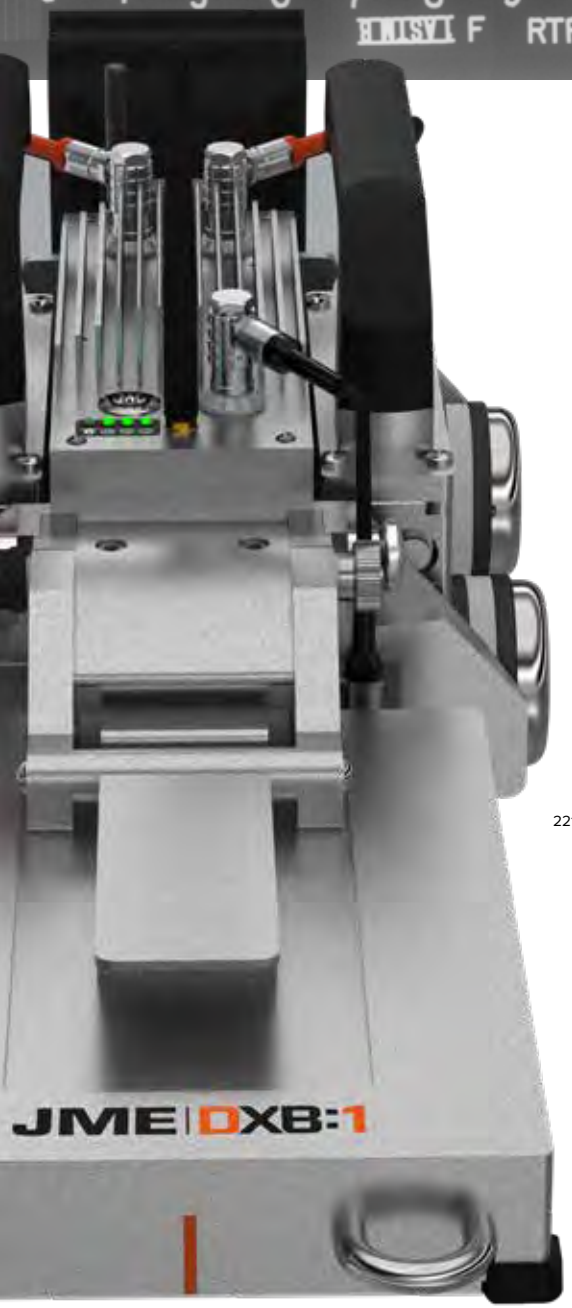
DXB:1 PACKAGE CONTENTS

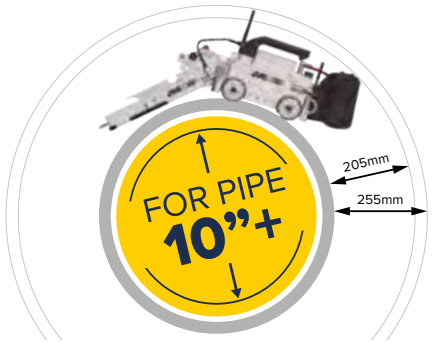
- **DXB** Buggy
- 2x Spare Batteries
- Battery Charger
- Rugged Control Tablet - IP65 Rated
- 2x Control Tablet Spare Batteries
- Control Tablet Charger
- Raid-1 Configured External USB HDD
- Assortment of Aerials, Adapters and IQI's
- Box of Charging and Data Leads
- 3 Months Trial DÜRR 'D-Tect X' Software

Each X-Ray can be stored along with additional photos, notes, inspection date, time and GPS co-ordinates - it is also possible to scan a QR Code at the point of the weld.

FIND OUT MORE AT WWW.JME.CO.UK





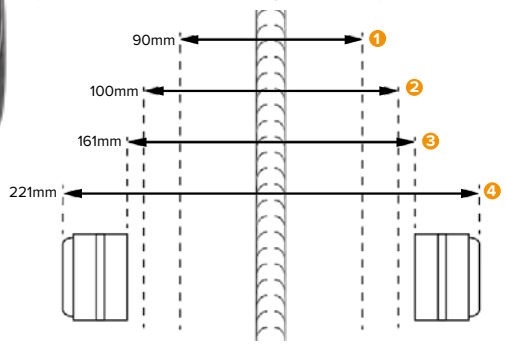


PIPE SIZE

The **DXB** operates on 10" outer-diameter pipe and above, including the ability to inspect flat surfaces. 10" and below available upon request.

PIPE CLEARANCE

The **DXB** has a minimum pipe clearance of 205mm (255mm with antenna fully extended).



PIPE CUT BACK CLEARANCE

A minimum insulation cut-back of 221mm is required for the **DXB** to travel along the metal of the pipe surface.

1. Recommended area for markers - 90mm
2. Area covered by detector - 100mm
3. Inside of wheel running area - 161mm
4. Outside of wheel running area - 221mm

IMAGING AREA

The **DXB:1** imaging area is 100 x 150mm, enabling versatility for stand-alone use, alongside the ability to utilise the panel size based on Ug/magnification limits for pipeline use, reducing scan time.

TECHNICAL SPECIFICATIONS

OVERALL SYSTEM SPECIFICATIONS

Buggy width
8.7" (220 mm)

Minimum pipeline diameter
10" (254mm) (10"> upon request)

Average scan speed
15 mm/s (including imaging time and movement between images)*

Required Radial clearance from pipe surface
> 8.1" from pipe surface (> 205mm)

Image quality
Image quality class B acc. ISO19232-5, ISO 10893-7, ISO 17636-2

Image format
DICONDE compliant data export, via network or USB

System weight
Buggy, Detector and Battery - < 44.1 lbs (< 20Kg)

Dimensions (mm)
Overall Package Kit 2 Cases - 690(L) x 530(W) x 290(H)

Positioning
Manually positioned directly onto pipe cut back with no bands

Operating temperature
-20°C to +60°C

Power consumption
< 50W

Imaging X-Ray energy
Up to 300kV

Internal image storage
Capacity 500+ Images @ 36" pipe (+USB Drive Storage)

** Depending upon pipe schedule*
DXB system is supplied in 2 rugged flight cases

BUGGY POWER OPTIONS

Battery specifications (DeWalt FLEXVOLT)
18/54V (6/2Ah) Available upon request
18/54V (9/3Ah)
18/54V (12/4Ah) = 125 shots* (18" Pipe)

**Average shots - dependent upon system settings*

IMAGING

Resolution
100 µm

Technology
CMOS

Image stitching
Uses image feature matching algorithm

CONTROL TABLET SPECIFICATIONS

Display
10.1" 10-point capacitive multi touch screen, LED backlit for daylight visibility + Waterproof digitizer pen for improved ease of use

Certification
MIL-STD-810G certified at 180cm IP65 certified

Power option
Li-ion 11.4 V, 4360 mAh - Comes with 2 battery types

Dimensions (mm)
279(L) x 188(W) x 23.5(H) (11.0" x 7.4" x 0.93")

Weight
Approx 2.64 lbs (1.19Kg)

Operating system
Windows® 11 Pro

CONTROL SOFTWARE

User interface
Touch-screen use within user interface to improve user functionality. Image viewing functions for on-site checking of acquired images prior to formal interpretation.

Image acquisition
Automatic acquisition process, controlled by user

Crawler control
Full crawler control integration, to synchronise crawler operations and image acquisition

Additional functionality
Software includes functionality from the JME CR2 handset for Pipeline Crawler and X-Ray source control

Image control
Acquired images are stitched together within the control software

Image ID
All images are tagged with GPS co-ordinates (Unless GPS module removed or turned off)

All specifications correct at time of printing - Please check for alterations before purchase

FIND OUT MORE AT WWW.JME.CO.UK

WHO WE SERVICE:
JOB SECTORS

PIPELINE RADIOGRAPHY

JME has been involved in Pipeline Radiography since 1986 See the 'Historical Product Page' of the **JME** website for more information.

Since then we have continually developed our products and services and now offer a multitude of products for global applications. Including Pipeline Crawlers for Girth Weld/New Pipeline radiography using X-Ray or Gamma, Stand-alone X-Ray generators for static and external imaging including DWSI with our DXB system, enabling a bolt-on solution for digital radiography. And not forgetting our Betatron systems for heavy wall, In-service valve inspections or even PIG retrieval applications. Along with stand-alone tubes and the Betatron for in service CUI applications.

INDUSTRIAL RADIOGRAPHY

JME offer a wide range of industrial radiography solutions, from our stand-alone tubes from COMET, Balteau, ICM, to our Betatron range for heavy wall castings, pipeworks and large automotive components.

SECURITY

JME offer a multitude of products suited to the security sector, including EOD, Public Security, Border Security and more: With products ranging from Battery Powered X-Ray tubes, Portable scanning solutions, and high energy Betatrons (PXB).

SUBSEA

Over the years **JME** has been involved in many subsea applications whether for direct project support or end-user product applications.

These applications include Subsea Pipeline Inspection with a Betatron and a ROV, Subsea Telecoms Inspection with a DXR, or Subsea Pipeline Inspection with **JME** Pipeline Crawlers.

TELECOMS

The **JME** DXR Digital Telecoms product can be used for the inspection of subsea fibre optic cabling. You can read more about the DXR here *www.jme.co.uk/dxr/*

RENEWABLES

Being Located in Lowestoft, the most Easterly point in the UK, we are ideally suited for Inspection equipment for the Renewables Sector. Lowestoft has become a hub for the construction and development of wind turbines which are built and shipped from the local port.

JME have increasingly become involved within the renewables sector, from carbon fibre and composite inspection, mechanical and heavy wall steel inspection, to subsea and ROV applications. As well as subsea infrastructure and cabling inspection. Whatever your need please reach out for assistance.

HEALTHCARE AND MEDICAL

JME has been supplying equipment for the medical sector since the early 90s with the first "Medical (electron) Betatron", supplied to a UK trust.

Since then we have not only been involved in the development and manufacture of medical systems such as the Papillion 50, the original cancer treatment system from Ariane Medical Systems, but also continue to supply standard equipment such as portable X-Ray Tubes and Betatron's for use within the sector for varying applications including medical shielding verification, and are now beginning to supply digital detectors for varying applications.

AEROSPACE

JME's range of Portable X-Ray Generators have been used in applications within the Aerospace industry to quickly and efficiently ensure the safety and integrity of components. In conjunction with Digital Radiography, allowing imaging of Aerospace's complex structures to identify small defects in assemblies from fuselages, wings and stabilisers, landing gear and bearings, to shielding and turbine engines.

JME has a range of low/mid energy X-Ray tubes available, as well as high energy Betatron systems. The varying range of X-Ray solutions we provide often mean that lengthy and costly dismantling is not required, minimising ground time.

DEFENCE

With the wide variety of radiography systems offered by **JME**, we are able to apply solutions to multiple areas in the defence industry, such as fuel inspection, Armour testing, in service submarine inspection, alongside War head, munitions, construction projects on vessels, rocket system inspection and overall failure analysis within both traditional and digital applications.

VIEW **JME** PRODUCT **CASE STUDIES** ONLINE www.jme.co.uk

ADDITIONAL JOB SECTORS JME SERVICES

ACADEMIA/MUSEUMS/GALLERIES - FORESTRY
MARITIME/CONSTRUCTION
FOOD INDUSTRY - RAIL INSPECTION - MINING

FIND OUT MORE AT WWW.JME.CO.UK

PORTABLE X-RAY BETATRON

FIND OUT MORE AT WWW.JME.CO.UK

PXB:2.5
PORTABLE X-RAY BETATRON

PXB:6
PORTABLE X-RAY BETATRON

PXB:7.5
PORTABLE X-RAY BETATRON

PXB:9
PORTABLE X-RAY BETATRON

ALSO AVAILABLE IN RF

JME Portable X-Ray Betatron Systems (**PXB**) are a range of compact circular electron accelerators, producing a high energy directional X-Ray beam. The Betatron systems are easy to assemble, operate and maintain, they contain no moving parts or cooling liquids, so system maintenance is kept to a minimum. They are capable of producing radiographs of very high contrast, sensitivity and resolution, allowing operators to meet the highest inspection standards.

JME offers 4 industrial **PXB** systems within the Betatron range, each with a different maximum energy output, these include 2.5, 6, 7.5 and 9MeV. The energy output on all systems is variable from 1Mev through to the maximum energy, with adjustments being made in 0.1MeV increments. The systems offer cost savings and a greater degree of portability when compared with Linac generators, they also provide greater flexibility for mobile inspection tasks. **JME** can also supply **PXB**'s with an optional Wireless Control Panel and Control Handset*, allowing operation up to a 1km distance.

*DEPENDENT UPON MODEL

1. POWER SUPPLY UNIT
2. RADIATOR
3. LASER ALIGNMENT
4. REMOTE DOSIMETER
5. AV WARNING UNIT
6. REMOTE CONTROL UNIT
7. RF WIRELESS CONTROL PANEL + HANDSET
   AVAILABLE ON 2.5MEV, 6/7.5MEV SYSTEMS

JME has completed many bespoke projects using Betatron systems, including subsea pipeline inspection.

CONTACT JME FOR MORE INFORMATION

APPLICATIONS

JME's Betatron range has been supplied to many different sectors of the NDT industry for a variety of inspection tasks. Examples of inspection uses include, but are not limited to:

- Large Forgings
- Castings
- Valves
- Beams
- Ships Hulls
- Munitions
- Composites
- Propellants
- Pressure Vessels
- Cargo/Security Scanning
- Reinforced Concrete Buildings
- Billets
- Thick Welds
- Bridges
- Engine Blocks

DIGITAL DETECTOR OPTIONS AVAILABLE

CONTROL PANEL FEATURES

- Control of energy levels
- Exposure time settings
- Auto-stop feature
- Warning/system messages
- Adjustment of injection current and contractor timing
- Accumulated dose measurement

FEATURES

- Completely portable
- Output energy selectable up to 9 MeV - **Dependent on Model*
- Excellent sensitivity and resolution
- Light-weight and compact
- Penetrates upto 11.81 inch's (300mm) of steel, 39.37 inch's (1m) concrete - **Dependent on Model*
- Designed for portable and stationary applications
- High image resolution due to a small focal spot size
- Efficient power conversion
- Compatible with generator power

JME BETATRON SERVICE PLAN

Whilst JME's Betatron systems offer the user exceptional reliability, planned and preventative maintenance is always preferable to reactive maintenance and repairs.

The aim of our Annual Service Plan is to maximise the productivity of your **PXB** equipment and minimise the risk of breakdowns occurring during projects. **JME**'s Betatron Service Plans offer the most cost effective solution to provide you with peace of mind, ensuring your system is always in optimum condition. Plans are available for our entire range of Betatron products that have been supplied after 2002. The service can be carried out at your premises or at our U.K. base, depending upon your preference.

CALL OUR SALES TEAM ON +44(0)1502 500969 FOR MORE INFORMATION.

JME ADVANCED INSPECTION SYSTEMS

PXB:2.5

PORTABLE X-RAY BETATRON

WIRELESS AND BATTERY OPTIONS AVAILABLE

RF B

PXB:2.5 PORTABLE X-RAY BETATRON

The PXB:2.5 Portable X-Ray Betatron is designed to produce high energy ionising radiation for industrial radiographic non-destructive testing. Half Value Layer (HVL) for Steel is 20mm

Radiation outside the main beam is low, so safe working distances are moderate. After demarcation of dose rate boundaries, the betatron may be used at external sites or in fabrication workshops with little or no additional screening.

The **PXB:2.5** is recommended for radiographic testing of weld joints and castings with a steel thickness of 30 to 120mm, concrete and other materials from 100 to 300mm. The irradiation field equals 350mm x 350mm @ 1M focal distance. In operation the **PXB:2.5** has no need for compensating filters that improves the uniformity of the radiation field. The **PXB:2.5** is far less costly than other NDT accelerators such as 'Linacs'.

The **PXB:2.5** can replace a Cobalt Isotope which may give unnaceptable quality, they also require costly periodic replenishment. The **PXB**'s shot time is much quicker and with a small focal spot size, It provides a sharper, high quality radiograph, increasing project production rate and profit.

PXB:2.5 TECHNICAL SPECIFICATIONS

Maximum X-Ray Output	2.5 MeV
Dose Rate at 1m (3.3ft)	>0.7R/minute
Typical Dose Rate @ 1m (3.3ft)	1R
Focal Spot Size	0.2 x 2.0 mm
Duty Cycle Radiation Beam	75% per hour
Beam Coverage	350 x 350mm @ 1m
Radiographic Sensitivity	Down to 1%
Supply Voltage	Single-phase, 110V or 220V, 50/60Hz
Adjustment Range of Energy	1.0 to 2.5MeV in 0.1MeV increments
Power Consumption	1.0kW (4.5A @220V, 9A @ 110V)
Standard Cable Length	PSU to Radiator 5m - PSU to Control Panel 15m Mains Supply to Power Unit 5m
Generator	Recommended 6kVA

DIMENSIONS AND WEIGHT

Accelerator (Rad.)	440 x 300 x 150mm	31kg
Power Unit	445 x 245 x 390mm	20kg
Control Panel	305 x 275 x 150mm	4.2kg
Pulse Converter	415 x 205 x 240mm	10.5kg

PXB:9 TECHNICAL SPECIFICATIONS

Maximum X-Ray Output	9 MeV
Dose Rate at 1m (3.3ft)	>20R/minute
Focal Spot Size	0.3 x 3 mm
Duty Cycle Radiation Beam	50% per hour
Beam Coverage	250 x 250mm @ 1m
Radiographic Sensitivity	Down to 1%
Supply Voltage	3-phase, 220V or 380V, 50/60Hz
Adjustment Range of Energy	2.0 to 9.0MeV in 0.1MeV increments
Power Consumption	5.0kW, 7.6A per phase
Standard Cable Length	PSU to Radiator 5m - PSU to Control Panel 15m Mains Supply to Power Unit 5m
Generator	Recommended 10kVA

DIMENSIONS AND WEIGHT

Accelerator (Rad.)	595 x 510 x 644mm	160kg
Power Unit	640 x 320 x 590mm	60kg
Control Panel	235 x 200 x 115mm	1.5kg

PXB:9 PORTABLE X-RAY BETATRON

The JME PXB:9 Portable Betatron 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.

Interlockable to safety systems or supplied with a stand-alone audio visual warning system. The Betatron produces radiographs of very high contrast, sensitivity and resolution, meeting the tightest inspection standards.

The **PXB:9** can replace cobalt isotope gamma sources which may not give acceptable quality and require costly periodic replenishment. Compared to cobalt, the Betatron's shot time is drastically reduced and the extremely small focal spot size provides a sharper, higher quality radiograph, thus increasing production rate and profit.

CONTACT **JME** FOR INFORMATION REGARDING SERVICE PACKAGES AND EXTENDED WARRANTIES

WIRELESS
OPTION COMING SOON

RF

JME ADVANCED INSPECTION SYSTEMS

PXB:9

PORTABLE X-RAY BETATRON

JME ADVANCED INSPECTION SYSTEMS

PXB:6

PORTABLE X-RAY BETATRON

JME ADVANCED INSPECTION SYSTEMS

PXB:7.5

PORTABLE X-RAY BETATRON

WIRELESS
OPTIONS AVAILABLE

RF

The PXB:6/7.5 Portable X-Ray Betatron systems are designed to produce high energy ionising radiation for industrial radiographic non-destructive testing.

Radiation outside the main beam are low, so safe working distances are moderate. After demarcation of dose rate boundaries, the Betatron may be used at external sites or in fabrication workshops with little or no additional screening.

The **PXB:6** is recommended for radiographic testing of weld joints and castings with a steel thickness of 50 to 200mm, concrete and other materials from 200 to 900mm. Half Value Layer (HVL) Steel 28mm. The irradiation field equals 250mm x 250mm @ 1M focal distance. In operation the **PXB:6** has no need for compensating filters that improves the uniformity of the radiation field.

The **PXB:7.5** produces radiographs of very high contrast, sensitivity and resolution. Half Value Layer (HVL) STEEL: 32mm. The **PXB:7.5** is recommended for radiographic testing of weld joints and castings with a steel thickness of 50 to 300mm, concrete and other materials from 200 to 1200mm. The irradiation field equals 250mm x 250mm @ 1M focal distance. In operation the **PXB:7.5** has no need for compensating filters that improves the uniformity of the radiation field. The **PXB:7.5** is far less costly than other NDT accelerators such as 'Linacs'.

Both systems can be used to replace cobalt isotope gamma sources which may not give acceptable quality and require costly periodic replenishment. Compared to cobalt, the Betatron's shot time is drastically reduced and the extremely small focal spot size provides a sharper, higher quality radiograph, thus increasing production rate and profit.

FEATURES

- Inert when not powered
- Instant Stop of X-Ray / Cut off
- RF Wireless E-stop (optional extra)
- CNSC Approved
- Completely Portable
- Output energy selectable up to 7.5 MeV
- Excellent sensitivity and resolution
- Penetrates upto 11.81 inch's (300mm) of steel, 39.37 inch's (1m) concrete*

*Dependent on Model

JME:PBU

PORTABLE BATTERY UNIT

NEW

BATTERY POWERED
PORTABLE X-RAY BETATRON

Should your application require the need for a Battery powered Betatron solution, **JME** are able to offer a range of Battery power options with our 2.5/6/7.5MeV Betatrons for use in remote locations, Hazardous areas which do not enable the use of generators, locations with instable power supply and more.

FIND OUT MORE: PBU - PAGES 18-19

COMMON SPECIFICATIONS

Focal Spot Size	0.3 x 3 mm
Duty Cycle Radiation Beam	75% per hour
Beam Coverage	250 x 250mm @ 1m
Radiographic Sensitivity	Down to 1%
Supply Voltage	Single-phase, 110V or 220V, 50/60Hz
Standard Cable Length	PSU to Radiator 5m - PSU to Control Panel 15m Mains Supply to Power Unit 5m
Generator	Recommended 10kVA
Number of Pulses per second:	200
Time Between Pulses:	5mS
Pulse Duration:	1µS
Dose Per Pulse: (in air @ 1m)	0.250mR

DIMENSIONS AND WEIGHT

Accelerator (Rad.)	700 x 430 x 355mm	109kg
Power Unit	607 x 450 x 570mm	94kg
Control Panel	305 x 275 x 150mm	4.2kg

PXB:6 TECHNICAL SPECIFICATIONS

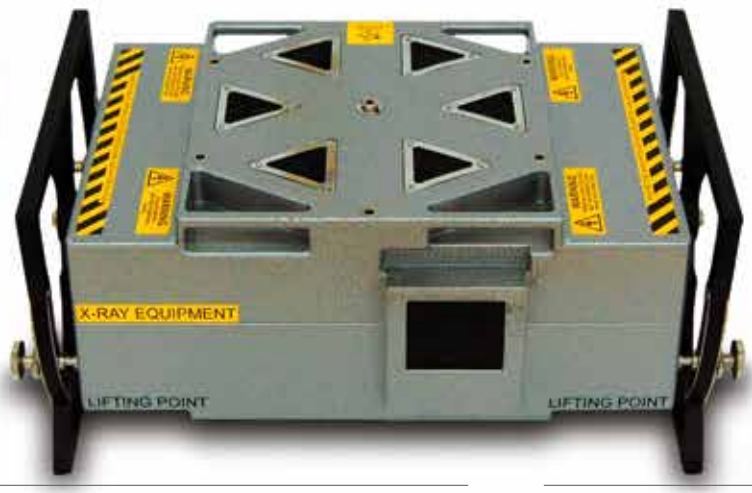
Maximum X-Ray Output	6 MeV
Dose Rate at 1m (3.3ft)	>3R/minute
Typical Dose Rate @ 1m (3.3ft)	3R
Adjustment Range of Energy	2.0 to 6MeV in 0.1MeV increments

PXB:7.5 TECHNICAL SPECIFICATIONS

Maximum X-Ray Output	7.5 MeV
Dose Rate at 1m (3.3ft)	>5R/minute
Typical Dose Rate @ 1m (3.3ft)	5R
Adjustment Range of Energy	2.0 to 7.5MeV in 0.1MeV increments

SEE THE FULL **BETATRON**
TECHNICAL SPECIFICATIONS ONLINE

FIND OUT MORE AT
WWW.JME.CO.UK



PXB:RF

PORTABLE X-RAY BETATRON

- Improved safety and awareness – distance of operation
- Ability to stop an exposure at any time
- Encrypted wireless communications from 50-500m+
- Ability to turn wireless on / off via password protection
- Live system feedback
- FCC approved
- 4 language options
  English | French | Russian | Arabic (Egypt)

DIRECT COMMUNICATION
– typical range up to 500m:

COMMUNICATION VIA REPEATER
– typical range up to 1,700m:

APPLICATIONS

- EOD/IED
- ERW/UXO
- OFFSHORE USE
- CONFINED SPACE
  (OPERATE FROM OUTSIDE VESSELS)
- NUCLEAR RESPONSE
- WORKING INSPECTING AT HEIGHT
- BRIDGE INSPECTION
- SEE MORE AT WWW.JME.CO.UK

PXB:2.5B

PORTABLE X-RAY BETATRON

Portable and portability power like never before with no specification change from mains usage.

- All components under 35kg
- Utilising the **JME:PBU**
- Enabling the in-operable, operable
- Ability to switch between mains, battery or generator power with no modifications

PXB:2.5 specific spec, no reduction in specification from standard use:

- 90 Minutes of X-Ray (@2.5MeV)
- 2.5 Hour charge time
- Silent operation, no emissions, no hazardous or flammable liquids, no maintenance

APPLICATIONS

- REMOTE LOCATIONS
- RAPID DEPLOYMENT
- UNRELIABLE MAINS SUPPLY

PACKING CONSISTS OF:

Peli Case 1	849 x 560 x 327mm	45kg
Peli Case 2	849 x 560 x 327mm	50kg
Peli Case 3	510 x 420 x 215mm	TBC
Peli Case/ Back Pack 4	510 x 420 x 215mm	<20kg

TACTICAL/REMOTE DEPLOYMENT OPTIONS AVAILABLE UPON REQUEST

Sizes and Weights are given as estimates and subject to change

MADE POSSIBLE WITH THE JME:PBU

JME ADVANCED INSPECTION SYSTEMS

JME:PBU

PORTABLE BATTERY UNIT

- **PORTABLE | SILENT POWER WITH NO EMISSIONS**
- **ALLOWING DEPLOYMENT AND OPERATIONS SAFER, FASTER**
- **INSTANT POWER, INSTANT IMPROVEMENT**

The JME:PBU provides a lightweight/mobile power solution for devices intended to run on 230V/16A.

Proven and tested with the **JME** 2.5meV (1kW) Betatron, **JME** 6/7.5meV Betatrons (for a full 45min duty cycle) and COMET EVO/ECO range to provide over 1.5 hours of X-Ray time (900W).

The **PBU** removes the need for flammable liquids on site for use with generators, reduces overall deployment weight, improves access to hard to reach and hazardous locations, while removing the need for maintenance and risk of unplanned break downs.

Enabling improved deployment with stable and clean power, producing no noise or environmental emissions the **PBU** is suited for: Powering pipeline crawler chargers, X-Ray tube run-in without loading the battery of the Pipeline Crawler, Dark Room back up and Powering auxiliary operations such as **DXB:1** system charging, and much more.

FAST CHARGING - FULL CHARGE IN 2.5 HOURS. CHARGE THE **JME:PBU** IN THE MIDDLE OF YOUR WORKDAY

WORK ANYWHERE - TAKE A 230V WALL SOCKET WITH YOU – POWER ANY DEVICE NO MATTER WHERE YOU ARE

POWER YOUR MOST DEMANDING TOOLS
18,000 W PEAK POWER

ROBUST AND WEATHER-PROOF IP54+ RATING. WORK IN ANY CONDITIONS, UNAFFECTED BY DUST OR WATER

COMPATIBLE PRODUCTS

PXB:2.5/6/7.5 PORTABLE X-RAY BETATRON | DXB:1 DIGITAL X-RAY BUGGY | CR2 ACCESSORIES | ECO/EVO X-RAY SERIES

OPERATING STATE: DISCHARGING

Output voltage	
230 VAC / 50 Hz	
Rated power	
3.600 W / 16 A	
150% overload (5,400 W / 24 A)	
Operation for >500 s possible	
200% overload (7,200 W / 32 A)	
Operation for >50 s possible	
250% overload (9,000 W / 40 A)	
Operation for >10 s possible	
Peak Power	
18.000 W / 80 A	
Maximum short-circuit current	
500 A (peak)	
Maximum operating time (idle)	
150 h	
Line protection	
16 A – similar to „B16“ circuit breaker	
Permitted operating temperature	
-20°C to 60°C	

OPERATING STATE: CHARGING

Input voltage	
120-240 VAC / 50-60 Hz	
Rated power	
500-1.000 W / 4 A	
Charge time	
< 3h to 100%	
Permitted operating temperature	
0°C to 45°C	

BATTERY CAPACITY	PROTECTION CLASS	IP CLASS	WEIGHT	NOISE EMISSION
2.1 Wh	CLASS II / DOUBLE INSULATED	IP54	20 kg	< 10 dB(A) SILENT

PIPELINE CRAWLER
X-RAY SYSTEMS

JME Pipeline Crawlers have been continually improved and updated to produce panoramic radiographs of the highest quality. Our range of systems are designed to inspect circumferential butt welds in new pipelines, such as oil and gas transmission pipelines, from 5.5” to 60”.

As a self-contained and self-powered exposure vehicle, they are ideal for a vast range of NDT applications both on and off-shore. **JME** Pipeline Crawlers are constructed using high-grade materials to provide superior corrosion resistance, easy maintenance and an extended service life. Electronic circuits utilise microprocessor control allowing future software updates to be applied. They are constructed using military specification components to ensure reliability in harsh environments.

JME’s brand new system, the **10:CR2:S** is a shorter and lighter version of our flagship **10:CR2** Crawler, allowing for easier transportation and tighter pipeline bends. See website for more indepth info.

Our systems are unique within the industry, supporting X-Ray tubes from various manufacturers*, including **JME**, Comet, Balteau and ICM, making **JME**’s Pipeline Crawler range the most versatile systems in the world.

Common electronics contained within the Crawler chassis allow the universal connection across the range of supported X-Ray/Gamma sources.

* For full compatibility list of X-Ray tube/Crawler configurations, please enquire. Options subject to Crawler model and territory.

1. CHASSIS
2. E-BOX
3. BATTERY PACK
4. 2.4GHZ ANTENNA
5. END OF PIPE SENSOR
5. WATER SENSOR
6. RECOVERING RING
7. X-RAY SOURCE
8. D-BOX
9. WHEEL EXTENDER CONES
10. MOTOR / GEARBOX / TRACKER ISOTOPE
11. CRAWLER CONTROL UNIT (CCU)

CR2 REMOTE HANDSET CONTROL

JME’s unique handset, with 4.3” touchscreen and multi-language support, allows external control and monitoring of the crawler whilst operating in the pipe.

This device allows the user to set up and configure the entire system, including X-Ray Tube, prior to placing it in the pipe. It is also capable of providing real time data from the system whilst in operation. *Read more at www.jme.co.uk*

VIEW PAGE 28 FOR OUR RANGE OF SOURCE OPTIONS ▸

USER CONFIGURABLE SETTINGS ADJUSTABLE AT ANY TIME

- Pre-waring time for X-Ray
- Anti-runaway timing, useful for when first welds are further along the string
- Exposure time, along with tube kV & mA
- Drive motor speed
- Sensor adjustment

IMPROVED EASE OF SET UP

On-board Detector and Mechanical Pipe size configuration wizard:

Enabling consistent reliability of deployment and removing the reliance of a hard copy manual for reference on site.

JME ADVANCED INSPECTION SYSTEMS

6:CR2 PIPELINE CRAWLER

6:CR2 PIPELINE CRAWLER

The JME 6:CR2 Pipeline Crawler is specifically designed for non-destructive testing of circumferential butt welds in tubular installations such as oil and gas transmission pipelines.

Our 2nd Generation **CR2** range is the world’s most ‘Technologically Advanced’ NDT crawler system. The **JME 6:CR2** Pipeline Crawler is extremely compact and lightweight, deployable in an Internal Diameter (ID) range between 5.5” / SCH120 (140mm) and a maximum of 18” (457mm). Coupled with X-Ray generators from **JME** or ICM, this system can produce internal panoramic single-wall-single-image (SWSI) radiographs of very high quality.

The crawler can be commanded using **JME** ’s Magnetic Control System (Magnetope), or a conventional isotope control system, additional features are accessible using our brand new **CR2** Remote Handset.

CONTACT **JME** FOR INFORMATION REGARDING EXTENDED WARRANTIES

6:CR2 TECHNICAL SPECIFICATIONS

Pipeline ID/ND diameter range
5.5” to 18” (140mm to 457mm) / 6” SCH120
Weight (Excluding X-Ray Tube)
9Ah Battery – 71lbs (32 Kg) 15Ah Battery – 90lbs (41 Kg)
Length (Excluding X-Ray Tube)
1500mm (59”) (including recovery ring)
X-Ray tube output options
JMXT 180, ICM CP160CR/C1802S
Power source
Sealed Lead Acid Batteries 48V (9Ah or 15Ah)
Battery capacity
9Ah / 15Ah Depending on pipe size requirements
Travel speed
Up to 12metres (40ft) per minute
Maximum angle of climb
(Optimum Conditions) 25° from horizontal
Mean positioning accuracy
±5mm
Operating temperature range
-20°C to +70°C

24:CR2 TECHNICAL SPECIFICATIONS

Pipeline ID/ND diameter range
22” to 60” (558mm to 1524mm)
Weight (Excluding X-Ray Tube)
24Ah = 370 lbs (167Kg) 34Ah = 441 lbs (200Kg)
Length (Excluding X-Ray Tube)
51.1” x 60.4” (1300-1535mm) (Depending upon configuration)
X-Ray tube output options
160kV – 360kV
Power source
Sealed Lead Acid Batteries (120v)
Battery capacity
34Ah or 24Ah Depending on pipe size requirements
Motor rating
182W x 2
Travel speed
Up to 0.39m/sec max
Wheels
Contoured High Traction Rubber
Maximum angle of climb
(Optimum Conditions) ± 30°
Mean positioning accuracy
± 5mm
Operating temperature range
-40° to +70° C (-20° upon request)

24:CR2 PIPELINE CRAWLER

JME’s 24:CR2 Pipeline Crawler is specifically designed for non-destructive testing of circumferential butt welds in tubular installations such as oil and gas transmission pipelines.

Our 2nd Generation **CR2** range is the world’s most ‘Technologically Advanced’ NDT crawler system. The **JME 24:CR2** Pipeline Crawler is robust and suitable for use in a wide range of challenging environmental conditions. Deployable in an Internal Diameter (ID) range between 22" (558mm) and a maximum of 60" (1524mm) - Larger sizes available upon request. Coupled with X-Ray generators from Balteau, Yxlon and ICM, this system can produce internal panoramic single-wall-single-image (SWSI) radiographs of very high quality.

The crawler can be commanded using **JME**’s Magnetic Control System (Magnetope), or a conventional isotope control system, additional features are accessible using our brand new **CR2** Remote Handset.

CONTACT **JME** FOR INFORMATION REGARDING EXTENDED WARRANTIES

JME ADVANCED INSPECTION SYSTEMS

24:CR2 PIPELINE CRAWLER

10:CR2 TECHNICAL SPECIFICATIONS

Pipeline ID diameter range
9.5” to 48” (240mm to 1220mm)
Weight (Excluding X-Ray Tube)
286.6lbs (130Kg)
Length (Excluding X-Ray Tube)
1717mm (246mm Recovery Ring)
X-Ray tube output options
160kV - 360kV
Mean positioning accuracy
±5mm
Power source
Sealed Lead Acid Batteries - 120V
Battery capacity
24Ah
Average exposures per battery pack
204 @30sec
Total travel distance per battery pack (Including exposures)
3km
Motor rating
1x 0.25HP (182W)
Travel speed
Up to 22 metres per minute
Maximum angle of climb
(Optimum Conditions) ≤20° / 36.4%
Operating temperature range
-20°C* to +70°C

*For lower operating temperature range, please contact sales@jme.co.uk

10:CR2 PIPELINE CRAWLER

JME 10:CR2 Pipeline Crawlers are designed to produce high-quality panoramic radiographs of circumferential butt welds in new pipelines with an Internal Diameter (ID) between 9.5” to 48” (240mm to 1220mm). These units have been developed and proven to work as a fully self-contained, self-powered exposure vehicle both onshore and offshore. Compatible with X-Ray generators of various manufacturers including Balteau, Comet/Yxlon and ICM. The JME Pipeline Crawler system is unique and the most versatile in the world.

JME’s unique Remote Handset allows external control and monitoring of the crawler whilst it is being operated within the pipe. The Handset is used to configure both the crawler and X-Ray generator prior to placing it into the pipe. **JME**’s **10:CR2** crawler also integrates both water and end of pipe sensors to provide protection against damage and give the owner/operator peace of mind.

CONTACT **JME** FOR INFORMATION REGARDING EXTENDED WARRANTIES

FOR PIPE ID 9.5”-48”

FIND OUT MORE AT WWW.JME.CO.UK

JME ADVANCED INSPECTION SYSTEMS

10:CR2 PIPELINE CRAWLER

JME ADVANCED INSPECTION SYSTEMS

10:CR2:S PIPELINE CRAWLER

FIND OUT MORE AT WWW.JME.CO.UK

31KG LIGHTER THAN **10:CR2** SYSTEM

333MM SHORTER THAN **10:CR2** SYSTEM

25% INCREASE IN X-RAY ON TIME COMPARED **10:CR1**

10:CR2:S PIPELINE CRAWLER

JME 10:CR2:S Pipeline Crawlers are designed to produce high-quality panoramic radiographs of circumferential butt welds in new pipelines with an Internal Diameter (ID) between 12” to 48” (305mm to 1220mm).

These units have been developed and proven to work as a fully self-contained, self-powered exposure vehicle both onshore and offshore in the standard **10:CR2** configuration. With the **10:CR2:S** providing all of the same components, features and functionality, in a lighter more compact package. Compatible with X-Ray generators of various manufacturers including Balteau, COMET/Yxlon and ICM.

The **JME** Pipeline Crawler system utilises all current **10:CR2** stock, reducing the need for additional spare parts, enabling a crossover of spares while also solving additional pipeline and transport solutions.

CONTACT **JME** FOR INFORMATION REGARDING EXTENDED WARRANTIES

10:CR2:S TECHNICAL SPECIFICATIONS

Technical Specifications as per 10:CR2

Weight (Excluding X-Ray Tube)
286.6lbs (130Kg)
31Kg lighter than 10:CR2
Length (Excluding X-Ray Tube)
1717mm (246mm Recovery Ring)
333mm Shorter than 10:CR2

CR2S X-RAY ON TIME 12M SECTIONS

All the technology from **JME**’s **CR2** Range but in a shorter package, and still more X-Ray minutes than your old crawler.

CR1 = 56 min
CR2S = 65 min (115V)
70 Min (112V)

X-Ray minutes calculated at 20°C ambient, with new batteries at 300Kv 3mA.

JME ADVANCED INSPECTION SYSTEMS

PIPELINE CRAWLER ACCESSORIES

- MOTOR VOLTS CHECK
- ARA CHECK
- AMAX CHECK
- MAG SWITCH CHECK
- END OF PIPE SENSOR CHECK
- WATER SENSOR CHECK
- EXPOSURE CHECK
- TUBE OVER HEAT CHECK

JME CR2 TEST BOX

The CR2 Test Box is designed to plug into any CR2 E-Box via the E-Box connector using an interconnecting cable. Using a simple control and interface method the Test Box can perform a variety of tests automatically at the touch of a button.

With visual feedback displayed directly on the test box, the user is able to quickly and effciently identify any faults with the Pipeline Crawler System. Because of its compact size, a full range of tests can be performed on site, minimising down time and allowing the user to quickly replace faulty or damaged components. The Test Box simulates sending commands to the E-Box to mimic live operation, with each of the tests being enabled/disabled to create a custom test routine. Any error codes are displayed on the user interface to identify issues with specific components. If an issue cannot be rectified onsite, error codes can be supplied to **JME** technicians to aid our support process. You can also connect the Test Box to a PC, allowing you to configure an E-Box prior to use and to download updates for PCB's.

JME MAGNETOPE
NON ISOTOPE CONTROL SYSTEM

JME Crawlers can be supplied with our unique and proven, magnetic control system, replacing conventional isotope control systems and their inherent transportation and storage problems. The Magnetope is easy to install to new and existing JME Crawler equipment.

A magnetic transmitter (Magnetope) is used to control the functions of the crawler in a similar way to the signalling isotope. There are no trailing leads and all commands are executed from outside the pipeline via magnetic transmitter (Magnetope). The unit can be used to command travel, stop and exposure as required by the user.

ISOTOPE Control Method also available.

JME RADIO REPEATER

JME Radio Repeater Unit allows an extension of communication between JME's Remote Handset and the CR2 Pipeline Crawler while operating within a pipeline.

The unit has two separate antennas – one for communicating with the Crawler (inside the pipe), and one for communicating with the Handset (outside the pipe). Internal circuitry forms a data-link between the two radio channels. The Repeater is used as a 'bridge' when there is no direct line-of-sight between the Handset and Crawler, or when operating the system in adverse weather conditions that can reduce the communication distance.

CR2 SPARES KIT

This package contains an essential set of tools which allow the construction, set-up and configuration to be undertaken.

In addition to this, the tools also allow a trained **JME** service engineer the ability to access internal PCB's within the E-Box and swap them out with spares in this kit. See www.jme.co.uk for the full kit contents.

AUDIO/VISUAL RADIATION ALARM

The JME Audio/Visual Radiation Alarm is a tool to assist radiographers in environments where controlled exposure bays are not possible.

Typical applications are landlines and offshore pipeline barges. The Alarm is normally used close to the area of X-Ray emission to indicate visually and audibly the presence of Ionising Radiation. The alarm unit is connected to the remote control Handset to provide an accurate representation of the X-Ray status, as well as an integrated GM tube for failsafe operation and non-**CR2** linked modes.

4/10 CHANNEL CHARGER

JME offers 12V, 4 or 10 channel battery chargers for sealed lead acid batteries. All channels operate individually and are controlled by a microprocessor.

The front display panel will show all relevant information about each individual battery and channel. The charger uses an algorithm which makes it possible to significantly reduce recharging time and avoid damaging the batteries. Average re-charge time is 6 hours (10 Channel).

RECOVERY OPTIONS

RADIO RECOVERY TRANSMITTER

A radio recovery transmitter used for when the crawler has broken down due to an electrical fault, this unit will reverse the crawler out of the pipe.

This recovery system is provided with every **CR2** Pipeline Crawler chassis. This technology overrides the crawlers internal logic and provides an alternative means of recovery in the event of a failure in the crawlers internal electronics.

RECOVERY VEHICLE

Purpose built vehicle complete with latching harpoon. Can be sent into a pipe to recover the crawler if it becomes disabled.

Even with the very best equipment, on the best regulated projects, there's a possibility of the crawler becoming inoperable in the pipe. This unit will connect to a disabled crawler system allowing the unit to be recovered with the assistance of an attached steel cable. **Available for 6CR2 and 10CR2 systems.**

VIEW WWW.JME.CO.UK FOR OUR FULL RANGE OF ACCESSORIES

BESPOKE OPTIONS ALSO AVAILABLE - CONTACT **JME** FOR MORE INFORMATION

X-RAY TUBES for PIPELINE CRAWLERS

FIND OUT MORE AT WWW.JME.CO.UK

X-RAY TUBE OPTIONS

JME Pipeline Crawler systems are unique within the industry, supporting X-Ray Tubes from manufacturers including **JME**, Comet, Balteau and ICM; making **JME** Crawlers the most versatile systems in the world.

X-Ray tubes are connected to our universal Crawler Chassis via an electrical interface, this is a bridge module that contains the electronics, allowing the Crawler to communicate with the tube. The interface also allows the Crawler and Tube to be controlled with the **JME** Remote Handset, including operation features such as tube parameters warmup, temperature and error reporting.

JMXT:180

JME JMXT:180

High Voltage Range	120 - 180kV CP
mA Adjustment	1.8 - 2.4mA
Beam Angle	360° x 45°
Focal Spot Size	5.0 x 0.6mm
Max X-Ray Power	320W

COMET SMART EVO 200P

BALTEAU GFC 200C

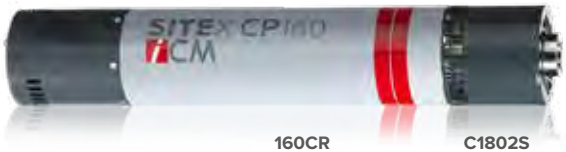
comet EVO 200P / EVO 300P

	200P	300P
High Voltage Range	30 - 200kV	50 - 300kV
mA Adjustment	0.5 - 6.0mA	0.5 - 4.5mA
Beam Angle	38° x 360°	38° x 360°
Focal Spot Size	0.4 x 4.0mm	0.5 x 5.5mm
Max X-Ray Power	750W	750W

BalteauNDT GFC 160C / 200C / 300C

	200C	300C
High Voltage Range	140 - 200kV	150 - 300kV
mA Adjustment	3mA	3mA
Beam Angle	45° x 360°	45° x 360°
Focal Spot Size	4.0 x 1.2mm	4.0 x 1.3mm

*i*CM CP160CR / C1802 / C3003 / CP300CR

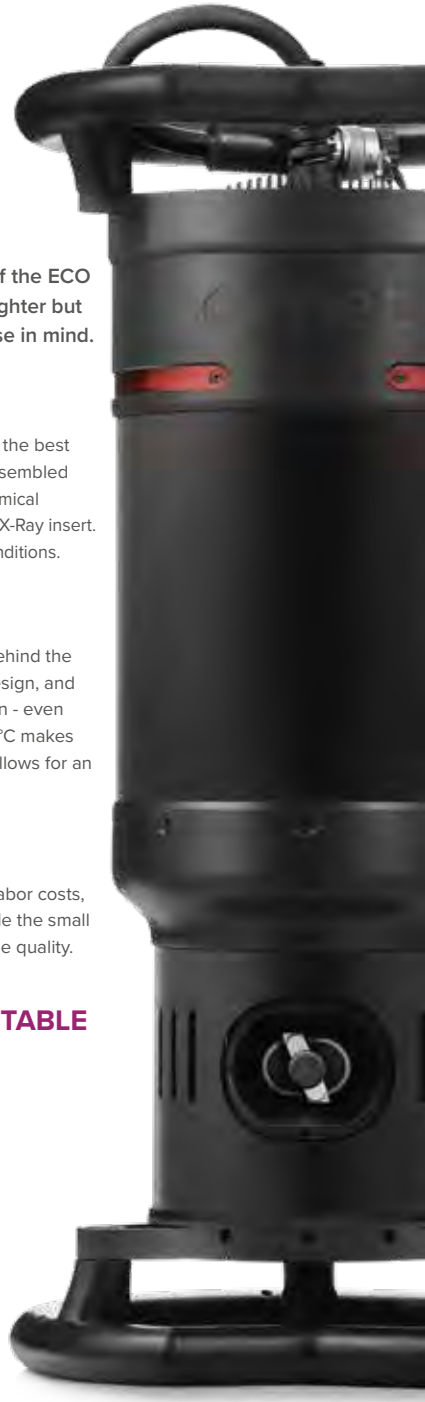


	160CR	C1802S	C3003	CP300CR
High Voltage Range	40 - 160kV	50 - 180kV	90 - 300kV	30 - 300kV
mA Adjustment	0.5 - 2.0mA	1 - 3mA	1.0 - 5.0mA	0.5 - 10mA
Beam Angle	360° x (2 x 20°)	360° x (2 x 20°)	360° x (2 x 20°)	360° x (2 x 20°)
Focal Spot Size	4.0 x 0.5mm	4.0 x 0.5mm	0.5 x 5.5mm	0.5 x 5.5mm
Max X-Ray Power	320W	N.A.	750W	750W

VISIT **WWW.JME.CO.UK** FOR A COMPLETE LIST OF X-RAY OPTIONS AND TUBE SPECIFICATIONS

comet

ECO 160DS • ECO 200DS



Say hello to the ECO 160DS and ECO 200DS, the first members of the ECO family! Embodying innovation, the latest ECO models are not just lighter but notably more manageable, designed with even a single person's use in mind.

BUILT TO LAST

IT'S RUGGED AND RELIABLE

The ECO is designed and built in Denmark using refined EVO technology. With the best components, including new low weight composite materials, the units are assembled with the utmost care - making them reliable, long-lasting, and a sound economical investment. Protected by a sturdy, robust casing is a high-quality metal ceramic X-Ray insert. The systems meet IP65 standards and are fully operational in dusty and wet conditions.

SMARTER WORKFLOW

MAKES WORK FLOW

Creating a smarter workflow for portable X-Ray has been our driving force behind the development of the ECO. With its unique length-to-width ratio, ergonomic design, and well distributed 13/14 kg, the unit requires less effort to handle and re-position - even for just one person. A broad operating temperature range from -20°C to +50°C makes the ECO reliable even in extreme environments, while its intuitive interface allows for an even smarter workflow.

HIGH PERFORMANCE

A SOLID INVESTMENT

The ECO makes good economic sense too: As a one-man tool, you get a faster and smarter workflow as it's easier to handle and carry - while the small focal spot gives the possibility of shorter exposure times and increased image quality. That's what we call economical.

JME is the Exclusive Distributor for **COMET PORTABLE X-RAY PRODUCTS** within the **United Kingdom**.

comet ECO 160DS / ECO 200DS

	160DS	200DS
Weight	13 KG	14 KG
Height	610 MM	637 MM
Focal Spot Size EN 12543	1.0 MM	1.0 MM
High Voltage Adjustment	20 - 160 KV	30 - 200 KV
mA Adjustment	0.5 - 7.0 MA	0.5 - 6.0 MA
Max X-Ray Power	750W	750 W
Beam Angle	40° X 60°	40° X 60°
Leakage Radiation	MAX. 2.0 MSV/H	MAX. 2.0 MSV/H
Environment	IP65	IP65
Temperature Range	-20°C TO +50°C	-20°C TO +50°C

comet

EVO/ECO X-RAY TUBES ARE COMPATIBLE WITH THE COMET APPROVED, JME:PBU - PORTABLE BATTERY UNIT

SEE PAGE 19 FOR MORE INFORMATION

JME:PBU PORTABLE BATTERY UNIT

X-RAY TUBES AND GENERATORS

JME are proud to be the exclusive distributor of COMET Portable X-Ray products within the United Kingdom. COMET offers a full range of high quality X-Ray Sources, ideal for use on the **JME** Pipeline Crawler range or as stand-alone solutions for NDT Inspection projects.

The range includes Panoramic and Directional X-Ray tubes in a range of kV outputs. All tubes run at Constant Potential for high penetration, this also makes them suitable for traditional film capture and digital panels.

comet SMART EVO DIRECTIONAL

SMART EVO tube heads and the CONTROL EVO is the key to a significantly improved workflow.

comet SMART EVO WATER-COOLED

Ideal for confined spaces, offers 24/7 operation in ambient temperatures up to 30°C.

comet XPO EVO DIRECTIONAL

Built around a robust metal ceramic X-Ray tube ensuring reliability.

comet SMART EVO 200P/300P

Constant Potential power for high penetration.

The ideal companion for the JME Pipeline Crawler

EVO/ECO X-RAY TUBES ARE COMPATIBLE WITH THE COMET APPROVED, JME:PBU - PORTABLE BATTERY UNIT

SEE PAGE 19 FOR MORE INFORMATION

comet CONTROL EVO

Based on state of the art technology, the unit features an exposure calculator and an intuitive interface with a wide range of advanced functionality.

Backwards compatible with the Y.SMART and Y.XPO portable X-Ray systems. Ethernet interface allows for remote diagnostics and software updates. The USB interface controls the system via a USB-to-Serial converter, saving diagnostics reports and allowing for software updates in the field.

comet Y.XMB

Available as a 100 kV, 160 kV and 225 kV with X-Ray power up to 2.25 kW. All Y.XMB can be fitted with panoramic, directional and fan beam X-Ray tubes. Available with different size focal spots. Benefits include:

- IP65 Waterproof
- Intuitive control panel with exposure calculator, data logging, 6.5 inch high contrast colour screen
- Power regulator
- Lightweight and easy to handle
- High quality metal ceramic X-Ray tube
- Ethernet, Bluetooth and USB interfaces
- 100 exposure profiles

Range of accessories including flight cases, tube stands, warning lamps, cables, lead cone package, water cooler, revolving hand ring, laser pointer and collimator.

The Y.XMB trolley systems are also available with a choice of heads ranging in KV output:

Y.XMB 100
7.5 - 100kV

Y.XMB 160
7.5 - 160kV

Y.XMB 225
10 - 225kV

comet iVARIO GENERATORS

COMET Industrial X-Ray generators are built for remarkably stable performance. Designed to meet the demanding requirements of industrial X-Ray applications, they are the ideal workhorse for both film and real-time applications. All generators are factory-configured and pre-tested.

The future-oriented iVario generator employs latest technological advancements for adoptable, stable, and efficient design.

Flawlessly integrated components guarantee an effortless installation process to ensure the highest standard of performance.

- Extremely high X-Ray power
- Access to confined spaces
- Safe operation
- High quality system
- Easy to handle

Available in:
160kV
225kV
320kV
450kV
models

JME ADVANCED INSPECTION SYSTEMS

JME:MXI

MOBILE X-RAY INSPECTION

ENGINEERED TO ADDRESS THE EVOLVING CHALLENGES ACROSS INDUSTRIES

FOR FIXED AND PORTABLE SOLUTIONS

JME has partnered with Luka-X to provide a turnkey solution for a multitude of varying applications and industry requirements in one product, the JME:MXI.

Providing **JME's** renowned name for quality and reliability, partnered with the innovation and engineering excellence of Luka-X, there really is no better mix.

A VERSATILE SYSTEM:

The **JME:MXI** comes equipped with three tube cradles and an optional HV cable quick disconnect. Allowing the user to swap tubes based on their application requirements in 5 minutes. SAVING COST, REDUCING DOWN TIME AND MAXIMISING YOUR CAPABILTIES.

DECREASED DOWNTIME

When your stationary X-Ray system faces downtime and requires repairs that may take days, weeks, or months, the **JME:MXI** steps in. Ready to be wheeled in and installed in 60 minutes or less.

PLUG AND PLAY

A truly plug-and-play system, the **JME:MXI** ships fully integrated with an X-Ray system and interfaces seamlessly with all the necessary safety interlocks and warning beacons.

COST SAVING

The impact of extended system downtime is undeniable - every minute translates to potential financial losses, reduced productivity, and a halt in critical inspections.

PARTNERED WITH

LUKA-X

TECHNICAL SPECIFICATIONS

	JME:MXI:160	JME:MXI:225
Weight	950lbs (431kg)	1050lbs (476kg)
Height x Width	50" x 30"	50" x 30"
HV Adjustment	7.5 - 160kV	10 - 225kV
mA Adjustment	0 - 45mA	0 - 30mA
Max Power	3000W	4500W
Cable Length	5m - 35m	5 - 35m
Input Power	208-264VAC 50/60Hz	208-264VAC 50/60Hz

APPLICATIONS

EMERGENCY SYSTEM FAILURES

When your on-site system fails, the **JME:MXI** steps in immediately, minimizing delays and maximising profit.

FACILITY OVERHAULS

During planned maintenance or upgrades, prevent production halts with the **JME:MXI**.

REMOTE WORKSITES

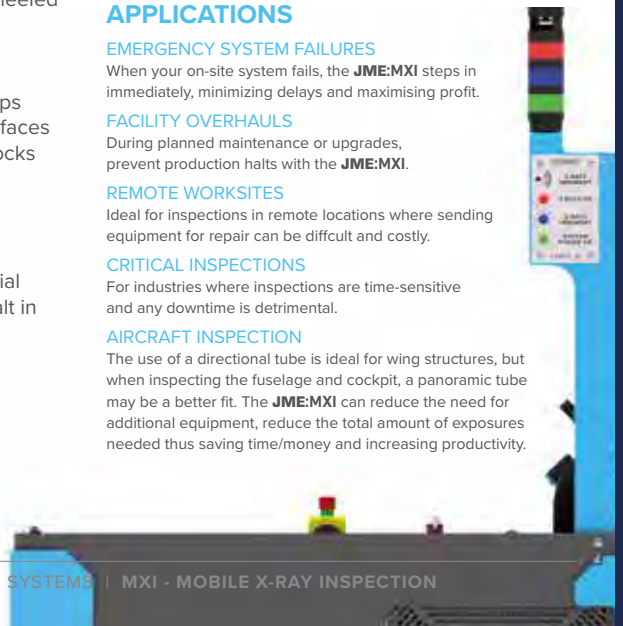
Ideal for inspections in remote locations where sending equipment for repair can be diffcult and costly.

CRITICAL INSPECTIONS

For industries where inspections are time-sensitive and any downtime is detrimental.

AIRCRAFT INSPECTION

The use of a directional tube is ideal for wing structures, but when inspecting the fuselage and cockpit, a panoramic tube may be a better fit. The **JME:MXI** can reduce the need for additional equipment, reduce the total amount of exposures needed thus saving time/money and increasing productivity.



JME ADVANCED INSPECTION SYSTEMS

DXR:1

DIGITAL RADIOGRAPHY

for SUBSEA INSPECTION

DIGITAL X-RAY AND ASSESSMENT DEVELOPMENT FOR SUBSEA CABLE JOINTING

Global Marine

The Global Marine | JME DXR:1. This state-of-the-art X-Ray camera superseded Type 13 cameras and eliminate film technology and wet chemical processing in a "stand-alone system". Revolutionising the Submarine Cable inspection, introducing rugged construction and improved operational and environmental Safety since 2016, with now over 100 systems in the field.

As the camera is fully digital, Image assessment can commence as soon as the first image is available, removing delays in film processing time, and improving efficiency of cable inspection and repair. The digital images can be stored in a dedicated folder on the vessel server and therefore immediately available for the assessor to assess the image or send via email / transfer to a 3rd party for review. When all images have been assessed, a summary sheet is produced giving an overall result for the joint.

The **DXR** enables 0-165^{0} Rotation around the joint, with up to 36 images possible, ensuring a full picture of the joint is obtained with no hidden defects.

THE ASSESSOR SOFTWARE included with the **DXR**, the software allows images to be obtained, evaluated and reports generated all within the equipment provided. streamlining the operation and inspection process and ensuring there are no hidden costs. Once the images are processed, they can be loaded onto the assessment software, and are automatically positioned on the viewer screen to re-create the inspected object form, allowing efficient interpretation for each image's individual assessment. The assessment Software has access to features such as Contrast adjustment, user defined Zoom, measuring tools such as point to point, wall thickness and defect annotations. The advanced software also contains noise reduction features and identifies 16,000 levels of greyscale. These tools will assist to generate the automatic final report, which along with the 'one-click' Image quality assigned, can highlight if the joint has passed, failed, or requires a re-work.

FEATURES

- Windows compatible
- Remote engineering support available via PC connection
- Rugged marine construction
- Highest radiography safety
- Power: 100-240V 5A 50/60HZ
- High Image definition (75 Micron)
- System repair time reduced
- Images saved digitally - email
- Software image assessment |
- Touch-screen control
- Image enhancement software
- No chemical processing
- No X-Ray films required
- No lightbox or graticules
- No hard-copy film archiving

EXAMPLE JOINT X-RAY IMAGE (INC IQI)

JME ADVANCED INSPECTION SYSTEMS

DIGITAL RADIOGRAPHY

JME has been designing and manufacturing bespoke Digital Radiography (DR) systems for over 15 years - these products have been produced to the highest standards that meet specific customer requirements.

All **JME** RTR/DR Systems are built with integrated safety at the core, which includes emergency stop buttons and monitored door interlocks, audible pre-warning and fail-safe warning lamps. All **JME** systems meet the statutory requirements of the current Ionising Radiation Regulations (IRR17) and any other industry standards set out by the industry sector of the product and with a vast experience of industries ranging from Food, Pipeline, Subsea Cabling, and medical applications **JME** ensure compliance whatever your need.

DIGITAL IMAGING - THE WAY FORWARD

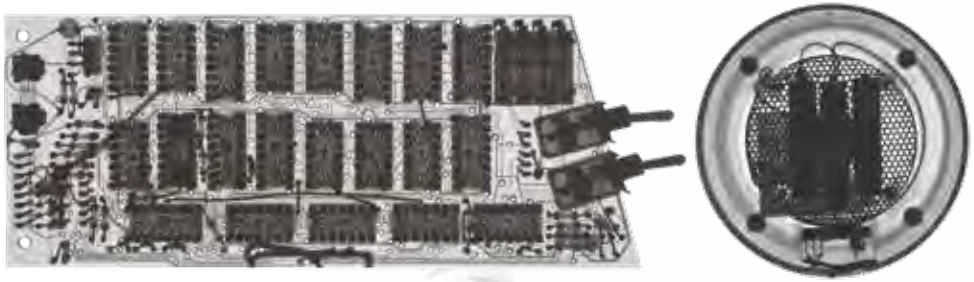
Wet film radiography has been accepted and used as a NDT technique for many years. However, new X-Ray imaging techniques haven been available for a while now that offer improved performance and productivity over film. As a leader in the field of advanced inspection equipment **JME** can offer Digital Radiography to our customers in a range of applications and industry sectors.

JME CAN:

- Provide advice on choosing and using our DR systems, radiographic techniques and safety requirements
- Conduct feasibility studies and trials on site or in-house
- Design and manufacture turn-key solutions
- Supply X-Ray sources
- Supply assessor and image manipulation software
- Provide after sales service and repair

HOW DOES DR WORK?

RTR/DR works by replacing the conventional radiographic film with an electronic imaging panel/plate or Detector Array. The panel is connected to a computer which 'captures' the image digitally and stores it as a data file. A conventional X-Ray /Gamma source is used. There are other types of image capturing devices to suit different applications. The resulting image can be viewed on a monitor, digitally enhanced or manipulated, archived, printed or emailed as required. Although the image can also remain encrypted to prevent permanent changes as required.



WHAT ARE THE ADVANTAGES?

- DR IS FASTER: Dependant on the application, images can be produced in seconds, increasing productivity dramatically.
- REDUCED RUNNING COST: DR uses no film or chemicals and therefore does not require conventional processing.
- IMPROVED IMAGE QUALITY: Dependant on the application, images can be produced which are superior to their film equivalent thereby enabling better inspection. A pixel size of down to 75 µm is achievable.
- AUTOMATED FLAW DETECTION: DR systems can be designed to automatically scan an image and report flaws. Such equipment can operate as an automated 'go / no-go' inspection system.
- FILE LABELLING: Image files can be electronically labelled with information about the work piece. This could include a description, job number, date, time etc. Labelling can appear as an overlay on the image, electronically embedded in the file or a combination of both.
- FILM EMULATION: If required images can be processed to emulate conventional radiographic film such as D4 or D7.
- IMAGE MANIPULATION: Computer software may be used to manipulate the images. This can help to highlight flaws by adjusting parameters such as contrast, brightness and dynamic range. Sections of image may be magnified. Also digital point to point measurements can be made.

DIGITAL RADIOGRAPHY CASE STUDY

for the FOOD INDUSTRY

The **JME** Digital Food Radiography System (**DFR**) was produced for Birds Eye/Iglo Foods, one of the largest food manufacturers in the UK. The focus of the project was to manufacture a unit that could X-Ray batches of inbound goods for quality control purposes, prior to accepting shipments into the factory. The **DFR** is a bespoke Digital Radiography project, taken from initial inception, design, software development to final production equipment.

Supplying Fast-Moving Consumer Goods (FMCG) or Consumer Packaged Goods (CPG), such as food products, require a fast turnaround to ensure perishable items reach the consumer as fresh as possible. Food safety is extremely important during this process, ensuring products reach the customer free from objects such as bones, foreign objects, defects, and contaminations can often be challenging. Adding a Digital Radiography solution to a production workflow allows for fast, in-situ X-Ray imaging of products. This process can be added prior to goods entering the production workflow, such as purchased ingredients, or inline as part of the production process. Both methods can reduce the likelihood of unsafe objects or damaged goods reaching the consumer.

The DFR is capable of detecting each of the following in each type of food product block:

- 3mm Glass Ball
- 2mm Stainless Steel Ball
- 2mm Steel Ball
- 2mm Aluminium Ball

In blocks ranging from 62mm to 115mm

ENHANCING FOOD SAFETY: IMPLEMENTING X-RAY TECHNOLOGY FOR BLOCK INSPECTION

The project was to produce a self-contained Digital X-Ray System capable of detecting bones or foreign objects within frozen blocks of produce. This would include a 'safe system' for loading blocks into the machine, along with a method to scan barcodes and save the images against the barcode.

The project included the procurement and installation of an X-Ray system capable of generating high-resolution images of any defects or foreign objects. These may include bones, metal, glass, and non-fish voids. The software will facilitate the customization of settings for different types of blocks or meats. Moreover, ensuring the safety of operators during block loading is integral to the system's design.

JME's inhouse Design Team were able to work alongside Birds Eye to produce a plan that incorporated all Health and Safety concerns when dealing with X-Ray equipment, any specific criteria, and guidelines for the safety of the operators and working environment. This included all risk assessments and operator training to mitigate operational risks.

FIND OUT MORE: DFR CASE STUDY PAGE 56

NDT CASE STUDY
PIPELINE INSPECTION IN AN OFFSHORE ENVIRONMENT

TRINIDAD INSPECTION SERVICES
INTEGRITY MATTERS

PIPELINE CRAWLER IN OFFSHORE ENVIRONMENT

JME have been supplying Pipeline Crawlers since the mid 1980's, over that time a loyal customer base has been established. **JME** were contacted by Trinidad Inspection Services (TIS) in late 2021 to provide information in support of a tender for Offshore Crawler work.

The project involved the inspection of approximately 1350 joints of 8" diameter pipework and was scheduled to be undertaken in Quarter 2 of 2022. TIS were being engaged as a sub-contractor to a Submarine Pipeline Project based in the Gulf of Paria, Trinidad and Tobago. The contract duration involved was in the region of 14 days of production, equating to the inspection of around 100 welds per day. This project was scheduled for Quarter 1 of 2022 and the objective was to install a subsea pipeline facilitating the transmission of Natural Gas between two Offshore platforms which were approximately 17km apart.

To initiate this project the team at **JME** worked in conjunction with the technical team at TIS to provide a review of drawings and documentation to ensure the Pipeline Crawlers suitability for the project. **JME** worked with the client to ensure suitability of the system for their application, this involved bespoke modelling in CAD to ensure it was able to operate within the client's specific needs.

The schedule onboard the vessel was challenging as it required continuous operation of the equipment in 2 x 12 hours shift patterns. TIS had operated crawlers historically, however prior projects were land based and this would be their first time operating **JME's** new **CR2** range of Crawlers. With the offshore nature of this work and the fact that the equipment supplied was **JMEs** new generation of **CR2** Crawlers, the decision was taken that **JME** and TIS would approach this project from the beginning, with a complete re-training of all personnel. Prior to release, the equipment was configured to operate in an offshore environment. This meant the addition of a magnetic reed switch to prevent the Crawler system from over driving in the pipe. In addition to this, **JME** also re-orientated the end of pipe sensor in order to allow it to provide protection in conjunction with the stop trolly. **JME** identified the required equipment and the order was placed. **JME** was able to get the system onsite 10 days from the confirmation of the order.

Training was provided to the crawler technicians/ operators in territory, this involved a 3 day operation and maintenance course. With this training completed, the TIS team were issued with operators training certification for their personnel file and to fulfil site H&S requirements. The team were now fully conversant with all contents of the Crawler package meaning that it could be put into operation quickly once work began on the vessel.

During this project any issues encountered were easily overcome using the provided training and the equipment worked flawlessly throughout the inspection process. This project was a true example of developing a mutually beneficial partnership to provide the end user with an excellent service resulting in exceptional satisfaction.

The project was successfully completed on time and all project activities were well planned and efficiently executed by the teams involved. All equipment which was used was very well suited to the application and the team were competent in its operation thanks to the onsite training provided to the TIS team in territory. **JMEs** Pipeline Crawler performed flawlessly throughout the project and was key to ensuring the NDE elements of the project were delivered.

> It was noted by all Operators that the new **CR2** Range of Pipeline Crawler Systems were significantly faster and easier to deploy than the previous generations.

The smooth operation of the Crawler System throughout the project was testament to the professionalism of the TIS team, the training which was provided and also the exceptional quality of the equipment operating on the job.

Due to the successful execution of this job, TIS are in a position where their relationship with this client continues to develop and grow. TIS are currently bidding on additional work of this nature, having proved they are able to consistently deliver onsite, within an aggressive production schedule. With TIS having previous experience in multiple crawler deployments, it is excellent to see that the set-up and operation of the **CR2** range of crawlers is fast and intuitive, which greatly assisted in this project. This ease of use really helped in providing the client with a positive experience in the effective completion of this project.

FIND OUT MORE: 6CR2 - PAGE 22

NDT CASE STUDY
CONSTRUCTION AND CIVIL ENGINEERING

BRIDGE INSPECTION USING THE JME BETATRON SYSTEM

In March 2019, **JME** were tasked with supporting an inspection company in Italy to perform X-Rays of a road bridge in an area notorious for earthquakes. After the Morandi bridge collapse in Genoa in 2018, large scale discussions took place to determine the extent of the potential problems other structures could face as a result of an increase in pollution, corrosion, vehicle traffic, geological factors and poor maintenance schedules.

The Morandi bridge was a new breed of structure, constructed pretty much solely of pre-stressed concrete, and as a result required substantially less steel cabling than previous structures. This was originally billed as a maintenance free method of construction, and as a result, thousands of bridges, viaducts and tunnels were constructed in a similar manner.

Bringing us forward to the current day, many of these structures are still yet to be inspected 100%, ultimately raising questions as to whether there are going to be repeats of the Morandi bridge collapse.

JME delivered their 7.5 MeV Portable Betatron system to a small village north of Rome, and supported the inspection company, alongside the digital panel supplier in successfully carrying out over 120 individual exposures on concrete thicknesses ranging from 300 – 1100 mm's. Using this system, the inspection company were able to evaluate, not only the presence of the steel cables within the concrete, but take accurate measurements of its thickness, determine its integrity, and ultimately prove whether the structure was safe.

The portability of the Betatron system, coupled with its high energy output puts it in a position of being the only X-Ray source capable of performing this kind of inspection. Using an underbridge inspection platform, the Betatron system and digital panel were mounted in their specially designed fixtures and lowered into position under the bridge superstructure.

The **JME** 7.5MeV Betatron system comes equipped with a wireless control panel and handset, with an open air range of 3km, meaning exclusion zones present no operational issues as well as an increase in safety for operators.

If you would like more information regarding the **JME** PXB:7.5, please email sales@jme.co.uk or telephone +44(0)1502 500969

FIND OUT MORE: PXB RANGE - PAGE 16

NDT CASE STUDY
OFFSHORE BETATRON

IN ASSOCIATION WITH AXESS GROUP

PROJECT OVERVIEW

It was identified that part of a heavy wall pipe, in relation to an offshore wellhead, failed/collapsed during a routine drilling operation. Additionally, a drilling tool had become lodged inside the tubing due to a breakage and is stuck in the well.

After initial evaluation, it was decided that the best 'product' solution for the project was through Radiography using the **JME** High Energy Portable Betatron system (PXB 7.5MeV). This equipment could be used to detect where the pipe had collapsed and confirm the area in which the tool was stuck so it could be removed and the pipes repaired.

REPAIR AND POSTREPAIR INSPECTION

The project would include a complex well operation to expand the collapsed pipe and remove the tool that was lodged in the pipe. Once the tool had been removed, additional Radiography with the Betatron system would be required to ensure the repair was successful and operation of the pipelines could continue.

THE SOLUTION

The **JME** Betatron system was used along with Film Radiography to monitor inside the pipe between the repair operations. Due to the expense associated with downtime on an offshore platform, the customer needed to verify that the operation proceeded and progressed as planned. The plan of operation was to conduct a radiography shot with the Betatron, before, during and after the repair procedure was completed. This ensured that the full scope of the project could be completed as quickly and efficiently as possible with the minimum of disruption.

The inspection measure was simple, before the well could be put into operation, the criteria was to prove if there was a 2" solid steel bar inside the 7" casing. During well operation, radiography was conducted from different angles to ascertain the direction of the collapse in the 7" casing. A final radiograph was taken after well operation to prove that the 2" solid steel bar was removed.

CHALLENGES

The main challenge with this project was radiation protection for the operators, in what was a relatively small, yet open area with lots of machinery present. The requirement was to shield enough of the radiation and keep them at low enough levels to fulfill the requirements of 'radiation protection'. The majority of exposures were done after the main day shift was over, this minimized the amount of people around the exclusion zone and in areas close by. All exposures performed with the Betatron system were done so the emission direction was pointing towards the sea and not in the direction of other rig modules.

The well consists of five casings, dimensions as follows:

32" Pipe	- 25.4mm thickness
20" Pipe	- 16.1mm thickness
13 3/8" Pipe	- 13.1mm thickness
10 ¾" Pipe	- 13.8mm thickness
7" Pipe	- 10.4mm thickness (production pipe)

The total thickness to be penetrated with the Betatron system was 1576mm, along with the potential of having accumulated water between each pipe wall. The required exposure time was between 25 to 30 minutes with 7.5MeV to achieve the required film sensitivity on AFGA D7 film.

In relation to the inspection criteria, there were no challenges associated with the use of the Betatron system. The machine was very easy to set up and operate, especially with its intuitive control panel to set all of the radiograph parameters.

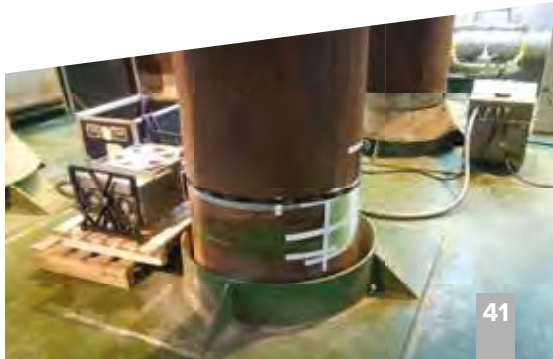
RESULT OF INSPECTION

Before the well operation was conducted, the 2" solid steel bar was located and proven to be within the 7" pipe.

During the well operation, the direction of the collapsed 7" pipe was proved, making the repair operation simpler.

The customer found the radiographs very helpful during the well operation and are hoping that the Betatron system will be available for future complex well operations.

FIND OUT MORE: PXB RANGE - PAGE 16



NDT CASE STUDY
OFFSHORE INSPECTION

OCEANEERING®

Oceaneering Inspection Solution Combines High-Energy X-Ray and Digital Detector Array to Confirm Fitness for Service on Large-Diameter, Heavy Wall Risers Solution safely delivers high-resolution images and corrosion measurement data in near real time on an offshore installation

In 1964, Mike Hughes and Johnny Johnson formed a Gulf of Mexico diving company called World Wide Divers. The company grew in response to increasing demand for their services and in 1969 merged with two other diving companies to form Oceaneering International, Inc.

Since the beginning, the company has transformed from a small regional diving company into a global provider of engineered products and services. Today, Oceaneering develop products and services for use throughout the lifecycle of an offshore oilfield, from drilling to decommissioning. they operate the world's premier fleet of work class ROVs. Additionally, They are a leader in offshore oilfield maintenance services, umbilicals, subsea hardware, and tooling. They also serve the aerospace, defense, and theme park industries. With more than 50 years of experience providing inspection on critical infrastructure, Oceaneering deliver optimized, project-appropriate solutions that meet inspection criteria and ensure that your assets are fit for service. Their globally-deployable solutions meet your critical and time-sensitive needs for non-destructive testing.

PROJECT OVERVIEW

In January 2016, a client approached Oceaneering for a non-destructive testing (NDT) method that would be suitable for use on two risers in the North Sea. Each of the risers had significant external corrosion scale, also known as scabs – prompting the need for verification of the risers' integrity. The goal was to extend the production timeline for the main oil line (MOL), which has a 24-inch outside diameter (OD), and the gas producer, with a 20-inch OD. The client required another year's service from the risers in order to align the completion of its necessary repairs with the next planned turnaround.

ISSUES

The operator could not support or defend continued production without developing an integrity case to prove the risers' fitness for service (FFS). Justification of FFS relies on accurate profiles of the flaws and, in this case, the remaining wall-thickness figures around the full 360-degree circumference of the risers. The scale on the risers prevented direct access to the pipe surface and could not be removed for fear of puncture and product release, bringing with it production loss and potentially serious health, safety and environmental (HSE) issues.

THE OCEANEERING SOLUTION

There was no conventional, industry-accepted NDT method or hardware capable of completing the required inspection. Without verification that the risers were fit for service, the operator was potentially exposing both personnel and the environment to a high level of risk. The position of the area needing inspection – just 39 feet (12 meters) above the lowest astronomical tide (LAT) – and the operator's desire to keep operations online posed additional significant challenges. Oceaneering subject matter experts (SMEs) evaluated a range of possible options and concluded that radiography was the method with the most potential to deliver a solution; however, it was obvious that traditional X-Ray or gamma sources lacked the energy required to complete the novel technique they envisaged.

Measuring the remaining wall thickness meant taking X-Ray images around the circumference of each pipe tangentially. Although this is a conventional radiography technique, very powerful equipment capable of penetrating the very thick "chord" lengths of the risers was needed to complete multiple-angle exposures to ensure full area coverage. Oceaneering SMEs proposed a 7.5 MeV PXB betatron with digital detector array (DDA) radiography as a possible solution. A betatron is a very high-energy, highly penetrating source of X-radiation and had never been used offshore in conjunction with a DDA. The Oceaneering and client teams worked together to develop this industry-first operation. They established a comprehensive project plan that included trials; extensive safety planning; electrical, scaffolding and rigging teams; and the development of customized hardware.

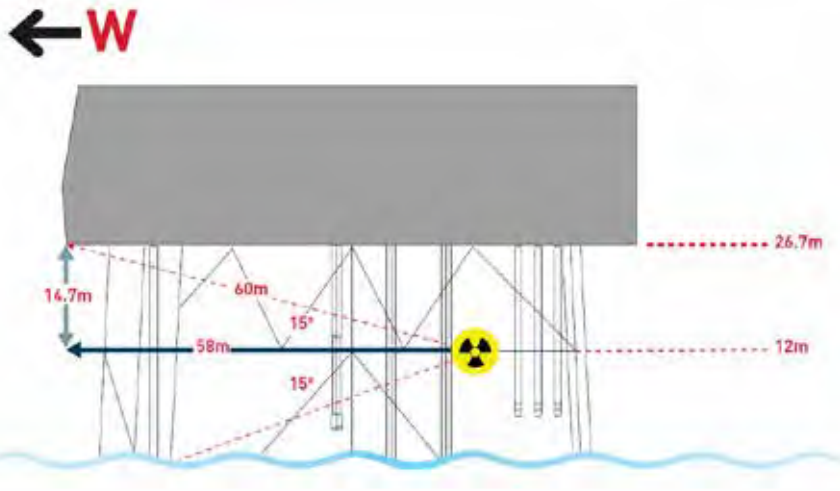
EXECUTION PLAN

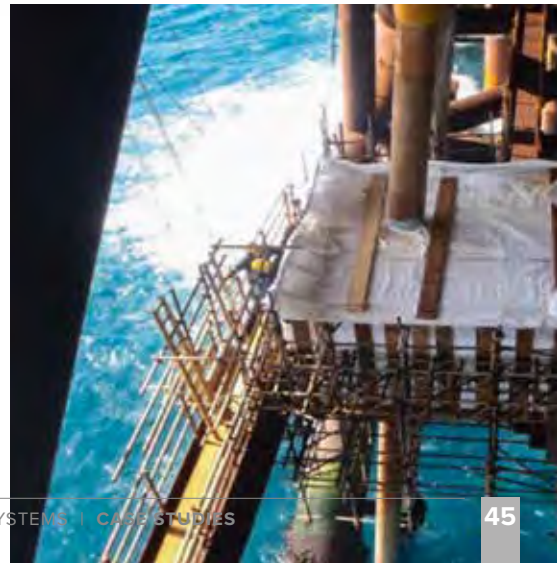
Using high-energy X-Rays offshore was unprecedented, and, therefore, testing was required onshore to provide a degree of confidence that safe technical delivery was achievable. X-Ray trials were conducted in a special facility in Rosyth, Scotland, in February 2016. These trials were completed using the planned tangential technique on a 24-inch-OD pipe to prove the concept. Two scoping visits were made to the platform to further understand the complexities involved with the project and to develop relationships with the client's senior management team, including the offshore installation manager (OIM) and HSE representatives. These visits provided the platform personnel with an introduction to the inspection concept, and gave the Oceaneering team the opportunity to view the work scope, particularly in relation to the positioning of the safe controlled area, exposure direction, and main personnel concentrations on the platform.

Oceaneering designed and manufactured customized hardware used to support the completion of the precise radiography. A projectspecific positioning trolley and radiation beam angle guide interfacing with the pipe flange ensured that each exposure was on target and that a comprehensive, accurate set of data was produced and used to assess the pipe thickness. The team also established a comprehensive health and safety plan, inclusive of extremely detailed exclusion areas and provisions, to ensure that personnel were not exposed to radiation. The project required an engineered scaffolding setup, and offshore preparation was completed prior to the mobilization of the radiography crew in May 2016. The radiography was conducted in 12-hour day shifts over two visits in an overall four-week time period, and was completed in June 2016.

CHALLENGES

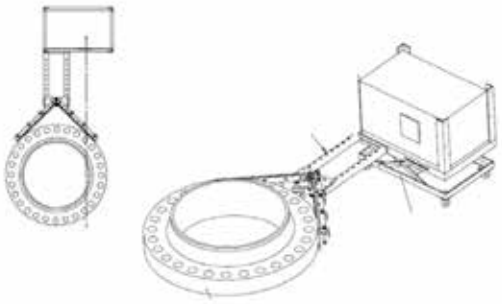
Radiation safety, rather than a technical deliverable, was the primary challenge. This was overcome with detailed radiation dose profiling (with the beam directed toward the highrisk areas of the platform), along with special monitoring and detailed barrier plans. A twin-wire rigging system was used to lift and lower the heavy equipment from the deck level through a floor grating hole down to the scaffolding platform. Manual handling and positioning of the 220-lb (100-kg) accelerator head at the workface was achieved by fabricating a bespoke, wheeled support trolley and by rigging an overhead lifting beam in the radiation habitat. The location of the inspection site was only 39 feet (12 meters) from the sea, and, therefore, moisture, sea spray and salt, in combination with high winds and gusting, precipitated the need for an engineering-designed scaffold and weatherproofed habitat. Challenges in cable management, along with routing of the necessary communications and power from the system control habitat at emergency shutdown valve (ESDV) levels, were identified and overcome.





EQUIPMENT HIGHLIGHTS

- 7.5 MeV PXB Betatron accelerator head
- Splash-proof covers for the power supply unit (PSU) and the accelerator head
- Special positioning trolley and angling device
- Specially fabricated collimation solution
- High-energy certified TRACERCO™ T202 Dose Rate Monitors
- A high-resolution, wireless digital detector array to deliver near-real-time digital X-ray images



PROJECT HIGHLIGHTS

- First time that high-energy X-Rays and digital detector array radiography were used in combination on an offshore installation
- First time that the “tangential” technique has been used on this pipe thickness to provide wall-thickness information through heavy external corrosion scale
- First time that this information has been used for such a high-profile FFS exercise

RESULTS

The radiography was completed successfully, and the client was able to use the data produced to establish the risers’ FFS. The images and calculations generated confirmed that the risers were fit to continue production at specific pressures appropriate for the required timescale. More importantly, the safety of the platform and its personnel was confirmed, and approval from the HSE team further established the suitability of the method used.

For this challenge, Oceaneering investigated possible methods, identified a solution, and completed the inspection of the risers by using its expertise in asset integrity and inspection methodologies. The solution provided significant cost savings and superior integrity assurance in a busy production environment on an offshore installation. The project identified a successful NDT solution for a degradation issue that is typically present on the many offshore installations with more than 20 years of production life. Oceaneering is confident that this extremely powerful inspection combination can be a useful tool in the U.K. Health and Safety Executive’s Key Programme 4 (KP4) Ageing and Life Extension (ALE) program’s search for inspection options.

FIND OUT MORE: PXB RANGE - PAGE 16

JME ADVANCED INSPECTION SYSTEMS

NDT CASE STUDY

LOCATING STUCK PIPELINE PIG USING HIGH ENERGY X-RAYS AND DIGITAL RADIOGRAPHY DETECTOR

OCEANEERING HELPS OPERATOR SOLVE MAJOR FLOW DISRUPTION ISSUE

OCEANEERING®

The following Case Study details the use of JME’s Betatron to solve a complex challenge involving a pipeline pig that was disrupting oil flow to the online terminal.

PROJECT OVERVIEW

An oil and gas pipeline operator contacted Oceaneering because an in-line inspection (ILI) pig was stuck in one of its pipelines in the North Sea. The pig had broken, and while one portion was recovered at the onshore reception facility, the rest remained stuck at an unknown position within the pipeline and was preventing oil production to the onshore terminal. The pipeline was suspected to be full of crude oil and wax deposits.

ISSUES

Production disruption meant large revenue losses, and the remediation plan needed not only an expedited solution, but one that had the best probability of positively identifying the missing pig’s location.

There were no obvious known non-destructive testing (NDT) solutions available for obtaining non-intrusive inspection (NII) data or visual images of the pig with any confidence. However, radiography had potential as a viable option for targeted inspections. Conventional radiography using high-energy gamma radiation was considered and ultimately rejected based on the method's insufficient penetrating power. The target areas of the pipeline included thick tee sections and complex non-return valves (NRVs). An additional consideration was the likelihood of the larger diameter pipe potentially being full of heavy crude wax.

Oceaneering was able to recommend **JME**'s Betatron high-energy X-Ray system as a possible solution. The Betatron system, also known as a cyclotron, is normally used in a purpose-built exposure compound onshore to X-Ray components with thicknesses up to 250mm. It is, however, seldom used for open site-based locations; one of the main challenges is assuring personnel safety during the operations and setting up a 'Controlled Area'.

EXECUTION PLAN

The pipeline blockage was discovered in 2018; initial recovery operations using pressurization regimes and cleaning pigs were attempted during 2019. An unfortunate outcome of these intervention operations was that part of the pig broke off, but was recovered at the terminal pig trap. However, the fear was that other loose pig parts may remain in the pipeline along with the rest of the pig.

Oceaneering developed a timeline that included a data verification review using a similar data set from previous work involving a stuck pig and Betatron; pipeline exposures in our specialized facility at the Rosyth, U.K., dockyard; a presentation of the intended solution to the client; a detailed risk assessment of the site; and mobilization of equipment and specially trained personnel for the work from our head office in Aberdeen.

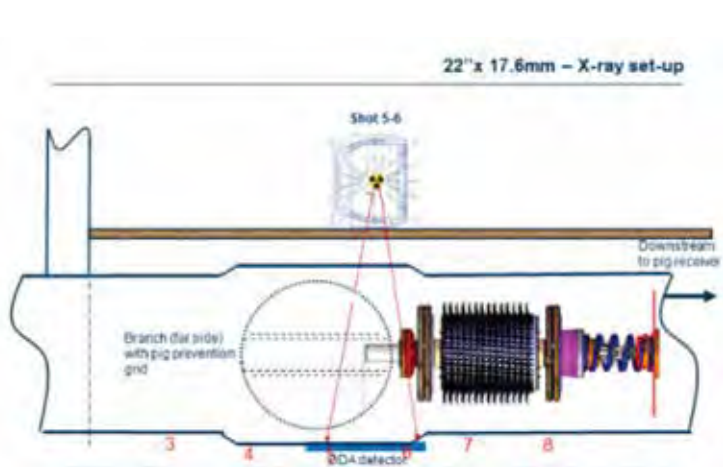
CHALLENGES

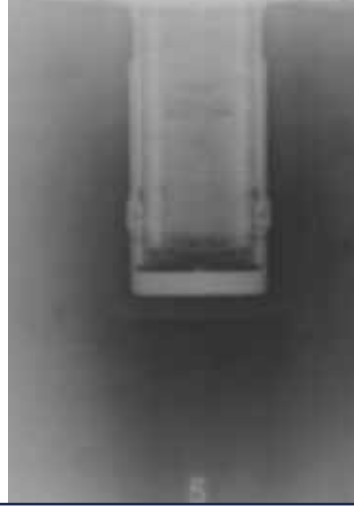
Several challenges presented themselves as the team prepared to execute the project plan, including:

» Radiation dose levels
» Stable power supply for Betatron
» Moist/salty air environment
» Scaffolding management
» Nucleonics
» Site personnel training

To resolve the challenges, the Oceaneering team put controls in place, lead sheeting, and collimation to attenuate the beam and test exposure to ensure radiation dose levels were properly managed. Special job-specific and site-specific local rules were adhered to, and a high-energy monitor adequacy trial was completed.

The team also ensured that adequate and stable power supply to the Betatron unit could be supplied by working closely with the site's electrical supervisor to ensure that there would be no power output spikes.





To account for the moist and salty air environment, the team ensured that equipment was supplied with adequate covers and control habitat.

A scaffolding management protocol was implemented. This consisted of a lift plan and local manual handling and storage on the scaffold itself. The accelerator was stored in the transport case overnight. The team also installed a load-bearing overhead beam with shackle to support lifting. In addition, the group enlisted a specialized engineering design team for scaffold construction.

To ensure the beam did not affect nucleonic instrumentation, the team established precise beam control and collimation directed away from the pressure plant and equipment likely to be affected.

For safety and site personnel radiation awareness, the team conducted on-site training and toolbox talks.

The team provided daily scheduled calls to the site for project management fitness for service (FFS) input and image assessments from subject matter experts (SME).

To identify and inspect additional risks, the team conducted a daily risk assessment and perimetry regime.

RESULTS

By using this innovative solution, the customer was able to resume pipeline production operations after only three months. We were able to positively confirm the pig position and the absence of pig debris in the tee prevention bars and inside the NRV. The pig's location would have prevented valve closure or even caused damage to the valve internals during the closure which would have required a major pipeline intervention and workover to replace the valve. Around 20 m of pipeline was radiographed before eventually finding the pig. One of the main X-Ray set-ups and actual X-Ray digital image through the process thick wax product is shown.

CASE STUDY ORIGINALLY PUBLISHED AT **WWW.OCEANEERING.COM/NEWS-MEDIA/CASE-STUDIES/**

FIND OUT MORE: PXB RANGE - PAGE 16

NDT CASE STUDY

JME PXBMJ BETATRON VALIDATION FOR USE IN INSPECTION OF FIRE PROOFED STRUCTURAL STEEL

INITIAL CONCERN

The catalyst for this study was the concern that main structural I-beams at a Petrochemical facility could be suffering from degradation due to the fracturing of a fire-resistant concrete that was applied during installation. The initial goal is to locate possible damage caused by oxidation due to water ingress through the fractures that could affect the integrity of the structure as well as determine the extent of the damage revealed without the removal of the fire protectant.

COMMENTARY OF ANALYSIS:

This paper will focus on the ability of high energy X-Ray photons to penetrate structural steel encased in fire proofing material. Based on the previous results, as demonstrated by the Iridium 192 image below and considering the energy levels associated, it is hypothesized that to penetrate a specimen consisting of a 12” I-beam with a web thickness of .750” and flange thickness of .500” encased in 14” x 16” fireproofing concrete, that energies of 2 MeV or greater will be necessary to reveal artificially induced degradation. These discontinuities consisted of 3 drilled holes .500” in diameter at 3 different depths 1/4t (.1875”), 1/2t (.375”), and 3/4t (.500”). These depths were chosen in an effort to simulate expected damage that could jeopardize the structural integrity of the beams at specific areas of concern.

PREVIOUS ATTEMPTS:

When the concern was initially revealed, a concerted effort was made to radiograph the suspect area using digital radiography (DDA) and an Iridium 192 isotope and 400 KV X-Ray tube. While both Iridium and 400 KV were successful in producing an image, the image lacked definition and sensitivity to reveal the extent of the damage. It was noted the aggregate within the concrete drastically attenuated the photons of the radioisotope. After assessing the image, along with the procedure parameters, it was pondered that utilizing shorter wavelength photons, effectively reducing the amount of particulate interaction within the specimen, should provide the desired definition and sensitivity.

HYPOTHETICAL CONCEPT:

During our attempt with Iridium 192 and 400 KV, it was discovered that the thickness and characteristics of the concrete drastically attenuated the photons in the bandwidth provided by the radioisotope and X-Ray tube, Irdidium energies are composed of 10 distinct energies ranging from .21 to .61 MeV with the primary energy at .35 MeV, (there is some debate depending on the referenced material) and the spectrum upon energies found with the X-Ray tube at a maximum output of 400 KV. It is postulated that the longer wavelengths of these energies are being heavily absorbed. **Ird. 192 (.35 MeV Primary Spectrum) Image: X-Ray tube shot: 400 KV Distances: 9.5” from concrete.** within the cement, and significant buildup is causing excessive scatter to the image compromising sensitivity and definition. The basic principle here is to eliminate the excessive scatter by lessening the particulate interaction, electron/positron emission associated with the pair production principle and attempt to penetrate the specimen with photons in the 2 to 7.5 MeV range. Inherently, X-Rays produce an energy spectrum with the highest output at the maximum capacity of the accelerator. This spectrum, although consisting of all energies, possess bands of energies that have more intensity than other energies within the spectrum.

ADDITIONAL

This case study is part of a larger study including 13 tests. Download the full study or read it online at **www.jme.co.uk/jme-services-how-we-can-help/services/case-studies/**

SUMMARY

As postulated, using a high energy particle accelerator was indeed successful in revealing the ¼ t, ½ t, and ¾ t holes in the specimen. Improved definition and sensitivity were witnessed at the higher energy levels as the higher energies allowed for less exposure time which decreased the forward build-up typically associated with longer exposure times and lower energies. Pb filters of ¼” at the detector proved to be an appropriate filter to increase sensitivity levels which enabled the detection of not only ¼ t x ½” diameter hole, but also revealed an 8mm hole within the concrete itself. It is believed that the sensitivity achieved is more than adequate to assess the integrity of the structural I-beam; however, after obtaining the data, it is recommended that engineering calculate the criticality of the degradation.

FIND OUT MORE: PXB RANGE - PAGE 16

NDT CASE STUDY
CONSTRUCTION AND CIVIL ENGINEERING

aurora

INSPECTION USING THE JME BETATRON SYSTEM

In the UK, facilities in which ionising radiation is used, are subject to The Ionising Radiations Regulations 2017 (IRR17). Under these regulations, employers are required to consult a Radiation Protection Adviser (RPA) regarding the plans for any new or modified facilities and specifically the control measures which are implemented to ensure exposure to ionising radiation is kept as low as reasonably practicable (ALARP).

Aurora has experience of providing this advice for all uses of ionising radiation in the healthcare sector, including proton beam therapy, traditional external beam radiotherapy, brachytherapy, nuclear medicine, radiopharmacies, medical isotope production facilities and diagnostic radiology equipment. Aurora uses the **JME** Portable X-Ray Betatron (**PXB**) System for Shielding Integrity Testing (SIT) within radiotherapy bunkers. SIT provides confidence to both the construction partner and the healthcare provider that the facility has been constructed in accordance with the design before it is handed over. SIT uses a mobile radioactive source, which allows more comprehensive testing than is possible with a fixed clinical source. The test source is chosen to match the shielding provided, which allows testing to take place even when adjacent spaces are occupied.

THE BENEFITS OF THE JME PXB SYSTEM

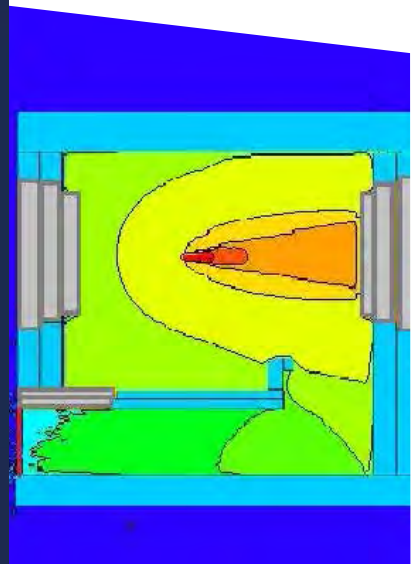
Why was a Betatron chosen for this particular application and what specification was used?

- It is powered from a standard single phase 230 volt electricity supply which is readily available on the client's premises.
- It is controllable, allowing the user to select higher or lower energy X-Rays. This enables operator doses to be minimised and the X-Ray output matched to the structure being examined.
- It is easy to terminate an exposure in an emergency if required – in the event that an exposure needs to be terminated quickly, this is easily achieved with the control panel by either using the Emergency Stop (quick action - sharp tap to the Emergency Stop button) or switching off using the Betatron operating key.
- It is reliable, producing a stable X-Ray output with repeatable results across each energy range.
- Completely portable and easily transported to a clients premises.

PROJECT DETAILS

Testing of the facility with the **JME** Betatron system produces X-Ray transmission data. Typically, upwards of 100+ data points will be assessed dependent on the size of the structure and the nature of the clients' requirements. The data is then analysed off-site and a 'Shielding Integrity Test Report' is produced.

FIND OUT MORE: PXB RANGE - PAGE 16



NDT CASE STUDY

EXAMPLE OF HIGH ENERGY X-RAY FOR FORGING & CASTINGS INSPECTION

IN COMPLIANCE WITH BS EN 12681-1

Clarity NDT Limited

APPLICABLE FOR INDUSTRIES SUCH AS
DEFENCE, NUCLEAR, PETROCHEMICAL, EXCLUDING AEROSPACE

Introduction: This case study focuses on the utilization of high energy X-Rays for the inspection of large Castings in compliance with BS EN 12681-1, a European Standard that specifies the requirements for industrial radiographic examination using X-Rays and gamma rays. Demonstrating the importance of the application of high energy X-Ray Betatrons in accordance with BS EN 12681-1 for the inspection of castings with varying thicknesses.

BACKGROUND:

BS EN 12681-1, titled “Industrial radiographic examination of metallic materials by X-Rays and Gamma rays” provides guidelines for conducting radiographic examinations to detect internal and surface defects in metallic materials. It ensures the safety of personnel involved in radiographic testing while maintaining the quality and reliability of inspection results.

Within BS EN 12681-1 there are a number of methods of inspection, using both Gamma and X-Ray, stating the minimum and maximum permissible wall thicknesses that can be inspected using each method.

Table Extract from Standard BS NE 12861-1

Penetrated thickness range for Gamma Ray sources and X-Ray equipment with energy above 1 MeV for steels, cast irons, cobalt, copper and nickel base alloys.

RADIATION SOURCE	PENETRATED THICKNESS w^a mm	
	Class A	Class B
Se 75	$10 \le w \le 40$	$14 \le w \le 40$
Ir 192	$10 \le w \le 100$	$20 \le w \le 90$
Co 60	$40 \le w \le 200$	$60 \le w \le 150$
X-ray equipment with energy from 1 MeV to 4 MeV	$30 \le w \le 300$	$50 \le w \le 180$
X-ray equipment with energy from 4 MeV to 12 MeV	$w \ge 50^b$	$w \ge 70^b$
X-ray equipment with energy above 12 MeV	$w \ge 80^b$	$w \ge 100^b$

a If there are different thicknesses imaged with one exposure, an averaged value of these thicknesses can be used.

b The minimum penetrated wall thickness may be reduced by 10 mm in class A and by 20 mm in class B, if film system class C1 according to EN ISO 11699-1 is used, provided the IQI requirements are met.

Gamma - The standard allows for use of a three types of Gamma source; Selenium, Iridium and Cobalt. For this project, with a higher wall thickness, it is a high activity Cobalt source which is the option most suited to the application.

Ir-192 Sources are typically available in activity from 10Ci to 150Ci. Se-75 Sources are typically available in activity from 30Ci to 100Ci. Co-60 Sources are typically available in activity from 30Ci to 100Ci

The activity level of the source is dependent on licence level, local regulations and availability. The time for a new licence or change to licence is usually around 12 weeks with the current lead time of a new Co-60 source at 12 months.

Betatron - The **JME** Portable X-Ray Betatron systems are a range of compact circular electron accelerators producing a high energy directional X-Ray beam. The Betatron systems are easy to assemble, operate and maintain. They are capable of producing Radiographs of very high contrast, sensitivity and resolution.

Being electrically powered, the Portable X-Ray Betatron offers enhanced control and safety over a Gamma source with the limiting factors being physical bay requirements instead of Legislative.

PROJECT:

Clarity NDT is an NDT company specialising in the testing and inspection of large castings for a number of industries, including Oil and Gas, Nuclear and Defence.

This document will now relate to a project with sections in excess of 200mm wall thickness within the requirements of the standard. The example used includes sections in excess of 200mm, meaning with the use of Cobalt Gamma Sources alone would be unable to complete this project while still conforming to spec. Using Cobalt alone, the maximum thickness would be limited to 150mm.

The variation in penetration thickness requirement would require multiple pieces of equipment; including Gamma sources, and X-Ray equipment for higher wall thickness sections. The **JME** Portable X-Ray Betatron 7.5MJ was chosen within the equipment list as it offers full control of the output energy and can be lowered for smaller wall thicknesses, giving increased versatility, still conforming to BS EN 12681-1.

RESULT:

Clarity NDT were able to successfully complete the project for the client while still conforming to standard with the use of their **JME PXB 7.5MJ** systems. Since using such systems it has been proven that the use of a **JME** Portable X-Ray Betatron decreased the imaging times by as much as 70% while still providing enhanced image quality due to small focal spot size.

Clarity NDT were able to utilise the ability of the **JME** 7.5 MeV Portable X-Ray Betatron system and lower the output energy, in 0.1MeV increments, to carry out a number of processes using a single system, leaving no need to change equipment, reducing overall bay time and offering enhanced project opportunities for this, and further inspection standard / criteria.

CONCLUSION:

This document highlights the effective application of high energy X-Rays in industrial radiographic examination in compliance with BS EN 12681-1. By adhering to the standard’s requirements, Clarity NDT ensured the quality and safety in their project, demonstrating their commitment to meeting regulatory standards and customer expectations. Clarity NDT were able to utilise the Betatron system in a number of ways showing versatility in projects previously seen as only possible with Gamma.

Furthermore, with the use of **JME** Betatron there is no Half-Life, so inspections maintain a consistent procedure and image quality throughout the contract and allow routine re-inspection of parts to be consistent. Simplifying internal procedures, increasing staff throughout (no calculations and procedural adjustments over time) and further improving both quality and reliability of the services provided. EU and UK Legislation also makes the purchase and installation of high activity Gamma sources both a difficult and time-consuming process, so alongside **JME**’s shorter lead-time the end user was confident that should workloads increase they could react quickly by increasing productivity with an additional system, knowing all procedures would remain consistent.

Over the years, supply and pricing of the **JME** Portable X-Ray Betatron systems have stayed consistent with no effect on lead times, supply or service availability. Gamma source price and availability, including Cobalt, is directly affected by other world markets and requirements making procurement difficult or costly.

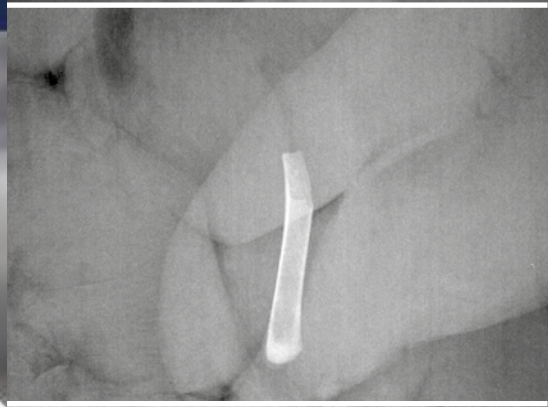
FIND OUT MORE: PXB RANGE - PAGE 16

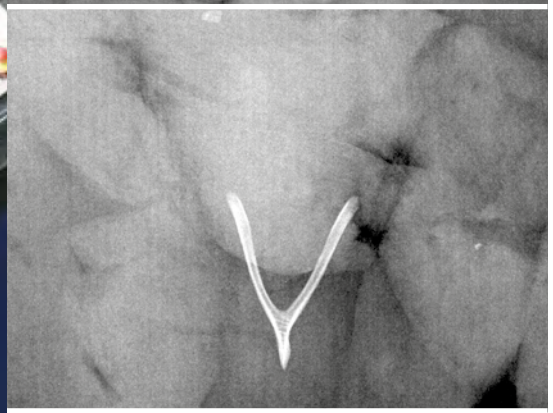
NDT CASE STUDY
FOOD INDUSTRY

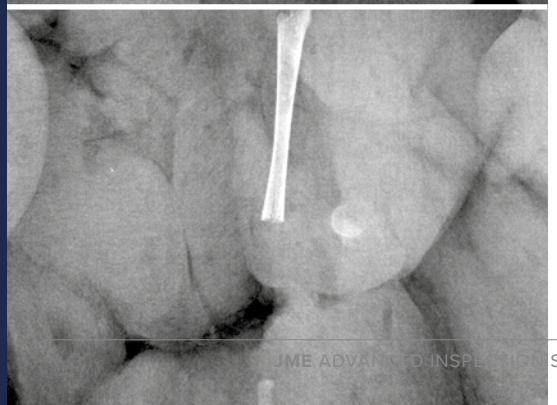
INSPECTION USING THE JME DFR SYSTEM

Supplying Fast-Moving Consumer Goods (FMCG) or Consumer Packaged Goods (CPG), such as food products, require a fast turnaround to ensure that highly perishable items reach the consumer as fresh as possible. During this process, food safety should be of the utmost importance, ensuring products reach the customer, free from unwanted objects such as bones, foreign objects, defects and contaminations can often be challenging. Adding a Digital Radiography solution to a production workflow allows for fast, in situ X-Ray imaging of products. This process can be added prior to goods entering the production workflow, such as purchased ingredients, or inline as part of the production process. Both methods are able to reduce the likelihood of unsafe objects or damaged goods reaching the consumer.

JME is a leading, UK based manufacturing company, specialising in the design and production of high quality inspection systems. With a focus on innovation, quality, service, and commitment to the NDT industry, **JME's** reputation as a market leader has been unsurpassed in the past 30 years. As a company, **JME** thrives on customer satisfaction, which explains why the majority of our customers continue to use our services year upon year. We offer on-site service and support for all of our products, coupled with a large spare-component warehouse to minimise down-time, you can be assured of a prompt and efficient service at all times. **JME** products are recognised around the world, in all serviced industries, as a premium brand. This is why **JME** remains far ahead of our competition for reliability, innovation and customer care.







JME DIGITAL FOOD RADIOGRAPHY SYSTEM (DFR)

The **JME** Digital Food Radiography System (DFR) was produced for Birds Eye/Iglo Foods, one of the largest food manufacturers in the UK. The focus of the project was to manufacture a unit that could X-Ray batches of inbound goods for quality control purposes, prior to accepting shipments into the factory. In this instance, this process increased the quality of goods before entering the production process. In turn, this also greatly reduced manufacturing costs from early identification of product defects.

The **JME DFR** system is a bespoke NDT solution that can be engineered to fit in with your company's current work flow. The machine uses Digital Radiography to generate a radiograph that allows an operator to detect foreign objects or defects in foodstuffs, including frozen fish, chicken and beef blocks.

Products loaded into the machine through its 'safe-system', are scanned to log the bar code and then X-rayed to detect any defects or foreign objects. The Radiograph is stored on a remote server alongside the bar code for easy identification. If no bar code is present, the **DFR** has the ability to manually input batch details through a touch-screen control interface. A simple menu system allows the user to save settings for different product types, reducing labour times when setting up the unit for frequently used product lines.

Mechanically the machine is of welded and bolted stainless-steel construction, containing single axis motorised linear positioning units for the digital imaging panel and X-Ray generating tube. A wheeled buggy running along guide rails transports the product in and out of the cabinet, providing linear positioning during the inspection process. The

buggy system can be used with either an onboard drive unit, or a free running trolley with a fixed drive unit and drive belt, with cabling to connect to the trolley. With these options, there should be no maintenance and replacement costs, other than those associated with similar systems.

In a normal food processing environment, the stainless-steel structure requires little maintenance other than regular sanitising and visual inspection for damage or potential safety risks.

The machine incorporates numerous safety features, including interlocks to prevent X-Ray operation in the event of a component failure; this includes any bulb failures on the X-Ray warning beacons.

A regular radiation safety inspection is recommended every 3 months, or following any maintenance and servicing of the machine. **JME** can provide these on an annual plan if required.

JME's Digital Food Radiography (**DFR**) system has dramatically improved workflow within the production environment, reducing the amount of staff required to process the incoming blocks of frozen produce. Along with the huge cost saving with staffing, reducing the operational personnel to a single person, there has also been massive savings with decreasing the amount of food waste from having to dispose of entire batches.

Birdseye are using the **DFR** system to X-Ray five blocks from every batch-delivery of Chicken and Fish, and two from every batch of Beef.

The system is used to X-Ray 100 blocks per day, running for around 6 hours a day, 5 days per week – This equates to about 20 blocks per hour.

Previously, if a bone was found in an inspection block, the whole batch was rejected. This due to the rest of the batch needing to be thawed for inspection. A large volume of this rejected meat was still good quality, but the thawed meat cannot be used, and so the batches were rejected regardless.

X-RAY PROCESS AND COST SAVING

The **DFR** can be operated by one person, whereas the previous process would have required a team of up to 20 people thawing and checking batch blocks. So as well as a cost saving with wasted produce, there is also a significant saving in human resources.

Scanning of batch samples for bone size in each produce type

CHICKEN – if any bone is found above 32mm in the X-Ray image, the whole batch is rejected and returned to the supplier. If there are bones found Above 10mm, the entire batch is scanned box by box.

BEEF – If any bones are found of any size in the X-ray image, the whole batch is rejected and returned to the supplier.

FISH – When 2 or more bones of any size are found or a single bone of more than 4mm, the whole batch will be rejected and returned to the supplier. If a single bone of 2-4mm is found in the image then the whole batch is scanned box by box.

The DFR is manufactured to engineering standards:

- Machine performance standard ES003 Rev E
- Electrical Standard ES001 Rev J
- Electrical Standards ESS001 Rev J
- Hygienic Design ESS BE H Design Rev B
- Components Standard ES005 Rev E
- ESS 005 Rev E

The DFR is capable of detecting each of the following in each type of food product block:

- 3mm Glass Ball
- 2mm Stainless steel ball
- 2mm Steel Ball
- 2mm Aluminium Ball

In blocks ranging from 62mm to 115mm

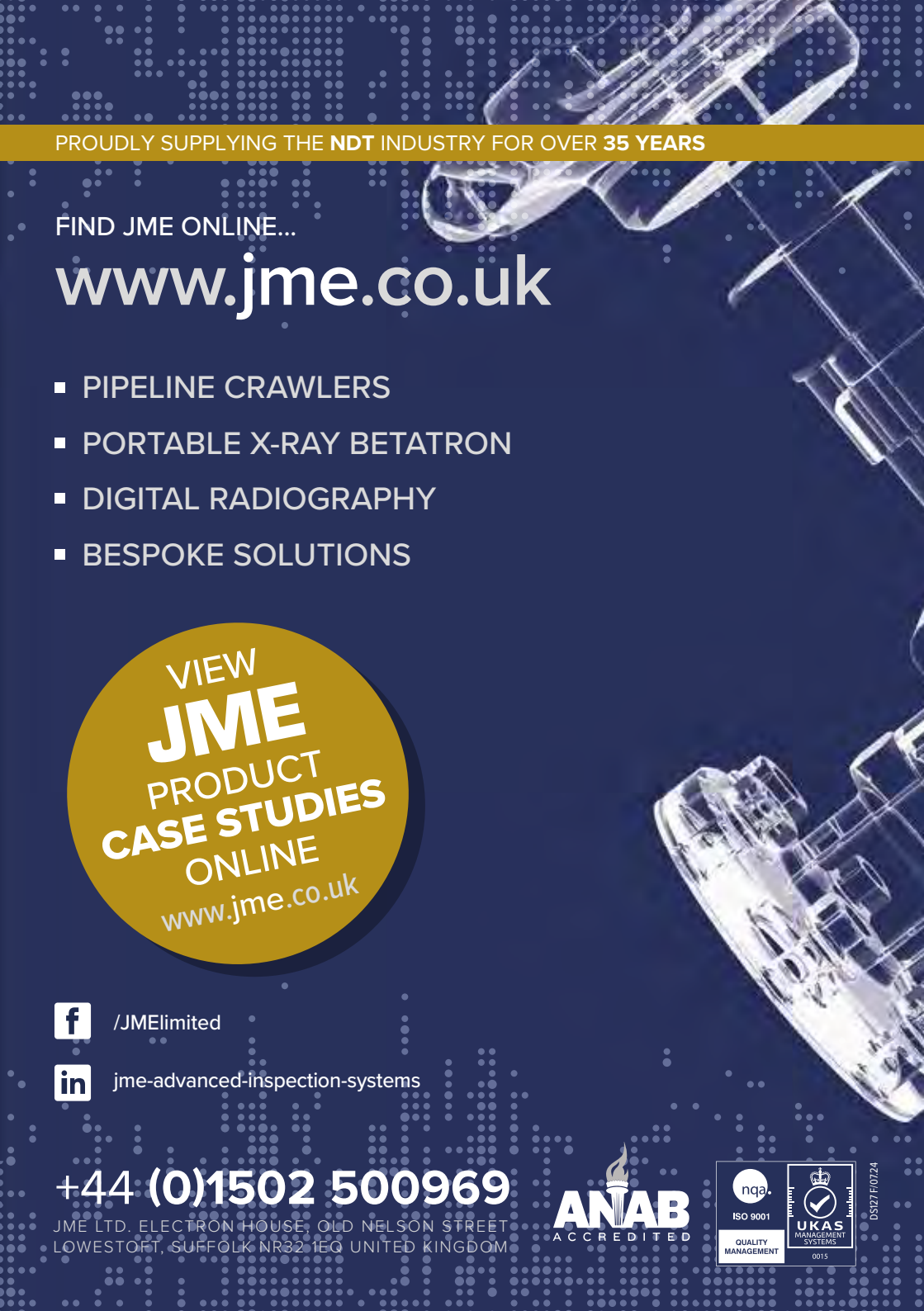
Amount of produce rejected if the **DFR** system were not in use in 2021

60,250kg Chicken was rejected:
Cost of £2500 per 1000kg

4,000kg Beef: Cost of £1500 per 1000kg

3,000kg Fish: Cost of £3000 Per 1000kg

FIND OUT MORE: DFR - PAGE 33



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