commercial availability of non-destructive test methods

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Outline

- Company background
- Products
  - Autoclam
  - Permit
  - Limpet
  - Septopod
- Services
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➢ Company background

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➢ Services
Company Background

Amphora Non-Destructive Testing Ltd.

Established in May 2002
Founded by staff of Queen’s University

Aim – To combine the leading edge research from within the university and technology to produce instruments for the construction industry to measure, drive and set the standards for concrete of the future.
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Autoclam
Autoclam Permeability System

Autoclam Application Areas

- Assess resistance to carbonation
- Predict salt induced corrosion of steel
- Monitor micro-cracking
- Assess sealants and surface treatments
- Measure the influence of special formworks
- Quality assurance of building materials
- Compliance testing of durability specification
Autoclam Permeability System

Autoclam Tests

- Sorptivity Test (20mBar Water)
- Water Permeability Test (500mBar)
- Air Permeability Test (500mBar)
Autoclam Permeability System

Fixing Methods

- Bonding
- Bolting
- Clamping

Horizontal
Vertical
Autoclam Permeability System

Test Areas

20mm – High flow (Masonry)
50mm – Normal flow
75mm – Low flow
Autoclam Permeability System

Advantages of the Autoclam

- Portable for in-situ testing
- Horizontal and vertical operation
- Stores up to 20 tests
- LCD display to recall any test stored
- Serial interface to download information to PC
- User friendly program
Autoclam Used in Practical Application

Testing Concrete Quality with Autoclam in Dayawan Nuclear Power Station by CRIBC
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Permit Ion Migration Test

Permit Application Areas

- Assess the resistance to chloride ingress
- Determination of chloride diffusion coefficient enables Service Life Prediction
- Assess the effectiveness of mineral admixtures improving chloride resistance
- Assess protection provide by surface treatments
- Compliance testing for chloride diffusion coefficient
Permit Ion Migration Test

Fixing
The Permit is bolted to the test area

Results
The data is stored in the controller and can be accessed during the test and at the end. Information is downloaded via an add-in program to Excel where it is tabulated and graphed.
Permit Ion Migration Test

Advantages of the Permit

- Measures ionic diffusivity for service life prediction
- Assesses susceptibility to chloride induced corrosion
- Non-destructive in situ test – no cores
- Tests can be completed in a day
- Can be used horizontally and vertically
In the Qingdao Bay Bridge, the effect of different methods for improving the resistance to the penetration of chloride ions of cover concrete was investigated by Tsinghua University.
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Limpet Pull-off Test

Purpose of the Limpet

- Measures the pull-off strength of cover concrete
Limpet Pull-off Test

Purpose of the Limpet

➢ Measures the bond strength of patch repairs

Substrate Concrete

Tensile force

Repair Material

Substrate Concrete
Limpet Pull-off Test

Limpet application areas

- Determine concrete strength in situ
- Assess progressive deterioration due to exposure
- Monitor effect of micro-cracking on strength
- Assess bond strength of patch repairs
- Measure influence of formwork on strength
- Quality assurance of building materials
- Compliance testing of strength specification
Limpet Pull-off Test

Test Types

50 mm bonded probe (standard 10kN)
37.5 mm bonded probe (high strength 15kN)

Results

Displayed on LCD during test
Maximum force held after failure
Limpet Pull-off Test

Advantages of Limpet Tester

- Quick strength test
- Portable in-situ testing (field or lab)
- Internationally approved test for patch repairs
- Holds maximum value after test failure
- Accurate and good repeatability
- Light - so can be used in any orientation
Limpet Pull-off Test

Orientations that can be used for the Limpet Test
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Septopod Structural Health Monitoring System

Purpose of Septopod

- Provide long term information on the performance of the cover concrete
- Monitor changes to the environment around the reinforcement
- Monitor onset and rate of corrosion
Septopod Structural Health Monitoring System

Advantages of the Septopod

- Lifetime durability monitoring
- Prediction of service life
- Capable of easy system expansion
- System can store large amounts of data
- Data can be accessed directly or via the internet
- User friendly software
Wireless Monitoring Using Septopod

- Solar Panel
- Data Logger
- Multiplex Unit
- Power Supply
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Services Provided by Amphora NDT Ltd

- Assessment of durability
- Compliance testing of specifications
- Structural Health Monitoring of structures
  - Installation
  - Training
  - Interpretation of data
  - Report
- Service life prediction (at the beginning and during the service)
- Training and education in durability, non-destructive testing and structural health monitoring
thank you for your attention